



**CANADA**  
4-H Ontario

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## 4-H ONTARIO PROJECT



**Dairy**

**REFERENCE MANUAL**

## Credits

### The 4-H Pledge

I pledge my Head to clearer thinking,  
my Heart to greater loyalty,  
my Hands to larger service,  
my Health to better living, for my club, my community,  
my country, and my world.

### The 4-H Motto

Learn To Do By Doing

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4-H Ontario is pleased to be able to provide project resource reference manuals for use by volunteers in clubs. 4-H Ontario screens and trains volunteers to equip them with the tools to serve as positive role models for youth. With so many topics to choose from, 4-H volunteers are trusted to use these resources to provide safe and quality programming while using their judgement to assess the appropriateness of activities for their particular group of youth. By downloading any 4-H resource, you agree to use it for 4-H purposes and give credit to the original creators. Your provincial 4-H organization may have restrictions on the types of 4-H projects or activities which can be completed in your region.

4-H Ontario grants permission to 4-H Volunteers to photocopy this 4-H project resource for use in their local 4-H program. All information presented in this Project Resource was accurate at the time of printing.



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The 4-H program in Ontario is supported by the Ontario Ministry of Agriculture, Food and Rural Affairs.



## 4-H Inclusion Statement

4-H in Canada is open to all\* without discrimination based on race, national or ethnic origin, colour, religion, sex, age or, mental or physical disability.\*\*

4-H is dedicated to providing a safe and inclusive environment that allows for universal access and participation. Where barriers to participation are identified, 4-H will, with reasonable accommodation, adapt programs, rules, policies, or expectations to reduce or remove the barriers.

Any accommodations, changes or exceptions will be assessed on an individual basis, taking into account the individual experience of the member and their family. The physical safety and emotional well-being of members, leaders, staff and volunteers is 4-H's highest priority, and is the ultimate consideration in final decisions.

4-H Canada and local 4-H organizations consider inclusion a priority. Leaders are encouraged to work with individuals and their families to identify and discuss accommodations as required, and to reach out to provincial or national office staff for help with unresolved concerns.

*\*This applies to youth members (ages 6 to 21), volunteers, leaders, staff and professionals.*

*\*\*Definition of discrimination as per Canadian Charter of Rights and Freedoms.*

## Déclaration sur l'inclusion des 4-H

L'adhésion aux 4-H au Canada est ouverte à tous les jeunes\* sans discrimination fondée sur la race, l'origine nationale ou ethnique, la couleur de la peau, la religion, le sexe, l'âge ou le handicap mental ou physique. \*\*

Les 4-H ont pour mission d'offrir un environnement sécuritaire et inclusif qui permet l'accès et la participation de tous. Lorsque des obstacles à la participation sont décelés, les 4-H adapteront, à l'aide de mesures d'adaptation raisonnables, les programmes, les règles, les politiques ou les attentes afin de réduire ou d'éliminer ces obstacles.

Toute mesure d'adaptation, modification ou exception sera évaluée au cas par cas, en tenant compte de l'expérience personnelle du membre et de sa famille. La sécurité physique et le bien-être émotionnel des membres, des animateurs et des animatrices, des membres du personnel et des bénévoles sont la priorité absolue des 4-H et constituent le facteur ultime à considérer lors de la prise des décisions définitives.

Les 4-H du Canada et les organisations locales des 4-H considèrent l'inclusion comme étant une priorité. Les animateurs et les animatrices sont encouragés à collaborer avec les personnes et leurs familles afin de définir et d'examiner les mesures d'adaptation, selon les besoins, et de communiquer avec le personnel du bureau provincial ou national pour obtenir de l'aide en cas de préoccupations non résolues.

*\*Ceci s'applique aux jeunes membres (âgés de 6 à 21 ans), aux bénévoles, aux animateurs, aux membres du personnel et aux professionnels.*

*\*\*Selon la définition de discrimination en vertu de la Charte canadienne des droits et libertés*

# Welcome to 4-H Ontario's Dairy Project!

The purpose of the 4-H Dairy Project is to provide you with general knowledge about the dairy industry. This project focuses on health, nutrition, genetics, reproduction, housing, marketing and the business of the dairy industry and will create an awareness of scientific, technological and environmental factors that can influence the health and wellness of dairy animals and the dairy industry as a whole.

## Objectives

- Increase your knowledge of the various segments and production techniques involved with the Ontario dairy industry
- Develop your skills in various segments of the dairy industry to ensure the best health possible for dairy animals
- Ensure that you know and understand the importance of the Canadian National Code of Practice for the Care and Handling of Dairy Cattle
- To start you on a path of continual learning about the dairy industry by directing you to more in-depth information
- Expand your skills in problem-solving, judging, communication and leadership
- To gain an appreciation for careers related to the dairy industry
- To learn the proper use of parliamentary procedure

## How to Use This Manual

### The Reference Manual:

The reference book is laid out into 6 sections:

	Meeting Topics	Suggested Speakers
<b>Section 1 - Health</b>	<ul style="list-style-type: none"><li>• What is healthy</li><li>• Calf Health - strong start</li><li>• Heifer and Dry Cow health</li><li>• Lactating Herd Health</li><li>• Common Diseases in the Dairy Industry</li><li>• Hoof Health</li></ul>	<ul style="list-style-type: none"><li>• Veterinarian</li><li>• Vet technician</li><li>• Calf specialist</li></ul>
<b>Section 2 - Nutrition</b>	<ul style="list-style-type: none"><li>• What is a ruminant</li><li>• The digestive system</li><li>• Feeding calves</li><li>• Feeding heifers</li><li>• Feeding Dry Cows</li><li>• Feeding the milking herd</li></ul>	<ul style="list-style-type: none"><li>• Nutritionist</li><li>• Visit a feed mill</li><li>• Calf nutritionist</li><li>• Feed sales person</li></ul>

	<b>Meeting Topics</b>	<b>Suggested Speakers</b>
<b>Section 3 - Reproduction and Genetics</b>	<ul style="list-style-type: none"> <li>• The reproduction systems (male and female)</li> <li>• Breeding with AI</li> <li>• Genetics and Genomic testing</li> <li>• Pregnancy and calving</li> <li>• Dairy breeds in Canada</li> <li>• Canadian Genetic Indexes</li> </ul>	<ul style="list-style-type: none"> <li>• AI technician</li> <li>• Semen salesman</li> <li>• Reproduction specialist</li> <li>• Vet</li> <li>• Elite breeder</li> </ul>
<b>Section 4 - Housing</b>	<ul style="list-style-type: none"> <li>• Cow comfort requirements</li> <li>• Housing calves</li> <li>• Housing heifers</li> <li>• Housing lactating cows</li> <li>• Milking systems</li> <li>• Housing feed</li> <li>• Environmental factors</li> </ul>	<ul style="list-style-type: none"> <li>• Animal Housing specialist</li> <li>• Contractors</li> <li>• Producers with new barns</li> <li>• Producers who have retrofitted</li> </ul>
<b>Section 5 - Marketing and Regulations</b>	<ul style="list-style-type: none"> <li>• Making and Collecting milk</li> <li>• proAction requirements</li> <li>• Quota system</li> <li>• Marketing milk</li> <li>• Niche markets</li> </ul>	<ul style="list-style-type: none"> <li>• proAction validator</li> <li>• Someone from the milk board/DFO rep</li> <li>• Organic dairy producer</li> </ul>
<b>Section 6 - Business</b>	<ul style="list-style-type: none"> <li>• Record keeping on the farm</li> <li>• Financial management</li> <li>• Working in Canadian Dairy</li> <li>• Succession planning</li> <li>• Technology on the dairy farm</li> </ul>	<ul style="list-style-type: none"> <li>• Financial planner or Bank Account Manager</li> <li>• Accountant</li> <li>• HR Consultant</li> <li>• Succession planner/consultant</li> </ul>

Each section can be used as a complete project, thus having six projects contained within this Reference Manual. A member could take this project for multiple years and learn different content each year. Each meeting contains Setting Objectives, Suggested Learning Outcomes, Roll Call questions, a suggested agenda, Topic Information, Activities and a Digging Deeper section. Activities should be used in combination with the discussion of topic information to teach members in a hands-on, interactive learning environment.

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# Including STEM in the 4-H Dairy Project

## What is STEM and why is it important?

Since 1915, 4-H in Ontario has engaged youth in science, technology, engineering, and math (STEM). This has traditionally meant a solid focus on agricultural science, mechanics, entrepreneurship, natural sciences and household science. Today, 4-H has grown to include rocketry, robotics, computer science, environmental sciences, and more. 4-H provides hands-on learning experiences to encourage learning about the world around us. Our lives are completely immersed in science and technology. Understanding how science, engineering, and technology impact our lives, solve problems and create new ones makes it easier to navigate our modern world.

In school, science classes need to cover a broad range of topics in a limited amount of time while STEM in 4-H allows members and leaders time to dig deeper into ideas and concepts and to spend as much time as desired to work on projects based on personal interests, questions, and skills.

STEM in 4-H allows a person to work on their own questions, design their own tests, create their own models, build their understanding, and share their work with others – learn to do by doing. That's what science and engineering are, trying to understand the natural universe and develop solutions to the problems faced in our world today. Science is inquiry that uses specific approaches and skills. But all learning is an inquiry process so working with science helps develop your learning muscles.

## STEM in 4-H Ontario Projects

As you work through the Dairy Project, you will see STEM integrated throughout the project within almost all of the activities provided. Examples of activities include 'Building a Digestive System, Building a Reproductive System, Performing a California Mastitis Test (CMT) and Culture Samples' amongst many others.

STEM can be challenging but it can also be fun! Be sure to try out the activities. Observe what works and what doesn't and how activities can be changed slightly to get different results. It's all a part of the STEM learning process!



# Planning a Meeting

Plan your meetings well. Review all the information well in advance so you are prepared and ready!

## Before Each Meeting

- Read the topic information and activities and photocopy any relevant resources for the members' Record Books.
- Be familiar with the topic information for each meeting. Think of imaginative ways to present the information to the members. Do not rely on just reading the information out loud. Review available resources, plan the meetings and choose activities and themes that complement the ages and interests of your members. Gather any equipment and/or resources that will be needed to complete the meeting.
- At least 12 hours of club meeting time is required for every project; including club business, specific project information and social recreation. The delivery format for that material is left to the discretion of the leaders. Before each meeting, create a timeline to ensure that you are providing an adequate amount of instructional time for club completion. Note: the best practice recommendation is that a club have multiple meeting times for each project. Included on the following page is a Leader's Planning Chart to help with the planning of meetings. In addition to the chart, keep track of what went well and what could be changed next time. That way, each time this project is run, the content of the meetings can be different!

## When planning each meeting, a typical 4-H meeting agenda should include the following:

- Welcome & Call to Order
- 4-H Pledge
- Roll Call
- Parliamentary Procedure:
- Secretary's Report
- Treasurer's Report (if any)
- Press Report
- New Business: local and provincial 4-H activities/opportunities, upcoming club activities
- Meeting content and activities
- Clean-up
- Social Recreation and/or refreshments
- Adjournment

## Judging and Communications

Each meeting must include either a judging or public speaking activity.

- Judging gives the members an opportunity to use judging techniques as part of the learning process. Through judging, members learn to evaluate, make decisions and communicate with others. They also develop critical thinking skills, confidence and self-esteem. Many examples are used in this reference manual but use your imagination! As long as members are setting criteria and critically thinking about where items fit within that set of criteria, they are learning the basic skills of judging!
- A communications activity has been provided for each meeting but can be included in the Roll Call or social recreation time. These activities do not need to involve the topic of dairy as the outcome is more about understanding the concepts of effective communication.

## Electing Your Executive

Elections can be chaired by a youth leader, senior member or club leader. The person chairing the elections is not eligible for any positions.

### Procedure:

1. All positions are declared vacant by the chairperson, who indicates this by saying "I'd like to declare all positions vacant."
2. The group decides on the method of voting (i.e. show of hands, ballot or standing).
3. The chairperson accepts nomination from members for each position being filled. Nominations do not require a seconder. Nominations are closed by motion or declaration by the chairperson.
4. Each member nominated is asked if he/she will stand for the position. Names of members who decline are crossed off.
5. Voting takes place by selected method and majority rules (i.e. member with most votes).
6. Announce the name of the successful member. Offer congratulations and thank all others that ran for the position.
7. If ballots are used, a motion to destroy the ballots is required and voted on.

## Steps in Making a Motion

The motion is a very important key to having good meetings. Motions are a way of introducing topics for discussion and allowing each member to speak and vote. Any member can make a motion.

### Steps in Making a Motion:

1. Address the chairperson (i.e. raise your hand).
2. Wait for the chairperson to acknowledge you.
3. Make the motion: "I move that..."
4. Another person seconds the motion: "I second the motion."
5. Chairperson states the motion.
6. Chairperson calls for discussion of the motion.
7. Chairperson restates the motion.
8. Chairperson calls the vote: "All in favour? Opposed?"
9. Chairperson announces the result of the vote: "Motion carried" or "Motion defeated."

**Leader's Planning Chart**

Mtg. #	Date/Place	Topics Covered	Activities	Materials Needed

## **As a club volunteer your responsibilities are to:**

- Be a Volunteer in Good Standing by completing the volunteer screening process, attend a volunteer training session and adhere to the 4-H Code of Conduct.
- Notify the local association of the club, arrange a meeting schedule and participate in club meetings, activities and the Achievement program, assuring that all meetings and activities are accessible and inclusive for all participants.
- Review the project material in the Reference Manual to familiarize yourself with the information and adapt it to fit your group. Be well organized and teach the material based on your group's age, interest and experience level.
- Organize the club so members gain parliamentary procedure, judging and communication skills.
- Ensure that members are registered for the club using the online registration system.
- Review the Participant Agreement Form (PAF) that members will have completed when registering online. Ensure that all members, leaders and parent helpers know the appropriate actions during any emergency. Check with members for any food allergies or dietary restrictions and plan snacks accordingly.

## **As a club member your responsibilities are to:**

- Participate in at least 2/3 of his/her own club meeting time. Clubs must have a minimum of 12 hours of meeting time.
- Complete the project requirement to the satisfaction of the club leaders.
- Take part in the project Achievement Program.
- Fill in and complete the Record Book.
- Complete any other project as required by the club leaders.
- Adhere to the 4-H Code of Conduct at all times.

## **Achievement Program Ideas/Suggestions**

- Have members show their project animal at a local show/fair.
- Have members create an exhibit or enter a float in the parade at a local fair/show.
- Have members make a presentation at school about the 4-H Dairy Project and/or their project animal if they had one for this project.
- Have members make a presentation at school or a community event about how to be safe around cattle.
- Create a skit about field crops and farming and perform it at school, at a senior's home, at another organization's meeting, etc.
- Have members assist at a foodbank in your area.
- Attend the 4-H Ontario Dairy \$ense conference.

## Special Projects/Digging Deeper Activities

These projects are done outside of meeting time and are for members interested in doing more - often senior members. Its up to you as the leader to decide if you will require members to complete a Special Project/ Digging Deeper Activities for club completion. Some ideas include:

<b>Health</b>	Strong Start	Select a newborn heifer and follow it until weaning. Make note of things like vaccinations, diet, growth and any complications. Check in with the calf (and if not your calf the farmer) at least on a weekly basis until weaning. Keep a log of your findings!
	Herd Health	Develop a health log for treated animals. Consider things like who was sick, the cause, how they were treated, the results, the cost and the date treated (challenge older members to follow proAction record recommendations)
	Creating an SOP	Develop the required SOP's for handling and treating animals under proAction. This includes animal health practices (dehorning, vaccination, teat removal), euthanasia, dealing with down cows
	Vet ride along	Ride along with the vet for a day. Go with a list of questions you want answered. Write a blog or summary of your day. What did you treat? What calls did you go on? What surprised you?
	Create a resource book of dairy diseases	Include pictures, descriptions, common causes and treatments of common health issues on the farm.
<b>Nutrition</b>	Milk vs Milk replacer	Keep track of two different calves. Feed one whole milk and the other milk replacer. What are the differences? What are the similarities? Track the growth and weight of the two calves, and present your findings at a meeting
	Creating a balanced ration	Try to build a balanced ration with the feed on your dairy. Alternatively determine if your current ration is balanced. If not make suggestions on how to balance it
	Comparing systems	Visit a few different dairies. Compare similarities and differences in feeding programs. Visit a farm with TMR, a farm that top dresses, a robot farm, a free stall and a tie stall. Track the differences and report them to your club.
	Feeding throughout a life cycle	Interview a farmer about how his herd's nutrition changes through out their lives. Start from birth and go to dry cows.

<b>Genetics and Breeding</b>	Canadian Dairy Breeds	Select a dairy breed and research them. Learn about the history of the breed, the popularity, and the benefits of using that breed, what makes them unique and why you like them. Challenge yourself by choosing a breed not in your barn!
	Build a family tree	Research your 4-H calf and build a detailed family tree. Use free animal inquiry systems at Holstein Canada or at Lactanet/CDN. How many generations can you go back?  For Senior members follow a recessive trait that your animal might have. Where did your calf get the recessive gene?
	Select the bulls best for you	Select a few breeding age heifers and look at their genetic evaluation. Using a bull proof from a local provider, who would you breed each animal to and why? Present your top picks to the group.  For senior members take it a step further, what would the Parent Average (PA) be for that breeding?
	Spend a day with an AI technician	How does the technician breed animals? Go with a list of question for the technician like: who is their favourite bull, what is their success rate?  What did you learn? Provide a report to your club!
<b>Housing</b>	Build your dream barn	If you could build your own dairy facility, what would you include? Think about barn type for all stages of life, milking system and layout. Draw a map and present what you would do to the club
	Compare milking systems	Compile a pros and cons list of the different type of milking systems. What one would you choose?
	Paying rent	If a single cow had to pay rent for the month, what would the cost be? Consider bedding, water, feed and if you want to get detailed hydro! How do you think this will change throughout the seasons?
	Visit and compare	Visit at least two dairy farms and look at the housing situations. For younger members, select a specific age group (or part of the facility), for older members try to compare the entire facility.
	How much storage will you need	Determine how much feed storage or manure storage you need per year. Several online calculators can help you!

<b>Marketing and Business Regulations</b>	proAction validation	Walk through a self-evaluation for your proAction requirements. Select a pillar/module and work through the requirements. Suggested modules are Animal care, Quality Milk or Traceability
	International Trade	Choose one of the international agreements (CUSMA, CETA or TPP). Research the effect it has or will have on the Canadian dairy Industry. Do you think the dairy we have given up was worth the gain in other areas?
	Creating Milk	Create a poster on how milk is made. Be sure to include a diagram of an udder!
	Marketing Milk	Create a poster campaign on the benefit of milk in the diet. How would you encourage your friends to drink milk!
	Dairy preferences	Survey your class or club on their preferred dairy products. Do you notice any trends?
	Dairy and dairy alternative	Go to the grocery store and compare cheese made from real dairy and an alternative cheese (nut cheese) what are the ingredient differences and similarities
	Create a template	Choose something that a good manager should keep record of. Create a template that can be used on farm to record the needed data
	Set a budget	Create a budget for yourself to get through the week. Keep in mind your weekly expenses and allowance.  Senior members: determine how much it costs for you to live for 1 week in your current situation
	Choosing a career	If you could not work on farm, what would you do? Research a job within the dairy industry and provide a report to the club on the daily tasks of that job.
	Reading reports	Take an in depth look at your milk recording reports or classification reports. What did you learn about your farm? What management decisions would you make now that you know this information?

#### Tour & Guest Speaker Ideas

- See suggestions in the 'How to Use this Reference Manual' section on pages 4 & 5.

# The 4-H Pledge

I pledge

My head to clearer thinking,

My heart to greater loyalty,

My hands to larger service,

My health to better living,

For my club, my community,

my country, and my world.



**CANADA**  
4-H Ontario



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#### Health

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- Holstein Canada; Info Holstein Jan/Feb 2018 Back to Basics [https://www.holstein.ca/PublicContent/PDFS/Info\\_JanFeb\\_2018.pdf](https://www.holstein.ca/PublicContent/PDFS/Info_JanFeb_2018.pdf)
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- OMAFRA, accessed 23/02/20 - [http://www.omafra.gov.on.ca/english/livestock/dairy/facts/info\\_sand-bed.htm](http://www.omafra.gov.on.ca/english/livestock/dairy/facts/info_sand-bed.htm)
- OMAFRA, accessed 23/02/20 - <http://www.omafra.gov.on.ca/english/engineer/facts/15-017.htm>
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- Government of Canada - Types of dairy barns, accessed 03/03/2020 - [https://www.dairyinfo.gc.ca/index\\_e.php?s1=dff-fcil&s2=farm-ferme&s3=db-el](https://www.dairyinfo.gc.ca/index_e.php?s1=dff-fcil&s2=farm-ferme&s3=db-el)
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- Government of Canada, - <https://www.international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/cusma-aceum/summary-sommaire.aspx?lang=eng>
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- Dairy Processors Association of Canada - <http://www.dpac-atlc.ca/hot-topics/international-trade/ceta/>
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- Canadian Dairy Information Centre, accessed 08/03/2020 - [https://www.dairyinfo.gc.ca/index\\_e](https://www.dairyinfo.gc.ca/index_e)

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## Resources - Images:

### Nutrition

- Farm animals: <https://www.freepik.com/free-photos-vectors/nature>>Nature vector created by freepik - [www.freepik.com](http://www.freepik.com)</a>
- Human: <https://www.freepik.com/free-photos-vectors/background>>Background vector created by rawpixel.com - [www.freepik.com](http://www.freepik.com)</a>
- Milk carton: <https://www.freepik.com/free-photos-vectors/food>>Food vector created by brgfx - [www.freepik.com](http://www.freepik.com)</a>

### Breeding and Reproduction

- Cow: <https://www.freepik.com/free-photos-vectors/nature>>Nature vector created by freepik - [www.freepik.com](http://www.freepik.com)</a>
- Cell: <https://www.freepik.com/free-photos-vectors/background>>Background vector created by brgfx - [www.freepik.com](http://www.freepik.com)</a>
- DNA: <https://www.freepik.com/free-photos-vectors/abstract>>Abstract vector created by studiostock - [www.freepik.com](http://www.freepik.com)</a>
- Female Repro Tract: [https://aces.nmsu.edu/pubs/\\_b/B212/welcome.html](https://aces.nmsu.edu/pubs/_b/B212/welcome.html)
- Ayrshire photo: [https://ayrshire-canada.com/en/the-ayrshire-breed/\\_\\_\\_trashed/](https://ayrshire-canada.com/en/the-ayrshire-breed/___trashed/)
- Brown Swiss: Courtesy of Holstein Canada
- Canadienne: [http://www.vachecanadienne.com/the\\_canadienne\\_cow.aspx](http://www.vachecanadienne.com/the_canadienne_cow.aspx)
- Milking Shorthorn: <http://milkingshorthorn.ca/oceanbrae-pingerly-betty-named-2019-cow-of-the-year/>
- Holstein: <https://www.progressivedairyCanada.com/topics/a-i-breeding/albert-cormier-s-eye-for-elite-cattle-influenced-the-holstein-breed-around-the-world>
- Guernsey: <http://bovin.qc.ca/en/>
- Jersey: <https://jerseycanada.com/>

### Housing

- Calf hutch picture courtesy of Holstein Canada
- Monoslope barn picture from Summit Livestock Facilities - <https://www.summitlivestock.com/beef/gallery/craig-doug-sandven/?ftr=all>
- Gable roofed barn picture from - <http://angssoftware.blogspot.com/2018/06/dairy-cow-shed-designs.html>
- Animal Care Assessments - proAction - <https://www.dairyfarmers.ca/proaction/resources/animal-care>
- Rotary parlour - Science Direct - accessed 04/03/20 - <https://www.sciencedirect.com/science/article/pii/B9780123858818000082>

## General Activity: Label the Parts

**Purpose:** To teach members the names of the parts of the cow.

**Age Group:** All ages

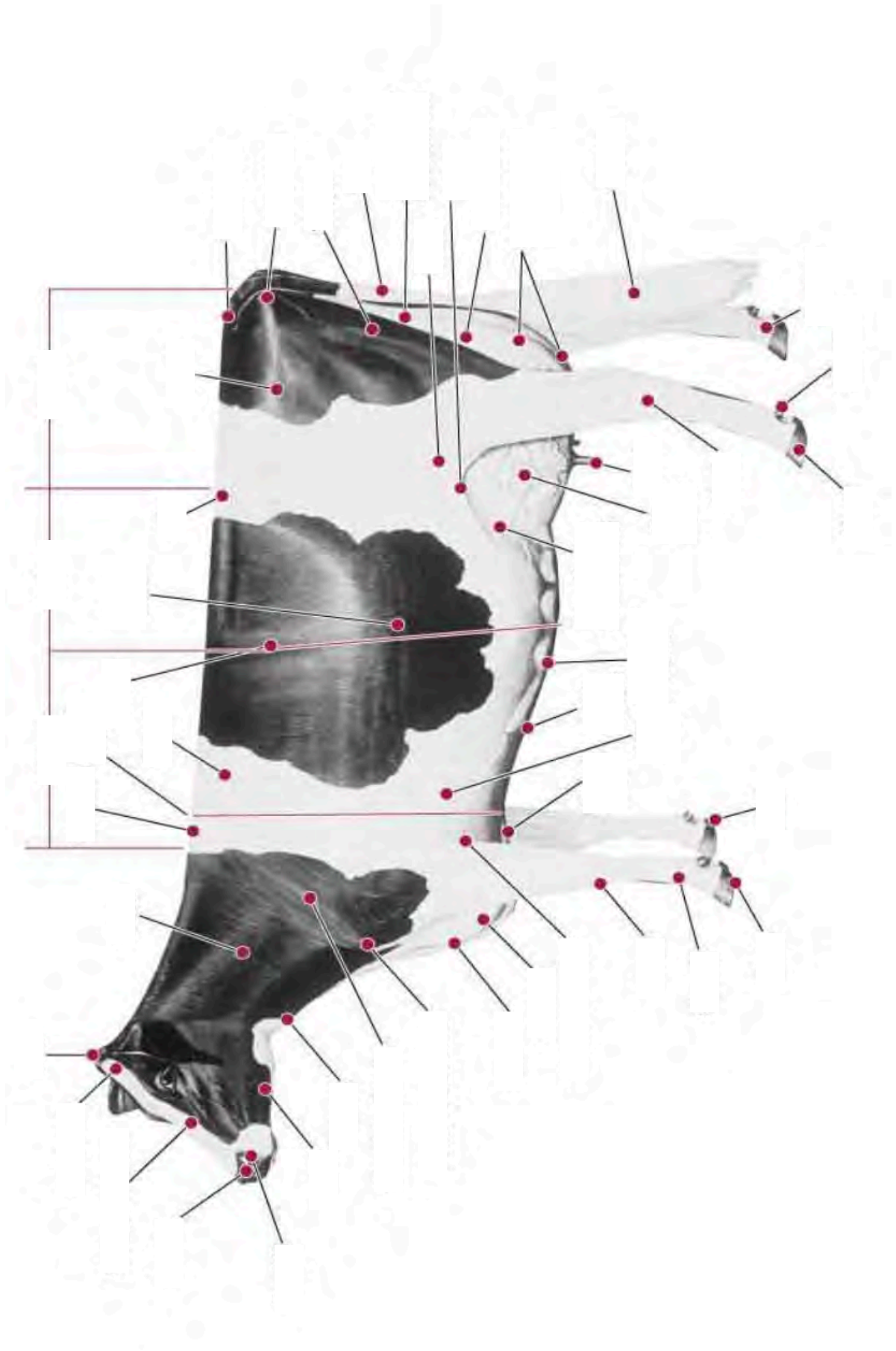
**Time Allotted:** 15 minutes; this is an activity that should be a component of every dairy club

**Preparation & Equipment/Instructions:** There are a few ways to do this activity – and an activity that can be done in different ways over several meetings - for example, focus on one section of the body at a time.

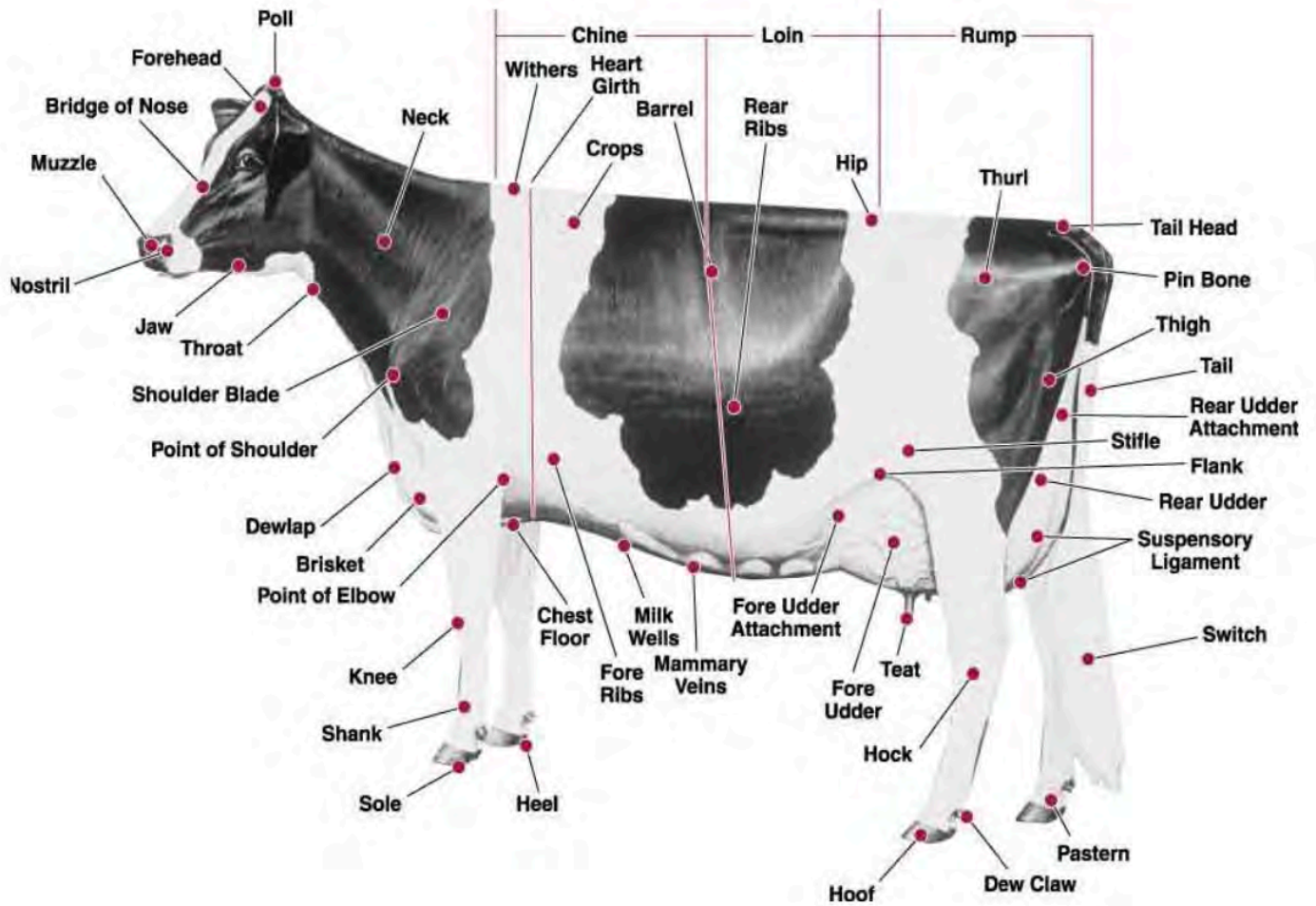
### Answers:

1. Members are given “Label the Cow” worksheets that are found on the following page and are asked to label the parts.
2. Members could be asked to point out specific body parts on a live animal or poster of a live animal. Conversely, if the leader points to a location on the animal, the members could be required to name the part.
3. Members could be given slips of paper and be asked to put them on the proper location on the animal.
4. If a quiet animal is available, put Post-It Note numbers on different parts of her and ask members to write down the body part that corresponds to each number.

Label the Cow Worksheet



# Answers



## Vocabulary

<b>Antibodies</b>	Blood proteins that are produced by the body in response to a germ (specifically antigens) and then work to fight disease by building immunity.
<b>Antibiotics</b>	A drug or medication that stops infection or disease caused by bacteria.
<b>Bio-Security</b>	Measures that prevent the introduction and spread of disease
<b>Clinical Disease</b>	Symptoms of the disease are outwardly evident that an animal is sick.
<b>Colostrum</b>	The first milk that a cow gives after calving. It has high levels of antibodies to help protect the calf from disease early in life.
<b>Digital Dermatitis</b>	An infection of the hoof by different bacteria and is a cause of lameness.
<b>Immunity</b>	Protection from infectious diseases caused by antibodies in the body that fight the disease.
<b>Infectious Disease</b>	Diseases that can be spread from one animal to another animal.
<b>Inhibitors</b>	Substances other than bacterial culture that do not occur naturally in milk and inhibit the growth of bacteria (drug residues in milk).
<b>Intramuscular</b>	An injection into the muscle
<b>Intravenous (IV)</b>	An injection made into the bloodstream of an animal
<b>Mastitis</b>	An infection of the udder
<b>Metabolic Disease</b>	Diseases which are caused by an imbalance between body reserves or consumption and metabolic demand (calcium, energy, magnesium)
<b>Negative Energy</b>	A state when a cow's body is using up more energy than it is consuming in its feed. Body fat reserves are used to obtain necessary energy
<b>Non-infectious disease</b>	Disease that cannot be transmitted from one animal to another
<b>Parasite</b>	An organism that lives in or on another animal and benefits (housing/food) at the expense of its host.
<b>Respiration Rate</b>	Number of breaths in one minute.
<b>Somatic Cell</b>	Somatic cells are white blood cells that destroy bacteria, fight infection and repair damaged tissue in the udder.
<b>Subclinical Disease</b>	An animal is sick but has no obvious outward signs of her illness.
<b>Subcutaneous</b>	Under the skin injection
<b>Topical</b>	Applied on to the skin
<b>Vital Signs</b>	Clinical measurements that indicate the state of essential body functions.
<b>Zoonotic Disease</b>	Disease that can be passed between animals and humans





Section 1 **Health**



## Meeting 1 - Healthy Calves & Cattle

### Setting Objectives:

To create an understanding of why good health in a dairy herd is imperative and how to identify health and disease issues.

### Suggested Lesson Outcomes:

- To learn what is normal for animal health
- To learn about vital signs, body condition score and normal animal behaviour
- To understand the importance of having healthy animals

### Suggested Roll Call Questions:

- Why is animal health important?
- What do you think a healthy animal looks like?
- What causes stress to cows?

### SAMPLE MEETING AGENDA

Time: 1 hour 40 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Taking vital signs</li><li>• Body Condition Scoring</li><li>• What makes animals healthy</li><li>• Stressors on animals</li></ul>	45-50 minutes + Activities
At Home Activity		5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### What is Healthy?

One way to help determine if an animal is healthy or sick is to check their vital signs. Vital signs include temperature, respiration rate and heart rate. The respiration rate refers how many times an animal takes a breath in one minute. The heart rate (pulse) refers to how many times the animal's heart beats in one minute. A cow or calf's vital signs can be a range of values. They can change, just like a person's do, due to the time of day, the weather, the animal's excitement and activity level and whether or not she has been out in the sun.

Vital Sign	Ideal	Healthy Range
Temperature	38.6oC	38.1-39.5oC
Respiration Rate	30 breaths per minute	10 - 30 breaths per minute
Heart rate	50 beats per minute	40 - 70 beats per minute

### Biosecurity Break!

Make sure that you wash your hands before and after you take an animal's vital signs. You can spread diseases from one animal to the next on your hands.

## Body Condition Scoring

Since a cow cannot step on a scale or mark her height on the barn door, it is important to have another way to measure the body condition of a cow. Body condition is like a secondary vital sign to help determine if she is healthy. Body condition scoring helps you measure, by look and feel, the amount of body fat on a cow. Fat is an energy reserve for a cow, like the battery in a plug-in alarm clock. The cow only uses it when the "power" goes out. In other words, sometimes cows need this extra 'battery' (fat reserve) when they are using more energy than they are eating in their feed. This is called a negative energy balance.

The most common time a cow is in a negative energy balance state is in early lactation when she is milking more energy out than she is taking in. It takes 1kg of fat to make 7kg of milk. Therefore, you have to make sure that the heifer or dry cow's body has enough stored fat to produce milk in early lactation. You can rate on a scale of 1 to 5 how much fat the cow has on her body using body condition scoring. A score of one is a very thin cow. A score of five is a very fat cow. Dry and calving cows should have a score of 3.0 to 3.5. A farmer needs to take corrective action if a cow's body condition score goes below 2.0 according to the National Code of Practice.

Cows with a body condition score higher than 3.5 will usually have more health disorders, such as retained placentas and calving problems. Often, fat cows have a poor appetite right after calving so they eat less and can get ketosis and fat in the liver. Cows that are too fat will go "down" at calving. A "downer" cow is one that lies down and has difficulty or is unable to stand or remain standing. Although "downer" cows remain alert, they may never get back up.

Body condition scoring can be done by pressing fingertips against the pin bone, hipbone and backbone of a cow as well as gripping the area below the loin where the short ribs protrude from the cow's body, to feel the amount of fat cover. With a lot of practice, body condition scoring can be done in 10-15 seconds per cow and it provides a lot of information.

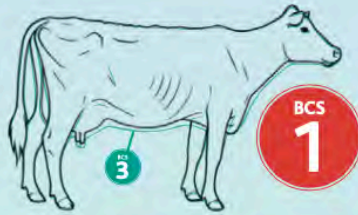
### Discuss It!

Why is body condition scoring so important?

### Experience It!

Invite a veterinarian to your meeting to have them evaluate a group of cows in the barn. See if the body score you would assign each cow matches the vet's evaluation of the cow!

# Evaluating the outcome of BCS



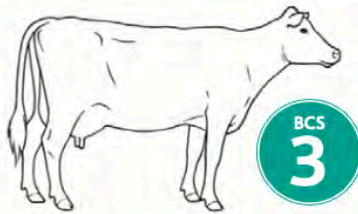
## Emaciated

Ends of short ribs sharp to touch. Loins have prominent shelf-like appearance. Individual vertebrae of backbone are prominent. Hook and pin bones are sharply defined and angular in appearance. Sunken and hollow on either side of tail head, and vulva is prominent.



## Thin

Ends of short ribs can be felt, but less prominent than BCS 1, and less of a shelf-like appearance. Hook and pin bones still prominent, but more round and smoothed over. Both sides of tail are still fairly sunken and hollow, but vulva is less prominent.



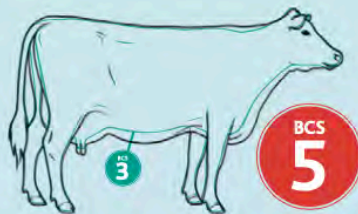
## Average

Short ribs can be felt with moderate pressure. Overhanging shelf-like appearance gone. Hook and pin bones are visible, but smooth and rounded, and a fat pad is palpable. Both sides of tail are somewhat hollow, but better filled out than previous BCS, no evidence of fat deposits.



## Heavy

Short ribs not visible and only felt with firm pressure and have a rounded over appearance. Ridge of the backbone flattening over loin, rump and chine areas. Area between hooks and pins almost flat. Sides of tail no longer hollow and some fat deposits are palpable.



## Fat

Short ribs cannot be seen or felt. Vertebrae in chine, loin and rump are not visible. Obvious fat deposits around the tailbone and over the ribs. Thighs curve out and the brisket and flanks are heavy.



The evaluation chart illustrations above are a guide for farmers (Code of Practice for the Care and Handling of Dairy Cattle). For more detailed illustrations to evaluate BCS, you can consult the following resources:

- Learn to Score Body Condition, PennState Extension website.
- The 5-point body condition scoring system, Elanco animal health.

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## Healthy Animals Act...Healthy!

In addition to vital sign and body condition scoring assessments, the most obvious signs of health or disease can be observed by watching the behaviour and general appearance of an animal. There are several physical characteristics of healthy cows and calves:

- Eat and drink well
- Active (energetic)
- Shiny, smooth hair
- Bright eyes and alert ears
- Normal manure and urine
- Milk production is normal in milking cows
- Older heifers and cows show regular heats

It is important to keep a close eye on your animals all of the time so that you know when an individual animal's behaviour changes to indicate that it is sick. Now that you know about the signs of healthy animals, its time to learn about when animals get sick.

### Keeping Cattle Healthy - at all ages and stages!

Just like people change throughout their lifetime, so do cows. At different ages, animals have special needs to ensure that they are kept healthy.

### Less Stress Equals Healthier Cattle

Cattle of all ages are healthier if they are kept in a good environment and fed properly. Reducing sources of animal stress will help to ensure that animals of all ages are more resistant to diseases.

There are many forms of stress:

- Environmental Stress
  - Humidity
  - Drafts
  - Dust
  - Manure gases (hydrogen sulphide, carbon dioxide, carbon monoxide, methane and ammonia)
  - Temperature changes
  - Airborne bacteria, viruses, fungi, etc.
- Behavioral Stress
  - Overcrowding
  - Mixing animals from different sources
  - Social stress - bullying by dominant cows
  - Nutrition
    - Imbalance or deficiency of nutrients
  - Production Stress
    - Heavy production

Any combination of these stresses can suppress an animal's immune system. If an animal is exposed to a disease-causing agent (bacteria, virus) at a time when its immune system is not able to function at its best, it is likely to be infected with the disease and become very sick. Its body may take longer fighting the disease, meaning that the animal takes longer to recover. Keep stress to a minimum!

## Check It Out!

Discover Canadian agriculture by taking a virtual farm tour (video) produced by Farm & Food Care at: <http://www.farmfood360.ca/> There are videos that highlight dairy farms in Ontario in addition to many other videos that showcase other sectors of the agriculture industry.

## Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1: Taking Vital Signs

<h1 style="text-align: center; color: white;">Do</h1>	<p>Time: 15-20 minutes</p> <p>Materials needed: record keeping sheet, rectal thermometer, lube/jelly, timer (if thermometer does not automatically time), recording device</p>	<ul style="list-style-type: none"> <li>▪ Split into groups with both older and younger members</li> <li>▪ Assign each group a calf and take the vital signs</li> </ul> <p><b>To take vital signs:</b></p> <p><b>Temperature</b></p> <ol style="list-style-type: none"> <li>1. Restrain the calf.</li> <li>2. Make sure the thermometer is shaken down.</li> <li>3. Put Vaseline on the end of the thermometer and insert it 3/4 of its length into the calf's rectum.</li> <li>4. Hold the thermometer in the rectum and for temperature to remain constant or for thermometer to beep.</li> <li>5. Remove the thermometer. Wipe it clean and read it.</li> <li>6. Wash the thermometer with soap and water.</li> </ol> <p>TIP: Attach string to the thermometer to avoid losing the thermometer in the calf</p> <p><b>Respiration Rate</b></p> <ul style="list-style-type: none"> <li>▪ Count the number of breaths an animal takes in one minute by placing your hand on her ribs or flank.</li> <li>▪ Or count the number of breaths in 20 seconds and multiple by 3 to get the number of breaths per minute</li> </ul> <p><b>Heart Rate</b></p> <ul style="list-style-type: none"> <li>▪ Place your fingertips underneath of the calf's jaw or between her ribs to feel the heartbeat for one minute. Count the beats.</li> <li>▪ Or count the number of beats in 20 seconds and multiple by 3 to get the number of breaths per minute.</li> </ul>
<h1 style="text-align: center; color: white;">Reflect</h1>		<p>The objective is to learn how to take vital signs of animals. This will help determine which animals may be sick and needing extra attention.</p>
<h1 style="text-align: center; color: white;">Apply</h1>	<p>Meet back as a group - prompts</p>	<p>Why is it important to look at animal vital signs? How did the vital signs differ between calves? Were the calves' vital signs in normal range How do calves vital signs compare to humans?</p>

## Vital Signs worksheet

	Calf #1	Calf #2	Calf #3
Heart Rate			
Respiration Rate			
Temperature			



## Activity #2: Body Condition Score

<b>Do</b>	Time: 15-20 minutes  Materials needed: Cows, recording sheet, pen/pencil, guide to body condition scoring dairy cows	<ul style="list-style-type: none"><li>• Split into groups with both older and younger members</li><li>• Take the BCS of 5 different animals, at different stages of their lactation.</li><li>• Fill out the recording sheet. What can we tell about these cows?</li></ul>
<b>Reflect</b>		The objective is to learn how to take body condition scores of milking cows. This will help determine which animals may be sick and needing extra attention. It will also tell you how well their nutrition program is working.
<b>Apply</b>	Meet back as a group - prompts	Are there any animals that are too thin or too fat?  Why do you think that animals who all have access to the same feed may have different BCS?  Why could the stage of lactation affect the animals body condition score?

Cow ID number	DIM	BCS	Why did you score her at that level (discuss fat coverage and visible features)





## Meeting 2 - Getting Calves Off to a Good Start

### Setting Objectives:

To learn the importance of calf care and health.

### Suggested Lesson Outcomes:

- To learn about the importance and handling of colostrum
- To learn about the different types of dehorning methods and why dehorning is a part of most management practices
- To explore the different types of diseases that can affect calves in the first few weeks of life

### Suggested Roll Call Questions:

- What do you think kick starts a calf's life?
- What type of dehorning do you use on your farm?
- Name a disease or parasite that can affect calves

### SAMPLE MEETING AGENDA

**Time: 1 hour 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"> <li>▪ Limiting calf disease</li> <li>▪ The importance of colostrum</li> <li>▪ Dehorning methods, pros and cons.</li> <li>▪ Common calf diseases</li> </ul>	45-50 minutes + activities
At home activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Off to a Good Start - keeping calves healthy

Preventing calves from getting sick is very important. It means fewer vet bills and less time spent caring for sick calves. It also means that calves spend more time and energy growing than they do fighting germs.

## There are five main management tips to help you control and prevent calf diseases:

1. Remove the source of the disease
2. Remove the calf from the contaminated environment
3. Feed colostrum
4. Vaccinate the calf
5. Reduce stress

## The procedures below will help make sure that all of the five management strategies are met:

- Vaccinate the cow for E. coli and Rotavirus scours and/or other diseases (as advised by your veterinarian) before she calves. Her body will then build disease-fighting antibodies that will be passed to the calf through colostrum.
- Clean calving place - a calf must be born in a clean place. A newly bedded maternity pen and a shady, grassy area away from other cows are both good places to be born.
- Make sure that manure does not come into contact with a calf's nose
- Bedding should provide disease control, comfort and footing
- There should be 4 to 6 inches of clean bedding in the calving area
- Within half an hour of birth, calves should be removed from the calving area to an area for calves only where no other dairy animals are being housed
- Remove soiled bedding and add fresh straw or shavings after each calving
- Keep cows clean - Cows and their udders should be clean and free from manure so that the cow is not a source of infection for her calf
- Navels - Keep them from becoming infected. Examine navels for swelling and reaction to pain at feeding time until the calf is two weeks old and the umbilical area has healed
- Feed colostrum - Feed calves 4 litres (40 kg calf or 10% of their body weight (i.e. 3 litres to small breeds) of high-quality colostrum. Feed the first colostrum feeding within 60 minutes of birth. Colostrum gives calf important antibodies to help her fight disease but the calf's body can only absorb these antibodies for a short period, with the most antibodies being absorbed during the first two hours of her life. After 24 hours, she can no longer absorb antibodies from colostrum.
- Keep calf housing clean and dry - Do not let germs and dampness find a home in your calf housing. Make sure the pens or hutches are always dry and freshly bedded. Clean old pens with disinfectant and let the area rest between calves to kill germs that could be spread to the next calf.
- Do not crowd your calves - When calves are crowded, it is easier for germs to travel. Calves need at least 1.2m x 2.4m of space each.
- Feed calves well - Do not overfeed calves or give them bad feed. Also, keep the feeding pails and other equipment clean. Giving your calf a dirty bottle is like you eating off a dirty plate!
- Be a good caregiver - Remember to be patient with young calves and be alert to changes in their behaviour. You have to be willing to put in the extra time calves need to thrive.

### Do It!

Create a standard operating procedure for newborn calf care.

### Talk About It!

What disease control protocols do you have in place at your farm?

## Colostrum Management

Colostrum is an important part of jump-starting a calf's life. The dam's antibodies help protect the calf while the calf's own immune system develops. High quality colostrum makes the calf more resistant to disease. When dealing with colostrum, it is important to follow some important steps.

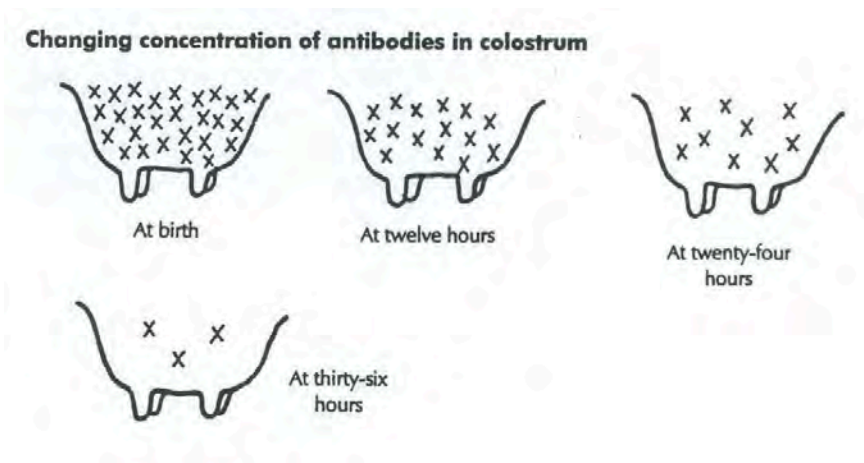
- Wash your hands to get rid of germs before collecting the colostrum
- Preparing the dam's udder should follow the same procedures as animals going through the parlour: this keeps the colostrum clean and free of contaminants
- Collect the colostrum from the dam as soon as you can after the calf is born, this will ensure the quality is the highest. Colostrum should be at least 22% on the brix scale read on a refractometer. If a cow's colostrum is lower than that, feed thawed previously frozen colostrum or colostrum replacement (powder).
- Disinfect bottles and nipples.

Not all colostrum is made equal. The normal appearance of colostrum should be bright yellow, sticky and sweet. It's important though to measure the quality of colostrum using a refractometer as colour and viscosity are poor predictors of the immunity giving qualities of colostrum. Colostrum that is poor quality can result from several things.

- The dry period was too short (less than 4 weeks)
- The cow was milked or leaked heavily before calving
- The cow's teats and udder were not cleaned
- The cow is new to the herd and hasn't built up antibodies against the diseases within the herd
- The cow has mastitis or another disease
- The cow's genetic background

A calf should receive colostrum soon after it is born. Example of colostrum feeding protocol:




- 2L within the first hour of life
- 2L six hours after birth
- 2L twelve hours after birth
- Calves should have 4-8L of colostrum within the first 24 hours of life with at least 4 L of colostrum in the first 6 hours of life. The calf can be slowly transitioned to milk or milk replacer by feeding transition milk, which is the milk that is produced after colostrum for 2-3 days. If the calf does not drink from the bottle, consider tubing the calf to they have colostrum.



## Dehorning and Removing Extra Teats

Dehorning is an important part of safety on your farm; for both you and the animals. Dehorning should be done early, as the older the animal gets the more horn tissue there will be. Dehorning at a young age will limit pain and infection to the animal. For proper dehorning methods and recommendations consult the National Code of Practice for the Care and Handling of Dairy Cattle.

When dehorning cattle, it is a requirement to give them some freezing and pain management. As the animals will have open skin for a few days, avoid dehorning when there is a high fly population. There are several methods for dehorning, each with pros and cons.

	PRO	CON
<p><b>Polled Bulls:</b> animals are born without horns</p>	<ul style="list-style-type: none"> <li>welfare friendly</li> <li>becoming more available in dairy breeds</li> </ul>	<ul style="list-style-type: none"> <li>smaller bull selection</li> </ul>
<p><b>Chemical Dehorning:</b> caustic paste applied to horn bud</p> 	<ul style="list-style-type: none"> <li>bloodless</li> <li>can be used anytime of year</li> <li>done within 3 weeks of age to be most effective</li> </ul>	<ul style="list-style-type: none"> <li>can cause injury to eyes</li> <li>is ineffective if not done correctly</li> </ul>
<p><b>Hot Iron:</b> head of the iron fits over the horn bud, burning the horn tissue</p> 	<ul style="list-style-type: none"> <li>bloodless</li> <li>young calves up to 12 weeks of age</li> </ul>	<ul style="list-style-type: none"> <li>if done incorrectly, horns can grow in</li> <li>requires pain control</li> </ul>
<p><b>Dehorning Spoons or Tube:</b> sharpened tube cuts and removes the horn producing skin at the base of the horn bud</p> 	<ul style="list-style-type: none"> <li>good for calves up to 8 weeks of age</li> </ul>	<ul style="list-style-type: none"> <li>not bloodless</li> <li>open wounds can lead to infections</li> <li>if done incorrectly horns can grow</li> <li>requires pain control and bleeding control</li> </ul>



Removing extra teats should be done to make the milking process easier. It is best to remove teats within the first 2 months of a calf's life. Consult your vet to ensure the teats are not milk producing. Trained personnel must do extra teat removal, however they may be farm staff.

### Did you know?

75% of calf losses are within the first 2 weeks of life.  
Scours is the most common cause of death in calves.

## Common Calf Diseases

Calf health is extremely important in any dairy operation. The issue can affect a calf that gets sick, long after the disease is gone. Animal that were sick at a young age have been shown to have a harder time getting in calf and a poorer first lactation.

### Talk About It!

What procedure(s) do you use on your farm for dehorning calves?

### Share It!

What protocol do you have in place if a heifer has an extra teat that needs to be removed?

## Common Calf Diseases & Parasitic Infections

	Symptoms	Cause	Treatment
<b>Calf Scours</b>	<p>Thin, watery and sometime bloody manure. Manure often an orange-green or yellow-green in colour</p>	<p>Non-Infectious:</p> <ul style="list-style-type: none"> <li>poor nutrition due to poor quality feed</li> <li>change in diet</li> <li>dirty feeding environments</li> <li>feeding too much milk</li> </ul> <p>Infectious Germs and Bacteria:</p> <ul style="list-style-type: none"> <li>Escherichia coli (E. coli) affects calves up to 1 week old</li> <li>Salmonella affects calves 1-4 weeks old. Result of contaminated feed and infected animals</li> <li>Rotavirus affects calves between 1-2 weeks of age. Low chance of mortality</li> <li>Coronavirus affects calves from two days to 3 weeks. Causes dehydration and has high mortality</li> </ul>	<ul style="list-style-type: none"> <li>separate calf in order to limit spread of disease</li> <li>feed electrolytes which contain minerals needed in the body (kind of like a sports drink!)</li> <li>alternate milk and electrolytes feedings</li> <li>work with your vet to determine the cause to limit anymore scours in the herd</li> </ul>
<b>Pneumonia - lung infection</b>	<ul style="list-style-type: none"> <li>hacking cough</li> <li>rapid breathing</li> <li>fever</li> <li>refusal to eat</li> </ul> <p>Can result in:</p> <ul style="list-style-type: none"> <li>stunted growth</li> <li>death</li> </ul>	<p>Enzootic Pneumonia - occurs in calves up to 6 months of age. Results from a damp, drafty environment</p> <ul style="list-style-type: none"> <li>results from germs from other calves and cattle</li> <li>most likely to affect weaker calves</li> <li>calf did not receive sufficient colostrum at birth</li> </ul>	<ul style="list-style-type: none"> <li>isolate calves from the rest of the herd</li> <li>keep calf environment clean, dry and free from drafts</li> <li>antibiotics</li> <li>monitor animal's temperature</li> </ul>

<b>Bovine Viral Diarrhea</b>	<ul style="list-style-type: none"> <li>▪ initial infection in respiratory or vaginal mucosa</li> <li>▪ infection of immune, respiratory, reproductive and enteric systems</li> <li>▪ immunosuppression</li> <li>▪ reduced blood clotting</li> <li>▪ fever</li> <li>▪ loss of appetite</li> </ul> <p>Can result in:</p> <ul style="list-style-type: none"> <li>▪ death</li> </ul>	<ul style="list-style-type: none"> <li>▪ transmission from other cattle</li> </ul>	<ul style="list-style-type: none"> <li>▪ there is no specific treatment</li> <li>▪ recommendations typically for an antibiotic treatment for the infections</li> <li>▪ prevention by vaccination and quarantined new additions to the herd (recommended 2 weeks)</li> </ul>
<b>White Muscle Disease</b>	<ul style="list-style-type: none"> <li>▪ depletion of muscle cells</li> <li>▪ inflammation</li> <li>▪ pain</li> <li>▪ weakness</li> </ul>	<ul style="list-style-type: none"> <li>▪ common when young stock are turned out to pasture</li> <li>▪ depletion of Vitamin E and/or Selenium</li> </ul>	<ul style="list-style-type: none"> <li>▪ prevention is very common in newborn calf care - Vitamin E and Selenium vaccinations</li> </ul>
<b>Ringworm</b>	<ul style="list-style-type: none"> <li>▪ raised grey-white scabs most frequently on head and neck</li> <li>▪ hair loss</li> </ul>	<ul style="list-style-type: none"> <li>▪ infection of the hair and skin surface by fungi</li> <li>▪ direct contact to infected animals and environment</li> </ul>	<ul style="list-style-type: none"> <li>▪ topical anti-fungal</li> </ul>
<b>Parasite: Coccidia/ Coccidiosis Common name: bloody scours</b>	<ul style="list-style-type: none"> <li>▪ bloody diarrhea</li> <li>▪ anemia</li> <li>▪ weight loss</li> <li>▪ general weakness</li> <li>▪ constipation</li> <li>▪ stringy manure containing mucus</li> <li>▪ delirium</li> <li>▪ nervous twitching</li> </ul> <p>Can result in:</p> <ul style="list-style-type: none"> <li>▪ death</li> </ul>	<ul style="list-style-type: none"> <li>▪ is more common in younger animals (over 4 weeks) but can affect all life stages</li> <li>▪ eating infected bedding or manure</li> <li>▪ enter the body through feed and water</li> </ul>	<ul style="list-style-type: none"> <li>▪ give electrolytes</li> <li>▪ consult vet</li> <li>▪ keep clean bedding and feeding environment</li> <li>▪ isolate infected animals if possible</li> </ul>

<b>Parasite: Crypto sporidium (Crypto)</b>	<ul style="list-style-type: none"> <li>scours in 2-3 week old calves</li> <li>mild to moderate</li> <li>feces are yellow or pale, watery, and contain mucus</li> <li>zoonotic disease</li> </ul> <p>Can Result in:</p> <ul style="list-style-type: none"> <li>dehydration</li> <li>death</li> </ul>	<ul style="list-style-type: none"> <li>excreted oocysts in feces</li> <li>calf to calf, human-calf contact (infected clothing, instruments, etc.), contaminated environment including feed and water supply</li> </ul>	<ul style="list-style-type: none"> <li>calves get immunity after 4 weeks of age.</li> <li>infected cases clear up in 5 - 10 days</li> <li>oocysts can survive in the environment for several months</li> </ul>
<b>Parasite: Lice</b>	<ul style="list-style-type: none"> <li>external parasite</li> <li>can cause hair loss from itching</li> <li>extreme cases can decrease average daily gain</li> </ul>	<ul style="list-style-type: none"> <li>contact from infected animals</li> <li>animals most susceptible in high stocking densities and high stress</li> </ul>	<ul style="list-style-type: none"> <li>topical or pour-on pesticide</li> </ul>
<b>Parasite: Warbles</b>	<ul style="list-style-type: none"> <li>inflammation around the spinal cord</li> <li>incoordination</li> <li>paralysation</li> </ul>	<ul style="list-style-type: none"> <li>warble fly larva burrow under the animal's skin and travel to the back</li> </ul>	<ul style="list-style-type: none"> <li>insecticide treatment before December 1st to avoid larva migrating to the spinal cord</li> </ul>

### Research It!

Choose one of the diseases/ conditions from the chart above and find out what the best medicine/course of action is the most effective.

### Biosecurity Break!

There are several diseases and parasites, like crypto, that can affect humans too! These are called zoonotic diseases. When working with animals who are sick, ensure to wash your hands before and after. Avoid contact with mouth, eyes and nose. Consult your doctor if you feel like you are getting sick.

### Deworming

Deworming cattle on a dairy farm is important for animals that are pasture bound. It is recommended that heifers are dewormed three to four weeks before they go to pasture. Younger animals are more susceptible to worms and will need deworming more frequently. In general, animals that are housed outside should be dewormed in the spring and fall. Milking cows are more likely to respond to deworming treatment in early lactation, therefore it is recommended to deworm milking cows at freshening. In herds where there is very little worm contamination, deworming is not needed.

Deworming protocol and drugs should be discussed with your vet.

### Check It Out!

What deworming products are available from your veterinarian? How are they administered? What is the cost per animal?

### Judge It!

Compare four different deworming products for dairy cattle. Rank the products based on their availability, effectiveness, cost and ease of use.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Activity: Calf Examination

<b>Do</b>	Time: 20 to 30 minutes  Materials: Calf exam sheet, pencil/pen, calf	Work in small groups and examine a calf. Use the calf vitality to help with scoring calf behaviours and health. Use the VIGOR Score sheet as a guide (attached as a supporting document)  Fill in the calf exam sheet and then report to the rest of the club about the status of the calf
<b>Reflect</b>		The purpose of this activity is to learn about the signs of calf health. This will give us an indication if she is getting enough feed, if she growing properly and if she is in a supportive environment
<b>Apply</b>	Prompting Questions	What were some of the signs your calf was healthy?  How could you tell if your calf was not healthy?  What makes a good environment for a calf?

## Calf Exam Worksheet

Calf ID Number:		Breed:	DOB:	Weight:	Height:
Environmental Conditions:		Housing Type:	Temperature:	Ventilation:	
General Status at first look:		Excellent	Good	Poor	
Describe how the calf is acting and any noticeable signs of good or poor health:					
Are the following practices complete?	Yes	No	Date (if yes)	Notes	
Horns removed					
Extra teat removal					
Deworming					
Vaccinated (record what the vaccination was for in notes)					
Ear tagged					
Observations		Is the calf healthy? (yes/no)			
Udder and teats					
Ears and eyes					
Respiration rate					
Heart rate					
Temperature					
Fecal material					
Eating habits					
Drinking habits					

## Activity #2 - Creating a Standard Operating Procedure (SOP) for Calf Management

<b>Do</b>	Time: 20 to 30 minutes  Materials: SOP template, pencil/pen, reference manual	Work in small groups and create Standard Operating Procedures for dehorning, vaccinations and colostrum. Fill out the steps you need to take and the after care
<b>Reflect</b>		The purpose of this activity is to learn about the procedures of standard calf processes and how to create a SOP to follow proAction regulations
<b>Apply</b>	Prompting Questions	What were some of the things you considered when building an SOP?  Could someone who has never performed the procedure follow this systematically and do it correctly?  Explain why are SOP's important?



## Standard Operating Procedure Template

SOP#:	Title of SOP:	
Basic Information (age range and method)		
Medications to use (if applicable)		
Product	Dosage	Meat withdrawal
Before you start - what should you get ready?	Step 1:  Step 2:  Step 3:	
Completing the procedure or process (what steps do you take)	Step 4:  Step 5:  Step 6:  Step 7:	
After Care (both clean up and checking on the calf)	Step 8:  Step 9:	
Safety Risks of the procedure or process		



## Meeting 3 - Keeping the Entire Herd Healthy

### Setting Objectives:

To create an awareness how different life stages of an animal affect the nutritional and health needs of the animal.

### Suggested Learning Outcomes:

- Learn about health issues at different stages of life, post weaning
- Look at different nutritional disorders and how it can affect overall health
- Learn how to dry off cows and the importance of the dry period

### Suggested Roll Call Questions:

- What difference do you think there are in health between life stages?
- What is a nutritional disorder?
- How can you limit disease on your farm?

### SAMPLE MEETING AGENDA

**Time: 1 hour 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Heifer health</li><li>• Dry cow treatment</li><li>• Nutritional disorders</li><li>• Limiting diseases</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time, and adjournment		10 minutes

### Topic Information

#### Heifers and Dry Cows

- Healthy heifers and dry cows mean that they will have healthy calves and start milking well. Aspects of managing heifer and dry cow health include:
- Properly vaccinating for the right diseases at the right time
- Paying close attention to nutrition, especially close to calving
- Housing in a dry, well-ventilated environment
- Keeping clean and dry
- Effective dry cow treatment

#### Drying Cows Off

Drying cows off is the last period of a lactation. For an animal to have another calf she needs to dry off (stop giving milk) to give her udder a rest, and for the body's energy to go towards growing a healthy calf. A typical dry period lasts 60 days and should be no less than 40.

Dry off protocol will vary greatly from farm to farm. Not all cows are ready to be dried off at 305 days. Animals that produce a lot of milk at the end of their lactation curve will need to have additional care in place to get them ready to dry off. Regardless of dry off treatment, animals need to be down in milk production to prevent udder infections during dry off. Reducing milk production can be done by reducing milking frequency for 5 to 7 days before drying off or by changing the diet to a lower energy level. If changing the diet, it is important to work with your nutritionist to ensure the animal is still getting what she needs for a successful dry period. If you notice a lot of leaking in your dry cows within the first 48 hours of dry off, work with your veterinarian to fine tune your dry off protocol.

### **There are several methods to consider when drying off.**

1. **Cold Turkey Dry off** - if an animal is producing under 18 kg of milk a day or less (for at least 3 days) and less than 200,000 SCC. Some producers just milk her out and then apply a dry cow antibiotic treatment (optional) and teat sealant. This seals the teats until the next calf is born. This is done selectively based on animals at risk for infection. To analyze risk, use the Assessing Dry Cow Summary Sheet (supporting document).
2. **Gradual Dry off** - animals that are still producing a lot of milk should go through a gradual dry off. Producers will milk her once per day until her milk production begins to drop. Then they will administer a dry cow treatment.
3. **Dry off with antibiotic treatment** - This is administered before sealing the teats and prevents mastitis both during the dry period and throughout her next lactation.

Sealing the teats and antibiotic treatment are both used to limit and prevent mastitis/infection. A dry animal has the highest risk of contracting mastitis in the first 3 weeks of the dry period and the 2 weeks before the calf is born. If a dry cow is noticed to have mastitis, it is key to treat to avoid lost milk production when she enters her lactation.

Using a “blanket dry cow treatment” in the herd is a common protocol for many dairy facilities. This treatment is given to every cow when drying off, as opposed to selectively treating problem animals. Antibiotic treatments and teat sealers are injected into each teat after the quarter has been milked out, cleaned and sterilized.

Selective dry cow therapy looks at the best dry off method for each individual animal. Working with the herd veterinarian and using tools like Lactanet milk reports farmers can conduct a standardized evaluation of the herd and individual animals. This evaluation will determine which dry cow treatment will be best for the herd and animal. Use the Assessing Dry Cow Summary sheet (mentioned above, supporting document) to determine what dry cow treatments are best for your herd.

### **Keeping records is key!**



Under proAction, all drug treatment needs to be recorded on each animal. This is good practice to avoid mistakes like putting treated milk in the bulk tank, which can be very costly!

Some producers will vaccinate their dry cows as they are drying them off and when they move into the close-up pen (where animals that are about to calve are housed).

### **Nutritional Disorders**

Nutritional disorders are non-infectious and are directly related to the nutrition in the dry period before they

calve. There are three main issues that can be a result of poor dry cow and close-up heifer rations:

1. Milk Fever
2. Ketosis
3. Udder Edema

For more information on these nutritional disorders please see Meeting 5.

## Lactating Cows

Just like you, when cows are feeling under the weather their production drops. Sick cows can be expensive with vet bills, wear on the cows and stress on the farmer! Limiting disease is the best defence to making sure that animals are healthy and producing most efficiently.


### Four areas are important to keep all animals healthy:

1. New farm animals
2. Farm visitors
3. Housing
4. Cleanliness

## New Farm Animals

Animals moving into the barn can bring in outside diseases to the farm. When new animals arrive, taking the following steps can help limit outside issues coming into the herd:

- Isolate new cows - Isolating cows means keeping them apart from the herd. House, feed and calve new animals in separate areas from the rest of the herd. Animals should be isolated for 21-30 days. Watch the health of any new animal and test her for diseases.
- Know where the new cow came from - You can buy cattle from herds that are free from diseases. Examples are those that are tested to be Johne's Free and Leucosis Free herds that are certified as CHAH (Canadian Health Accredited Herds). Know the health of the animal you are buying.
- Use lab tests - You can take blood and milk samples from new animals and allow them to enter your herd only after their tests come back negative for the disease in question.



Under the proAction traceability pillar, animal movement must be recorded and reported to the Canadian Livestock Traceability System (CLTS). This includes information about the truck the animal was transported in and the Premises ID of both the original location (show, sale barn, another barn, etc.) and the new location (your farm).

### Discuss It!

Do you isolate animals when they arrive at your farm? How does your farm handle isolating animals?

### Research It!

Find out what vaccinations are available in your area for dairy cattle in various life stages. How are they administered?

- Use vaccinations - Vaccines protect animals from getting sick. Ask your vet what vaccines the new animals should have. Prior vaccinations will also help prevent existing animals in the herd from contracting diseases from the new animal or the new animal contracting disease from your animals.

## Farm Visitors

Dairy Farmers of Canada and the Canadian Food Inspection Agency (CFIA) completed the National Standard for Biosecurity on dairy farms. This outlined some new regulations and suggestions for visitors coming to the farm. This includes supplying visitors with sanitary plastic boots, a boot wash and visitor logs. Having hand-washing stations or hand sanitizer available for people to wash their hands after touching animals is important to limit zoonotic disease transfer.

Farm visitors include non-human animals too. Things like birds and rats can also spread disease. Keep birds out of the barn and control rodent populations with things like traps and poison.

### Experience It!

Invite a guest to your meeting from Dairy Farmers of Ontario (DFO) and/or Canadian Food Inspection Agency (CFIA) to speak about biosecurity and traceability.

## Housing

Animals need to be clean and have space to move, drink, eat and lay down! Animals should be housed in groups of similar age groups with lots of space for movement and laying. Making areas easy to clean will make sure the job gets done.

For more information look to the Housing Section of the Dairy Reference Manual

## Cleanliness

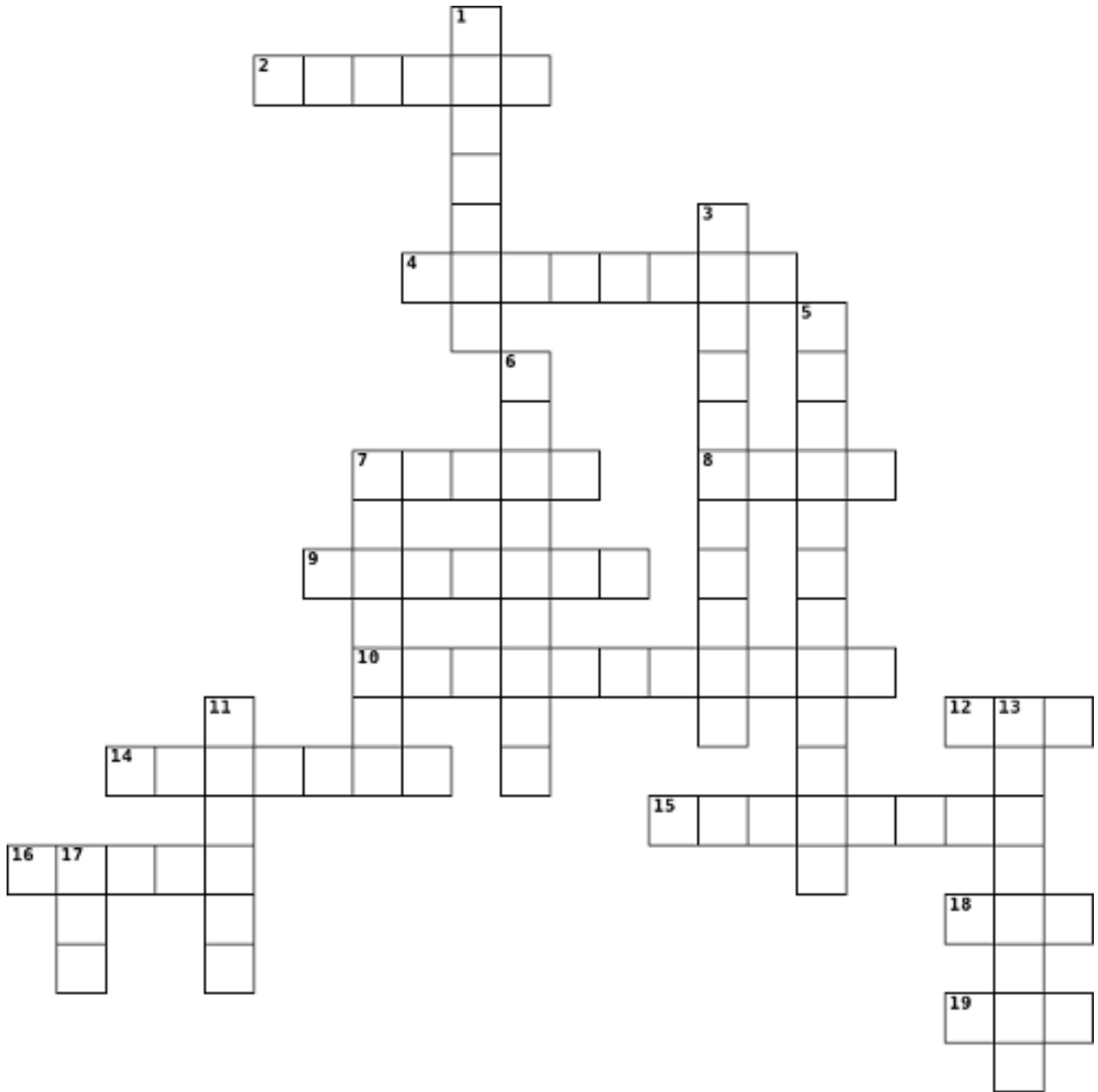
Cleanliness on the farm is important for many reasons, most of which is limiting the spread of disease. To ensure a clean and safe working environment:

- Remove deadstock - animals should be buried within 2 days under 1m of soil. Alternatively call a deadstock service to dispose of the animals
- Control flies and manure - most diseases travel fecal to oral (through manure, urine and flies). Proper manure management will help control fly issues
- Use disinfectant - these kill germs, which is important in high traffic areas, and areas where calves are. Use disinfectants in maternity pens, calf pens and hutches, foot baths and equipment.
- Time to rest - allowing areas where you have new animals coming into to rest (a period of time with no animals) can also be effective in controlling disease transmission.

### Judge It!

Compare four different types of disinfectants available for use in dairy barns. Look at factors such as cost, effectiveness, safety (for animals and humans) and ease of use.

# Activity #1 - Dry Cow Cross Word



## Across

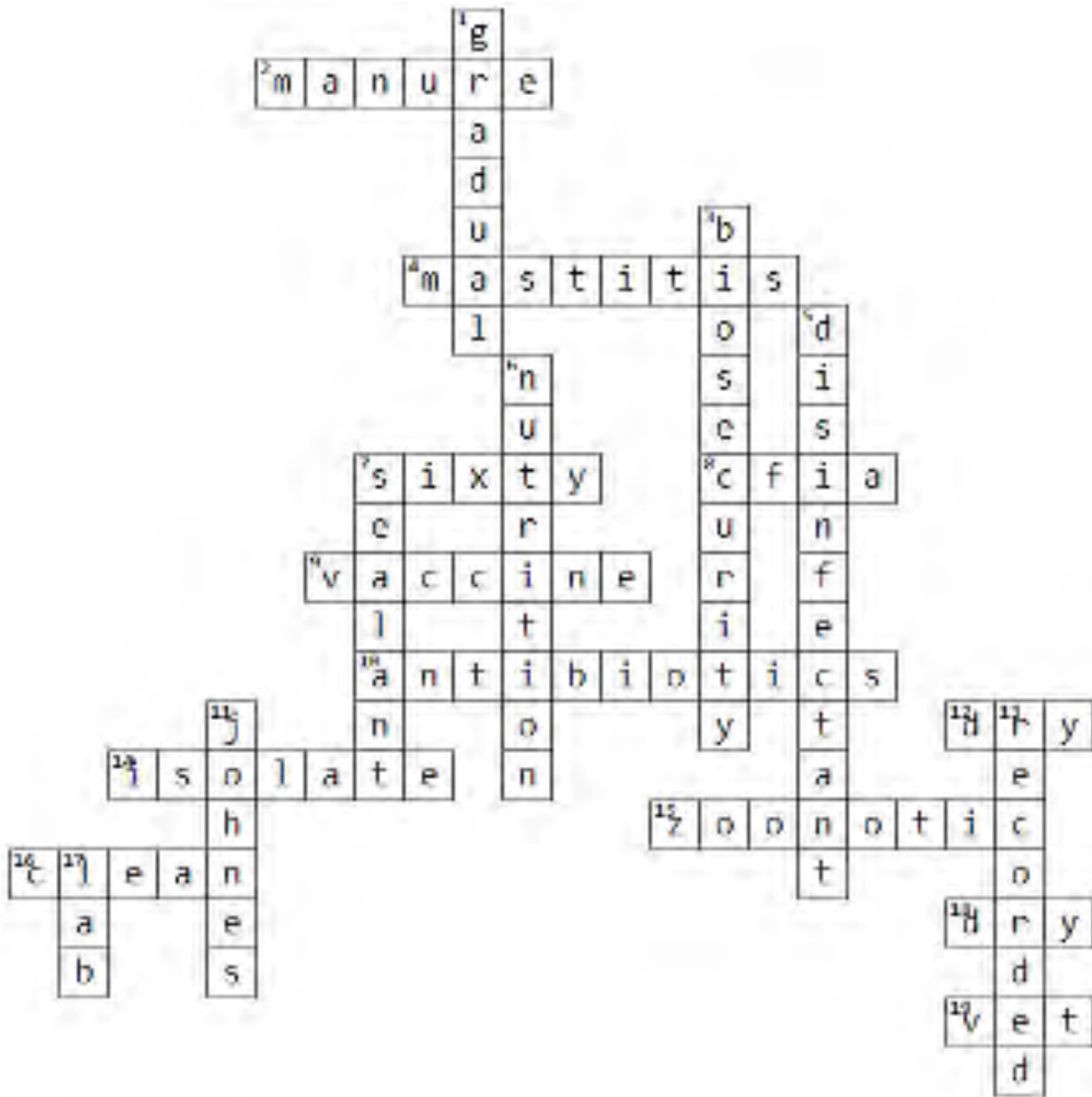
2. Most diseases travel through \_\_\_\_\_
4. A common infection that can happen if there is improper dry cow treatment
7. Number of days a typical dry period lasts
8. Abbreviation for the Canadian Food Inspection Agency
9. Protects animals from getting sick
10. Given at dry off to prevent mastitis
12. The period when a cow does not give milk
14. You should do this to new animals on your farm
15. Disease that can be transmitted from cows to humans
16. A good way to limit disease is keeping the pens and barn \_\_\_\_\_
18. Stalls and bedding should always be \_\_\_\_\_

## Down

1. Animals producing a lot of milk need \_\_\_\_ dry off
3. To limit disease all farms should have some form of \_\_\_\_\_ protocol
5. Kills germs
6. An important part of dry cow management (think food)
7. Closes the teats at dry off
11. Animals arriving on your farm should be free of this
13. All dry treatments should be \_\_\_\_\_
17. Where blood and milk samples can get tested



Crossword Answers:



## Activity #2 - Dry Cow Therapy

<b>Do</b>	Time: 10 - 20 minutes  Materials: a selection of cows close to dry off, their production, a list of dry cow treatments used on the farm, pen/pencil, Dry cow work sheet (below)	Look at some cows and determine if they are ready for dry off. Fill in the sheet below with the information and your recommendation.  Go over the animals as a group and discuss why an animal is or is not ready for dry off
<b>Reflect</b>		This activity will show members how to decide when it is time to dry animals off and how to do it.
<b>Apply</b>	Prompting Questions	What made you decide to dry or not dry a particular cow off?  Why did you choose the dry treatments that you did?  What would you do if an animal was over 305 DIM and still producing a lot of milk if she: <ul style="list-style-type: none"><li>▪ Is pregnant and ~60 days from calving</li><li>▪ Is not pregnant</li></ul>

## Dry Cow Therapy Worksheet

Cow ID	Current DIM	Current Production	Is she ready to dry off	If yes, then treatment and why	If no, why not



## Meeting 4 - Biosecurity and Preventing Disease

### Setting Objectives:

To instill the importance of biosecurity, and the management, prevention, diagnosis and quick treatment of diseases in dairy cattle.

### Suggest Lesson Outcomes:

- Look at the importance of biosecurity
- Learn about how to prevent diseases
- Learn about the importance of building immunity and vaccinations

### Suggested Roll Call Questions:

- What biosecurity cautions do you take on your farm?
- How can you prevent disease on the farm?
- Why would you vaccinate your animals?

### SAMPLE MEETING AGENDA

Time: 1 hour 30 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• The importance of biosecurity</li><li>• Preventable diseases</li><li>• Immunity function</li><li>• Vaccinations</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Biosecurity and Animal Health

Since 2012, Dairy Farmers of Canada and the Canadian Food Inspection Agency (CFIA) have completed the National Standard for Biosecurity on Dairy Farms. This handbook was the basis for the proAction Biosecurity pillar.

Biosecurity aims to reduce risks of introducing existing and emerging animal diseases, and to control disease outbreak. In 2019, the biosecurity validations started for all dairy farmers across Canadian dairy farms. There are several requirements that dairy farmers need to meet in order to meet the biosecurity standards set in the National Standard for Biosecurity.

#### Experience It!

Invite someone from Dairy Farmers of Canada (DFC) or Dairy Farmers of Ontario (DFO) to discuss the Biosecurity pillar of the proAction program.

## Cattle Health Management

- Biosecurity risk assessment with your vet to identify and address biosecurity risks
- Record disease events
- SOP's for vaccination against specific diseases of concern

## Cattle Additions and Movement

- SOP's for prevention of infectious diseases when new animals arrive on farm
- SOP for prevention of infectious disease when an animal returns to the facility from other locations (shows, other herds, etc.)

## Personnel, Visitors, Vehicles and Equipment

- SOP for prevention of the introduction of infectious diseases by family, employees, farm visitors and service providers
- Signage at main access points visible from the main parking lot.

### Biosecurity Break!

Diseases can be spread in several ways:

- Via direct animal to animal contact
- By the wind
- In feed or water
- On contaminated clothing, vehicles, equipment, etc.
- By wildlife, vermin or insects



There are several ways that people can improve biosecurity and prevent diseases. These include:

- controlling access to cattle on the farm
- preventing the cattle from coming into contact with other livestock or wild animals
- washing clothing and cleaning and disinfecting footwear and equipment used around cattle
- maintain records regarding the movement of people, cattle and other animals and equipment to and from the farm
- purchase cattle, feed and other supplies from reputable suppliers
- separate new animals from those already on the farm for a few weeks, until you are confident that they are healthy
- identify all animals with Radio Frequency Identification (RFID) tags (required by law)
- vaccinate against some diseases after consultation with your veterinarian
- identify signs of illness, treat sick animals as needed, and report any animals that are suspected to have a reportable disease (i.e. tuberculosis or BSE)

For more information see Biosecurity Farmer Requirements and Biosecurity Quick-Tips in the Dairy References/Resources section.

### Debate It!

What do you think is the one most important factor for improving biosecurity and disease prevention for a dairy farm?

## Diseases

Animals can become ill due to infectious or non-infectious disease. Infectious diseases are those that can be spread from one animal to the next while non-infectious ones cannot be spread from one animal to the next. That does not mean that only one animal in your herd will have a non-infectious disease though. For example, if one animal has a non-infectious disease from not eating properly, other animals in the herd may have the same disease because they are also not being fed a proper diet. Some diseases caused by bacteria and parasites can spread from animals to humans. Such diseases are referred to as zoonotic diseases.

Viruses, bacteria and parasites can cause infectious disease. Non-infectious diseases are caused by poor diet, stress, heredity, toxicity, tumours and injury.

## Prevention of Disease

The best way to deal with disease is to prevent disease. Preventing disease not only is the most cost-effective method, but it ensures good animal health long term. Preventing disease means that no milk will be lost, no medical cost and no loss of animals.

Herd Health programs are an important part of limiting and preventing disease on the farm. Having regular visits from the vet is the best way to keep an eye on your herd's reproductive health including doing pregnancy checks and determining if there are reproductive issues (example cysts). A good herd health plan should be made with your vet. Vets play a huge role on all dairy farms. Having a good vet, who knows your herd could greatly aid your management program.

Aside from herd health, there are several ways to prevent disease within your herd:

- Feeding a good, nutritious ration. Consult a feed dealer, nutritionist or veterinarian and test your feeds to create a ration that will keep cows healthy. (See Nutrition section of this Manual)
- Keeping housing clean and well ventilated to ensure cool and dry environments. Ensure that animals are kept comfortable at all ages and stages. (See Housing and Equipment section of the 4-H Dairy Reference Manual)
- Mastitis control in the milking herd. Ensure that you have proper milking procedures, use a teat dip after milking, milking equipment is clean and well maintained and a proper dry cow treatment program is followed.
- Pay attention to calf health to increase their growth rate and reduce losses due to disease. When animals start out healthy, it is easier to build on that good start.
- Building immunity to diseases through vaccination protocols and supporting healthy immune systems

## Building Immunity

Immunity is protection from infectious disease. Animals with good immunity are more likely to fight disease, just like you. Similar to how you were vaccinated for measles or chicken pox, calves can be vaccinated to decrease the likelihood of getting diseases like pneumonia.

Colostrum provides newborn calves with immunity; however, the immunity from colostrum typically wears off by 2 months of age. Many farmers vaccinate young heifers as a way to prevent disease. Just like you, some vaccinations require a booster shot at about 6 months of age. Vaccinations come in many forms including injections, nose sprays and pills.

## Experience It!

Invite a veterinarian to your meeting to discuss Herd Health. Or visit a dairy farm and have a veterinarian, farmer or herd manager discuss the health program for their facility.

## Vaccinating Animals: Needles/Injections

Before injecting a heifer, consult with your vet. Some geographic areas require different vaccinations. Most vaccinations need to be completed every year to maintain effectiveness, though many farms do them on an as needed basis. Here are some common vaccinations that can be given on the farm:

Disease	Transmission	Symptoms	Prevention
BVD (Bovine viral diarrhea)	Body fluids, dam to fetus	Abortion of calf, malformed or weak calves, diarrhea, fever, decreased milk production, respiratory disease	<ul style="list-style-type: none"> <li>cull carriers</li> <li>vaccinate heifers before breeding</li> </ul>
IBR (infectious bovine rhinotracheitis)  Viral disease common in fall and winter when animals get moved indoors	Saliva and nasal discharge.  Typically gets spreads by carriers who may not appear sick	Abortion of calf, brain and genital infections, pneumonia and inflamed eyes, red eyes, crusty nose, dry cough, diarrhea in calves.	<ul style="list-style-type: none"> <li>vaccinate at 6 months</li> <li>vaccinate 7-8 weeks before breeding, then annually</li> <li>vaccinations available by injections or nasal spray</li> </ul>
Rabies	Infected animal biting another animal (doesn't have to be another bovine)	Behavioural changes, trouble swallowing, bellowing calls	Yearly vaccinations where rabies is an issue.
Leptospirosis	Infected animals, mud, water, vegetation and urine	Cattle: abortion, which is often followed by retained placenta (RP), reduced milk production Calves: Sever illness with jaundice, reddish to dark brown urine	Yearly vaccinations where Leptospirosis is an issue.
Blackleg	Infected soil gets eaten by the animal	High fever, lameness, swelling, death within 12-48 hours	<ul style="list-style-type: none"> <li>vaccination of cattle under 2 years</li> <li>no treatment once infected</li> </ul>
Bovine Respiratory Disease Complex (BRDC)  Also known as Shipping fever pneumonia	Bacterial infections and stress.  Stressed may be caused by: weaning, shipping, weather changes, castrations, dehorning, etc.	Severe lung damage, difficulties breathing, lack of appetite, death if not treated	<ul style="list-style-type: none"> <li>vaccination</li> <li>stress prevention</li> <li>if started early, antibiotics can be successful</li> </ul>



## Research It!

Because of where you live in Canada, are different or specific vaccinations required for the animals on farms in your area?

### Infectious Diseases with No Vaccinations

Some infectious diseases do not have effective vaccination protocols but may affect cattle of all ages. A few common ones are:

**Meningitis** – This often develops in association with a viral or bacterial disease or due to a head injury. It is an inflammation of the membranes covering the brain and spinal cord. To treat this disease, the animal must remain in a quiet area away from other animals and be under the care of a veterinarian. It can be prevented by promptly treating bacterial infections.

**Bovine Leukosis (BL)** – Leukosis is caused by the bovine leukosis virus (BLV). 30-70% of carriers of the disease have an increased number of white blood cells, and tumours form in about 5% of infected animals. The disease evolves very slowly and may take months or years to progress. The clinical form is called enzootic bovine leukosis, and the tumours it causes are called adult bovine lymphosarcoma or benign lymphocytosis. There is no known cure.

**Symptoms:** When cows develop lymphosarcoma, they are subject to weight loss, weakness, bloat, and decreased milk production. Enlarged lymph nodes can be felt in the neck, behind the udder and in front of the shoulder. Other signs include congestive heart failure and paralysis.

**Cause:** The disease is spread by infected animals during contact from one animal to another, from mother to fetus in the womb, from mother to calf via her milk. For one animal to pass it to another there needs to be a transfer of blood from one to another. This could happen by animal contact with lesions or sharing needles and syringes, examination gloves, dehorning instruments, tattooing, ear tagging equipment, surgical instruments, or other tools that could become contaminated with infected blood.

**Prevention:** Prevention of spreading the disease includes culling infected animals, ensuring that management tools are kept clean and sterilized after use, and testing animals to determine which ones are carriers of BL. Lactanet (Dairy Herd Improvement) now has a milk test that producers can use to test milk to determine if cows are leukosis carriers. Traditional laboratory testing can also be done to determine which cows have the disease, so that those animals can be managed or culled accordingly.

**Listeriosis (Circling Disease)** – A bacterial infection that causes abscesses of the brainstem, and abortion. Signs may look like rabies. Urine, milk, feces and contaminated tissue spread infection. It can be found in feed. Keep diseased animals away from other animals and dispose of aborted fetuses immediately.

**Lumpy Jaw (form of osteomyelitis)** – A bacteria, *Actinomyces bovis*, causes the jaw bone to swell and sometimes ooze a yellow discharge. Antibiotics or intravenous iodine are used as treatment methods. If antibiotics are unsuccessful, the animal is culled.

## Preventing Non-infectious Diseases

You cannot vaccinate against any non-infectious diseases. Good farm management, early detection and an effective herd health program can still prevent many of these diseases.

## Subclinical and Clinical Diseases

In addition to being either infectious or non-infectious, diseases can be categorized as subclinical or clinical:

**Subclinical** - no obvious outward signs that an animal is sick. For example, parasites are usually subclinical because a cow can have them without showing signs externally for a long time.

**Clinical** - symptoms of the illness are outwardly evident that the animal is sick. Examples of clinical diseases are calf scours and pneumonia.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - What are the Symptoms?

<b>Do</b>	Time: 15 to 20 minutes  Materials: Chart paper, pen/pencil, resource material	Label each chart paper with different infectious diseases on the farm (BVD, scours, pneumonia, etc.)  Use another sheet of paper and list the symptoms of each using your resource guide in no particular order. Have members match the symptom to the disease.  Have a volunteer chart which symptoms belong to which diseases.  Discuss treatment options and how these diseases could have been prevented.
<b>Reflect</b>		To introduce and review common diseases found on a dairy farm
<b>Apply</b>	Prompting Questions	Why is knowing diseases like these important?  Why is preventing these diseases smart farming?  Name other areas of your life where preventing something from happening in the first place is better than fixing it once it does happen (i.e. studying before a test instead of trying to make up for a bad grade later on)



## Meeting 5 - Taking Care of the Herd

### Setting Objectives:

To appreciate the various diseases and health conditions that can happen on a dairy farm and the importance of prevention.

### Suggested Learning Outcomes:

- To learn about different diseases that effect a dairy farm and how to prevent them
- Learn about the importance of hoof health
- Learn how to detect if an animal is lame
- Take a detailed look at common diseases within the barn.

### Suggested Roll Call Questions:

- Name a disease that a cow can get on the farm?
- Why do you not want lame cows?
- What would you do to limit the spread of disease and infections on the farm?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"> <li>• The most common dairy diseases</li> <li>• Hoof health and things that effect the hoof</li> <li>• Lameness scoring</li> <li>• A detailed look at several diseases on the dairy farm</li> </ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Common Disease and Health Issues

Canadian producers will have several common diseases within their herd. Several diseases are described in the Code of Practice for the care and handling of Dairy Cattle. There are also resources at the Canadian Dairy Network (2013) that describe these diseases.

1. **Mastitis** - Abnormal milk from one or more quarter. This can be determined by in-line analysis or testing the milk. Other signs may include udder inflammation and systemic illness of the cow.
2. **Lameness** - Abnormal gait attributed to either issues in the foot or leg. Lameness can be assessed on a scale of one to five.

3. **Cystic Ovarian Disease** - occurs in cows over 30 days in milk, and not pregnant. Presence of one or more follicles greater than 25mm in diameters on one or both ovaries in the absence of corpus luteum and uterine tone.
4. **Displaced Abomasum (DA)** - Cow has decreased appetite with an audible, high-pitched ping produced by tapping the left abdominal wall between the 9th and 12th ribs. The abomasum (the true stomach) fills with gas and flips from the bottom of the abdomen and rises to the top. Some dairy farmers refer to this as a twisted stomach.
5. **Ketosis** - depressed appetite with evidence of elevated milk, urine or breathe ketones after exclusion of other clinical disease. Animal smells slightly sweet
6. **Metritis** - occurs in early lactation cows (up to 20 days in milk). Occurs due to the abnormally enlarged uterus containing fetid watery red-brown fluid, signs of systemic illness and fever. In cows, over 20 days in milk will have presence of abnormal cervical or vaginal discharge, not associated with an animal being in heat.
7. **Milk Fever** - occurs in cows 72 hours before or after calving and typically in older cows (third lactation or higher). Animals will show one of the following milk fever stages.
  - Stage 1 -Mild excrement or stiffness
    - Weakness or weight shifting
    - Increased rectal temperature (above 39C)
  - Stage 2 -Lies down and cannot get up
    - Cold extremities (feel for cold ears)
    - Decreased rectal temperature (less than 38C)
  - Stage 3 -Cow lies on side with legs stretched out
    - Pulse difficult to detect
8. **Retained Placenta** - failure to eliminate afterbirth within 24 hours of calving. Typically smells like rotting flesh. Antibiotics should be given to reduce and clear infection.

### Discuss It!

What is the most recent disease/condition that needed to be treated on your farm? What was done to treat the disease/condition?

## Lameness

Lameness is something that all producers should express concern about. Lamé animals will spend less time standing at the feed bunk and have a harder time getting to water and the milking parlour. This issue not only causes the animal great discomfort, but it can decrease milk production as well. The drop in production and treatment costs can lead a case of lameness to be quite costly.

Lameness can be caused by a variety of things including stressful environments, poor nutrition, poor conformation and improper hoof trimming techniques.

**Stressful Environments** – slatted floors, slippery free-stall housing and abrasive surfaces such as stones, stubble or frozen ground all put stress on an animal's feet and legs. Warm, wet housing breeds diseases such as foot rot.

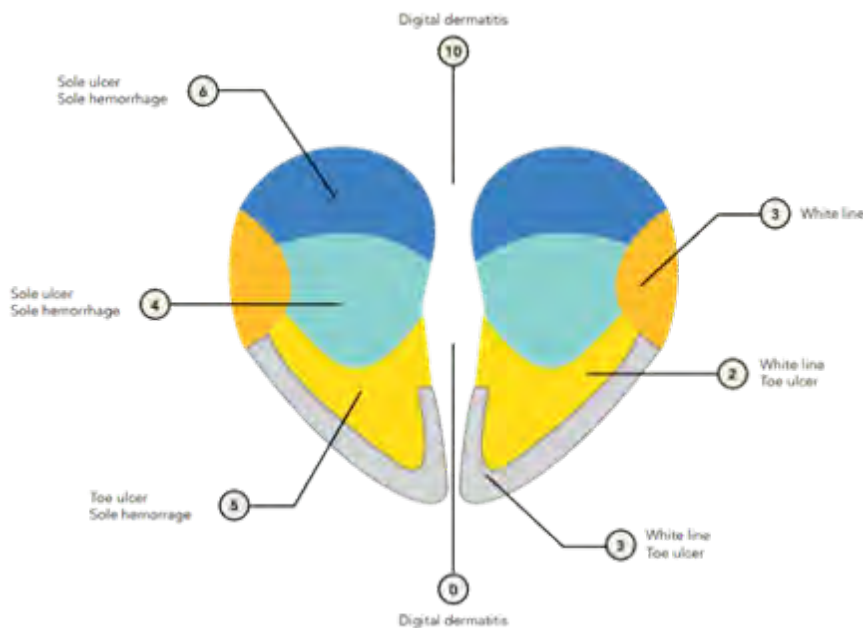
**Poor Nutrition** – Feeding too much high-energy feed or a sudden change in diet leads to

acidosis, a ruminant disease. Acidosis in turn causes laminitis, a crippling hoof condition. Once a cow gets laminitis, her feet will never develop properly again. Lameness can also be caused by a lack of calcium, phosphorus, magnesium, manganese, zinc and Vitamin E, or an excess of calcium and fluorine, and a lack or excess of Vitamin D.

**Poor Foot Conformation** – Cattle born with bad feet, abnormally straight hocks, sickle hocks, cow hocks, weak pasterns, flexed pasterns, overlapping toes, or soft hooves are more susceptible to lameness.

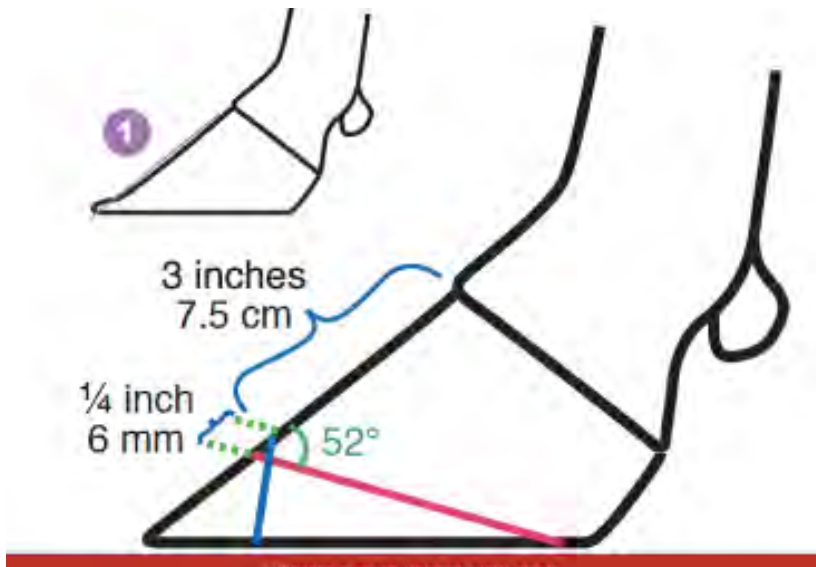
Just like any other illness, prevention is the best way to limit lameness in the herd. If lameness is, an issue in your herd consider the following management practices to prevent future cases:

- Breed cows to bulls with better conformation scores for feet and legs
- Follow proper nutrition guidelines, feeding balanced rations
- Allow cows to stand on well-drained dirt and grass. The grass cleans their feet and the dirt keeps away organisms
- Groove slippery concrete floors and smooth concrete that is too rough. Slippery concrete does not naturally wear down a cow’s feet and makes her tend to walk on her heels, giving her overgrown toes. Rough concrete injures a cow’s feet.
- Install a footbath. Footbaths remove irritants, harden the hoof and prevent infections. Install footbaths in the exit alley where the cows return back from the parlour after milking or a separate area that is easy to run cows through. The footbath solution should be selected based on the foot problems in the herd.
- Keep free stalls clean, dry and comfortable. Cows that lay down rest their feet and let them dry. To accomplish this don’t overstock pens.
- Trim feet at regular intervals. Many farmers hire a professional hoof trimmer to do this. When animals live in soft well bedded areas, their hooves grow too long and they cannot stand properly.



### Experience It!

Invite a hoof trimmer to a meeting to discuss how they started in their career. If possible, have them demonstrate trimming a cow’s hooves. Looking at the hoof can tell you a lot about the issue she is having. For more information on specific diseases, see the foot disease flash cards attached to this manual.



Locomotion scoring is an important tool to use to assess the prevalence of lameness in your herd. The following method is the industry standard for lameness scoring and is used for the proAction Cattle Assessments.

### Free Stall Lameness Assessment

	Score	Behaviours	Example
Not Lamé	1	Stands and walks with a level back. Tracks up completely.	
	2	Stands with a flat back, slight arch when walking. Gait is slightly abnormal, not tracking up completely	
Moderately Lamé	3	Stands and walks with an arched back. Has shorter strides with one or more legs	
Severely Lamé	4	Stands and walks with an arched back. Favors limbs, but can still bear weight on all limbs	
	5	Very pronounced arch when standing and walking. Will not put weight on limb. Very hesitant to move	

#### Do It!

Observe the cows in your barn to see if they exhibit any of the behaviours listed in the Free Stall Lameness Scoring List.



## Tie Stall Lameness Scoring

It is much harder to access lameness in a tie stall environment, when animals do not have the ability to take several steps to evaluate the gait. Research at the University of Guelph has led to a method adopted by proAction. It involves watching the animal stand for 60 seconds and then moving her back and forth in the stall. Presence of two or more of the following behaviours deems the animal as lame.

**Rest (Uneven Weight)** - Animal lifts hoof and places it back down in the same place

**Edge** - Animal rests one of its hoofs on the edge of the stall relieving pressure of the hoof

**Weight Shift** - animal shifts back and forth 4 times. If the animal shifts less than 4 times, it is considered a rest

**Uneven movement** - This is observed by moving the animal back and forth in her stall. She should take even, confident steps. It is important that animals will be used to moving to one particular side (the side that the milker gets attached), and therefore can be stubborn when moving.

If an animal does not exhibit any of the first three behaviours but she however is very uneven in movement, she can be deemed severe and marked as lame.

## Mastitis

Mastitis is the number one cause of dropped milk production. Mastitis is an infection in the udder. Bacteria enter through the teat. Many times, an animal can fight the infection herself, in which case there are no visible signs of mastitis, other than a drop in milk production and often an elevated Somatic Cell Count (SCC). This is called 'Subclinical' mastitis.

Mastitis infections can destroy milk-secreting cells. The cow will not get the milk-producing ability back from those cells. Therefore, mastitis lowers milk production while the cow is infected, and can have a permanent effect on milk production.

### Testing for Mastitis

There are several ways to test for mastitis. Depending on the type of mastitis (environmental or contagious) will determine the best method to use.

- Examine the udder - Feel the udder to see if it is swollen, painful to the cow, or feels warm. Squirt a small amount of milk from the quarters into a strip cup to see if the milk is lumpy, flaky or watery.
- California Mastitis Test (CMT) - A CMT is a quick, easy way to test for a high somatic cell count, a sign that a cow is trying to fight an infection. Squirt some milk from the quarters (or the quarter you think is infected) into the four sections of the paddle. The paddle has four sections so you can keep the milk from the four quarters separate. Then, squirt a little bit of purple CMT solution into the milk. Swirl the mixture around in the paddle, allowing the CMT solution and milk to mix. If the cow is infected, the milk has more somatic cells than normal and the mixture will thicken to a gel and/or have whitish clumps in it. The higher the somatic cell count, the more the milk thickens into a gel. Normal milk will remain the same consistency, turning purple because of the solution.
- Culture the milk - By sending a milk sample to the lab, you can find out exactly what type of organism is infecting the cow, and whether it is contagious or environmental.
- Somatic Cell Counts (SCC). Somatic cell counts are a cow's response to an infection. When the cow's

SCC is higher than normal it may mean that, she has an udder infection.

## **Treating Mastitis**

Some cases of Mastitis will treat themselves. Making sure that the cow is milked out is an important step in treatment. More severe cases will need treatment with antibiotics. Treatment typically goes directly up the teat. Your farm should have a Standard Operating Procedure (SOP) for mastitis treatment. In order to properly treat mastitis you should:

- Milk the udder out completely
- Clean and disinfect teat end or injection site
- Follow the instructions of the antibiotics - if using an inter-teat treatment insert the tip no more than 6mm into the teat. These cartridges are single use and should be disposed of after use.
- Dip treated teats with an approved teat dip

### **Biosecurity Break!**

Cows that have mastitis should be milked last so that other cows do not use the same infected milker. This will limit the spread of Mastitis within the herd. If animal is milked during the other milking's, disinfect the cups before using on another animal.

There are two forms of mastitis, contagious and environmental. The table below compares the differences between the two types of mastitis.

<b>Characteristic</b>	<b>Contagious</b>	<b>Environmental</b>
Source of new infections	<ul style="list-style-type: none"> <li>Bacteria on skin or udder</li> <li>Source is always other infected cows</li> </ul>	<ul style="list-style-type: none"> <li>Bacteria in bedding, manure or mud</li> <li>Source is the environment</li> </ul>
How infection spreads	<ul style="list-style-type: none"> <li>Contact with machine and milker's hands and wash cloths that have been in contact with an infected cow</li> </ul>	<ul style="list-style-type: none"> <li>Contact with a dirty environment</li> <li>Milking wet udders</li> </ul>
Most common organisms	<ul style="list-style-type: none"> <li>Streptococcus agalactiae</li> <li>Staphylococcus aureus</li> </ul>	<ul style="list-style-type: none"> <li>Coliform (i.e. E.coli)</li> <li>Streptococcus nonagalactiae</li> </ul>
Infection dynamics	<ul style="list-style-type: none"> <li>Usually persistent subclinical infection, with repeated clinical flare ups</li> <li>Seldom cured without antibiotics</li> </ul>	<ul style="list-style-type: none"> <li>Infection is less persistent, usually starts with a clinical case</li> <li>Often cured by the cow without antibiotic therapy</li> </ul>
Somatic Cell Count of infected cows	<ul style="list-style-type: none"> <li>Always high but quite variable</li> </ul>	<ul style="list-style-type: none"> <li>Highly variable</li> </ul>
Clinical symptoms	<ul style="list-style-type: none"> <li>Swelling and abnormal milk with               <ul style="list-style-type: none"> <li>- No fever - Strep. Agalactiae</li> <li>- Mild to moderate fever - Staph. aureus</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Swelling and abnormal milk with               <ul style="list-style-type: none"> <li>-No fever to moderate fever - Strep. Nonagalactiae</li> <li>- More severe fever and off-feed cows - Coliform</li> </ul> </li> </ul>
Detection (you can never be sure from the symptoms, only a culture can correctly identify an organism)	<ul style="list-style-type: none"> <li>Somatic Cell Count, California Mastitis Test, Culture</li> <li>Clinical signs are less helpful because many cases are subclinical</li> </ul>	<ul style="list-style-type: none"> <li>Clinical signs, culture</li> <li>Somatic Cell Count and California Mastitis Test are less helpful because most infections start with a clinical case</li> </ul>
Treatment	<p>Follow veterinary advice</p> <ul style="list-style-type: none"> <li>Use antibiotics at dry off</li> <li>Use antibiotic in lactation (Strep. ag and clinical Staph only)</li> <li>Staph infections are very difficult to cure and may result in culling the cow</li> </ul>	<ul style="list-style-type: none"> <li>Follow veterinary advice</li> <li>Strip the quarter frequently throughout the day and night</li> <li>Treat systemic symptoms</li> </ul>
Prevention	<ul style="list-style-type: none"> <li>Teat dipping</li> <li>Good milking hygiene and technique</li> <li>Stress free living - reduce flies that bother cattle, prevent teat injuries, increase cow comfort</li> <li>Dry cow treatment</li> </ul>	<ul style="list-style-type: none"> <li>Clean, comfortable stalls, fresh bedding</li> <li>Good milking hygiene and technique (sanitary, use teat dip, proper equipment)</li> <li>Stress free living - reduce flies that bother cattle, prevent teat injuries, increase cow comfort</li> <li>Dry cow treatment</li> </ul>

Source: Adapted from Jack Rodenburg, OMAFRA Dairy Specialist, 1997

**Somatic Cell Count (SCC)** - white blood cells. These cells can destroy bacteria, prevent or get rid of infections, and repair damaged tissue. If a cow has a high SCC, then her somatic cells are working overtime to get rid of an infection. SCCs are good management tools. Your cows can be tested for SCCs when they are tested for milk production. From these tests, you can spot cows that have mastitis infections.

Generally, SCCs are a good indication of contagious mastitis. Environmental mastitis tends to last only a few days and the chances of missing a high SCC are high compared to contagious mastitis.

### Share It!

If you have had a cow on your farm with a displaced abomasum, what treatment was used?

## Displaced Abomasum (D.A, Twisted Stomach)

The direct cause of a DA is unknown but animals that are fed a high grain or silage diet, or have sudden changes to their diet or ketosis are more prone to getting a DA. Ketosis is an accumulation of ketone bodies in the blood. This occurs when fatty acids are broken down. When this happens, the abomasum loses muscle, slows down and becomes full of fluid and gas. The gas causes the stomach to float up and to the left or up and forward. In extreme cases, it will cause the stomach to twist.

There are several signs and symptoms of DA's. Initial signs that a twisted stomach will occur or has occurred are going off feed, decreased milk production, dehydration (look for eyes that look sunken into the head), and reduction of manure passage. Once the stomach has flipped, the animal will be in pain, will kick at her stomach, and frequently gets up and down in effort to be more comfortable, rapid dehydration, elevated heart rate (over 100 beats per minute) and shock.

To determine if a stomach has flipped, tap on the body near the stomach and listen with a stethoscope between the 9th and 12th rib (this will determine for a left DA). Tapping will sound hollow or you may hear rumination noises. A displaced stomach will sound like tapping on an empty tin can.

## Treating Displaced Abomasums

Treatments of DA can really vary.

**Changing the diet** - moving a cow to a grass hay diet and removing all high energy components (grain and silage) can sometimes make a difference and cause the cow's stomach to return to its normal place

**Rolling a cow** - When a cow is laying down, roll her over (across her back). When done with someone experienced, this sometimes can put the abomasum back in place.

**Surgery** - Surgery can be done in severe cases to roll the stomach back. Some vets will now stitch the abomasum to the cavity wall in order to prevent future cases. (also called tying the stomach)

**Culling the animal** - Working with your vet to determine the future of the animal. In cases that the animal is untreatable, sending the animal for slaughter may be the most ethical treatment for the animal.

## Preventing Displaced Abomasums

If an animal goes off feed, remove silage and grains until the animal has returned to normal feeding routine.

If metritis or ketosis is also suspected, it should be treated. If an animal has had a DA before, the abomasum should be tied in place to prevent subsequent displacements.

## **Milk Fever**

Milk fever occurs when a cow has a sudden need for calcium at calving. Milk fever is due to the extreme drop in blood calcium levels. The animal will weaken and go down. If not treated, affected animals may die.

Milk fever will occur 72 hours pre or post calving. Milk fever is more predominant in mature cows (3 or more lactations). Cows with milk fever will show symptoms from one of the following 3 stages. Each stage increases in severity.

Stage 1: animal is stiff, weak or shifting weight. Increased rectal temperature, above 39°C

Stage 2: Animal lies down and cannot get up. Animal has cold extremities to human touch and a decreased rectal temperature, less than 38°C

Stage 3: Animal lies on its side with legs stretched out, pulse is difficult to detect.

## **Milk Fever Treatment**

The first step to treating milk fever is to administer calcium either orally through a bolus, subcutaneously or intravenously. In most cases, administering calcium is sufficient to treat the milk fever. For severe cases of milk fever, administering calcium intravenously will increase chances of survival, as it is faster acting. If administering calcium through IV it needs to be done slowly as injecting with too much calcium too quickly can cause the cow's heart rate to increase which can lead to heart attacks. Monitoring the pulse of the animal is important to ensure it does not become elevated. It is best to work with a vet when putting calcium in an IV.

Milk fever can be prevented in most cases with a proper dry ration close to calving (2 weeks). For older animals, a preventative calcium bolus can be given to the animal before and after calving.

## **Ketosis**

Ketosis is caused by a chemical change in the cow's body within the month that she calves. It occurs when the cow does not eat enough to keep up with her milk production. This creates a negative energy balance.

A cow who is suffering with ketosis will have decreased milk production, decreased feed consumption, and can smell sweet. Cows suffering from ketosis are more susceptible to E. Coli Mastitis.

## **Ketosis Treatment**

Cows suffering from ketosis should be drenched with glycol (which is essentially sugar solution). Drenching a cow is similar to tubing a calf with colostrum. As the cow will not drink on her own, a tube is placed down the animal's throat and glycol is put into her stomach. Dextrose (another type of sugar) can also be given intravenously to increase the animal's energy levels. Giving animals other vitamins during treatment is also important to maintaining healthy cells.

Preventing ketosis can be done primarily through diet. Cows close to drying off should be fed a different diet to ensure proper body condition. Similar to milk fever, giving an animal a different ration close to calving can also affect the likelihood of the animal getting ketosis. This diet will ensure she is getting enough energy to

produce milk once the calf is born. Fresh cow rations need to be high in energy, with many farmers feeding fresh cows a separate ration than cows who are further in lactation. Feeding proper diets will prevent the negative nutritional balance, which results in ketosis.

Further prevention can be done by ensuring the cows are calving in a clean, dry and comfortable area, which is not over-crowded.

## Other Diseases

### Abscess of the Liver

Caused by a disorder of the rumen resulting from heavy grain feeding. It could be the result of parasitism or an infection from the gut.

**Symptoms** - Usually no visual signs.

**Treatment** - Determine and treat the primary disorder that is resulting in the liver abscess.

**Prevention** - Conditions usually indicate some other disease and prevention lies in treating the primary disorder.

### Bloat

Occurs when the rumen and reticulum become filled with gases. It often results from eating lush pasture when the rumen overloads with gas that cannot escape. The gas mixes with food to form foam - frothy bloat.

**Symptoms** - This is a serious condition that can result in death within hours. It begins with pronounced swelling in left flank. In severe cases, the upper part of the flank rises above the level of the backbone. The animal moves uneasily and has difficulty breathing.

**Treatment** - WORK FAST! Release the gas as quickly as possible. Pass a stomach tube into the rumen until the gas pocket is reached. If much froth is present it means gas has mixed with the food and won't be easily released. Pass a pint of defoaming agent such as vegetable oil through the tube. If it won't go down the stomach tube, inject it into the paunch with a syringe and extra long needle. As a last resort, the rumen can be punctured with a knife or trocar (pointed instrument with a tube that stays in the loin to allow gas to escape). This is called tapping and should be done by someone experienced. A cow should be tapped halfway between the last rib and the point of the hip bone and four inches down from the side of the vertebrae to the short ribs.

**Prevention** - Gradually introduce animals to lush legume pastures and never let them overeat that type of feed. Feed high grain diets carefully. Commercial anti-foaming agents can be added to the feed concentrate to guard against frothy bloat.

### Hardware Disease

Occurs when foreign objects such as nails, wire or machinery parts are eaten. They are swallowed into the rumen where they often do little or no harm. However, once pushed into the smaller reticulum they puncture the wall and from there can damage the diaphragm, liver, heart or lungs. Most heavy metal objects will probably fall directly into the reticulum.

**Symptoms** - Going off feed, weakness, showing obvious pain when moving, may stand with her back feet lower than its front to relieve pressure on the abdomen

**Treatment** - Surgery may be required to remove the object. Antibiotics should be used to control infection. Never give laxatives to an animal suspected of having hardware disease.

There is a special magnet made in the shape of a bolus that can be given to the animal. The animal eats it, and it remains in the reticulum to collect and immobilize any magnetic material. The magnet can remain in the stomach of the cow for the rest of her life and will not cause her harm.

**Prevention** - The most logical preventive measure is to keep metal objects out of reach of cattle. Cow magnets are also practical and inexpensive tools to help prevent ingested objects from moving through the system.

## **Digestive Disorders**

There are several disorders that can affect the digestive systems of dairy cattle. Rations should be designed to minimize problems, but there are several complications that can occur. Note that displaced abomasums are a digestive disease but are discussed in previous sections with the other main diseases affecting dairy cattle.

### **Stomatitis**

Inflammation of the mouth caused by bruising or chemical irritation

**Symptoms** - Excessive salivation, evident pain in the mouth, bad breath

**Treatment** - Often, you simply need to remove the cause of irritation, such as a plant lying in the barn area. Antibiotics may sometimes be used.

**Prevention** - Keep animals away from pastures with sharp plants or grasses. Buttercups, crocus, and cowslips can cause chemical damage as can medicines containing arsenics, mercurials and iodides. Such medicines should not be applied to skin where the animal might lick them. Do not give animals hot foods.

### **Choke**

Occurs when foreign objects clog the esophagus

**Symptoms** - Coughing, retching, slobbering, forced swallowing, may appear anxious, bloated

**Treatment** - It may be possible to work the object up with your hand by feeling through the throat. Lower objects may be gently pushed into the stomach with a probing (rubber tube with wooden plug at one end)

**Prevention** - Do not feed large pieces of food to animals. Keep foreign objects that can be swallowed away from animals.

### **Gastric Impaction or Indigestion**

Indigestion occurs when the first two compartments of the stomach are packed with food that won't digest. In rare cases, the third and even fourth compartments are overfilled. Improper feeding, bad feeds or gorging are usually the cause.

**Symptoms** - going off feed, stops chewing cud, constipation, moaning, arches her back and kicks at her belly, in severe cases, the animal may go down and become paralyzed as if in a stupor.

**Treatment** - if bloat accompanies indigestion treat bloat first. Animals often recover suddenly without treatment. The animal should not be put back on feed until the rumen has again become active. In very severe cases, it may be necessary to operate to remove the undigested food.

**Prevention** - as with bloat, overeating of grain or green foods should be avoided. Sudden changes from pasture feeding to dry feeds are also dangerous as they can lead to impaction.

## **Johne's Disease (yo-nees)**

This disease is becoming a big cause for concern on dairy farms due to losses in milk production. The disease is spread via the manure of infected animals and gets into the food and water supply. When the organism arrives in the intestines it attacks the walls and sets up such an infection that food can no longer be absorbed into the blood. Though young animals are usually attacked, death may not follow until years after the infection has set in.

**Symptoms** - general loss of conditioning in the animal, diarrhoea, rough coat, dry skin, loss of appetite (appearing towards the end of the disease)

**Treatment** - there is no known cure. Practically all animals die within one month to two years after symptoms appear. Therefore, the best treatment is prevention.

### **Research it!**

What are some best management practices to help prevent and control Johne's disease in cattle?

## **Watch For...**

**Foot and Mouth Disease** - a highly contagious, viral disease

- In 2001 an outbreak had resulted in the slaughtering of 4,190,000 sheep, cattle, pigs, goats, and deer.
- It affects cloven-hoofed animals including cattle, sheep, pigs, goats, deer, elk, and buffalo; very rarely does it affect humans.
- Infected animals may develop blisters in the mouth (snout), on the feet, in teats and udder.
- Most commonly spread by direct contact between animals but can be spread by indirect contact.
  - Direct: blisters, nasal discharge, saliva, milk, semen, manure, and urine.
  - Indirect: contaminated vehicles, people, frozen semen, contaminated feed, and drinking water.

**Bovine Spongiform Encephalopathy (BSE)** - also known as Mad Cow Disease

- Caused by an abnormal prion protein that can convert normal prion proteins to abnormal ones, but the specific cause of this protein occurrence is unknown
- It is a disease that attacks the nervous system of cattle, slowly progresses and is eventually fatal
- This is a reportable disease in Canada, so veterinarians and laboratories are required to report it when they find an animal that has the disease. Canada's first reported case of BSE occurred in May 2003, with a handful of cases being reported after that. The presence of this disease resulted in the United States closing its borders to Canadian cattle from May 2003 to November 2007. Since the two countries are major trading partners, this caused great economic devastation to the Canadian agricultural industry.
- Infection results from eating infected brain or spinal cord material of an infected animal.
- Symptoms of the disease usually are not evident for four or five years. When they do progress, symptoms may include nervous or aggressive behaviour, abnormal posture, lack of coordination, trouble getting up,



an increased appetite but lost weight, and decreased milk production. Usually, the animal dies within two to six months after the onset of symptoms.

- Diagnosis may tentatively be made based on symptoms, but the only way to ensure an accurate diagnosis is to examine the animal's brain after it dies.
- There is no known vaccine or treatment for the disease. The best way to dispose of infected animals is incineration so that the disease cannot be passed on via the animal's carcass.

### **Do It!**

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

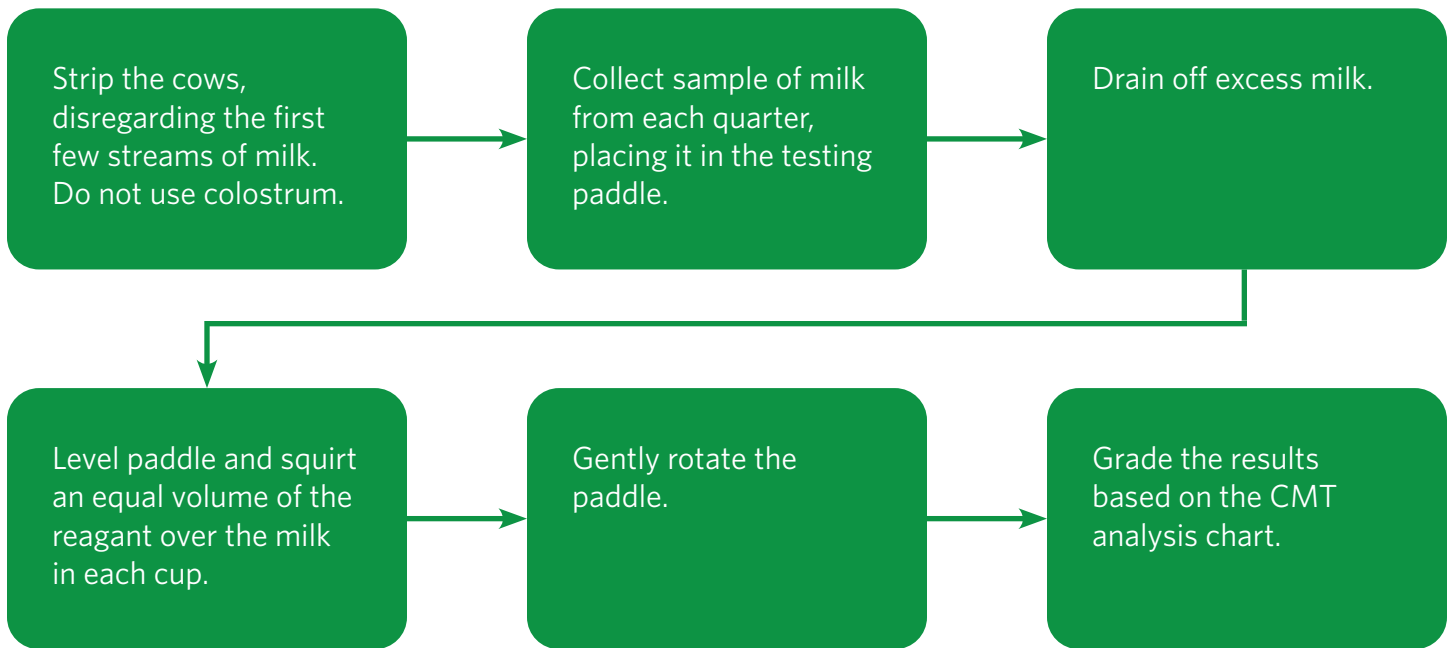
### **Judge It!**

Choose four of any one item that are used in a medical treatment of a disease or condition listed in this meeting (items could be four of magnets, bolus guns, syringes, tube feeder, etc.). Compare and rank the items based on their condition, effectiveness, cost and ease of use.

## Activity #1 - Performing a California Milk Test (CMT)

<b>Do</b>	Time: 20 minutes  Materials: strip cup, CMT, healthy cow and a cow with mastitis  NOTE: ensure the farmer is okay with his cows being stripped out for the demonstration. This should be done before members arrive	Start by discussing the signs and symptoms of mastitis as a group.  Compare the udders of a healthy animal and an animal with mastitis. Be sure to feel the udder to truly see the difference!  Squirt a small amount of milk into the strip cup (one cup for each animal) compare the two samples. Subject both samples to the CMT and compare the results.  Discuss treatment options for the case of mastitis
<b>Reflect</b>		To show all members what a case of clinical mastitis looks like and how to detect it. It also gives them some experience in how to treat an infection. Make sure they know that mastitis can also be subclinical, with no visible signs that the cow has mastitis.
<b>Apply</b>	Prompting questions	What were the differences observed between the two cows?  Why is it important to test for disease in your herd?  What can prevent mastitis? Are all cases preventable?

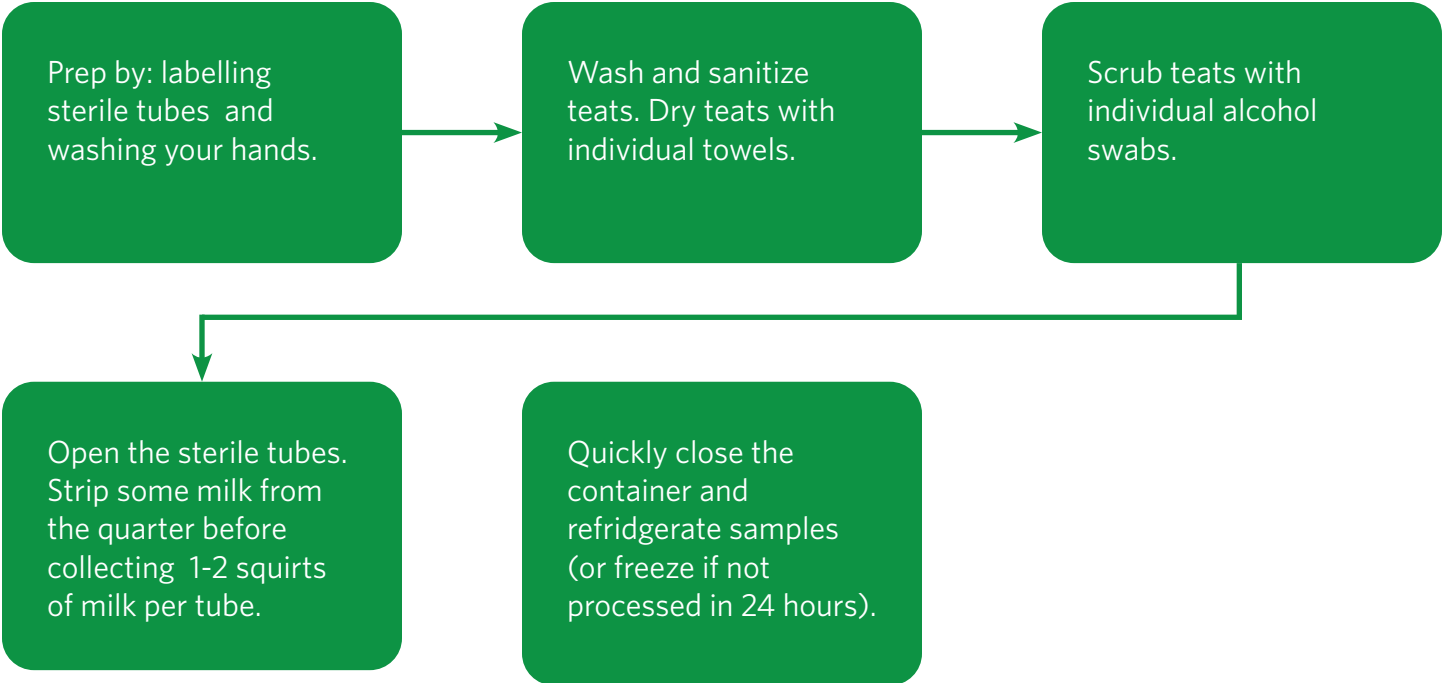
## Performing a California Milk Test (CMT)



	Negative	Trace	1/2 positive	2/3 positive
	Mixture remains liquid. No flakes or gel form	Mixture starting to turn to a gel. Seen best by tilting the paddle and observing how the liquid moves	Mixture is a distinctly a gel	Mixture thickens quickly, turning to a jelly
Quarter Sample	No mastitis	Trace mastitis	Mastitis	Mastitis
SCC (1,000s)	0-200	200-500	500-1500	1500-5000
% milk loss per quarter	0	6%	15%	25%

## Activity #2 - Culture Samples

<b>Do</b>	Time: 15 minutes  Materials: culture sample flow chart, sterile tubes, teat dip or sanitizer, clean individual towels, alcohol swab, milking cow  NOTE: ensure the farmer is okay with his cows being stripped out for the demonstration. This should be done before members arrive	Follow the flow chart below to learn how to collect culture samples.
<b>Reflect</b>		To discuss with members why culture samples are a valuable tool in combating mastitis infections. A culture sample tells you exactly what organism is causing infections so that you can treat the infection more effectively.
<b>Apply</b>	Prompting Questions	Why is it important to follow procedure when taking samples?  What are the different types of mastitis? How can they be diagnosed and treated



## Activity #3 - Evaluating Health Problems

<h1>Do</h1>	<p>Time: 30 minutes</p> <p>Materials: Worksheet provided below, pens/pencils, resource book</p>	<p>Divide into groups, each getting 1 or more situations (examples below).</p> <p>Members will play the vets and determine what the animal may have, suggest a treatment and how to prevent it from happening again</p> <p>Meet as a group and see if everyone has the same conclusions. If not, why did the groups diagnose the way that they did</p>
<h1>Reflect</h1>		<p>Members learn how to diagnose, treat and prevent common health problems on the farm</p>
<h1>Apply</h1>	<p>Prompted questions</p>	<p>If you did not have the resource guide, where would you go for information?</p> <p>How did you narrow down your prognosis?</p> <p>Why would a producer want to have a good understanding of treatments and signs and symptoms of different diseases?</p>

### Situations:

- Situation 1: Environmental mastitis
- Situation 2: Milk fever
- Situation 3: Acidosis causing laminitis
- Situation 4: Foot rot
- Situation 5: Ketosis

Situation 1: your herd has had consistent SCC for the last 6 months however, it has recently skyrocketed. What could be causing this?

Cause	Treatment	Prevention

Situation 2: You have recently noticed that some older cows are going down just after calving without getting up. What could be causing this?

Cause	Treatment	Prevention

Situation 3: You recently changed rations and you have noticed more of your cows are showing signs of lameness. What could be causing this?

Cause	Treatment	Prevention

Situation 4: You have noticed that your cows have started to go lame and you are noticing a strong rotting odour in the barn. What is going on?

Cause	Treatment	Prevention

Situation 5: you have a fresh cow who has lost a lot of weight and has a different smell than the rest of the herd. What is going on with this animal?

Cause	Treatment	Prevention



# Digital Dermatitis

1a



Also called: Strawberry Foot Rot or hairy heel warts

Causes: Bacteria (*Dermatophilus congolensis*) or contact with infected animals, equipment, dormant soil. Can be caused by high temperatures, humidity and wet environments

Effect: appears as a red patch just above the cleft of the hoof. Lesion will develop as a raised patch, with hair-like structures sticking out. Causes pain and lameness

Treatment: Difficult to treat. Footbaths may help. Topical dressing and antibiotic sprays. Keeping infected area clean and dry

1b

## Foot Rot

2a



Caused by: Bacteria (*Fusiformis Necrophorus*) or small stones, frozen ground, mud, urine or manure.

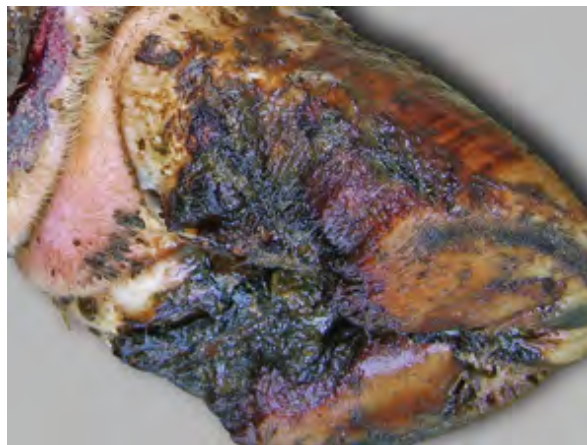
Effect: Lameness, swelling and inflammation of the skin of the coronary band and the skin between the claws. Animal will be in pain and have an odor similar to sour milk. Hoof may ooze puss.

Treatment: keep hooves dry. Animal should walk through foot baths. Can be treated with anti-biotics. Full recovery is possible if treated early.

2b

## Heel Erosion

3a



Cause: Wet and dirty environments or overgrown hooves (causes weight to shift toward the heels, exposing the heel to erosion)

Effect: Pits on the surface that can develop into grooves that get filled in with black material and bacteria. In some cases the horn can separate at the grooves to form a flap. A new sole can start to develop underneath the flap, causing the material to become packed in between the layers.

Treatment: Remove unsound horn. Clean area and treat with a disinfectant liquid. Animal should be confined for several days until the newly exposed heel hardens. In severe cases, protective bandage should be applied. Regular hoof trimming and dry environments are important to prevention.

3b

## Laminitis (founder)

4a

Cause: not fully understood. Likely due to high levels of carbohydrates within the diet.

Effect: Long, overgrown and deformed feet and toes. Animals appear lame and stiff and will have difficulty getting up and down. Can cause further issues such as ulcers and hemorrhages.

Treatment: Typically done on a case by case basis. If suspected within the herd, consult your veterinarian or hoof trimmer.

4b

## Sole Ulcers

5a



Cause: Typically a side effect of laminitis. Also caused by moisture, manure, excessive wear and poor hoof trimming.

Effect: Raw sores typically occurring on the inner side of the outside claw.

Treatment: Relieve the pressure on the ulcer. This is done by trimming the area around the ulcer, applying a topical treatment (copper sulfate based) and bandaging the hoof. This should be done by a hoof trimmer or vet. In some cases the ulcerated area has expanded to the point where there is no wall structure left on the hoof. In this case the effected claw should be elevated by using a block on the unaffected claw to elevate the effected claw.

5b

## White Line Disease

6a



Also called: White Line Separation, White Line Disease

Cause: Can be a side effect of laminitis. Also caused by moisture, manure, excessive wear and poor hoof trimming.

Effect: in mild cases a void occurs in the junction between the sole of the hoof and the hoof wall. In more severe cases an abscess can form (generally at the heel-sole-wall junction)

Treatment: Removal of black marks within the white line is important until healthy horn is exposed. Remove abscess from the hoof.

6b







## Meeting 6 - Medicine - Making Things Better

### Setting Objectives:

To have and appreciate the knowledge of knowing when and how to properly and safely use medication for animals.

### Suggested Learning Outcomes:

- To learn how treatments are administered properly
- To understand the various reasons why medication might be used for animals
- To recognize the importance of keeping records
- To learn about proper disposal of medical supplies

### Suggest Roll Call Questions:

- What do you expect to find in your barn's medicine cabinet?
- Have you ever treated an animal at your farm? Was it successful?
- What are some ways that we can give medicine to our cows?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Common medicine</li><li>• Delivering medicine to the herd</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Treatment Options and Medicine

While the most important way to maintain herd health is to manage your farm to prevent diseases, it is impossible to prevent your cows from ever getting sick. Medicines used to treat animals on the farm must be handled carefully - just like medicines for people! In fact, there are several reasons why medicines might be used on farms:

- Prevent and treat disease
- Promote or enhance growth
- Control parasites
- Enhance breeding
- Milk let-down

You cannot treat diseases properly unless you know how to store and use medicines safely. For example, some medications need to be stored in the refrigerator and would be useless if kept in a warm barn.

To make sure that medication is administered safely on farms, it is recommended that all Ontario dairy farms have someone trained on handling medicines. There are several volunteer courses like the Livestock Medicine Education Program Course, a one-day course with exam.

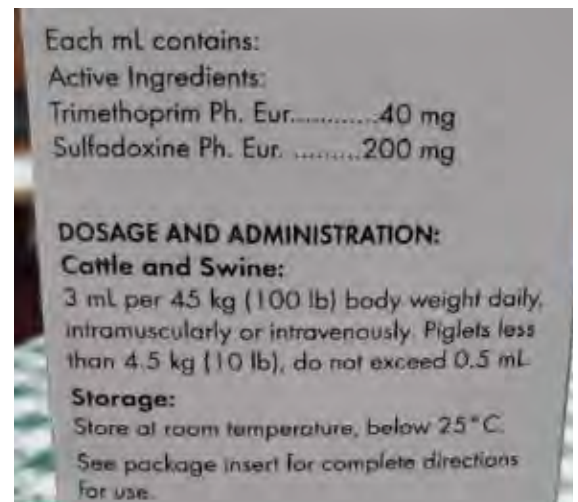
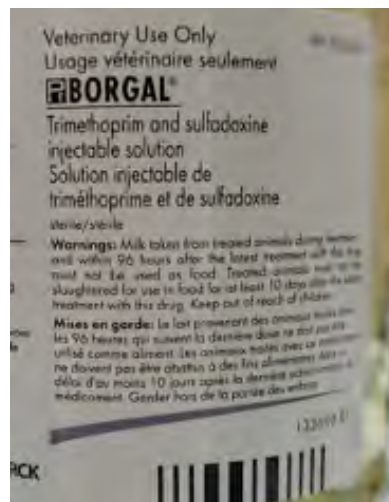
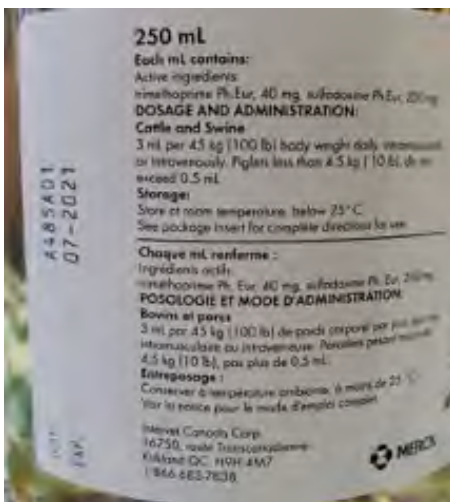
There are three ways to obtain medication on the dairy farm:

1. Veterinarian – sells over the counter drugs as well as prescription drugs
2. Livestock Medicine Outlets – Companies that are approved to sell over the counter medicines only
3. Feed Dealers – Some medications may be provided in feed rations, with prescriptions required from your veterinarian

Medicines should be stored according to the directions on their labels. Labels include expiration dates as well as the temperature at which the drug should be stored.

### Experience It!

Invite a guest to your meeting that is a livestock medication salesperson. Find out why this person chose this profession, what their career path has been and what their job looks like from day to day.



Medication should be stored in a closed cupboard or area that is not accessible to animals, children, or people other than those providing treatments.

### Discuss It!

Where/how is medication stored on your farm?

## Being Safe with Medicines

There are several steps you must take to properly and safely use medication on your farm:

- Read the label. Labels tell you the 5 W's and the H:
  1. Who the medicine is for
  2. What the medicine is for
  3. Where the medicine should be stored
  4. When the medicine should be used and when it expires
  5. Why the medicine works (the ingredients)The label also tells you how: how much, how long, how often, how it should be administered
- Use the right dose and equipment. Figure out the dose according to the animal's weight and the label's instructions. Always use the right equipment. For example, use disposable needles on one cow only.
- Stop milk contamination. Medicine travels into a cow's milk. Some medicines do not affect the milk, but others do, so you must keep a treated cow's milk out of the bulk tank. Otherwise, you can be fined for selling contaminated milk that contains inhibitors (drug residues). Make sure you keep milk from all quarters of a cow out of the bulk tank, even if you only treat one quarter. If you are unsure whether milk is safe to put back in the bulk tank, test it. You can use a home test kit for antibiotics. The label on the antibiotics will also tell you the withdrawal time during which milk or meat from treated animals cannot be used for human consumption.
- Keep records. Records will help you prevent milk contamination. You should always keep treatment records and properly identify treated cows. You can use spray paint, tags or leg bands to identify animals. Keep the label information from the medicine for your records too. Records should also be kept for calves and heifers because it can be helpful to know their medical history.

### Talk About It!

How does your farm identify cows that have been treated? How does your farm keep records of treated cows?

## Administering Medicine

There are several ways that medication can be administered to animals. Reading the label on the medication will tell you how it should be given to the animal.

### Giving Pills (i.e. aspirin, scour pills, etc.)

Steps involved:

1. Tie the animal in a stall or secure in a head gate. Grab the animal by the side of its mouth and turn its head to open its jaws. Don't raise the head too high or the calf/cow won't be able to swallow.
2. Force the balling gun containing a pill or capsule into the side of the mouth, over the back of the tongue and far enough so that the cow cannot cough up the pill. Push the plunger on the balling gun so the pill goes into the cow's throat.
3. Observe the animal for a few minutes to ensure they don't cough the pill back up.



## Drenching (i.e. glycol)

Drenching involves trying to give a cow a liquid drug. The steps to do this are:

1. Tie up the animal with its head to the stall or head gate so that its nose forms a straight line with its neck. Do not raise the head too high or the cow will not be able to swallow.
2. Give the animal a small amount of the liquid. The animal must swallow so that the liquid does not enter the lungs and cause more problems. It may be helpful to use a milker inflation over a pop bottle to get the liquid down far enough into the throat so that the cow cannot spit it out. A plastic bottle is better than a glass one because it will not break. If the animal starts to cough, lower its head at once so that the liquid does not get into her lungs.
3. Continue to give the liquid in small amounts, allowing the animal time to swallow and breathe.

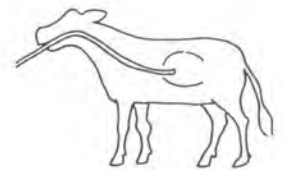
## Paste



1. Pastes can be administered using a large disposable syringe by following a couple of steps:
2. Restrain the animal in a stall or head gate
3. Place the tip of the syringe between the cow's lips at the corner of the mouth. Eject the paste well back onto the cow's tongue so that she can't spit it back out

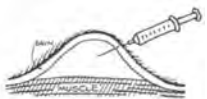
## Stomach Tubing

Stomach tubes are sometimes used to deliver large quantities of liquid medications or nutrients into the stomach of the cow. They are often used to give electrolyte solutions to sick calves. It can also be used to relieve pressure from gas when a cow has bloat.



For calves, an esophageal feeder can be used for this purpose. For older animals, a portion of a garden hose may be used. Stomach tubing should only be performed by people who are familiar with the procedure, as it is important to insert the liquid into the esophagus and not to get liquid into the lungs.

## Giving a Needle



Giving an animal a needle is a very common way of administering medicine. There are three ways to do it

- Subcutaneous (SC) - Given under the skin. Insert the needle into the loose-tented skin in the neck in front of the shoulder. Do not inject more than 10mL (also called cc) per site.
- Intramuscular (IM) - Into the muscle. To reduce scar tissue or abscesses in meat, give IM injections into the neck, ahead of the shoulder point. Do not inject more than 10mL per site.
- Intravenous (IV) - An IV injection is made into the vein on some area of the animal. IVs are most often given in the neck, but sometimes may be given in a vein under the tail or into the mammary vein. These injections are more difficult to give and should not be attempted by someone who isn't experienced. The medication must be administered very slowly and any air bubbles must be removed.

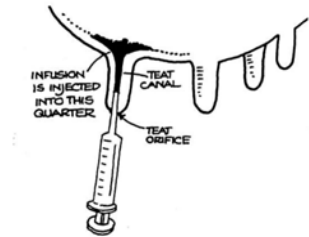


## Discuss It!

Why is it imperative that air bubbles be removed from a syringe before administering medicine intravenously?

## Intermammary treatment

Udder infusions are very similar to giving other needles, but instead of piercing the animal, the cannula of the syringe is inserted in the teat opening of the cow. When using a cannula to insert intermammary drugs, partial insertion is recommended to reduce the chance of forcing microorganisms into the teat cistern.



## Needling

Regardless of what type of needle you are giving there are several things that need to be considered.

- Needles and syringes should be clean and sterile. For best management practices, needles should be used once and disposed of.
- Needle size should be considered. The size of the needle depends on the size of animal, how the needle is being given and the medicine that is being given

Size of Animal	Route	Gauge	Length
Calf	IM	16-18	1 inch
Cow	IM	16-18	1.5 inch
Cow	SC	16-18	1-3/4 inch

- Secure the animal with a halter or with a head gate
- Shake the drug if the directions call for it. Disinfect the stopper. Hold the drug bottle upside down and push the needle through the rubber stopper. Inject some air into the drug bottle. Pull out the plunger until the syringe is filled to the correct level. Remove the drug bottle and hold the syringe upright. Force the air out of the syringe.
- Disinfect a clean area on the animal where the injection is to be made. Choose different injection sites if needling the animal over a long period or when dividing doses. Intramuscular needling should be done in the neck, not the hindquarters, to avoid bruising meat & tissue.
- Insert the needle and make the injection. You can pull back on the needle to check for blood to ensure that a subcutaneous or intramuscular injection is not going to go into a blood vessel. Conversely, you should pull back on the needle if making an intravenous injection to ensure that the injection will be made into the blood vessel. An intramuscular injection may require a little rubbing after the needle is removed.

## Experience It!

Have a farmer, herd manager or veterinarian demonstrate any of the above techniques. Find out what kind of training they received to know how to perform the technique.

## Judge It!

Choose four of any one item (choosing something different than the last meeting) that are used in a medical treatment of a disease or condition listed in this meeting (items could be four of bolus guns, syringes, tube feeder, etc.). Compare and rank the items based on their condition, effectiveness, cost and ease of use.

## Disposing of Medicines and Needles

Medicines, needles and other medical equipment can be considered bio-waste and therefore proper disposal is important.

- Prevent illness or injury resulting from handling
- If needles are not disposed of properly, someone could use them for another purpose
- Unwanted medicines could be used inappropriately by others or lead to antimicrobial resistant infections
- Waste can enter water and impact the farm water supply, creeks, rivers, lakes, municipal water supplies

Depending on what the medical waste is, it can be disposed of:

- At a local landfill – it is important to check with the municipality first
- Vet – some vets will accept medical waste and sharps depending on the vet’s biosecurity protocols
- Commercial medical waste facilities – safe waste disposal, which can be free! These places will autoclave the unwanted needles and incinerate other medical waste

When disposing of medical waste it is important to never dispose of it in:

- Long-term storage on the farm due to deterioration of containers and labels
- Buried on the farm because they could pollute soil and water
- Burn barrels because some medications can explode when heated
- Manure piles because someone or something could get hurt. Deterioration of needles takes a long time
- On public property because this is pollution
- In household garbage or recycling bins because this causes environmental contamination or can injure municipal workers or spread disease and because these substances are not recyclable
- On other farms because this promotes irresponsible use of medicines in livestock

### Research It!

Find out where the closest commercial medication waste facility is in your area.

## Activity #1 - Reading Medical Labels

<b>Do</b>	Time: 30 minutes  Material: different types of medicines used on a dairy farm including labels, Using Medicines Safely Worksheet	Divide into groups of two or three. Each group will look at the medical labels and fill out the Medicine Safety Worksheet.  For advanced/senior members, provide a list of symptoms and have them decide which medicines of the ones provided will treat the issue.  Members can use this template to create factsheets for all the medicines in the barn, providing staff and other workers with more detailed information
<b>Reflect</b>		Members will learn how medicines are administered and how to read medical labels
<b>Apply</b>	Prompting Question	What is the most important step in making sure that medicine is administered safely?  What would you do with this information on the farm?  How can you use the learned principals today in your own life?

## Medicine Safety Sheet

	Medicine 1:	Medicine 2:	Medicine 3:
Who is the medicine for?			
What is medicine for?			
Where should the medicine be stored?			
When should the medicine be used and when does it expire?			
Why does the medicine work? (Active ingredients)			
How much should be given?			
How should it be given?			
How often should it be given?			
For how long should it be given?			
What are the withdrawal times (if any)			



## Activity #2 - Giving Needles Safely

### Do

Time: 15 minutes

Materials: an orange (or grapefruit, etc.), a needle, syringe, knife, cutting board, paper towels or newspapers and a mixture of food colouring and water. It is best to have the water and food colouring mixed (strong, dark coloured mixture) prior to the meeting.

- Give each group an orange, needle, syringe, knife and cutting board, and paper towels
- Have someone from each group come to a central location to draw their syringe, filling it with the food colouring and water mixture. Discuss how a syringe of fluid should be drawn from a real medicine bottle, by injecting air into the bottle and then drawing fluid into the syringe by pulling out the plunger of the syringe. Discuss the removal of air from a syringe once it has been loaded.
- Members should tap the syringe, holding the needle part (with cap covering needle) upwards, to move any air bubbles to the top. With the cap removed, the plunger should be pushed in a little bit so some liquid and air comes out the opening of the needle. When the air is gone and there is only liquid left, the needle is ready to be given to the animal.
- To simulate giving a subcutaneous injection, members should insert their needle just under the skin of the orange and push the plunger in to insert some fluid.
- To simulate giving an intramuscular injection, the needle should be pushed all the way into the middle of the orange, and the plunger pushed in to release fluid.
- The injections can be repeated by the other member(s) of the group.
- The orange can then be cut open on top of the cutting board, revealing the spreading of the 'subcutaneous' injection just under the skin of the orange, and the 'intramuscular' injection through the middle of the orange. Hint: if no spreading of the 'medicine' can be seen, try cutting the orange in the opposite direction.

<h1>Reflect</h1>		<p>To give members hands on practice at administering subcutaneous and intramuscular injections. It is unreasonable to expect an animal will be available for demonstrating injection procedures at a 4-H meeting, so this is a good simulation.</p> <p>To take an additional step have members write the steps they took down</p>
<h1>Apply</h1>	<p>Prompting Questions</p>	<p>When would each type of injection be given?</p> <p>What other steps should be taken when giving injections (location of injection, disinfecting the area, etc.)</p> <p>What are the safety precautions that we should take when giving needles?</p>





Section 2 **Nutrition**





## Meeting 1 - Something to Ruminare About

### Setting Objectives:

To appreciate the complexity of the ruminant digestive system.

### Suggested Learning Outcomes:

- Learn the difference between ruminants and non-ruminants
- Learn about the complexity of the bovine digestive system

### Suggested Roll Call Questions:

- Name a ruminant animal.
- What is one part of the digestive system you know about?
- How much do you think a cow's stomach weighs?

### SAMPLE MEETING AGENDA

Time: 1 hour, 30 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Ruminant animals</li><li>• The digestive system</li><li>• In-depth look at the cow's stomach</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Diet: Energy In and Energy Out

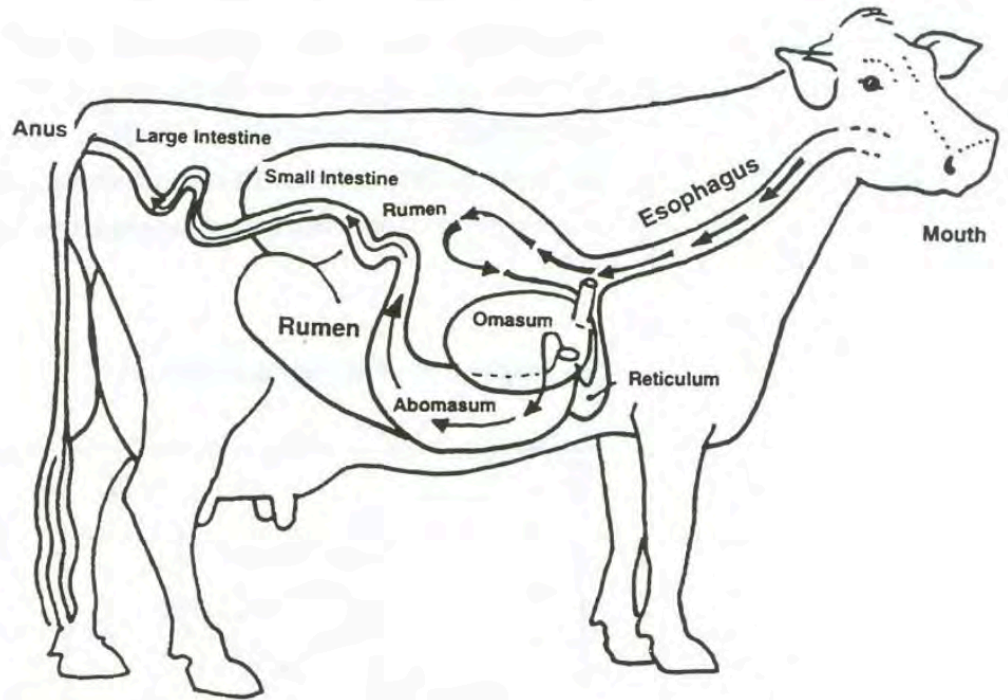
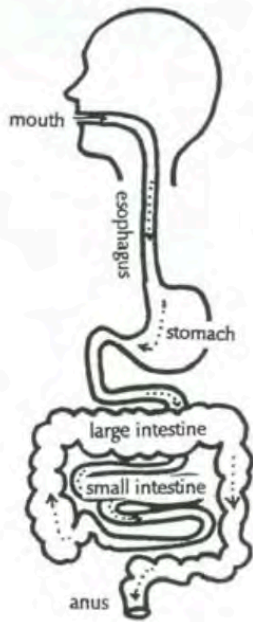
##### What is a Ruminant?

Dairy cows are ruminant animals. Ruminant animals are special in couple ways:

1. They need a special diet to stimulate digestion
2. They have multiple chambers in their stomach (4 in the case of cows)




Humans are monogastric, which means that we have one stomach to digest our food. For ruminants, digesting their food is a team effort, requiring all 4 chambers to play a part.

To realize the size of a mature cow's stomach compare it to the following (Total Digestive system weight listed inside animal):



Ruminants	
<p>A silhouette of a cow with a large black weight marker on its side that reads "356kg".</p>	<p>Digestive System</p> <p>Stomach - 70.8%</p> <p>Small Intestine - 18.5%</p> <p>Cecum- 2.8%</p> <p>Large Intestine - 7.9%</p>
<p>A silhouette of a sheep with a large black weight marker on its side that reads "44 kg".</p>	<p>Digestive System</p> <p>Stomach - 66.6%</p> <p>Small Intestine - 20.5%</p> <p>Cecum - 2.6%</p> <p>Large Intestine - 10.3%</p>



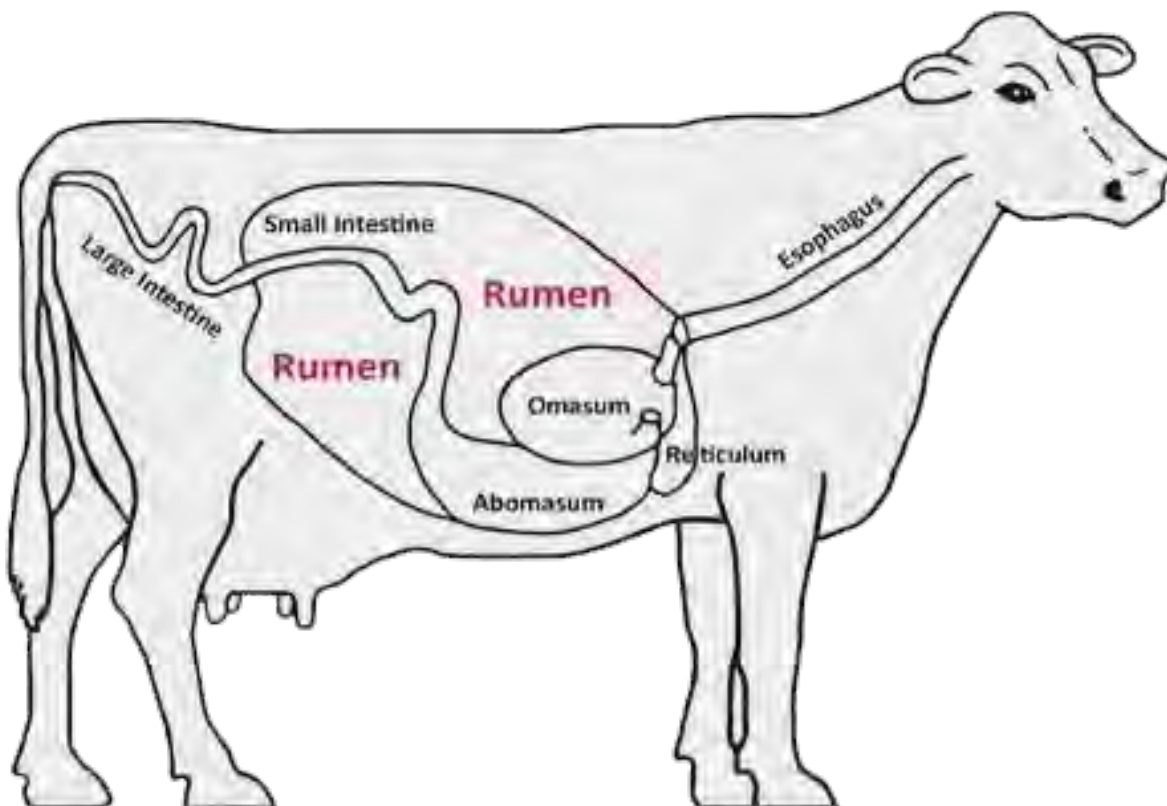
Monogastrics	
	<p>Digestive System</p> <p>Stomach - 29.2%            Small Intestine - 33.3%            Cecum - 5.6%            Large Intestine - 31.9%</p>
	<p>Digestive System</p> <p>Stomach - 8.6%            Small Intestine - 30.2%            Cecum - 15.6%            Large Intestine - 45.3%</p>
	<p>Digestive System</p> <p>Stomach - 18.8%            Small Intestine - 62.4%            Cecum - 0%            Large Intestine - 18.8%</p>

**The Digestive System**

**Research It and Talk About It!**

What are the differences between monogastrics and ruminants?  
 What are the differences between species with the same types of stomachs?

There are many different parts of cow's digestive system, all of which play a different role in digestion.



<p><b>Mouth</b></p>	<p>Contains: Lips, teeth, tongue and salivary glands</p>	<p>Lips help bring the food into the mouth.</p> <ul style="list-style-type: none"> <li>• Teeth begin mechanical digestion.</li> <li>• The tongue helps mix and move the food towards esophagus.</li> <li>• Salivary glands provide juices containing enzymes that help in the chemical digestion of food.</li> <li>• The epiglottis, a muscular flap, closes off the trachea and opens up the esophagus so that food can pass smoothly to the stomach.</li> </ul>	<p>The teeth crush the food.</p> <ul style="list-style-type: none"> <li>• Saliva wets it and turns it into a soft mash;</li> <li>• saliva contains enzymes which begin digestion of starch (a complex carbohydrate).</li> <li>• Tongue turns the mash into a bolus.</li> </ul>
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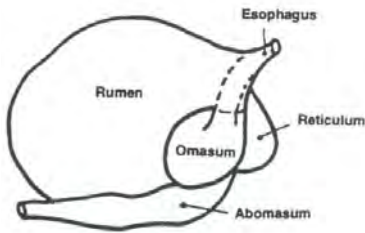
<p><b>Esophagus</b></p>	<p>The tube that connects the mouth and stomach</p> <p>Cardiac sphincter (ring of muscles) is located where the esophagus joins the stomach</p>	<p>The passage of chewed food from the mouth to the stomach.</p> <ul style="list-style-type: none"> <li>• The cardiac sphincter is normally closed preventing food and acid in the stomach from moving back up. A peristaltic contraction triggers it to open.</li> </ul>	<p>No digestion occurs here</p>
<p><b>Stomach</b></p>	<p>The stomach has 4 chambers (discussed following this chart):</p> <ul style="list-style-type: none"> <li>• Rumen</li> <li>• Reticulum</li> <li>• Omasum</li> <li>• Abomasum</li> </ul> <p>The walls of the stomachs have three layers:</p> <ol style="list-style-type: none"> <li>1) An inner MUCUS MEMBRANE, or lining with glands that secrete important digestive juices</li> <li>2) A thick middle MUSCLE LAYER that makes movement possible</li> <li>3) An outer layer of CONNECTIVE TISSUE</li> </ol>	<p>First major digestive organ.</p> <ul style="list-style-type: none"> <li>• Stomach lining secretes a gastric juice (mix of mucus, enzymes and hydrochloric acid)</li> <li>• Mucus acts as a gel to provide a flexible protective coating to the stomach</li> <li>• Pepsin (enzyme) digests the proteins</li> <li>• Hydrochloric acid (HCl) provides the acidic environment that the enzymes need</li> <li>• Pyloric Sphincter acts as a valve, preventing food from moving back into the stomach, letting food enter the intestine when opened.</li> </ul>	<p>Powerful contractions churn the food, mixing it with the gastric juice.</p> <ul style="list-style-type: none"> <li>• PROTEINS are partially digested here; fats and carbohydrates are not well digested.</li> <li>• No nutrients are completely digested in the stomach.</li> <li>• Therefore, the food must be sent on to the small intestine.</li> <li>• By the time the stomach is finished, the food is a soft, warm, grey to brown mush called Chyme</li> </ul>

<p><b>Small Intestine</b></p>	<p>The small intestine is divided into three sections: Duodenum, the jejunum and the ileum</p> <p>Duodenum - the first part of the small intestine. It occupies roughly 5% of the total intestinal length. It is tied to the stomach, and is formed in an S-shaped curve, which holds the pancreas. Ducts from the pancreas and the liver enter here.</p> <p>Jejunum - central portion is the largest part of the small intestine, occupying 90% of its length. It is not clearly separated from either the duodenum or the ileum</p> <p>Ileum - This last 5% is usually bunched up or contracted. It meets the large intestine at the ILEO-CECAL VALVE, which prevents food from moving back up into the small intestines.</p>	<ul style="list-style-type: none"> <li>• The small intestine has two major functions.</li> <li>• To complete the digestion of food</li> <li>• To absorb nutrients</li> <li>• Digestion occurs primarily in the duodenum and the jejunum. This is where intestinal juice mixes with bile and pancreatic juice to provide the enzymes needed to finish the breakdown of food.</li> <li>• Intestinal juice comes from the lining of the wall of the intestine. Unlike the stomach, which is acidic, the juices in the small intestine are alkaline.</li> <li>• Absorption takes place once digestion is complete, in the final two thirds of the jejunum and in the ileum.</li> <li>• The exception to this rule is animals whose cecum is enlarged and specialized, because this is where cellulose digestion and absorption occurs.</li> <li>• The horse, rabbit and pig all have special cecums.</li> </ul>	<p>As food leaves the stomach, it is a semi-fluid acidic mass known as CHYME. Chyme is gradually released into the duodenum thanks to periodic openings of the pyloric sphincter.</p> <p>As soon as chyme enters the duodenum, it mixes with new secretions, and turns from an acidic to an alkaline mush.</p> <p>Once digestion is complete, the chyme becomes chyle, a milky material that contains all the nutrients from digestion.</p> <p>The nutrients are picked up by the villi that line the intestine, and ultimately make their way into the animal's bloodstream.</p>
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<p><b>Large Intestine (colon)</b></p>	<p>The large intestine differs from the small in that it is larger, lumpier and has a more fixed position. It is divided into the cecum and the colon.</p>	<p>NO digestion and very little absorption occur here. Its main job is:</p> <ul style="list-style-type: none"> <li>▪ To remove excess water from the non-absorbed foods</li> <li>▪ To concentrate non-absorbed foods into feces</li> </ul> <p>Cecum: an off-shoot where the small and large intestine meet.</p> <p>Colon: a reservoir for excrement.</p> <ul style="list-style-type: none"> <li>▪ It empties into the RECTUM, which opens to the outside at the ANUS.</li> <li>▪ The anus is controlled by two sphincters.</li> <li>▪ In animals that have been trained, the external, voluntary sphincter allows feces to be held until it is convenient for voiding.</li> </ul>	<p>Specialized cecums act like rumens. They have billions of microorganisms that ferment and digest cellulose. Unlike rumens, little gas is produced.</p>
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### Test Your Skills!

How well do you know the dairy digestive system?  
 Quiz yourself at <https://www.purposegames.com/game/digestive-system-cow-game>



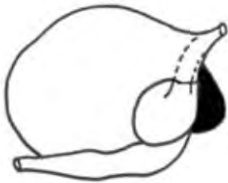
## Four Chambers are Better Than One: A closer look at the stomach

### Rumen



- The largest stomach chamber in an adult cow, taking up 80% of the total stomach capacity, and holding up to 110kg of food
- All the food goes here first. The food is mixed.
- The muscles in the rumen help to physically break down the food and mix the contents.
- Bugs (called microorganisms) are present in the rumen to break down the food and rebuild it into protein. The cow digests the bugs later and uses the protein made by the bugs for herself. When you feed a cow, you are really feeding the rumen bugs!

### Reticulum (honeycomb)



- The second stop for partially digested food is the reticulum.
- It has honeycomb shaped compartments all over it. The honeycomb catches wire, nails and other foreign materials.
- Food is mixed, soaked in acidic juices and broken down further
- Food that is too long is regurgitated back to the mouth to be rechewed as cud, or bolus a process known as rumination.

### Omasum (books)



- The third stop on the digestive trail is the omasum.
- Food is broken down further.
- Many 'leaves' like the pages in a book make up the omasum.
- The omasum squeezes the food between the leaves to get rid of water and move the material to the last compartment

### Abomasum (true stomach)



- Finally, the food stops in the last chamber of the stomach - the abomasum.
- The abomasum is similar to a human (monogastric) stomach.
- This is the only stomach that works in a young calf and the milk she drinks goes directly here.
- Secretes stomach juices and acids that break down food materials into simple nutrients (proteins, carbohydrates, fats, etc.)
- The cow's body will absorb these nutrients to give her energy and help her grow. Most absorption takes place later, in the intestines.

## Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Ruminant or Monogastric

<b>Do</b>	Time: 15 minutes Materials: list of animals	<ul style="list-style-type: none"><li>▪ Define monogastric and ruminant</li><li>▪ Discuss the differences between diets</li><li>▪ Provide members with a list of animals and have them sort them into monogastric and ruminant.</li><li>▪ Get creative, what animals outside of the farmyard are ruminants?</li></ul>
<b>Reflect</b>		Members should familiarize themselves with different digestive systems
<b>Apply</b>	Prompting Questions	Why is it important to know the type of digestive system an animal has?  If you did not know what kind of digestive system an animal, what clues will help you determine the type of digestive system?



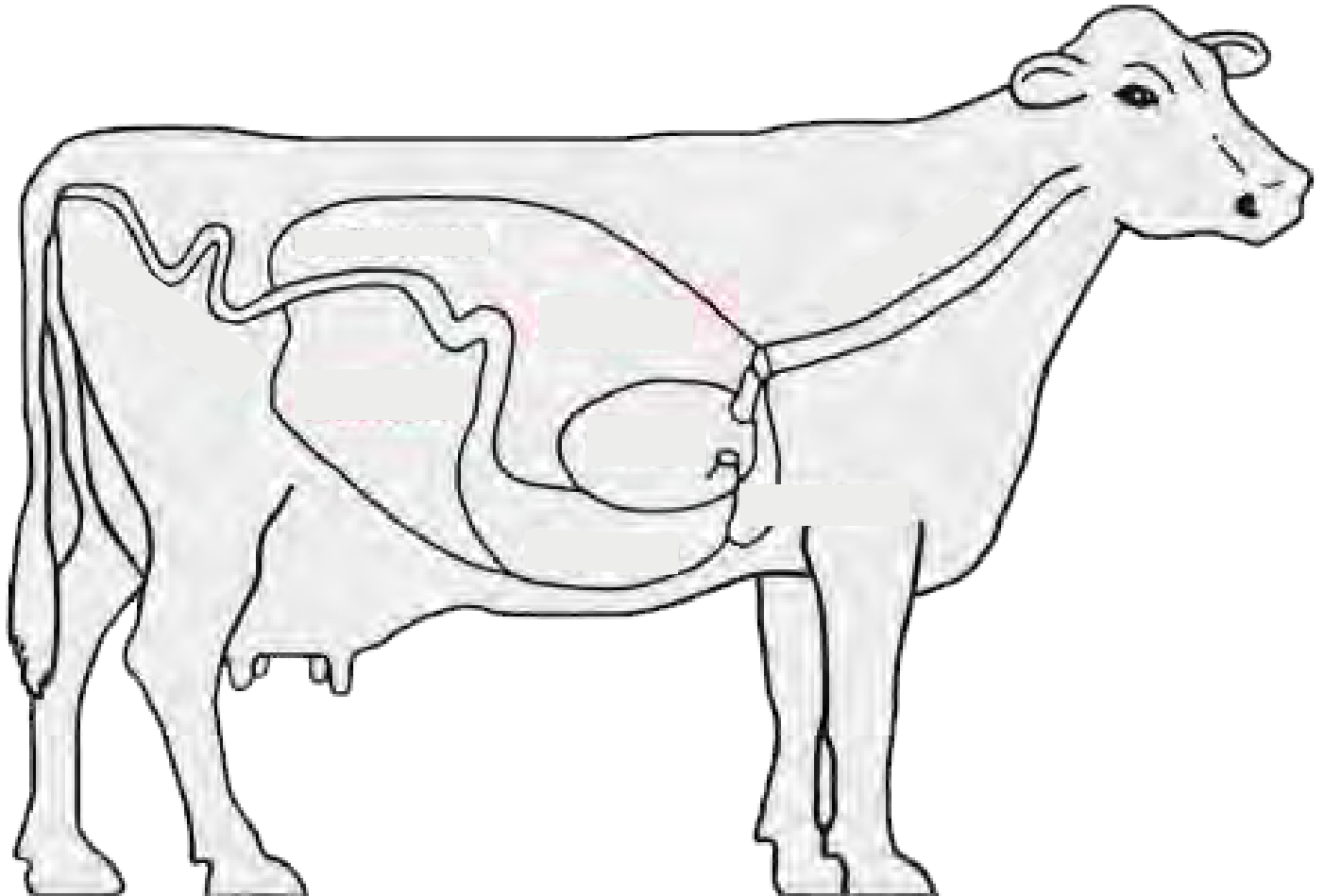
## Activity #2 - Label the digestive system

<b>Do</b>	Time: 15 minutes  Materials: an orange (or grapefruit, etc.), a needle, syringe, knife, cutting board, paper towels or newspapers and a mixture of food colouring and water. It is best to have the water and food colouring mixed (strong, dark coloured mixture) prior to the meeting.	Have members label the diagram of the digestive system
<b>Reflect</b>		Members should familiarize themselves with the ruminant digestive system
<b>Apply</b>	Prompting Questions	Why is it important to understand what components make up the digestive system?  Why is it important to understand how the digestive system works?

## Ruminant Digestive System Worksheet

Use your knowledge from the meeting to label the digestion system.

Key terms: esophagus, large intestine, rumen, small intestine, abomasum, reticulum and omasum.



### Activity #3 - Stomach Dissection

<b>Do</b>	Time: 45 minutes  Material: dissected (or not dissected and have members dissect it) stomach from a vet or butcher shop, gloves, scalpel	<ul style="list-style-type: none"><li>• Use the stomach to go over the parts of the stomach</li><li>• Have members fill out the worksheet below. For added benefit to members having a vet, teacher or butcher present would add to the activity</li></ul>
<b>Reflect</b>		Members are given an opportunity to see a cow's stomach up close and to discuss how the stomach changes from the time a calf is born until she becomes an adult cow.
<b>Apply</b>	Prompting Questions	What did you notice is unique about each chamber?  What is the pathway that food gets digested?

## Stomach Dissection Worksheet

	What I see	What I feel
Rumen		
Reticulum		
Omasum		
Abomasum		

## Activity #4 - Build a Digestive System

<b>Do</b>	Time: 30 minutes  Materials: Household items you don't mind getting cut up and glued, glue, tape, general craft supply etc.	-break club into small groups  -have members build a stomach out of household items.  See who can create: <ul style="list-style-type: none"><li>▪ The most lifelike system</li><li>▪ The most detailed</li><li>▪ The most interactive digestive systems.</li></ul>
<b>Reflect</b>		Members will gain a detailed knowledge on the different parts of the digestive track
<b>Apply</b>	Prompting Questions	What parts of the digestive system were the most complex?  How did you break up the jobs amongst the group?  How does food flow through the digestive system?



## Meetings 2 and 3 - Getting Off to a Good Start

### Setting Objectives:

To learn the importance of starting a calf's life off strong with proper nutrition.

### Suggesting Learning Outcomes:

- Learn about how the calf's stomach develops
- Learn what to feed calves as their stomach's develop

### Suggested Roll Call Questions:

- What do you think calves eat?
- Do you feed whole milk or milk replacer on your farm?
- What other food and drink do you think calves should have access too

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"> <li>• Developing the calf's stomach</li> <li>• The importance of a good calf nutrition program</li> <li>• What you should feed your calves</li> </ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Feeding Newborn Calves

In newborn calves, the abomasum is the only compartment that functions, so calves are called 'pre-ruminants'. A calf's abomasum takes up much more space inside her stomach than the abomasum of an adult cow does. See the table below for a comparison of the stomach of a cow and a calf:

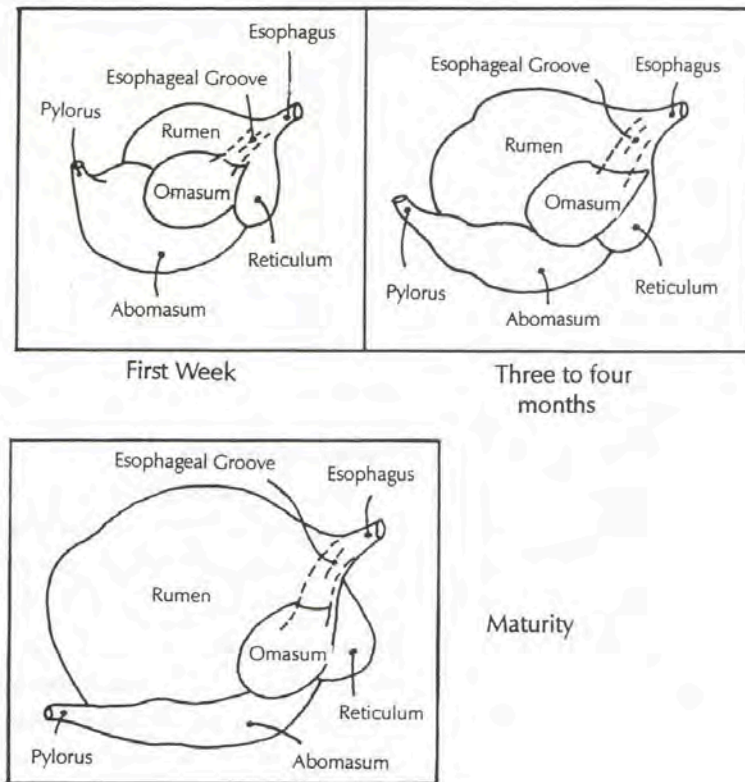
	% of Total Stomach	
	Newborn Calf	Adult Cow
Rumen	25%	80%
Reticulum	25%	6%
Omasum	10%	3%
Abomasum	40%	11%

In newborn calves, the liquid she drinks passes through the esophageal groove straight into the abomasum,

bypassing the other three compartments. The act of suckling, along with the smell and taste of milk, triggers the esophageal groove reflex, and a tunnel created in the digestive system when the muscular folds of the rumen and reticulum meet.

The milk she drinks flows through the tunnel, bypassing the other stomachs en route to the abomasum.

The other stomachs are bypassed at first because the calf needs to eat dry feed to develop the size of her rumen and the bugs contained within it. You can help stimulate the growth of the rest of her stomach through a good feeding program. You should offer a calf a dry grain mix within a few days of her birth. Grain stimulates rumen development, which increases the number and variety of rumen microbes. The microbes grow quickly and produce nutrients for the calf from the grain she eats.



## Start Strong - Keys to Feeding Calves

Designing a feeding program for your calves is one of the keys to raising healthy replacement heifers. Well-fed calves grow faster, can be bred at a younger age, and enter the milking herd sooner.

Well-fed calves can gain up to 1 kg a day without getting fat! Farmers should aim to have their calves gain 0.6 kg (small breeds) to 0.75 kg (large breeds) per day. Calves need to gain weight so they're big enough to have a calf by the time they're two years old. If it takes longer than that, the farmer begins to lose money because the heifer takes too long to become a milking cow and bring new calves into the herd.

There are several factors that are important to feeding calves, in addition to what is in the food they are getting. Here are some tips to make your calves "clear their plates":

- Regular feeding - calves must have regular mealtimes, eating at the same times each day, spread out evenly throughout the day. That helps keep calves from getting too hungry. Calves that are too hungry eat too fast and can get upset stomachs.



- Uniform food – calves grow better when they eat pretty boring diets. They need to eat the same quality and quantity of food every day, given to them at the same temperature.
- Clean Equipment – always wash the feeding equipment between feedings to kill germs that could make calves sick. The wash water should be 80°C and after washing in soap and water, the nipples should be rinsed in a 10% bleach solution to disinfect them. Just like people, calves do not like to eat from dirty dishes!
- Not too much, not too little – avoid underfeeding and overfeeding. Underfeeding leaves calves hungry so they eat too fast at the next meal and also prevents them from growing quickly. Overfeeding calves can cause scours or make them get too fat.

## What Should I Feed My Calf?

### Liquid Feeds

All calves should be fed colostrum for the first three days of their lives. After the first three days, you can feed sour colostrum, whole milk (fresh or acidified) or milk replacer. As calves get older, they can start eating dry feed.

### Colostrum

Colostrum is the first milk that a cow gives after she has given birth to a calf. It is very important to feed the calf four litres (large breeds) or three litres (small breeds) within 30 minutes of birth, and another two litres within eight hours of birth.

Good colostrum is the key to start raising a strong calf. Colostrum is important because:

- Immunity to diseases – calves are born without disease protection. Feeding a calf colostrum right away gives her immunity to diseases that will last until she is about 14 days old, when her own immune system starts to function. (For more information on immunity provided by colostrum, see Health section of 4-H Dairy Resource Guide)
- Cleans out the digestive tract
- Has three times more Vitamin D than normal milk
- Has 100 times more Vitamin A than normal milk
- Has a higher protein content to help calves start growing

Regular milk is great once the calf is more than 2-3 days old, until then a calf needs a high protein diet. Look at the difference between colostrum and normal milk!

Nutrient	Colostrum	Normal Milk
Protein	14%	3%
Milk fat (energy)	6%	4%
Lactose (milk sugar)	3%	5%
Minerals	1%	0.7%
Total Solids (not water)	24%	13%

Looking at the chart above - it looks like we should feed colostrum all the time! Once a cows digestive system is kick started, it no longer needs the additional nutrients in colostrum and can survive on regular milk. In addition, the dam only gives colostrum for the first 36-48 hours after birth

Feeding good colostrum is the key to success. How do you tell if the colostrum is a good enough quality?

- A tool known as a Brix Refractometer can be used to accurately test colostrum quality.
- Quality can be tested using a colostrometer to test the immunoglobulin levels.
- Bacterial counts can also be tested and should be less than 100,000cfu/mL (cfu refers to coliform forming units). Calves cannot absorb colostrum with high bacteria counts very well.
- Colostrum should not be pooled from several cows within the herd, because it increases the risk of spreading diseases.

### Research It and Share It!

If not available on farm, look online to find what a Brix Refractometer and a colostrometer look like and how they are used for testing colostrum. What is the cost of each of these items?

Sometimes a cow gives more colostrum than the calf needs or sometimes the calf is stillborn. In both cases, dumping colostrum should only be considered if you have a lot stored. Storing some high-quality colostrum is important in case a dam does not create enough for her calf or the quality she produced is too low.

- Colostrum can be refrigerated (1°C-2°C) without harm for two to three days. Bacterial growth from poor handling or improperly refrigerated colostrum could be high after several days. Freezing is recommended if colostrum is not going to be used within two to three days of collecting.
- It can be frozen in 2-litre double bagged freezer bags or plastic containers. It can be kept this way for up to one year. It is good to keep a supply of frozen colostrum so that if a cow gives birth and for some medical reason is unable to provide colostrum for her calf, frozen colostrum is available for it.
- Colostrum should be thawed in a warm water bath (50°C). It may be microwaved on low for short time periods as well if it is closely watched and mixed.

## Whole Milk

Whole milk is a great food source for growing calves; but, it is also the most expensive liquid to feed because it means that you will be unable to ship as much milk to the dairy and therefore will receive less money from milk sales on your milk cheque.

If you overfeed or suddenly change the amount or quality of whole milk that the calf is drinking, you can make it sick - so it is important to stick to a regular diet.

The temperature of the milk is also important. Feed calves at their body temperature (approximately 38.5°C) to reduce the stress on their bodies.

## Milk Replacer

Milk replacer is a substitute for milk. It is often fed because it is cheaper than feeding whole milk as it does not require milk to be kept out of the bulk tank. When purchasing milk replacer, it is important to read the label, just like when you are grocery shopping. Buying cheaper products might save money in the short term, but weak, small, unhealthy calves will cost you money in the future.

Remember that high-quality milk replacers have:

- minimum of 22 to 27% crude protein (build's and repairs the calf's body)
- minimum of 17 to 20% crude fat (provides energy for growth and muscle movement)
- 0.3 to 0.5% crude fibre
- protein sources include high quality milk products (buttermilk powder casein, dried whey, skim milk powder, milk albumin)
- the ability to mix easily with warm water and stay mixed until the calf drinks it

### Judge It!

Compare the labels from four different types of milk replacer. Rank the milk replacers based on the ingredient list and the percentages of crude protein, fat and fibre. Be prepared to present your reasons as to why you placed the milk replacer in the order that you chose.

If feeding milk replacer, it is important to follow the mixing instructions. Typically, they are as follows:

1. Read the instructions on the milk replacer container.
2. Measure the room temperature water and milk replacer powder you will need for one feeding.
3. Sprinkle the powder on top of water.
4. Stir the mixture well with a wire whisk.
5. Make sure you keep the water at body temperature.

Too much water or not enough water can cause problem. It is important to remember when feeding your calves - the cheapest option may be best for your bank, but not best for your calves. It is important to work with your nutritionist to ensure your calves are getting everything they need to kick-start their growth.

## Feeding Calves

There are three main styles of feeding calves:

1. Individually with bottle (or pail)
2. In a group via "calf-eteria" style feeder (large container with multiple nipples)
3. Robotic Calf feeder

Each style of feeding has its benefits. As technology improves, there has been an increased number of producers using automated calf feeders.

- Regardless of how calves are fed, there are several things to consider when building a calf nutrition program:
- Calves should be fed on a regular schedule, and fed at least 2-3 times a day
- Ensure your calves are getting enough. If you are using milk replacer, ensure that it is mixed properly, or if giving whole milk ensure that there is enough volume of quality milk. Recommendations for milk/replacer feeding volumes have increased significantly from older recommendations
- Ensure that calves have access to grain/calf starter.
- Feeding a calf through a bucket should not be done until the calf is a few weeks of age. Sucking on nipples allows the milk to pass into the abomasum through the esophageal groove. If the milk went into the

wrong part of the stomach, the calf can become bloated. When training a calf on a pail, ensure she is not gulping the milk.

- Calves should also have access to water from early on after birth

## Using Automated Feeders

As the industry has accepted automated feeding systems, free-choice feeding and group housing, calves are consuming more milk/milk-replacer with some animals consuming up to 12 L a day (in the past with 2-3 feedings it would be closer to 6 - 8 L per day). Research has shown that on averages, calves with free choice feeding will drink on average 8L over 12 trips to the feeder in the first 3 weeks (smaller meals, more frequently). Once over 3 weeks of age, calves were drinking 10L per day on average.

One of the benefits of automatic feeding systems is the ability to create calf specific and age specific feeding plans. When the computer reads the RFID chip in the ear the robot recognises each individual calf. It knows how old the calf is and can therefore determine how much milk replacer it should be able to drink in a day. As a calf grows, it will require more milk and food to meet its needs and continue to grow. An automatic feed allows you to program the feeder to give different milk volumes to different ages of animals. The feeder also can limit how much milk a calf can drink at a time. Having a calf drink more than 1.5-3 L at a time can cause them digestion issues, similar to you eating too much dinner!

Feeding through an automatic feeder also allows calves to nurse when needed, and they will suckle several times throughout the day. This mimics a more “natural” style of feeding, without the risk of a cow’s teat getting damaged or reduced milk production (which ultimately was destined for human consumption).

Weaning animals becomes very important regardless of feeding method. Ensuring that calves are eating enough concentrate prior to weaning is important. If calves are drinking a substantial amount of milk, gradual weaning is best, to ensure the animal is getting the nutrients needed through other feed stuffs (hay, calf starter, corn, etc.). Weaning should start at 6-8 weeks of age and last 10 days. This is the best method to optimize weight gain in your calves.

## Dry Feeds: Calf Starter, Grain and Hay

Calves should have access to other feedstuffs a few days after birth. This will get the calves used to eating dry feed. When a calf is born, their rumen does not work. By offering calves, dry feed the calf’s body “learns” how to digest dry feed, which is important! Calves who have access to dry feed typically have a faster growth rate and fewer issues that liquid feeding alone can achieve.

There are two different types of dry feed:

- Calf Starter - a dry grain formulated to meet energy needs of calves. It should be palatable (tastes good!), coarse (pellets, not finely ground), 18-20% crude protein and 72-74% total digestible nutrients
- Straw/Hay - straw is a cheap, low nutrient feed that is good to feed young calves and kick start their stomach. Once a calf is a close to weaning, she should be fed long, good quality dry hay. Hay is a good way to give her energy and promote rumen development.

## Weaning

Weaning is when you stop giving your calf milk and switch her entirely over to water and dry feeds.

Your calf should be eating 1.0 kg per day of dry calf starter for several days before she is weaned and should already be eating hay.

Calves left on milk a long time (i.e. more than three months) can also get very fat. This can result in health problems and decreased milk production later in life.

### **Experience It!**

Invite a feed nutritionist to your meeting to discuss feeding rations at various stages of a calf's life. Find out how the feed nutritionist became interested in this career, what training they have and what they like best about their job.

### **Experience It!**

Visit a farm that has used automated or robotic calf feeds. Find out what the farmer and/or herd manager likes about this type of feeding system and if there's anything they think could be improved.

### **Do It!**

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Measuring Quality

<b>Do</b>	Time: 20 minutes  Materials: colostrum of various qualities, powdered colostrum, milk replacer and water, colostrometer or brix refractometer	Break into small groups and test each of the prepared samples for colostrum quality.  Take note of what the readings of each sample is and compare as a group.
<b>Reflect</b>		Members learn how to test colostrum quality and what makes some colostrum/milks better than others
<b>Apply</b>	Prompting questions	How did the quality differ between samples?  Why would colostrum quality make a difference?  What would you do if the colostrum did not meet your quality standards?

## Activity #2 - Feeding Calves

<b>Do</b>	Time: 20 - 30 minutes  Materials: different feeds that can make up a calf's diet including but not limited to: milk, colostrum, milk replacer powder, calf starter, hay, straw, etc.	Put each feedstuff in a different container. Let members touch, smell and look at the different feed components.  If examples of feeding devices are available, have them suggest the best way to feed it.  Have members fill out the feedstuff sheet using the reference manual and packaging instructions
<b>Reflect</b>		Members will learn more about the different types of foods calves eat, with the opportunity to see and touch (and taste if unmediated and safe for human consumption) them
<b>Apply</b>	Prompting questions	Why it is important to know what goes into a calf's diet?  Why is it important to change an animal's diet as they grow?

## Feeding Calves Worksheet: General Information

	Name	Feels Like	Smells Like	When is it fed?
Feed 1				
Feed 2				
Feed 3				
Feed 4				
Feed 5				

## Feeding Calves Worksheet: Senior Member

	Name	Where is it from	When is it fed	How is it fed	Why is it fed
Feed 1					
Feed 2					
Feed 3					
Feed 4					
Feed 5					



### Activity #3 - Reading Labels

<b>Do</b>	Time: 15 minutes  Materials: labels and prices from two comparable feeds (milk replacer or calf starter)	Look at the labels of the comparable products  Compare the two products, which one is more ideal for the needs of your herd  Have members judge or rank the feeds and discuss why one is better than the others
<b>Reflect</b>		Members will learn how to judge and select calf feed based quality and price using labels
<b>Apply</b>	Prompting questions	What information were you able to get from the labels?  Why is having so much information important when making a diet choice?  What else might you consider when choosing calf feed?

## Activity #4 - Feed Classification

<b>Do</b>	Time: 5-10 minutes  Materials: different feed options including but not limited to: barley, oats, corn, hay, straw, calf starter, etc. and paper plates	Label plates as: proteins, energy, vitamins, minerals and water.  Have members sort the feed stuffs into the correct plate for what they provide the calf.
<b>Reflect</b>		Members will learn what different feedstuffs provide the animal
<b>Apply</b>	Prompting questions	What information were you able to get from the labels?  Do some feed ingredients fall into the multiple categories?

## Activity #5 - Making the right choice for your herd

<b>Do</b>	Time: 35 minutes  Materials: copies of the "Pieces of the Feeding Puzzle" and "Priorities and Goals"	Give each group two sets of "Priorities and Goals" so they can see how their thinking has to change with different goals. <ul style="list-style-type: none"><li>▪ Explain that each group must come up with a feeding program based on the options in the "Pieces of the Feeding Puzzle" and the goals they were given. Higher priority goals will have more impact on feeding plans than lower priority ones.</li><li>▪ Once the groups have feeding programs developed, have them write them on chart paper, along with their priorities.</li><li>▪ Have each group share their program with the other groups</li></ul>
<b>Reflect</b>		The purpose of this activity is to synthesize all parts of a calf feeding program into a whole, and to be able to analyze and prioritize the information
<b>Apply</b>	Prompting questions	How did priorities and goals affect the feeding programs?  Why are priorities and goals important? How can they help you make decisions and accomplish what you want to do?

## Priorities and Goals

<b>Option 1</b>	Calf health and Growth Low Cost Less Labour	Feeding Options: <ul style="list-style-type: none"> <li>▪ Whole milk</li> <li>▪ Milk replacer (plant proteins)</li> <li>▪ Milk replacer (animal proteins)</li> <li>▪ Sour colostrum</li> <li>▪ Acidified milk</li> <li>▪ Calf starter</li> <li>▪ Hay</li> <li>▪ Warm environment calf barn</li> <li>▪ Cold environment calf barn</li> </ul>
<b>Option 2</b>	Less labour Calf health and growth Low cost	
<b>Option 3</b>	Low cost Calf and heifer growth Less Labour	
<b>Option 4</b>	Low cost Less labour Calf health and growth	





## Meeting 4 - The Right (Feed) Stuff!

### Setting Objectives:

To understand the importance of proper nutrition for heifers throughout all stages of growth as well as nutrition for dry cows.

### Suggested Learning Outcomes:

- To learn about nutrition for the four different stages heifers go through before becoming a cow
- To learn about nutrition for far-off dry cows and close-up dry cows

### Suggested Roll Call Questions:

- What do you feed your dry cows?
- Why do you think it is important to have different rations for different age groups?
- What do you think is important in a heifer ration?

### SAMPLE MEETING AGENDA

Time: 1 hour, 30 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Heifer diets: post-weaning, heifers, breeding age heifers and bred heifers</li><li>• Dry cow rations</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Feeding Heifers

These groups of animals need healthy, nutritious diets made especially for them. Heifers need to grow but not get too fat. Older heifers also need feed to help support the fetuses growing inside their bodies.

Heifers must gain 0.6kg (small breeds) to 0.75kg (large breeds) a day to ensure that they are large enough and ready to breed at 14 to 15 months of age in order to calve at 23 to 24 months of age.

Heifers move through four feeding stages:

#### 1. Post-Weaning (2 to 6 months)

- Feed a palatable calf starter and good quality hay
- At three or four months of age, heifers can be switched from calf starter to grains

#### 2. Heifer Stage (6 to 12 months)

- During this stage it is important to have the ration balanced by a nutritionist regularly and

## Research It!

Talk to dairy farmers in your area and find out which calf starter they use and why they chose that calf starter.

producers should have simple ways of benchmarking growth of heifers. Height could be evaluated as simply as a mark on the wall or knowing how high a gate is for reference when looking at them walk by. Feeding without measuring progress against a standard is something to be avoided. If they grow too slowly, they won't be ready to breed at 14-15 months.

- 6-9 months

- At least half of the total roughage dry matter (DM) should be from dry hay. The rest can be from haylage, corn silage, total mixed ration or pasture.

- 9-12 months

- Balance the ration by varying the amount and type of grain according to the nutrients supplied by the forage being fed

### 3. Breeding Age (12 to 18 months)

- This is a key feeding time because heifers must be healthy and have proper diets to improve their reproductive success

- Feed a balanced ration, with mineral and vitamin pre-mixes, just like younger heifers

- Breeding weights, achieved partly by proper nutrition, range from 366kg for large breeds to 268kg for small breeds. If heifers aren't large enough to breed at 14 to 15 months of age, you need to figure out what is going wrong with your feeding program or other heifer raising conditions

## Discuss It!

What ration do you feed to breeding heifers on your farm?

### 4. Bred Heifers (18 to 24 months)

- Feed to prevent cows from getting fat but still keep them growing. Fat cows have problems calving and will milk less.

- Do not feed too much high energy forage such as corn silage (as it will make them fat).

- Maintain a balanced ration of roughages, grains and minerals. To maintain a balanced ration have it rebalanced by a nutritionist regularly

- Two to three weeks before calving, switch to a close-up dry cow diet

One of the ways to see if your heifer nutrition program is working is to monitor growth. This can be done by both height and weight. Growth Charts will vary by breed. Check out the Holstein Growth Standards in the resource section of this manual!

## Judge it!

Compare four different rations for a breeding a heifer at one of the stages of her development. Rank the rations and be prepared to give your reasons for your placings.



## Feeding Dry Cows

The time before an older cow has a calf can be very stressful on the animal. Managing nutrition is very important to limit the stress and prepare the animal for calving and milk production. In order to avoid complications with calving and post-calving, dry cows should have a Body Condition Score (BCS) of 3.0 to 3.25.

Dry cows can be divided into two groups: Far-Off Dry Cows and Close-Up Dry Cows. Many farmers will have separate diets for these different stages. Far-Off Dry Cow diets should contain less energy and lots of fiber. Close-Up Dry Cows should contain more metabolizable (digestible) protein and energy, however the amount of energy needs to be controlled to avoid animals getting too heavy. Close up cows diets can also contain forages low in potassium (corn silage and grain) to help prevent milk fever.

Some farms don't feed two different dry cow rations. Some producers do serve a single ration to all dry cows; to help decrease labour, if they have shorter dry periods or have space/penning limitations. In this case it is important to make sure needs are being met at all stages. Penn State recommends that to accomplish having one dry ration, the ration needs to keep the cows primed for lactation. To avoid issues with increased BCS or calving issues a single dry ration should contain low quality forages (example: straw) and non-forage fiber sources like soy hulls, cottonseed hulls or corn cobs. These forages will provide the needed fiber, are digested faster and therefore don't contribute to rumen fill as much as traditional forages.

There are advantages to both feeding one dry ration or by feeding a close-up and far-off ration. If you are successful with transition cows continue whichever method of dry cow treatment that you are currently using. If the transition period is an issue, work with your vet and nutritionist to find what is best for your herd.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

### Experience It!

Invite a dairy farmer, a herd manager and/or a feed nutritionist to your meeting to discuss feeding rations at various stages of a heifer's life. Discuss feeding rations for dry cows as well.

## Activity #1 - Comparing Dry Cow Rations

<b>Do</b>	Time: 10 minutes  Material: examples of close-up and far-off dry cow rations	Compare rations for both far-off and close-up dry cows.  Discuss how they are similar  Have members determine which group needs which ration
<b>Reflect</b>		To learn the differences in nutritional needs as a cow gets closer to calving
<b>Apply</b>	Prompting questions	Why would an animal's ration need to change as she gets closer to calving?  What different vitamins and minerals will close up cows need in different lactations?  Why is dry cow rations so important to overall health?

## Activity #2 - Matching Nutrients

<h1>Do</h1>	<p>Time: 30 minutes</p> <p>Materials: containers with their nutrition labels of different types of "people" food, including salt and vitamins; bags, labelled and filled with grains and forages (e.g. corn, hay, haylage, and so on); nutrient signs labelled: Protein, Energy, Water, Minerals, Vitamins</p>	<ul style="list-style-type: none"> <li>▪ Place all of the food and the bags labelled "corn," "hay," "haylage," and so on, on a table. Place the nutrient signs for Protein, Energy, Water, Minerals and Vitamins around the room.</li> <li>▪ Divide the members into two teams. Each team sends one person to the table who picks up a container or bag of food. That person has to place the container by one of the nutrient signs and say how that food helps either his or her body, or a cow's body. The points for this game are:             <ul style="list-style-type: none"> <li>3-placing the food under the nutrient sign that it has the most of</li> <li>2-placing the food under a sign that's close</li> <li>1-naming how the food helps the body</li> </ul> </li> <li>▪ The team with the most points wins</li> </ul>
<h1>Reflect</h1>		<p>To introduce members to the different nutrients cows need in their feed. By comparing the nutrients in cow feed to the nutrients in "people feed" members can see how these nutrients are important to them also.</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>Why are nutrients important for our health and a cow's health?</p> <p>How does knowing what nutrients are in food help you create a good diet for your calf?... for yourself?</p>



## Meetings 5 and 6 - Serving A Balanced Meal

### Setting Objectives:

To understand the importance of proper and good-quality nutrition for cows in various stages of lactation.

### Suggested Learning Outcomes:

- Learn how to construct a balanced ration and the importance of water
- Learn what goes into feeding milking cows and the importance of meeting their needs
- Look at different ways animals are fed in different environments

### Suggested Roll Call Questions:

- Who creates your farm's ration?
- How are animals fed on your farm?
- What do you think are important vitamins and minerals for cows?

### SAMPLE MEETING AGENDA

Time: 1 hour, 30 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Balancing a ration</li><li>• What makes up a ration</li><li>• The importance of water</li><li>• Vitamins and minerals</li><li>• Feeding methods</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

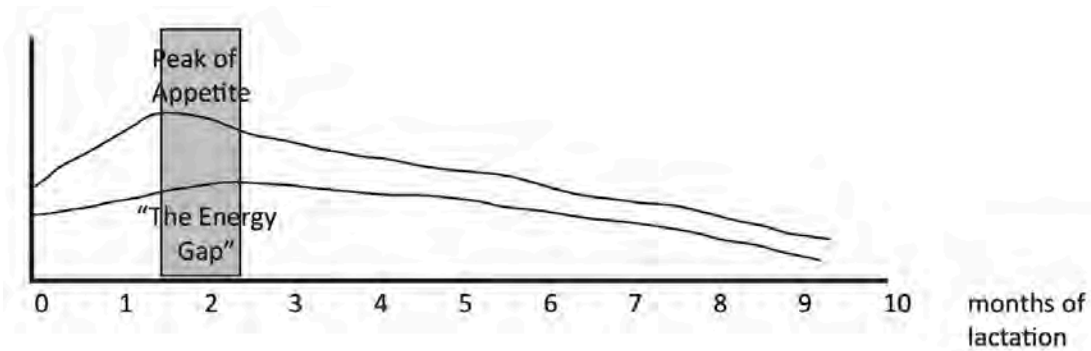
### Topic Information

#### Feeding the Milking Herd

**BALANCE** is the key to a good ration, regardless of stage in lactation. If a ration is balanced it will contain all the nutrients a cow needs for her to be healthy and meet her milking potential. A ration needs: Energy, vitamins, protein, minerals and water.

A cow's appetite will not be consistent throughout a lactation. The energy needed to create milk will change as her production volumes change. Often the energy needed by a cow to create milk exceeds the feed intake. By balancing a ration this cap between the energy need (energy out) and energy availability (energy in). If a cow is not getting the needed energy from her feed, she will take it from her body. In early lactation a cow will is not able to consume enough feed to support high milk production and for a time she will naturally use some of her fat reserves to support milk production. After this early part of her lactation, energy intake normally is more than she needs, so that body fat reserves are restored to her. If she is underfed, this will result in weight loss, a decline in milk production and in some cases decreases conception rates. By the end of her lactation, the opposite may be the case, as the milk production decreases. In this case, the energy the

animal intakes may be greater than the energy she needs to produce milk. At this point, some of the excess energy will go toward preparing for calving and returning to her normal body condition score.



## Building a Balanced Ration

### Energy

Cows need energy for:

- Growth
- Milk production
- Reproduction
- Muscle movement

Energy can be from two different sources: carbohydrates and fats

**Carbohydrates:** found in grains and forages like corn and hay. The sugar and starches in grains are easy to digest; because of they have a high feeding value. Carbs found in forages are harder to digest. The carbs in the forages are from cellulose, part of the plant's fiber. Forages keep cows stomachs working, and though they are harder to digest the rumen microorganisms break it down over time.

**Fat:** is added to rations in various forms, but most commonly from oil seeds like soybeans and supplemental fat provided to support high milk production. Fats give cows lots of energy in a small digestible bite. Fats are more energy dense than carbohydrates.

A cow's diet needs to be 75% energy (total digestible energy - TDN)

### Protein

Cows need protein for growth and to repair:

- Organs
- Hair
- Bones
- Skin
- Hooves
- Blood
- Milk protein

Protein is found in most feeds including both grains and forages. Feeds like Alfalfa, hay, haylage, and oil seeds

(soybeans and canola) are very high and protein. In order to make sure that an animal gets enough crude protein, some farms feed a supplement such as soybean meal. Milk cows need 15-17% crude protein in their diet.

Another protein source is through things called Bypass proteins (or rumen-undegradable protein). These proteins are resistant to rumen bacterial breakdown (they sort of bypass digestion in the rumen) and are digested in the small intestine instead. These proteins are important to high producing animals. They are also important for animals who are fed a high silage diet, as the fermentation process makes the proteins more digestible, and are used by the rumen bacteria and not the animal directly. Some sources of bypass proteins include:

- Dried corn gluten feed
- Dried distiller's grain
- Fish meal
- Dried brewers grain
- Corn gluten meal

### Share It!

What sources of protein are used on your farm in your cow's ration?

## Vitamins and Minerals

Though very small, vitamins are essential for normal growth and to remain healthy. Vitamins are required in small doses but cannot be created by the body (this is true for humans too!). There are several vitamins that cows need in order to grow and maintain a healthy body.

	Vitamin	What it does	Where it is found
<b>Fat Soluble</b>	Vitamin A	Helps with vision, cell growth and bone growth	Carotene
	Vitamin D	Makes for strong bones and teeth	Cow can make their own when exposed to sunlight
	Vitamin E	Muscle tone and development	Vitamin & Mineral premix (either put in the TMR or Top Dressed)
	Vitamin K	Helps with blood clotting	Vitamin & Mineral premix (either put in the TMR or Top Dressed)
<b>Water Soluble</b>	Vitamin B	Changes feed to energy and is important for blood	Vitamin & Mineral premix (either put in the TMR or Top Dressed)
	Vitamin C	Strengthens bones and teeth	Vitamin & Mineral premix (either put in the TMR or Top Dressed)

Minerals are another small but important part of a cow's diet. Minerals aid in digestions, milk production and other important functions of the body. Minerals are can be considered major (macro) which means the body needs them in larger amounts or minerals can be needed in trace (micro) amounts.

	Mineral	Required for
<b>Macro</b>	Calcium	Bones, milk production and muscles
	phosphorus	Bones, milk production and digestion
	Potassium	Digestion, amino acid uptake and protein synthesis- key to milk production, reproduction and immune function
	Sodium	Digestion, uptake and use of other nutrients
	Chlorine	Digestion, uptake and use of other nutrients
	Sulphur	Digestion, uptake and use of other nutrients

<b>Micro</b>	Selenium	Tissue repair, calve health
	Cobalt	Digestion and the use of Vitamin B12
	Iron	Red blood cells
	Copper	Blood and body tissue
	Zinc	Hooves, skin and growth
	Molybdenum	Energy use, growth, iron use
	Manganese	Growth, bones, reproduction, nervous system
	Iodine	Metabolism (the rate that food us used in the body as energy.)

### Did you know?

Salt is made up of sodium and chlorine, two major minerals needed by cows. A milking cow needs 30-100g of salt each day, depending on how much milk she produces.

### Did you know?

For a milking cow, the ratio of calcium to phosphorus should be 1.8-2.1:1. For a dry cow, this ratio should be 1:1.



## Water

Water is the most important part of a cow's diet (and most animals diets). A cow's body is 70% water.

Water is also the biggest part of milk! It takes 5L of water to make 1L of milk.



Cows need water to:

- Cool down
- Digest food
- Get rid of waste
- Maintain fluid levels

In order to ensure that a cow gets enough water cows should have access to water at all times. In tie-stalls that means a water bowl at their stall and in free stalls that means having several water troughs in a pen. Cows typically spend about 10 minutes a day drinking and 30 minutes a day within close proximity of the water troughs. A cow will ingest (drink) between 68-155L of water per day depending on the animal's environment (weather and seasons) and management. Water troughs also need to be able to refill quickly to ensure everyone can get the volume of water they need (refill rate should be about 23-27L per minute).

The amount of water a cow drinks a day will vary throughout the year and the animal's lactation. Things that can affect water intake are:

- Air temperature
- Humidity
- Feed temperatures
- Growth of animal
- Amount of water present in feed
- Salt intake
- Size of animal
- Feed intake
- Milk production

## Feeding for Balance

When looking at all the things a balanced diet requires, it can be intimidating to think of everything that needs to go into the TMR (total mixed ration). The good news is feedstuffs often includes several needed

components in one part of the diet. A typical ration is made up of Forages, Concentrates and Supplements.

**Forages** (roughages) – cows eat forages because their four-chambered stomachs can break down the hard to digest fibre in forages. Cows get energy from this fibre. The feed value of roughages depends on:

- the plant
- how good the soil is
- how well the crop is fertilized
- how long it grows before harvesting (younger, more immature plants yield higher feed values and are more palatable and digestible)
- how it's harvested
- how it's stored

There are a few types of forages, including hay, haylage, and corn silage:

**Hay** – a very common forage, made from legumes such as alfalfa, and grasses such as timothy. Hay is cut in the summer and dried in the sun, then stored after it is baled. It is best to store dry hay inside to prevent it from getting wet and moldy.

**Haylage** – made from hay cut early in the season and then wrapped, bagged or stored in a silo. Haylage should be green and smell like clean, sharp vinegar. Haylage has about the same energy as hay, but it is wet. This means that the leaves stay on the stem of the plant. Because most of the nutrients found in hay are in the leaves, haylage has more nutrients than hay.

**Corn silage** – made by chopping the cob, leaves and stalks of corn plants. The chopped corn is put in a silo or a bag to ferment, resulting in corn silage. Corn silage has high energy and low protein.

**Concentrates** – provide a “concentrated” source of energy. Concentrates are the sweet tasting part of a cow's diet, so you have to make sure you do not let cows ‘pig out’ on concentrates. Concentrates are a mix of grains and other products. Examples of concentrates are:

- grains such as corn, oats and barley
- distillery and brewing by-products
- oilseed meals, such as soybean, linseed and canola meal
- whole seeds, such as soybean and cotton seed
- Non-protein nitrogen (NPN), such as feed-grade urea and anhydrous ammonia

Farmers can buy concentrates that are already mixed with vitamins and minerals or can make their own concentrates and purchase a mineral mix to add.

Grains are rolled, ground or cracked to make them easier to digest. Whole grains are harder for the cows to digest.

**Supplements** – provide additional sources of protein and vitamins & minerals that are not found in high enough quantities in forages and concentrates. Supplements are either mixed in with the TMR or are top dressed to ensure that every animal is getting the nutrition that it needs

**Protein supplements** – high protein oil seeds such as soybeans and canola or by-products like soybean meal, distiller's grain and brewer's grains. These add a concentrated source of protein to the ration.

**Mineral and vitamin supplements** – add extra salt minerals and vitamins to the ration. Most of these nutrients come from other feeds in the ration, but the supplements boost the level a bit higher to meet the animal's needs.

## Creating the Perfect Recipe

To create a balanced ration, you need a recipe. To get the right recipe, you need to:

- know the weights of your cows
- know the stage of lactation and current production levels of your cows
- know the percentage of two-year olds in your milking herd
- weigh the feeds that the cows eat already
- aim for a ration with lots of forage
- feed the cow's stomach – microorganisms in the cow's rumen need to be fed for healthy digestion
- use concentrated sources of protein, such as roasted beans, soymeal, and corn gluten meal
- ask a nutrition expert to help you create the right ration recipe for your cows

As mentioned above many different things can affect the quality of the feed. It is important to get your feedstuff tested regularly to ensure quality. If the feed quality does not meet the needs of the herd, other components of the ration should be adjusted to ensure that all of the nutritional needs are met.

## Methods of Feeding

Just like some humans - cows can be picky eaters! Making sure that a cow 'cleans their plate' (eats all that is in front of them) is important to make sure they get all the needed nutrients and is cost effective to the producers. Here are some tips for making sure the cows get all the provided nutrients:

- Ensure that the animals have access to feed 24 hours a day and have fresh feed in bunks after milking.
- Ensure animals have fresh, clean water at all times (cows that drink more water, eat more feed)
- Feed the cows when they want to eat, not when you want to feed. Prime time is during or right after milking
- Clean mangers and bunks daily
- Push up feed regularly
- Healthy and comfortable cows eat more!
- Feed TMR, it gives the cows less opportunity to sort the feed
- Make it easy for cows to get to the feed: wide passage-ways and non-slip floors
- Make sure your feed bunks have the cows in mind:
- If feeding head to head, the feeders need to be at least 3 m apart
- Give cows at least 60 cm of bunk space
- Cows eat with their heads down in grazing position, feed should be 10cm above hoof levels
- Bunks should be smooth, this limits feed loss and allows for easier cleaning

## Feeding in Robot Barns

Feeding in robot facilities requires different strategies than feeding a traditional TMR. Robots typically supply some form of feed to entice animals into the robot for milking. Most systems will feed a pellet (think of it like healthy candy for cows) in the robots and then a partially mixed ration (PMR) at the feed bunk. Many dairy farms will see an increase in milk production when they move to a robot facility (after an adjustment period). Success of robot facilities is dependant on many factors (cow comfort, health, reproduction, etc.) however a

good feeding program with a high quality pellet and a balanced PMR are incredibly important. Good pellets and a balanced PMR can increase the number of voluntary trips to the robot, which ultimately results in greater milk production. When feeding pellets in a robot it is important to work with your nutritionist to balance your PMR and pellet together to avoid cows getting over conditioned. As many cows prefer pellets, they will enter the robot more often than they need to get milked, in cases like this the amount of pellets will be limited on trips where the cow is not getting milked.

There are two different layouts of robot barns, free flow and guided flow. The difference between these two layouts is feeding systems. In free flow systems animals can move freely between the feed and the robot. In guide flow systems cows will need to be milked to get to the feed (milk first guided flow) or pushed to the feed bunk before they get milked (feed first guided flow). Free flow and guided flow systems require different feeding requirements. In order to maximize milk production in these systems it is recommended that the dairy farmer works with their nutritionist to develop a proper ration (including pellet consumption) for each stage of lactation.

### **Experience It!**

Invite a dairy farmer, a herd manager and/or a feed nutritionist to your meeting to discuss feeding rations at various stages of a heifer's life. Discuss feeding rations for dry cows as well.

### **Do It!**

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Designing a Feeding Program

<b>Do</b>	Time: 30 minutes  Materials: pens and paper; related pages on feedstuffs from the resource manual	Split members into groups of two or three. Ask them to design a feeding program for their fictional herd of 100 cows (or 200 cows). They can include production objectives, health objectives, feeding method and feed bunk design.  If more time is allowed, members could be asked to design complete feeding programs for their herds (i.e. calves, heifers, dry cows, milking cows)  Groups can share their plans with each other.
<b>Reflect</b>		This activity allows members to apply their knowledge of ruminant digestion and the feedstuffs that are available
<b>Apply</b>	Prompting questions	What were some of the goals that you considered when building this feeding program  How did you handle competing goals (i.e. low cost vs high nutritional value)  Why did you choose specific feedstuffs?

## Activity #2 - Comparing Rations

<b>Do</b>	Time: 10 minutes Materials: examples of different types of rations	Discuss what is in each ration and why the cow needs these ingredients as the members pass them around, touch, and smell them. Let the members do most of the talking.
<b>Reflect</b>		Once members know what the feedstuffs are with various nutrients in them, you can let them actually see different types of rations.
<b>Apply</b>	Prompting questions	What makes a balanced ration?  Why is a balanced ration important?

### Activity #3 - Judging a Balanced Ration

<h1 style="text-align: center; color: white;">Do</h1>	<p>Time: 40 minutes</p> <p>Materials: paper and pen, feed tags from different mixes in your barn</p>	<ul style="list-style-type: none"> <li>▪ To begin the activity, introduce the different feeding terms that members may see on the feed rations. As each term is identified, have the member who did so write it on the chart paper. Include how much should be in a balanced ration.</li> <li>▪ Discuss how farmers develop balanced rations: feed testing of the forages and grains they grow on their farms; using commercial mixes to add nutrients that are missing from the home-grown feed; doing a little math to balance the ration. Pass around the feed tags so that members can see that a feed pre-mix is not a complete ration, but rather something that helps you balance a ration.</li> <li>▪ Next, members are to judge four rations on the basis of the needs for a balanced ration.</li> <li>▪ After they are finished, they can discuss their placements.</li> </ul>
<h1 style="text-align: center; color: white;">Reflect</h1>		<p>Introduces members to a cow's ration and what should be in that ration</p>
<h1 style="text-align: center; color: white;">Apply</h1>	<p>Prompting questions</p>	<p>Why is knowing the nutrients in any feed important?</p> <p>How can you use these things to make your own 'balanced ration'?</p>





Section 3 **Reproduction & Genetics**





## Meetings 1 and 2 - Getting It All Started - Reproduction

### Setting Objectives:

To understand how the male and female reproduction systems work in cattle.

### Suggested Learning Outcomes:

- Learn about the reproductive tracts for both males and females
- Learn about the importance of hormones and how estrous cycles/heats work.

### Suggested Roll Call Questions:

- What are some breeding goals on your farm?
- How do you detect heats on your farms?
- What do you want to learn about dairy reproduction and genetics?

### SAMPLE MEETING AGENDA

Time 1 hour, 30 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• The female reproduction tract</li><li>• The male reproduction tract</li><li>• The importance of hormones</li><li>• What is a heat cycle</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

Cows must have a calf before they are able to produce milk. Heifers must have a calf before they can produce any milk during their lifetime and older cows must keep having calves at regular intervals to keep producing milk. The heifer calves themselves are also important, as they will eventually be needed to replace older cows in the milking herd and to bring better genetics into the herd for improvement.

There are 5 things needed for a successful breeding program:

1. Goals
2. A good heat detection system
3. A good herd health program
4. A balanced nutrition program
5. Knowledge of breeds, traits and genetics

When starting to breed animals it is important to look at age/size (if a heifer) and days in milk (for milking cows). Heifers should not be bred until 12-15 months of age. Milking cows should not be bred back until 50-60 days in milk (DIM).

### Experience It!

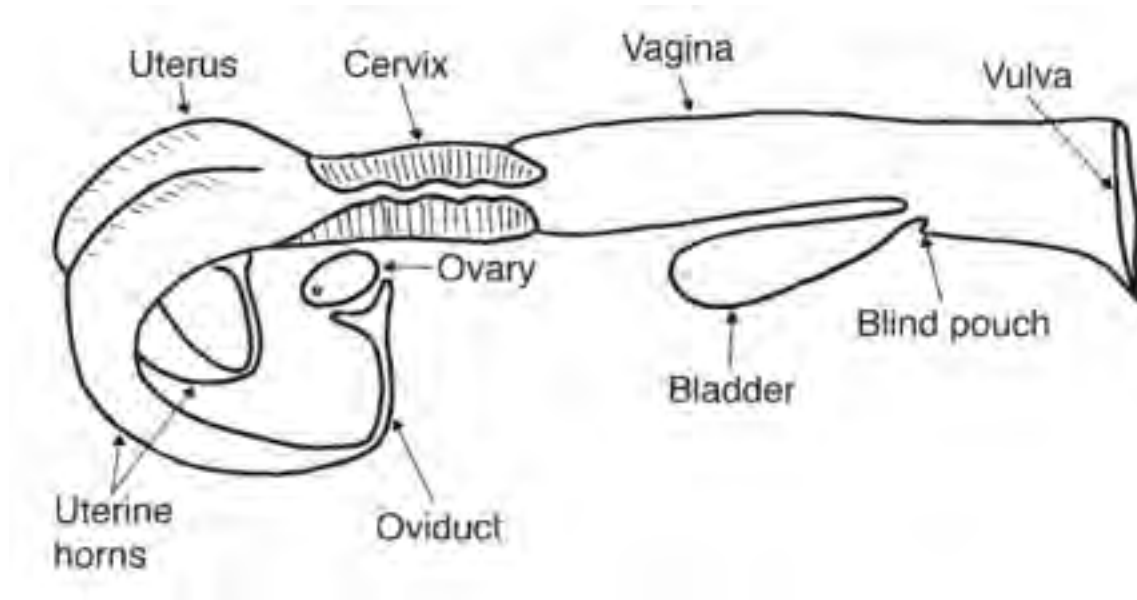
Invite a veterinarian as a guest to your meeting to discuss the reproductive systems in male and female cattle.

In order to understand the whole process, it is important to understand the reproductive body parts of a cow and how they work!

## The Female Reproductive System

Cows are mammals therefore they produce eggs internally. These eggs may be fertilized and result in a baby calf that grows inside their bodies. Like other mammals, they produce milk to feed their babies once they are born. Cows have the same basic reproductive system as other animals, like pigs, horses, and even humans.

The main parts of the cow or heifer's reproductive tract are her ovaries, oviduct, uterus, cervix, vagina and vulva.



Let us start at the beginning of a cycle. Ovaries are where all the ova (eggs) a cow will ever produce in her life are located. There are two ovaries, and typically shaped like an oval or bean. Ova are produced inside the ovaries. Ovums (plural of ova) are the female contribution to a calf. They contain half of the genetic material for the offspring. The other half comes from the male. Chromosomes from both the ova and the sperm combine to form the genetic blueprint for the development of a calf (a fetus at this stage).

The average reproductive cycle for a dairy cow is 21 days. At the start of each reproductive cycle a fluid filled follicle begins to grow on the ovary. Ovulation occurs when the follicle bursts and the egg is released. The follicle that has released the egg turns into a hard raised structure, called the corpus luteum (C.L.). It may also be called the yellow-body because it is yellowy-white in colour. The released egg then travels into the oviduct, a thin tube.

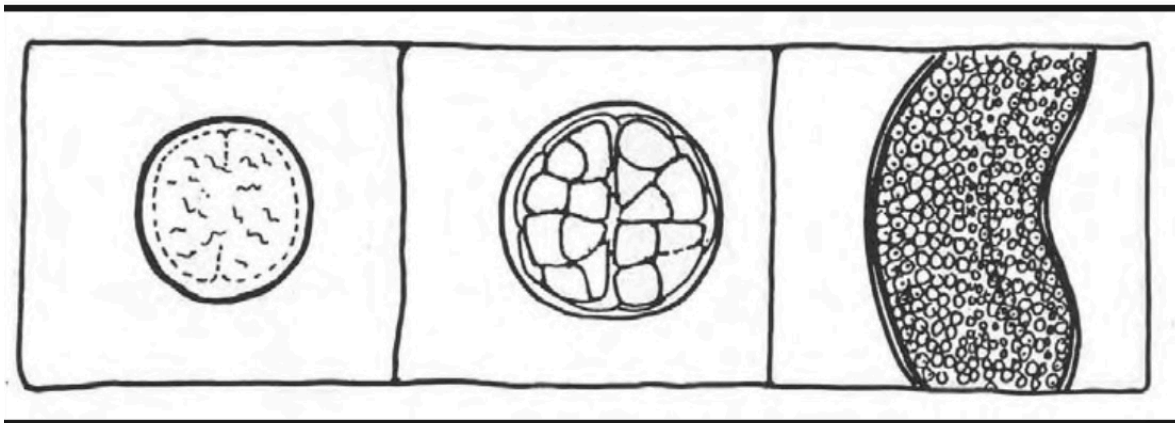
Once the egg reaches the oviduct one of two cycles can occur. Which cycle the egg goes through will depend if the dam has been bred.

## Cycle 1: No Fertilization

If the cow is not bred and there is no sperm for the ovum to meet up with, the C.L. shrinks. When this shrinking is complete, new follicles will begin to develop and the cycle starts again.

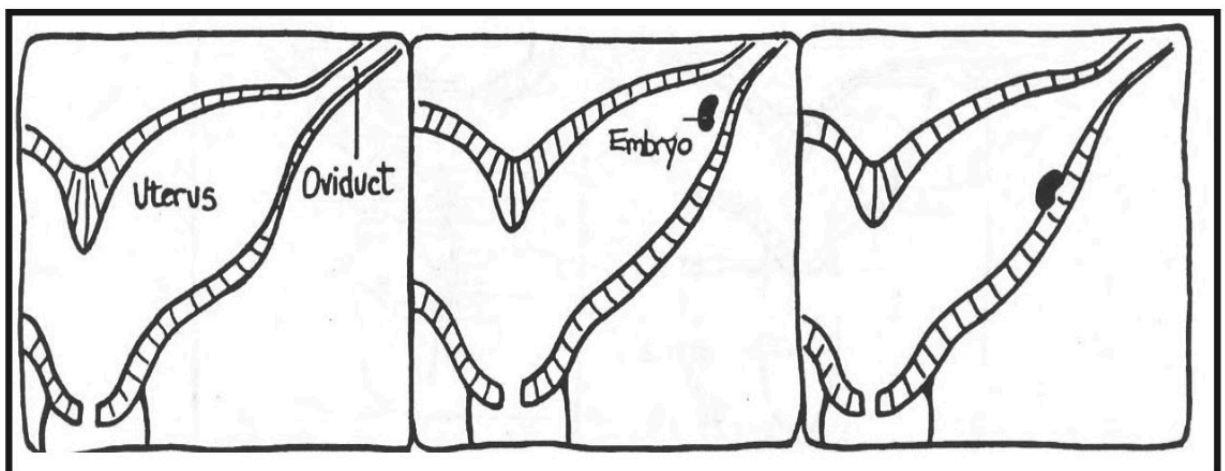
## Cycle 2: Pregnancy (fertilization occurs)

If breeding happened and the ovum meets up with a sperm cell from the male, fertilization occurs. The two cells, each containing one-half of the genetic material combine to form an entire cell. This single cell is now ready to grow and develop into a calf. The cell continues to divide to create many more cells and is now called an embryo.



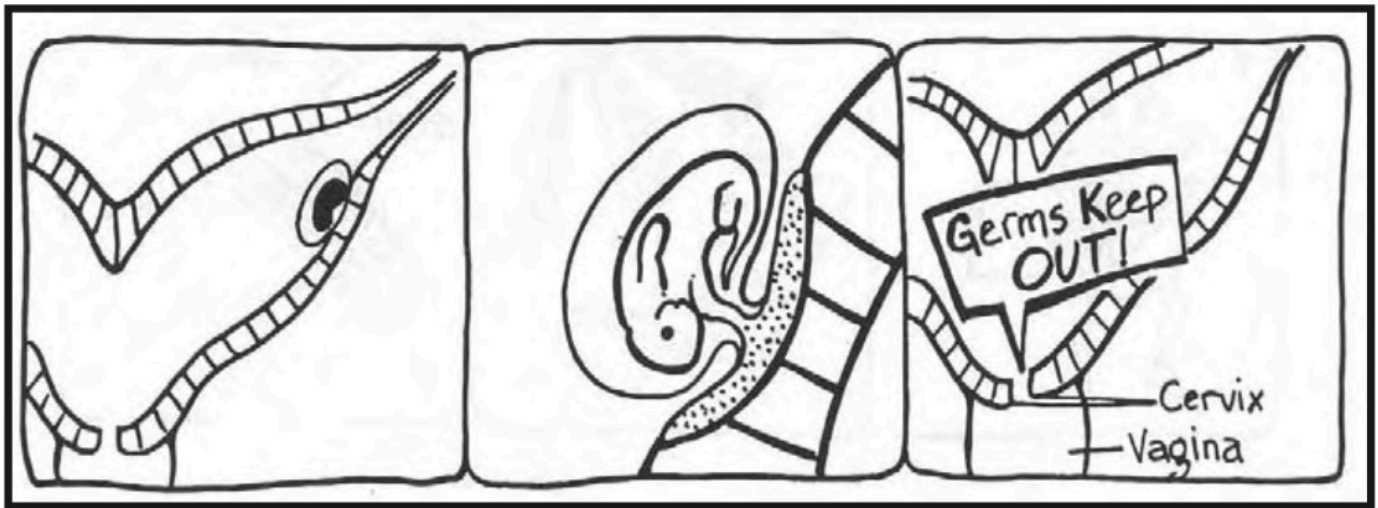
Newly fertilized egg divides to form an embryo

The oviduct opens into the horn of the uterus. Each uterine horn itself opens into the body of the uterus. The uterus is a big tube that is flexible, muscular, and shaped like a "Y". By the time the embryo reaches the uterus, it is a cluster of cells. The embryo attaches to the inner lining of the uterus 7-10 days after its release from the ovaries. This attachment is called implantation. Once the embryo has implanted itself into the uterus, it is called a fetus. At this point, the C.L. sends hormones to signal to the cow's body that she is pregnant.



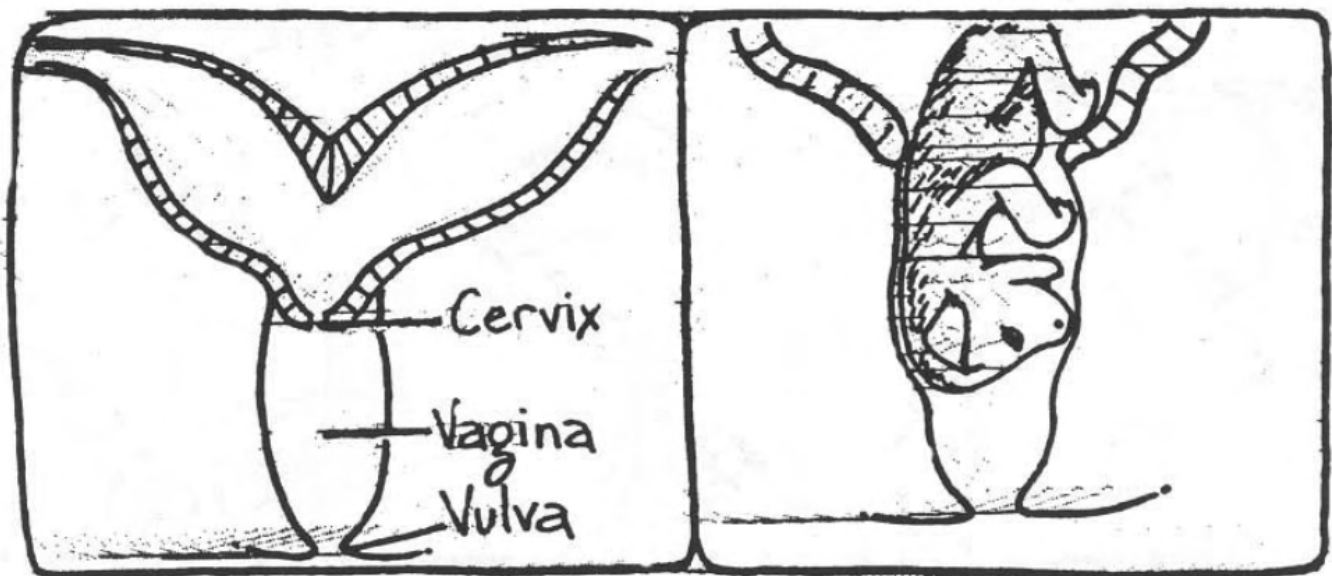
Movement of embryo into uterus

The lining of the uterus and the fetus form a fluid filled membrane for the fetus to grow in. This is called the amniotic sac, which is part of the placenta. The placenta allows nourishment to pass from the mother to the fetus and for waste material to pass from the fetus to the mother via the umbilical cord. It also absorbs shock and helps to keep some diseases away from the fetus. The fetus grows and causes the uterus to expand.



Implantation of embryo and growth of fetus

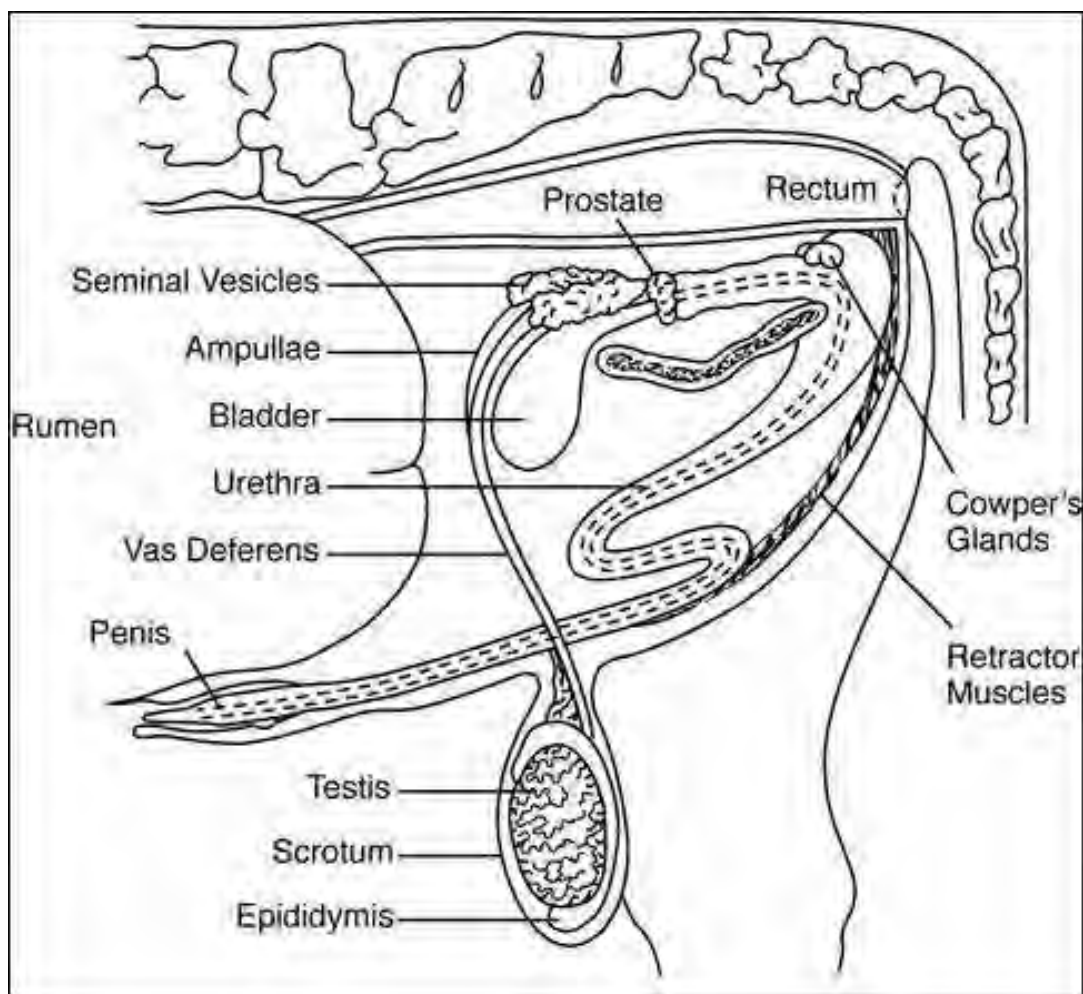
The outer entrance to the uterus is the cervix. During estrus, it relaxes to allow sperm cells to enter the uterus en route to the oviduct. It also relaxes during birth to allow the fetus to exit. The rest of the time, the cervix is closed and helps to help prevent infection from entering the uterus. The vagina is the canal that leads from the cervix to the outside of the cow's body. The vulva is at the outer end of the vagina. The vulva is the outer part of the reproductive system that you can see from outside her body. The cervix, vagina, and vulva are all very flexible. They need to be flexible so they can expand to several times their normal size to allow the fetus to be delivered during birth, as seen in the diagram below:



## Male Reproductive Tract

The male reproductive system contains half of the genetic material for an animal. Each male has two testicles. They produce millions of microscopic cells called sperm. The sperm are the cells containing genetic information.

The testicles are located inside the scrotum, which can be seen between the bull's hind legs. The testicles hang outside the body to keep them at a slightly cooler temperature since sperm do not survive as well at higher temperatures. During breeding, sperm travels through a thin tube called the ductus deferens and enters a larger tube called the urethra. Other fluids are added to the sperm on route. The urethra travels through the centre of the penis. The penis is usually hidden by a fold of skin called the sheath and is only visible when the animal is urinating or breeding.



Bulls are not always able to produce semen. There are several reasons why bulls might fail at breeding an animal:

- The bull is too young - younger bulls do not produce the same amount of sperm as older bulls, which can reduce the chance of fertilization. Most bulls are unable to produce a viable sample until 11 months of age
- The bull is stressed - this can be due to poor nutrition, too frequent of collection/breeding or being over or underweight
- Infection

## Hormones: More Stimulating than Coffee

Everyday different parts of the body get stimulated to do their job. All parts of the reproductive system are controlled by hormones; from estrous to pregnancy and from sperm production to breeding.

Each hormone has a different roll in the reproduction system. Below are the hormones responsible for all things reproduction!

Hormone	Source	Effect	Other Information
FSH (Follicle Stimulating Hormone)	Pituitary gland in the brain	<ul style="list-style-type: none"> <li>Stimulates follicle growth on the ovary of the female</li> <li>Stimulates growth of sperm cells of the male</li> </ul>	<ul style="list-style-type: none"> <li>FSH levels are high late in estrous cycle</li> <li>Injection by veterinarians can induce ovulation</li> </ul>
LH (Luteinizing Hormone)	Pituitary gland in the brain	<ul style="list-style-type: none"> <li>Activates ovulation (egg release from follicle)</li> <li>Controls C.L. development</li> <li>Stimulates secretion of progesterone in female and testosterone in male</li> </ul>	<ul style="list-style-type: none"> <li>Used to treat ovarian cysts</li> </ul>
Estrogen	Ovaries	<ul style="list-style-type: none"> <li>Produced by developing follicles</li> <li>Stimulates signs of estrus (heat)</li> </ul>	<ul style="list-style-type: none"> <li>Estrogen levels in blood are high during estrus</li> </ul>
Progesterone	Ovaries	<ul style="list-style-type: none"> <li>Produced by the C.L.</li> <li>Helps prepare for and maintain pregnancy</li> </ul>	<ul style="list-style-type: none"> <li>Low levels in the blood during estrous but high during pregnancy</li> </ul>
Prostaglandins	Uterus	<ul style="list-style-type: none"> <li>Causes the C.L. to shrink</li> <li>Stimulates start of heat and birthing process</li> </ul>	<ul style="list-style-type: none"> <li>Often injected to trigger birth or bring an animal into heat</li> </ul>
Prolactin	Pituitary gland in the brain	<ul style="list-style-type: none"> <li>Stimulates milk production and secretion by mammary gland</li> </ul>	<ul style="list-style-type: none"> <li>Levels in the blood are high during lactation</li> </ul>
Testosterone	Testes (testicles)	<ul style="list-style-type: none"> <li>Responsible for development of secondary sex organs and sexual characteristics and behaviour</li> </ul>	<ul style="list-style-type: none"> <li>Fairly constant after puberty</li> </ul>

### Research It!

How could a decreased level of one of the above hormones affect an animal's reproductive ability?



## The Estrus Cycle - What is a “Heat”

When the ovary releases an egg from a follicle, the cow shows signs of “heat”. Heat signs indicate that a cow is ready to be bred.

There are many different ways to detect heat, some using the naked eye and others with technology. Once a heat is observed, the heifer/cow should be bred 12-24 hours after the heat was detected.

### Here are some different ways to detect heat:

Activity Monitors/Pedometers – these monitors record how much a cow walks and transmits the information to a computer. The computer calculates the cow’s average physical activity. Cows are usually more active when they are in heat so the heat is detected when the cow has more movement than usual.

Heat mount detectors – a patch filled with dye or a scratch off sticker is applied to a cow’s rump. If it changes colour, it proves that the cow was mounted and is in standing heat.

Visual signs such as:

- Bawling, restless behaviour
- Butting
- Swollen, reddened vulva
- Mucous discharge
- Withholding milk
- Increased urination
- Mounting other cows
- Chin pressing on other cows
- Sniffing, licking of the vulva, lip curling
- Pays little attention to feed

### Talk About It!

What heat detection method(s) do you use on your farm?

Finding the best heat detection method will depend on your management. Often you will want to work with several different kinds of heat detection in order to detect the majority of heats within your herd. Missing a heat, means that your cow will miss a breeding and therefore will be later in calf. This can be extremely costly to the farmer.

An animal does not always go into heat. This is called anestrus. There are several reasons an animal may not show a heat:

- Lactational anestrus – is when an animal does not cycle when it is nursing its young. This is rare in dairy cows because they are usually milked by a machine and are not bonded to their young.
- Pregnancy – cows/heifers do not cycle when they are pregnant.
- Infection or illness – unhealthy animals often do not come into heat. For example, a uterine infection can prevent ovulation and therefore prevent estrus.
- Cystic ovaries – this is very common in dairy cattle, especially early in their lactations. Cystic ovaries occur when the follicles grow but do not release the ova from inside them. While this usually leads to anestrus, it can also have the opposite effect – increased frequent estrus behaviour (also known as nymphomania).

Some cases of anestrus are preventable through making sure the animal's needs are met and that the animal is healthy. To detect anestrus keep records, know your animal’s cycles and keep an eye for heats. Knowing these things can help identify if a heat is actually missed.

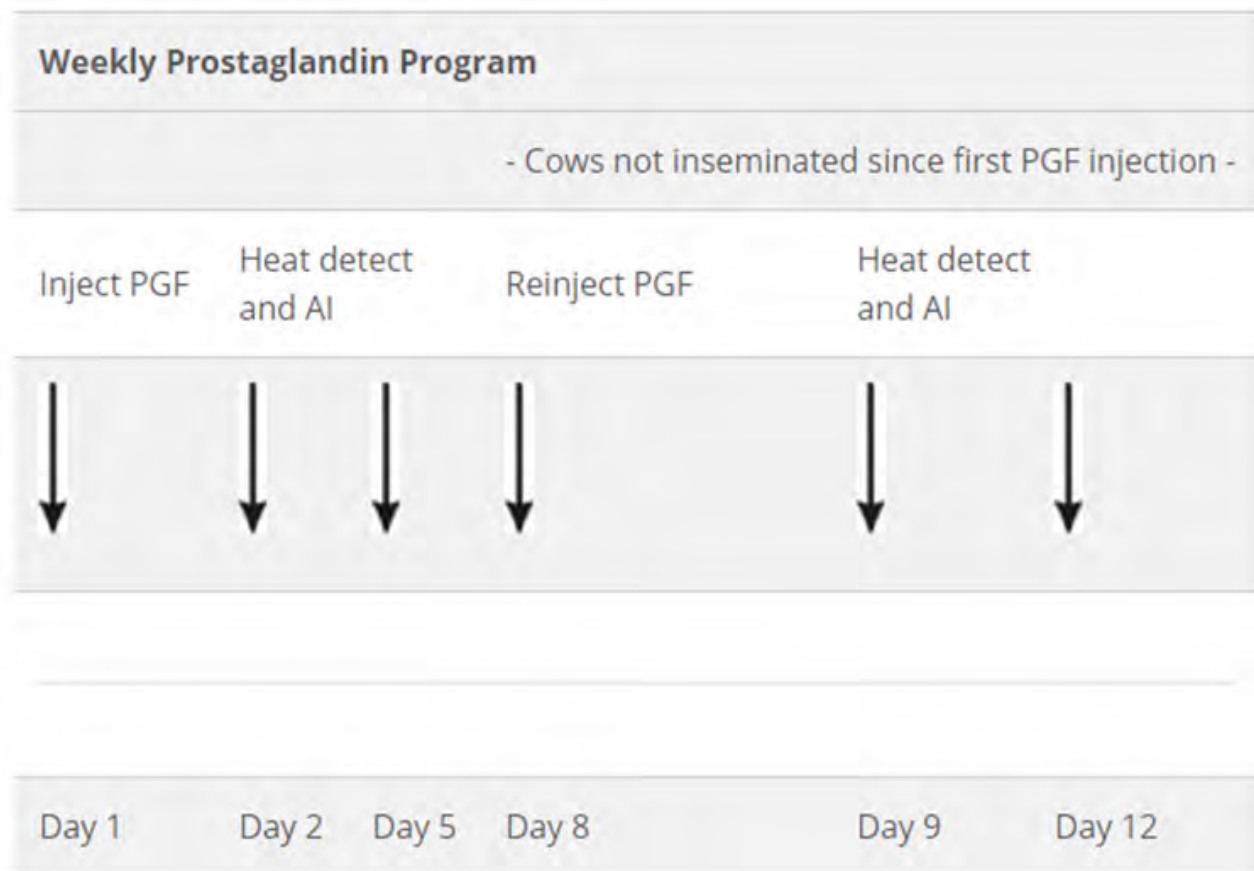
Other cases of anestrus can be treated by hormone therapy (remember, reproductive hormones are different than growth hormones or milk producing hormones, which are illegal in Canada for dairy cattle).

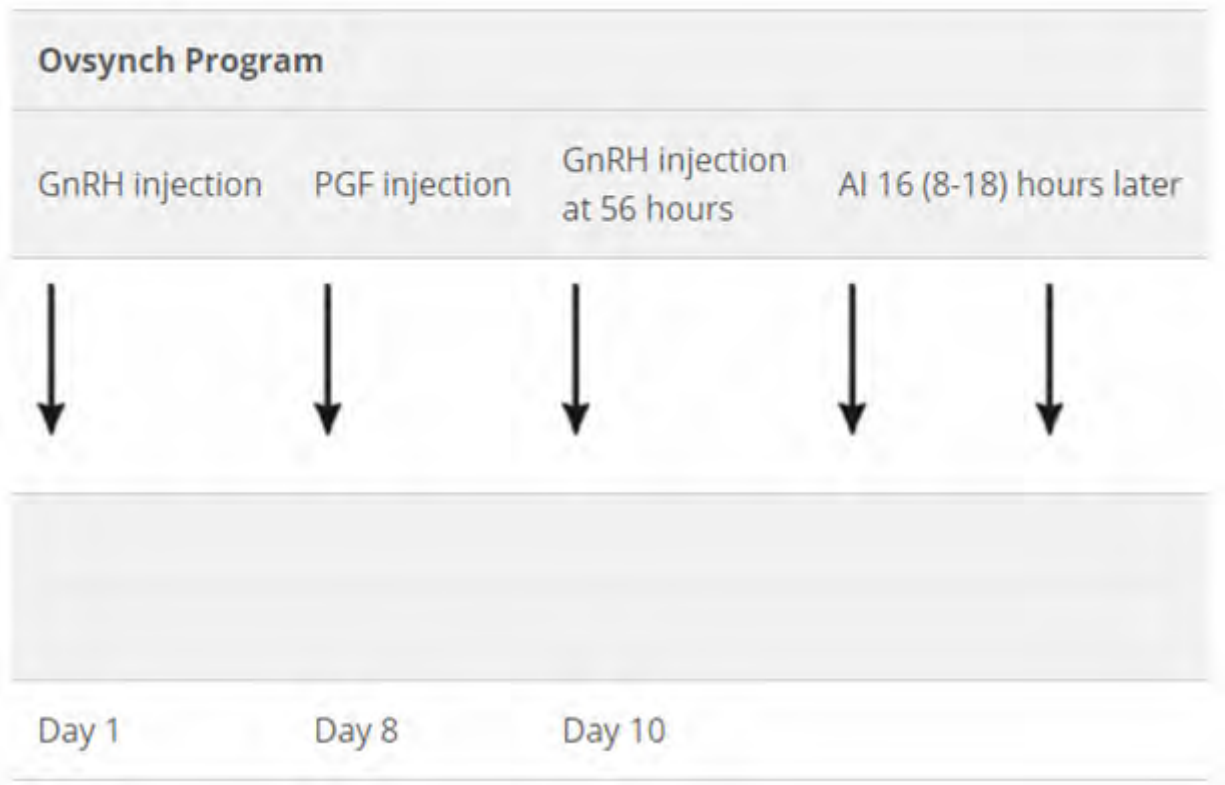
Some producers use heat/estrous synchronization programs (also called Timed A.I or Ovsynch) to have more predictable and consistent heat dates across the herd. This becomes important as most missed heats come from poor detection methods.

Heat synchronization starts with the injection of prostaglandin, a hormone which helps bring the animal into heat. Most producers with successful heat synch programs work on a weekly or bi-weekly schedule. Cows that are given prostaglandin should be 50 days or greater post partum, heifers should be at least 60% of mature body weight. Once a prostaglandin shot has been given, an animal will typically show heat 36-72 hours after injection. Once a heat has been observed she should be bred 8-12 hours later. If a heat is not seen, she can be injected the following week. If after 3 weeks no heat has been observed, she should have a reproductive exam by the vet.

Producers who use an ovulation synchronization program have a 90% success rate of syncing the ovulation of lactating cows. In Ovulation synchronization, the process starts by injecting GnRH 7 days before and 2 days after prostaglandin. Once a cow has received the second GnRH injection, the cow will ovulate within 24-36 hours. To be most effective in breeding, animals should be bred within 8-18 hours of the last GnRH injection.

With any form of synchronization programs and heat detection, cows should be checked for visual heat signs several times a day.





### Debate It!

What are the benefits and downfalls of using an ovulation synchronization program on a dairy farm?

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

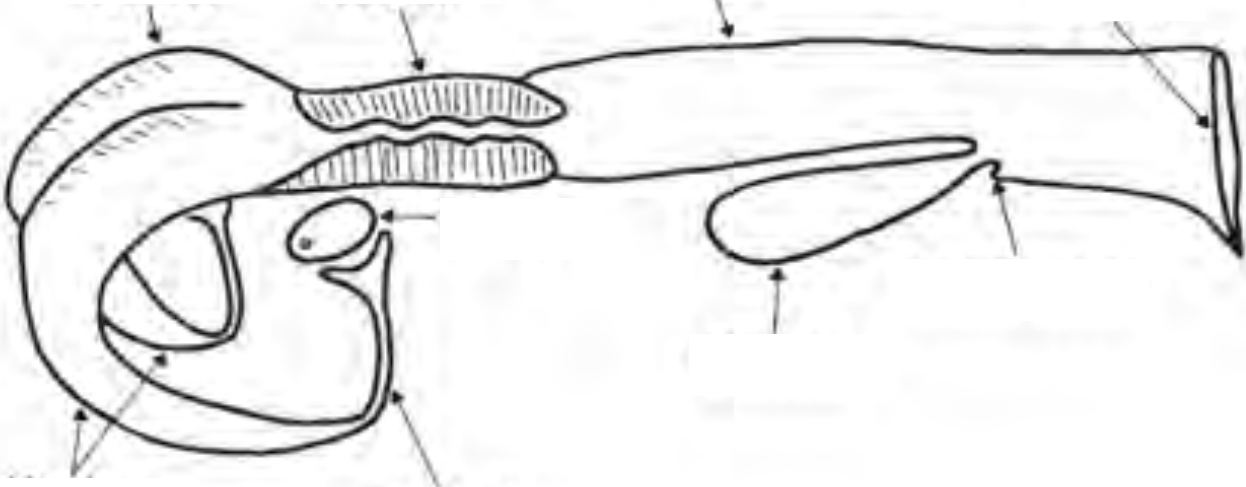
## Activity #1 - Breeding Trivia

<b>Do</b>	Time: 30-40 minutes Equipment: paper, pens and if using an online software, a computer	Come up with (or have members come up with) questions that relate to this section of this book.  Divide into teams and have teams quiz each other. The teams with the most questions right wins!
<b>Reflect</b>		To help members learn and review information about breeding through a trivia game
<b>Apply</b>	Prompting questions	Was this activity easy or difficult?  Did you learn something you didn't know before this meeting?

## Activity #2 - Labeling the Female Reproductive System

<b>Do</b>	Time: 15 minutes Equipment: Female Reproductive System worksheet, pens	Give each 4-H member a worksheet and them work individually or in pairs to complete the sheet
<b>Reflect</b>		To help members learn and review the parts of the female reproduction system
<b>Apply</b>	Prompting questions	Was this easy or difficult?  Why is it important to know the part of the female reproductive system and how they work?

Female Reproductive System Worksheet



### Activity #3 - Labeling the Male Reproductive Tract

<b>Do</b>	Time: 15 minutes Equipment: Female Reproductive Tract worksheet, pens	Give each 4-H member a worksheet and them work individually or in pairs to complete the sheet
<b>Reflect</b>		To help members learn and review the parts of the male reproduction tract
<b>Apply</b>	Prompting questions	Was this easy or difficult?  Why is it important to know the part of the male reproductive system and how they work?

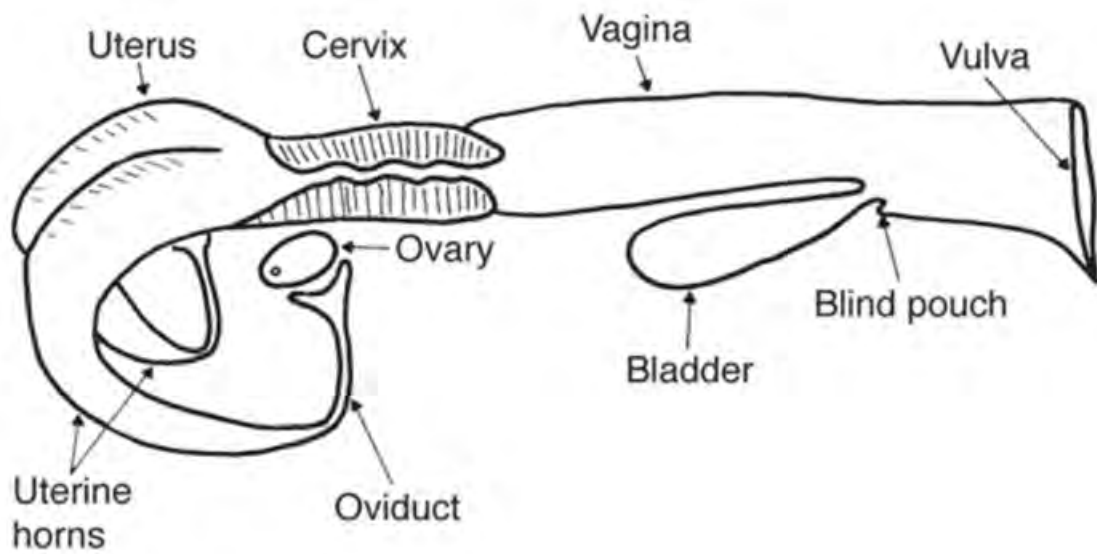
# Male Reproductive Tract Worksheet





## Answers for Reproductive System Worksheets

### Female Reproductive System



### Male Reproductive Tract

1. Scrotum
2. Testicles
3. Ductus deferens
4. Penis
5. Sheath

## Activity #4 - Build a Reproductive System

<h1>Do</h1>	<p>Time: 30 - 60 minutes</p> <p>Materials: Collect household items that members could use to construct a mock digestive system, such as tape, balloons, paper towel or toilet paper rolls, plastic bags, paper clips, fasteners, elastics, money rollers, straws, popsicle sticks, etc.</p>	<ul style="list-style-type: none"> <li>▪ Split members into groups of four or five. Give each group a number of items to build their reproductive system with</li> <li>▪ Give members 20 minutes to build a reproductive system with identifiable components</li> <li>▪ Have a contest at the end to see which group could build some of the following:             <ol style="list-style-type: none"> <li>1. Most lifelike looking system</li> <li>2. Include all parts of the reproductive system</li> <li>3. Flow through design to show the passage of ova to embryo to fetus</li> </ol> </li> </ul>
<h1>Reflect</h1>		<p>For members to familiarize themselves with the structure and components of the different parts of the reproductive tract.</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>What are the parts of the reproductive system?</p> <p>How does the egg from the cow move through the system?</p> <p>Did everyone in your group participate in building the system?</p>





## Meeting 3 – Genetics Match-Making

### Setting Objectives:

To create a better understanding of breeding and genetics options in the dairy industry.

### Suggested Learning Outcomes:

- Learn how to breed cows with AI and other breeding options
- Learn about the importance of genetics in the dairy industry
- Learn how to calculate Parent Averages and the practical side of genomic testing

### Suggested Roll Call Questions:

- What bulls do you use on your farm?
- Who does the breeding on your farm?
- Are some things you would look for in a bull for your heifer?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"> <li>• What is AI</li> <li>• How to inseminate cows</li> <li>• Other breeding methods Basic Genetics</li> <li>• Genomic Testing</li> <li>• Dominant and recessive genes</li> <li>• What's in a bull proof</li> </ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Breeding

Over 80% of dairy producers use AI (artificial insemination) as their primary breeding style (Natural breeding makes up 3% and a combination of both makes up 17%). AI breeding is either done by a technician (typically from the semen company that the herd uses) or by an employee/owner of the farm.

#### Talk About It!

What breeding style is used on your farm?  
Why?

Collecting semen for AI starts at an AI Collection facility. A bull is stimulated and mounts a dummy female and ejaculates into an artificial vagina. Collected semen is mixed with an antibacterial agent and frozen with a preservative. In some cases, before the semen is mixed and frozen, it gets sorted into "sexed semen". Sexed semen contains the sperm that will produce heifer calves. When sexed semen is used there is a 90% chance of getting a female calf. Once frozen, the semen stays in liquid nitrogen until use. When ready to use semen, it needs to be warmed to 35-37°C. Once warmed it needs to be maintained at body temperature until inserted in the cow. Semen should be inserted within a few minutes to maintain viability.

**Experience It!**

Visit an AI Collection facility in your area. Have at least three questions ready to ask such as methods of collection, processing and storage as well as training required to work in the facility.

## A.I. Recommendations



## Breeding with AI

- Most semen companies offer insemination courses. These courses teach people how to breed through AI and have a high pregnancy rate. When breeding with AI here are some tips to get the highest pregnancy rate:
- Ensure the animal is in heat, some research shows that up to 20% of cattle bred are not truly in heat
- Ensure that the cow is restrained, but as stress free as possible
- Make sure things are clean
- Insemination supplies should be clean and dry
- Once the insemination device is ready, it should be protected from contamination and the cold
- The vulva should be wiped clean to prevent manure getting into the reproductive tract
- Use protective sheaths, changing them between cows

When inseminating dairy cows, follow these steps for best results:

1. Position the cow, cow should be relaxed, standing level and comfortably restrained
2. Thaw the straw to approx. 35oC
3. Prep the cow by cleaning the vulva, insert a gloved and lubricated arm into the cow's rectum removing any excess manure.
4. Find the cervix with your inserted hand. It will be found on the pelvic rim
5. Insert the AI gun into the clean vulva and into the vagina. Guide the AI gun so that it is at the start of the cervix, pass the cervix over the AI gun
6. Line up the gun with the cervix and pass it through the canal
7. Once the gun reaches the end of the cervix, there will be less resistance against the gun. Release the semen into the chamber of the uterine horns, located on the other side of the cervix. Semen should be released to the count of 5. Ensure that you are not holding the cervix too hard, or the semen will not reach both horns
8. Remove the gun and dispose of the sheath and straw

### Experience It!

Invite an AI breeder to your meeting to discuss their role within the semen company they work for. Find out what a typical day for them looks like.

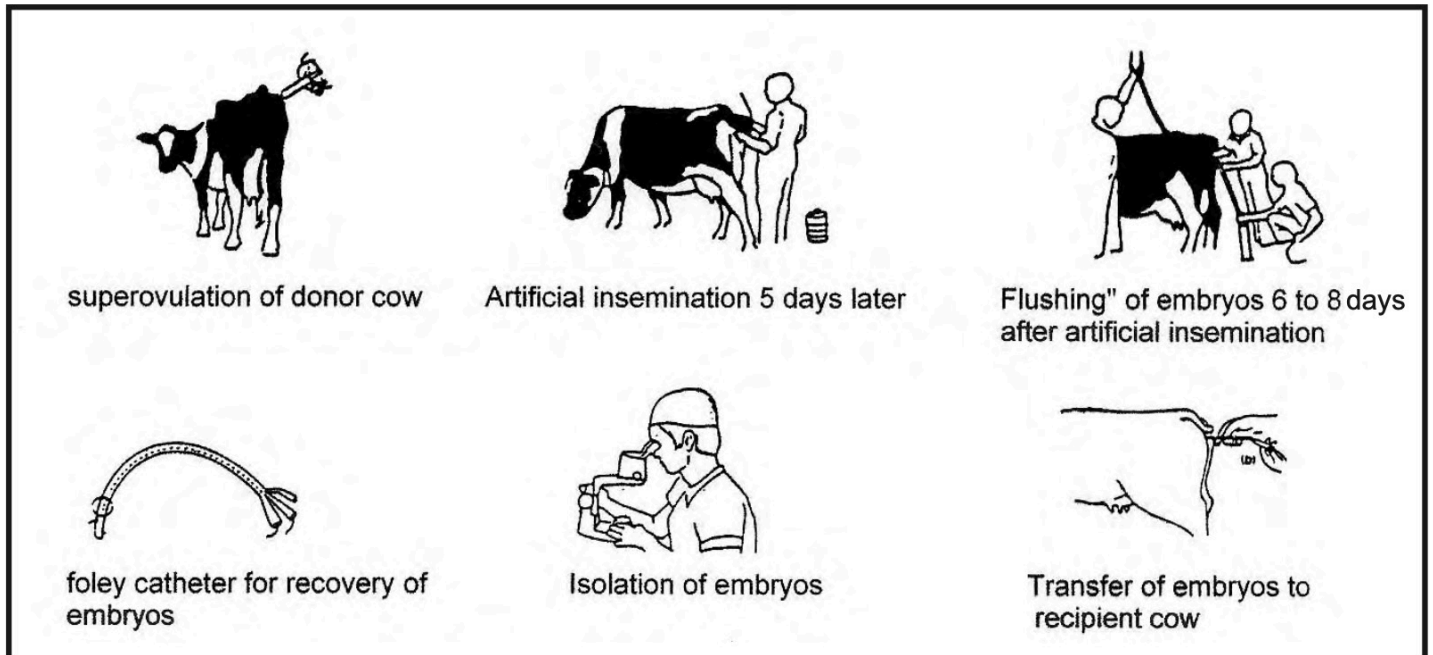
## Other Breeding Options

For some animals, producers may want more than one calf a year from the dam. In that case they may flush and do Embryo Transfers. Embryo Transfers is also another way to get new genetics into the herd. People can buy embryos from all over the world! For Embryo Transfer you need two cows: a donor (gives the egg) and the recipient (who carries the egg to term).

To start the embryo transfer process, the donor dam is given Follicle Stimulating Hormone a few days prior to egg collection. This causes the dam to release more ova (eggs) than a usual ovulation. This is called superovulation. Once the dam shows heat, she is bred. As there is more than one ova, several eggs will be

fertilized, making several embryos. A catheter is used to flush the eggs out of the uterine horns. Once the embryos are harvested, they can be implanted fresh or frozen in liquid nitrogen. Embryos will be implanted when the animal would traditionally be bred.

In Vitro Fertilization (IVF) is also used on rare occasion. In IVF an unfertilized egg is removed from the ovary and fertilized in a lab. The fertilized embryo is then placed just as in an Embryo Transfer.



**Research It!**

How many cows are bred using Embryo Transfer each year in Ontario? In Canada?

## Genetics/Genomics

Every animal and plant of every species is made up of cells. Some are made up as a few as one and some (like humans and cows) are made up of BILLIONS of cells. Cells contain many parts, one of which is called a nucleolus. This is like the brain of the cell. The nucleolus is what contains DNA. DNA is what makes a of us and all your cows unique. Have you eve noticed that some cows look like their dam? This is because of DNA!



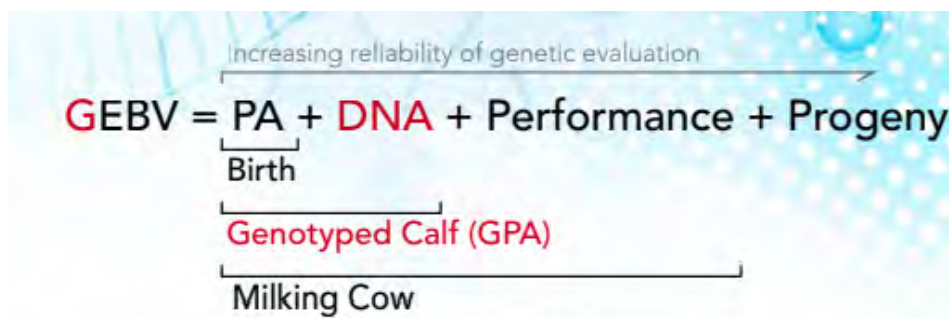
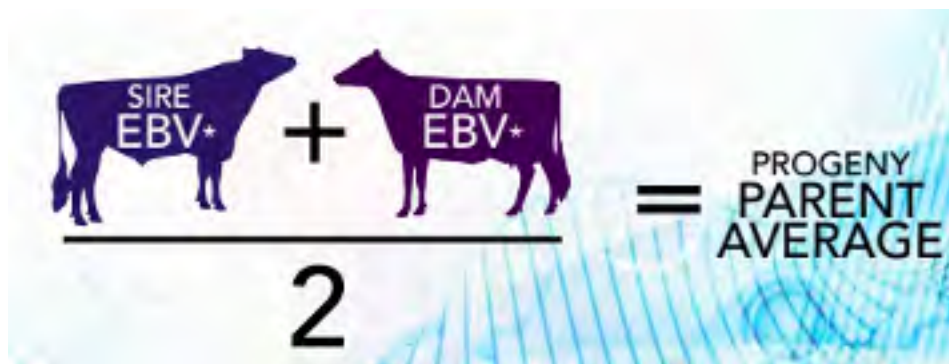


When we look at an animal's DNA, we are looking at the genetics of that animal. By looking at the genetics of the animal, or in other words looking at what makes the animal unique, we are able to make decisions regarding this animal like: does she stay in the herd, what sires should we breed her to, and what can we expect her production to be like.

Each animal is made up by DNA provided by both the Sire and Dam (half from each parent). We are able to use this to predict what the calf may be like. This number is called a Parent Average (PA). When we look at a PA, we are able to say with some accuracy (on average about 33% how the animal will perform). As an animal gets older and we get more information about her, we are more sure of the animal genetic traits and so the accuracy or reliability increases. We get more information on cows by getting them classified, getting them milk tested and through information about their daughters. Once an animal has been milk tested and classified her PA will change to an Estimated Breeding Value (EBV).

When we look at an animal's genetic evaluation her information can come from 4 possible sources:

1. Parents - who were their parents and what were their genetic potential and actual results
2. Performance - how is the animal ACTUALLY performing in the barn
3. Progeny - how have her sons and daughters performed
4. DNA (genotype) - what is her genetic make up. If an animal has been genotyped they will have a Genomic Parent Average (GPA) or Genomic Estimated Breeding Value (GEBV)



Each animal expresses their genes differently (think of you and your siblings!). Traits that we can see with our naked eye or traits that we can actually measure are called phenotypic traits. Some examples are: coat colour, amount of milk given, physical conformation. These traits can be determined by two factors: the environment and the animal's genes. We express this as:

$$\text{Phenotype} = \frac{\text{genotype} + \text{management}}{\text{environment}}$$

## Genotyping

One way to know more about an animal is to genomically test them. We call this Genotyping. Genotyping is the science of DNA sequencing. It can show us what the genotype or genetic traits of the animals are (remember phenotype = genotype + environment). It can be done at birth and will tell us the genetic make up of that calf with up to 75% reliability. Genotyping has been available since 2009, making it a very new and exciting tool for producers to use. Genomic testing can also tell us if the suspected parentage is correct.

Genotyping is done by looking at some tissue from the animal. Most of the time producers will submit hair samples (40 clean hairs with the follicles attached) or a Tissue Sample Unit (TSU), a small section of skin collected from the ear.

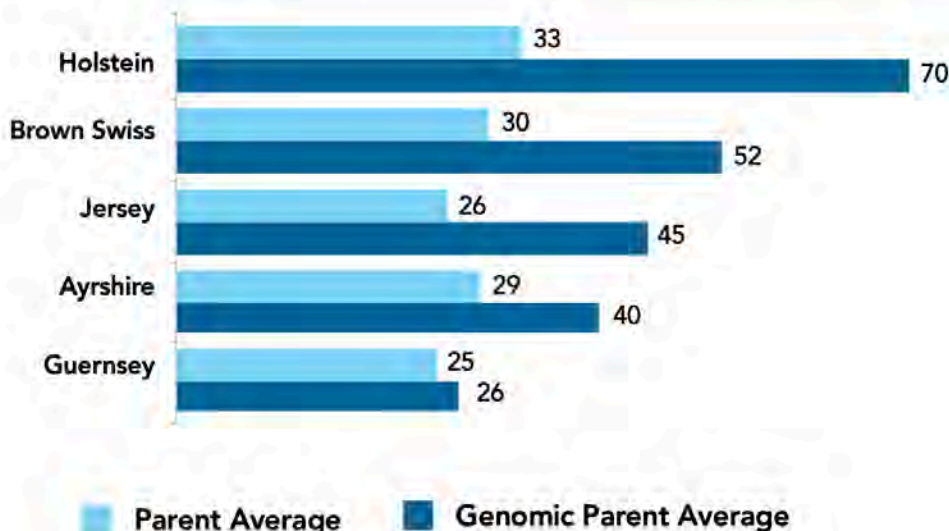
Genotesting females with a “Low Density” panel will look at approximately 10,000 parts of the genome. These are called SNP (pronounced snips), single nucleotide polymorphisms. Each snip looks at a different trait. Each SNP is made up of two halves (called alleles). By genotyping we are able to tell what those genes are and how many copies of that gene an animal has. This will determine how the trait/gene is expressed and shown.

Genotyping can be used to make better breeding decisions or to decide who in the herd should be culled. Not every breed benefits from genetic testing at this point in time. As Holsteins make up most of the dairy cattle in Canada, we know the most about them and therefore we know the most about how their genetic makeup works. If we look at a breed like Guernsey, we don't know a lot about them and don't have a large amount of animals to look at and compare, therefore we don't know a lot about their genetic make-up.

All bulls used for AI (artificial insemination) are genetically tested. Until these bulls are proven (see bull proofs) they are called Young Sires or Genomic Sires.

**Figure 1:**

**Average Reliability (%) for LPI (and Pro\$) of genotyped heifers based on Parent Average before genomics versus Genomic Parent Average with genomics.**



\* Source Brian Van Doormaal, CDN

### Research It!

Is there a facility/company in your area that does genomic testing for cattle? If so, what are the costs associated with this testing?

## Dominant vs Recessive Traits

When we look at traits they can be categorized into dominant and recessive. This has to do with the likelihood of that particular behaviour/trait (for example coat colour) will show through. Each gene is made up of two parts, one part comes from the dam and the other from the sire.

A dominant gene will always show if present, we can call a dominant gene "D". A recessive gene will only show if both parents are carriers of the recessive gene, we can call a recessive gene "r". An animal with two of the same gene (two "D" or two "d") is homozygous for that gene. An animal that has different genes (one "D" and one "d") is heterozygous for that gene.

When we breed animals, each parent is contributing half the genetic information for the animal. Most of the time we don't know what half of the gene is given from each parent. By looking at each parent and what their specific gene make up is, we can make a guess at the likelihood of the calf's gene make up. Let's look at an example using red coat colour (recessive):

Heterozygous bull (Br) - heterozygous dam (Br). If B stands for black (the dominant trait) and r stands for red (the recessive trait) we can see the likelihood of having a red calf!

		Dam	
		B	r
Sire	B	BB	Br
	r	Br	rr

Looking at the example above the sire is blue, the dam is red and the calf is purple. We can tell that there:

- Is a 25% chance it is Homozygous B (BB) and will be black
- Is a 50% chance it is heterozygous (Br) and will be black, but carry the red gene
- Is a 25% chance it is homozygous r (rr) and will be red

### Do It!

To try crossing genes yourself. Try the gene crossing Activity #4 'What Are the Chances' found at the end of this meeting.

## Bull Proofs

The majority of producers breed cows through artificial insemination. Breeding through AI has many benefits including, safety, increased sire selection, and faster genetic progress. Using AI allows producers to select bulls to make a better next generation and improve their herd through corrective breeding or selective breeding.

Bulls can be categorized in 3 different ways: Genomic/Young Sires, Proven Sires and MACE sires. Genomic/Young Sires are young animals who have not reached proven status, however are available for purchase. MACE Sires have microsatellite testing done. As Genomic testing is not internationally available, microsatellite testing is the international standard. MACE bulls in Canada are from countries outside of Canada and the US. In Canada, for an animal to be an officially proven bull they must meet the following criteria:

## CRITERIA FOR AN OFFICIAL BULL PROOF BY TRAIT (HOLSTEIN)

Trait	Holstein		
	Daughters	Herds	Reliability
Production (1,2)	20	10	70%
Somatic Cell Score	If production proof is official		
Lactation Persistency			
Type (2)	20	10	60%
Herd Life	If type proof is official		
Milking Speed	10	10	55%
Milking Temperament	10	10	55%
Daughter Fertility	20	10	45%
Calving Ability	10	10	70%
Daughter Calving Ability(3)	10	10	55%
Body Condition Score	20	10	60%
Mastitis Resistance (4)	20	10	45%

In Canada official proof releases happen 3 times a year: April, August and December. It is at these releases that a bull will have an official proof. Bull proofs are created by Lactanet (formerly Canadian Dairy Network). Bull proofs can be tricky to read as there are a lot of numbers! Learn how to read them by reading “What’s in a Bull Proof”.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - AI Demonstration

<b>Do</b>	Time: 30 Minutes  Materials: AI materials including semen straw, breeding gloves, warming bath, AI gun	Invite a technician or a farmer if they breed their own cattle. Have them talk through breeding and give a demonstration.
<b>Reflect</b>		Members will learn how the AI process works.
<b>Apply</b>	Prompting questions	Why do you think over 90% of farmers use some form of AI in their herd?  What are some of the benefits of AI?

## Activity #2 - Calculating Parent Averages using Online Software

<b>Do</b>	Time: 15-20 minutes  Materials: Animal registration numbers, bull codes or names, computer/tablet/ phone	Using Lactanet's inbreeding calculator or Holstein Canada's Dam x Sire mating trial find out what the breeding values of some potential breedings.  Lactanet: <a href="https://www.cdn.ca/inbreeding/selectlist.php">https://www.cdn.ca/inbreeding/selectlist.php</a> Holstein Canada: <a href="https://www.holstein.ca/en/AIS/SearchMatingTrial">https://www.holstein.ca/en/AIS/SearchMatingTrial</a>  Try breeding one cow to several different bulls and see the differences on the potential offspring.
<b>Reflect</b>		Learn how to use online mating programs to determine breeding values of potential offspring. This can help producers make breeding decisions
<b>Apply</b>	Prompting questions	Why would a producer use tools like breeding calculators?  How can producers use the information provided to aid in management?  What is something in the results you would look at? What are your deal breakers?

### Activity #3 - Calculating Parent Averages by Hand

<b>Do</b>	Time: 15-20 minutes Materials: Animal registration numbers, bull proofs, calculator	Using the parent average calculation, determine the parent averages of potential matings.  Parent Average= $\frac{(\text{Dam EBV} + \text{Sire EBV})}{2}$  Try breeding one cow to several different bulls and see the differences on the potential off spring.
<b>Reflect</b>		Learn how to use calculate breeding values to determine breeding values of potential offspring. This can help producers make breeding decisions
<b>Apply</b>	Prompting questions	Why would a producer use tools like breeding calculators?  How can producers use the information provided to aid in management?  What is something in the results you would look at? What are your deal breaker?

## Activity #4 - What are the Chances?

<b>Do</b>	Time: 10-15 minutes Materials: pen, paper, blank pennant squares, resource guide	Determine the probability of an animal inheriting the A2*A2 gene with the following crossings:  Crossing 1: Dam A1A1 + Bull A1A2  Crossing 2: Dam A1A2 + Bull A1A2  Crossing 3: Dam A2A2 + Sire A1A2  Crossing 4: Dam A2A2 + Sire A2A2  Use pennant squares to determine the probabilities
<b>Reflect</b>		Learn about the probability of a calf inheriting a trait.
<b>Apply</b>	Prompting questions	Why would you need to know the probability of an animal inheriting a trait?  What does it mean for a trait to be dominant vs recessive?







## Meetings 4 and 5 - Pregnancy & Calving - Helping Mom & Calf

### Setting Objectives:

To become familiar with and appreciate the complexities of the gestation process, calving (birthing) and the care needed post-calving.

### Suggested Learning Outcomes:

- Learn about what happens when an animal gets pregnant, and the calving process.
- Learn about difficult births and how to assist an animal when calving.
- Understand cow and calf care once the animal has calved.

### Suggested Roll Call Questions:

- What are some steps that you take to make sure the calving process go smoothly?
- Have you ever witnessed a difficult birth on your farm?
- What are some protocols that you have for your farm when a calf is born?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Gestation</li><li>• Calving</li><li>• Difficult births</li><li>• Assisting Calvings</li><li>• Newborn Care</li><li>• All Breeds</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Pregnancy and Calving

Once a cow is bred, the hope is that she gets pregnant. It is important to check the animal to ensure she is pregnant. There are three different ways this can be done:

1. Palpation - a hand inserted in the rectum can feel the uterus and ovaries from above and determine changes in the organs that are signs of pregnancy, such as the continued follicle development. A cow must be at least 35-40 days pregnant before palpation can be a reliable method of pregnancy detection.
2. Ultrasound - similar to palpation, a hand, holding the ultrasound wand, is inserted into the rectum of the animal. Sound waves from the ultrasound bounce off of the uterus and result in a picture forming on the ultrasound screen. A veterinarian can look at the fetus to determine the sex of the fetus. On farms, developing fetuses can be detected as early as about 25 days into pregnancy. When the fetus gets a little older (i.e. 60-90 days) then ultrasound can be used to determine the sex of the developing fetus.

3. Lab Testing - progesterone levels can be measured in the milk and blood of animals to detect the estrus and pregnancy cycles. Low levels indicate a normal estrous cycle (no pregnancy) and high levels indicate pregnancy. This testing can be done earlier than the other tests. Other hormone levels can also be measured to determine pregnancy during the first three months of pregnancy.

### Experience It!

Invite someone who is proficient in the use of ultrasound to demonstrate its use for the detection of pregnancy (and determining the gender of the fetus if possible). Find out how/where they received their training to be able to do this.

### Check It Out!

Find out how lab testing is done to determine pregnancy. Who can perform it, is there anything local in your area and what is the cost?

A cow's gestation period is 282 days. Typically cows milk throughout the pregnancy until the last 30-60 days at which point they are dried off until they calve again.

Occasionally there can be a problem during the pregnancy. When this happens the embryo or fetus stops developing and the gestation is ended prematurely. Abortion occurs when a dead fetus is passed out of the uterus before the normal birth is due to occur. If a calf manages to carry a fetus to term, and it is dead when it is born it is called a stillbirth.

There are several different reasons a cow's gestation will fail:

- Up to 40% of embryos just do not develop as a fetus. This could be because it did not develop properly or because the body is rejecting developing twins.
- Infection
- Stress from things like transportation, illness, or poor nutrition

## Late Gestation and Calving

As the cow comes to term there are many ways that you can make the calving period go smoother.

- 
- Keep an eye on the dam as her estimated calving date gets closer and once calving begins. Look for signs of distress. If the cow is having difficulty you may need to call for help or assist yourself.
- Ensure that there is a clean, safe and dry area for the cow to give birth
- Provide gentle assistance only if needed
- Consider breeding for calving ease and smaller calves, especially for first time calving heifers.

Calving refers to the birthing process, whereby the fetus makes its journey from the protected environment inside the uterus of its mother into the outside world. When a calf is born, it stops receiving oxygen and

nutrients from its umbilical cord and starts to breathe and eat for itself.

Calving occurs in 3 stages: pre-calving, calving and post-calving.

### **Pre-calving (labour)**

- Lasts 2- 6 hours
- Contractions begin. Contractions squeeze the muscles in the uterus to push the calf out.
- The calf changes position, turning so that it heads towards the birth canal.
- 'Labour' means work - the cow's body is preparing to calve

### **Calving**

- Calf enters the birth canal
- Contractions get stronger and closer together
- Cow strains to push out the calf
- The front feet and muzzle (nose) appear
- The rest of the calf appears and slides out easily
- Usually lasts two hours for cows and three hours for heifers

### **Post-calving (delivering the placenta)**

- The cow discharges the placenta, or afterbirth, within 12 hours of calving
- If the placenta is not expelled it could be due to a difficult calving or a poor diet. This is called a retained placenta and can cause infections or make it harder for her to get pregnant again. If a cow has a retained placenta, it is time to call the vet!

#### **Research It!**

If a cow has a retained placenta, what procedure will a vet need to do to rectify the problem?

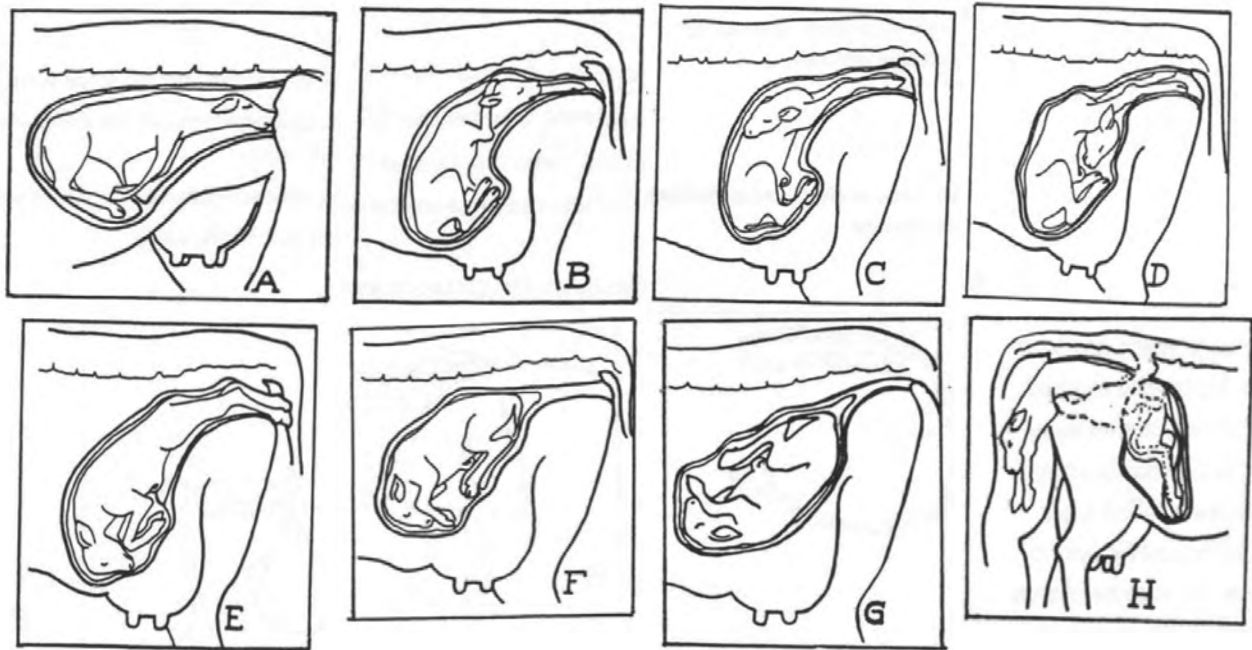
### **Difficult Births**

Not every calving goes as planned. There are several reasons that difficult births, also called Dystocia, can occur but the result is that the fetus cannot come through the birth canal easily. Most commonly, a fetus that is too large or is in an abnormal position causes dystocia. Dystocia can result in sick cows and/or weak or stillborn fetus.

The normal position for the calf at calving is facing the birth canal, with the front feet entering the birth canal first, followed by the head, which rests on the front legs. However, calves may be situated in these other positions:

- A. Head first with one or both legs bent backward
- B. Head and one leg first, with the other leg crossed over her neck
- C. Front feet first with the head twisted backwards

- D. Front feet first with the head bent down between the front legs
- E. Breech, backwards with the hind feet first
- F. Breech, with the rear legs tucked under the calf's body
- G. Breech, upside down, feet facing up
- H. Hiplock - the calf is stuck at the hips



If you suspect a cow is having a difficult birth, keep an eye on the labouring animal, and call for help if you are unable to assist. During stage two of calving you may need to assist if:

- Labour lasts longer than two to three hours
- The placenta or water bag as been showing for two to three hours
- The cow keeps straining but you can't see any part of the calf
- The cow is straining hard and you see no progress in the labour
- Part of the calf other than the front feet appear or can be felt at the start of stage two.

When checking the progress of the calving remember to sanitize and lubricate before you palpate. Clean your arm with warm soapy water and lubricate with mineral oil or lubricant. By putting your hand in the vagina you can check the positioning of the calf. If it is difficult to put your hand in, stop as it may complicate matters further.

If the calf is breeched, it can be delivered however all other unusual positions will require the fetus to be repositioned. When repositioning the calf:

- Correct the head first and then feet
- When moving feet, cup them in your hands to prevent ripping the inside of the uterus
- Reposition between contractions so you don't hurt the cow, calf or yourself
- If repositioning is taking more than 15 to 20 minutes, stop and call the vet

## Assisting Labour

Ideally a cow will calve on her own, naturally. If you do need to assist, use a calf puller or calving chains to help get the calf out.

When using calving chains follow these steps:

1. Disinfect the chains
2. Make a loop in the calving chain
3. Slip the loop over the calf's dewclaws
4. Make a half hitch in the chain between the dewclaws and the hoof head
5. Pull up 300 and down 300 from the ground and the ceiling. This is the natural angle to work with the cow's body
6. Alternate pulling on each leg a few centimeters at a time. By doing this the calf's hips and shoulders will be at an angle so that the calf passes easily through the pelvis.

### Check It Out!

Visit your local farm supply store or look online to see what a calf puller and calving chains look like and what these items cost.

## Newborn calf care

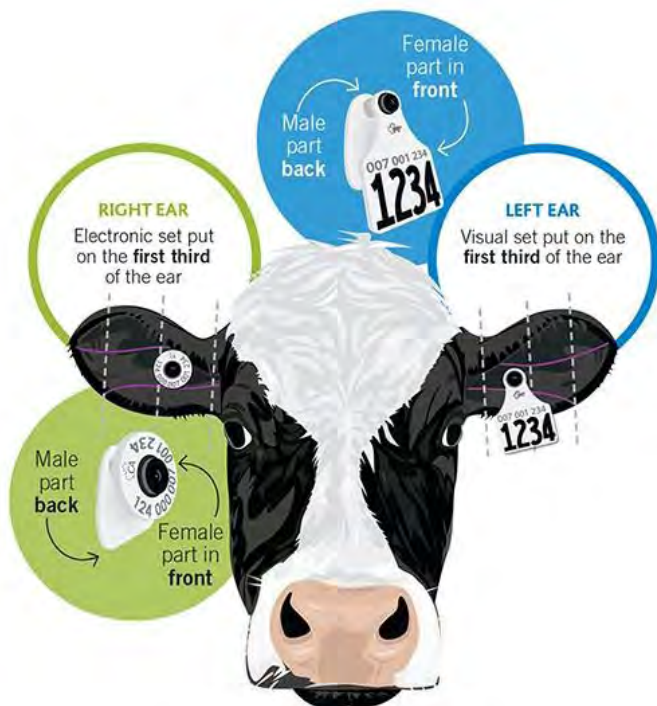
Once the calf is born there are a few things to look after to kick start the calf's life. The foundation of a great milking cow is having a healthy calf rearing. Here are the steps to take to kick start the calf's life:

1. Check to make sure it is breathing - clear membranes of the nose and from inside the nostrils. If the calf is having troubles breathing, lift it by its hind legs so its head is off the ground. Gently swing the calf from side to side to help drain the fluid and mucus from the lungs
2. Dip the navel - many farms dip the calf's navel in an iodine solution to disinfect the umbilical cord and to help it dry out faster. To further prevent infection, ensure the calf's living areas are clean and dry.
3. Feed colostrum - this is the first milk that the dam gives after the calf is born. It contains antibodies that help with the calf's immunity. A calf should have 2-4L within the first 30 minutes of life. Ideally a calf should have 6-8L within the first 12 hours of life. For more information on colostrum, check out the Nutrition section of the 4-H Dairy Resource Guide.
4. Record the birth - Once the calf's immediate needs are taken care of, it is important to keep record of the calf. proAction requires all births to be recorded within 7 days of birth or before the calf leaves the farm, whichever comes first. When recording a birth include: the animal's ID number (15 digits, alphanumeric), the date of birth and the premises ID. It is also beneficial to record the parentage of the calf. It is then recommended that the birth is reported to DairyTrace.
5. Identify/Tag the calf - dual tagging calves destined for milk production is required under the DFC proAction program. All calves must be tagged with Nationally approved tags. Holstein Canada is the provider of these tags for 9 out of 10 provinces through the NLID (National Livestock Identification for Dairy). Quebec uses the ATQ program.
  - NLID/ATQ tags come in a set of two, one with an RFID (Radio Frequency ID) button and one without. All tags have a management number, the animal's registration number and a barcode.
  - Male calves and freemartin calves that are not destined for dairy production can be tagged with CCIA (Canadian Cattlemen's Identification Agency) approved beef tags.

## Do It!

Find out where you can purchase CCIA approved beef tags in your area.

The placement of tags is the key to not losing the tags. Poorly placed tags are more likely to fall out or to catch on something within the barn yard. When tagging make sure the tagging sight is clean, the RFID tag is going in the correct side (this will vary if your farm has robots that read the tag. This would be things like robotic calf feeders, sorting gates and automated milking system). The male part of the tag (the part that pierces the ear) goes at the back of the ear and the female in the front.



## Experience It!

Have someone demonstrate the proper way to use a tagger for applying tags to ears and the proper placement of these tags on the ear.

## Other Identification

Tagging animals is the required method of identification, however some producers choose an additional type of identification for their animals in the case that they lose tags, or for management ease. Other methods include: tattooing, branding, sketches and photos attached to the animals registration, non permanent methods (chain numbers, straps, transponders and other, unapproved tags). If exporting animals across the border, check to see what method of identification is required.



### Discuss It!

Is using the NLID tags enough identification for a cow? Is it wise to use a second type of identification?

## Cow Care After Calving

Just like the calf, the new dam requires some additional care after calving. She should be given fresh, clean water, good quality feed and kept clean to prevent infection. There are several complications that can occur post calving.

**Retained Placenta** - occurs if the placenta does not pass from the uterus within the first 12-24 hours post calving. If a cow has a retained placenta, speak with your vet to see if antibiotics should be given

**Metritis** - is an infection of the uterus of the animal. This can delay the start of the estrus cycle.

**Prolapsed Uterus** - occurs after the calf comes out, the uterus also passes through the birth canal and hangs out the vulva, inside out. This can be caused by dystocia or low calcium levels in the cow's blood after she calves.

### Research It!

Find out what procedure a veterinarian will need to do if a cow has a prolapsed uterus. Be prepared to share your findings with the group.

**Nerve or muscle damage** - can occur due to dystocia or from slipping

**Milk Fever** - is caused by low calcium levels in the blood and muscle tissue resulting in weak muscles and the inability to stand. This occurs in early lactation, however is most common within a few hours of post calving. Treatment consists of calcium being administered subcutaneously, orally, or intravenously. The incidence of milk fever can be greatly reduced through proper dry cow rations.

Reproduction health is typically the main focus of herd health visits. When doing herd health be sure to show the vet:

- Pre-breeding, 15-45 days post calving
- Cows that have been bred 3+ times
- Cows with abnormal discharge from vulva
- Cows that have been pregnant for 1+ month (preg check)
- Cows that have been showing no, or irregular heats

### Experience It!

Have a veterinarian visit your meeting and discuss what they do when completing a Herd Health for a dairy farm.

## Activity #1 - Newborn Calf Protocols

<b>Do</b>	Time: 15 minutes  Materials: pen, paper and SOP template (found on the next page)	Use the knowledge you gained in the past section and create a SOP for the arrival of a new calf. Include steps like: <ul style="list-style-type: none"><li>▪ Feeding colostrum</li><li>▪ Navel dipping</li><li>▪ Tagging the calf</li></ul>
<b>Reflect</b>		Members will learn the steps to take after the calf is born to start it off strong
<b>Apply</b>	Prompting questions	Why is a good calf care important?  What would you do to look after the new mother?  What are the benefits of dipping navels?

## Standard Operating Procedure Template

SOP #:	Title of SOP:	
Basic Information (age range and method)		
Medications to use (if applicable)		
Product	Dosage	Meat withdrawal
Before you start - what should you get ready?	Step 1:  Step 2:  Step 3:	
Completing the procedure or process (what steps do you take)	Step 4:  Step 5:  Step 6:  Step 7:	
After Care (both clean up and checking on the calf)	Step 8:  Step 9:	
Safety Risks of the procedure or process		

## Activity #2 - Pulling a Calf Demonstration

<h1>Do</h1>	<p>Time: 10 - 20 minutes</p> <p>Materials: a set of calving chains and/or a calf puller</p>	<p>Calving chains</p> <ul style="list-style-type: none"> <li>▪ Demonstrate how to properly use calving chains. Ask one of the members to help with the demonstration by playing “the calf”</li> <li>▪ Gently put the calving chains on the member to show how it is put on properly. Then, pass the chains around for each member to hold</li> </ul> <p>Calf puller</p> <ul style="list-style-type: none"> <li>▪ Demonstrate how to properly use a calf puller</li> <li>▪ Give each member a turn using the calf puller. They can get the feel for how much weight should and shouldn't be put into pulling the calf from the cow</li> </ul>
<h1>Reflect</h1>		<p>To introduce the concept of helping a cow through a difficult birth with calving chains or a calf puller</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>When might a farmer use calving chains or a calf puller?</p> <p>When should the farmer decide that it's time to call the vet?</p>

### Activity #3 - Identifying a Newborn Calf

<b>Do</b>	Time: 10 minutes  Materials: different types of identification equipment should be laid out on a table: ear tags and ear tagger, neck and leg chains, branding iron, photographs, drawings	Ask members to try to identify all of the ID equipment and whether it is a permanent or non-permanent form of calf identification.  If an animal is available, the host farmer could demonstrate how to tag by doing a live demonstration. Emphasis should be placed on proper location of tags so they don't rip out as easily.
<b>Reflect</b>		To show members the importance of keeping track of dairy animals from the time they are born and the proper way to identify animals
<b>Apply</b>	Prompting questions	Why do you think there are so many ways to identify newborn calves?  Why are these records important?  In what other areas of your life is record keeping important? Why?

## Activity #4 - Recording a Birth

<b>Do</b>	Time: 10 Minutes  Materials: breeding slips, calf information, pen/paper, computer software	Make a record of a newborn calf. To comply with proAction be sure to include: <ul style="list-style-type: none"><li>• Premises ID</li><li>• Date of birth</li><li>• Dam and Sire (not required for proAction)</li><li>• Lifetime number</li><li>• Other things of note</li></ul>
<b>Reflect</b>		Learn how to record an animal birth within your farm records and what you need to report to DairyTrace
<b>Apply</b>	Prompting questions	Why would the government want you report animal births?  What is the importance of a lifetime number?  How is this similar to when you were born?





# Meeting 6 - Who's Who in the Dairy World

## Setting Objectives:

To gain knowledge about the characteristics of various dairy breeds and genetic factors to be able to make informed breeding decisions.

## Suggested Learning Outcomes:

- Learn about the different breeds in Canada.
- Learn the difference between the two Canadian indexes, LPI and Pro\$

## Suggested Roll Call Questions:

- What is your favourite breed of dairy animal?
- Name a breed of dairy animal that is not found in Canada.
- What are some factors you consider when choosing a sire for breeding?

## SAMPLE MEETING AGENDA

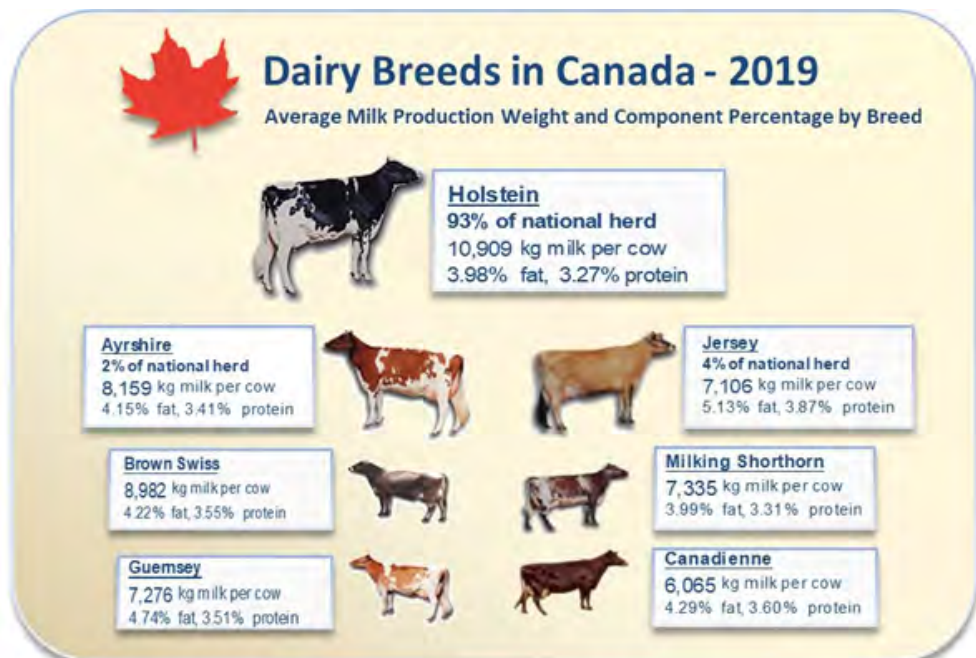
Time: 1 hour, 30 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"> <li>• Canadian Dairy Breeds</li> <li>• Registrations</li> <li>• Canadian Genetic Indexes</li> <li>• Breeding Strategies</li> </ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

## Topic Information

### Dairy Breeds

Canada recognizes 7 dairy breeds. Each breed has its own unique history, production qualities and conformation qualities. The seven breeds are: Holstein, Jersey, Ayrshire, Brown Swiss, Milking Shorthorn, Guernsey and Canadienne.

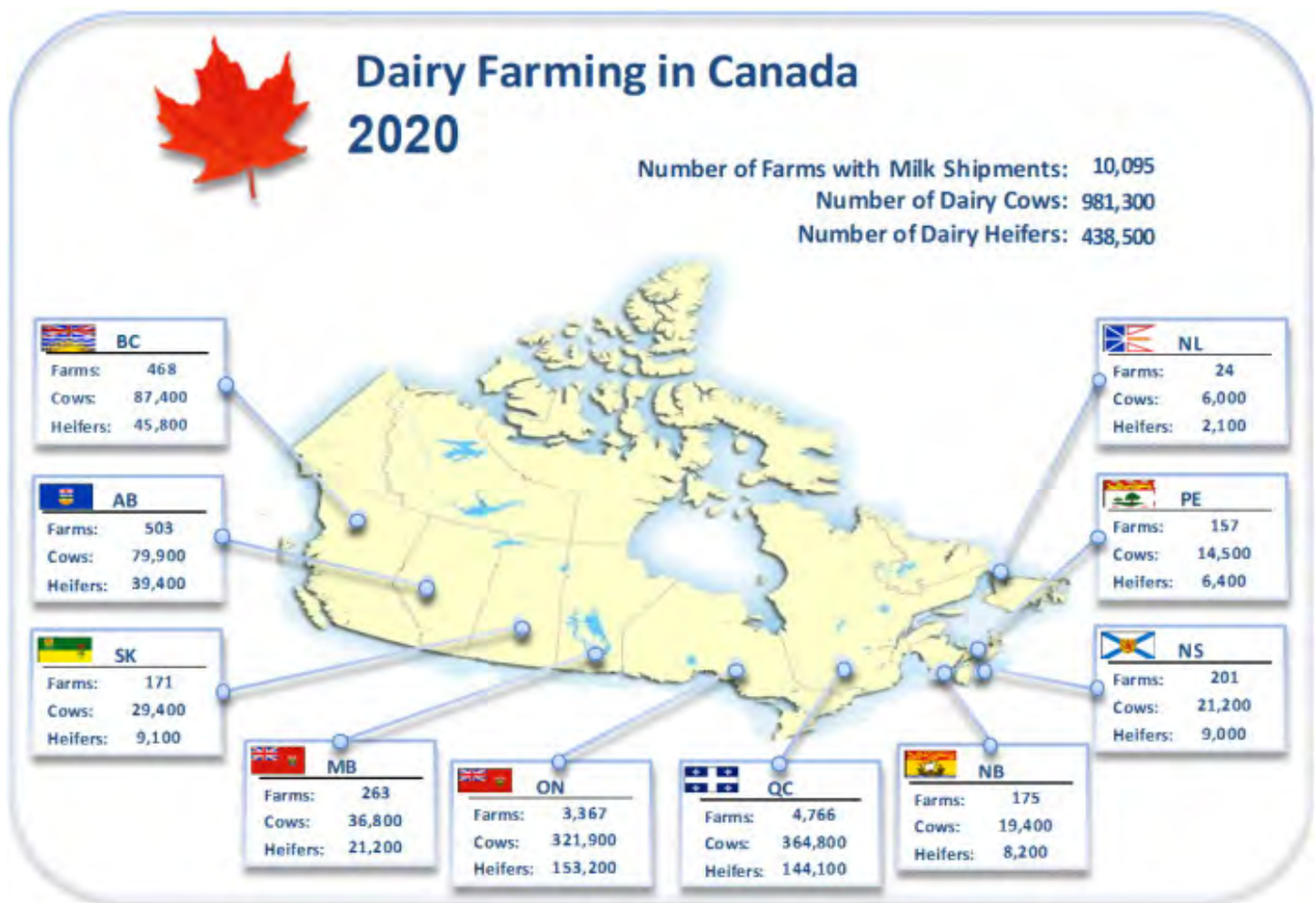


All dairy breeds in Canada, with the exception of Canadienne, originated in Western Europe and Great Britain.

### Research It!

Look for the latest statistics for dairy breeds in Canada. Has the percentage of breeds in the National Herd changed? If so, why do you think this has happened?

Canada's dairy industry goes from coast to coast, with the majority of farms being in Ontario and Quebec.



### Research It!

Look for the latest statistics on numbers of dairy farms, numbers of cows and numbers of heifers in Canada. Have the numbers changed since 2019? If so, why do you think this is?



## Ayrshire

### Descriptive Traits:

Ayrshires can be recognized by their red and white markings. They are slightly smaller than Holsteins.

### Origin:

Ayrshires originated in the mountains of Ayr County, Scotland, an area of very moderate temperatures. While the red and white characteristics of the breed developed by 1800, the breed was not recognized as such until 1814. The first Ayrshires came to Canada in the early 1800s.

### Distinguishing Characteristics:

Ayrshires are known for their low somatic cell counts. The breed currently has the highest average BCA indexes of any of the dairy breeds - indicating rapid breed improvement. They also have very low birth mortality rates of 1.09%.

### Breed Association:

The Ayrshire Breeders' Association of Canada



## **Brown Swiss**

### **Descriptive Traits:**

Brown Swiss are a solid dark brown to silver gray colour with black hooves and muzzles. Mature animals range from a pale whitish brown to a grayish brown colour. They are about the same size as Holsteins, with mature animals weighing an average of 625kg. They are rugged in nature.

### **Origin:**

Brown Swiss are the oldest of the dairy breeds, having descended from cattle in Switzerland from before historic records were available. There has been little introduction of outside blood, resulting in a pure breed with distinctive characteristics.

The first animals were brought to Canada from the United States in 1888. The original animals were brought as a dual purpose breed into the Eastern townships of Quebec, but North American animals were later developed into dairy animals.

### **Distinguishing Characteristics:**

The Brown Swiss are well known for their ruggedness and exceptional feet and legs that are strong and sound. Given their origins in the mountains of Switzerland, they are very adaptable to different altitudes.

### **Breed Association:**

In addition to the dairy strain of this breed, there is a beef strain, called Braunvieh, developed in Canada. Because Brown Swiss and Braunvieh share the same genetic makeup, they are included in the same breed association, The Brown Swiss and Braunvieh Association of Canada. Five provincial associations also exist.



## Canadienne

### Descriptive Traits:

Mature cows are usually a dark brown or black colour but can be a light brown or reddish. They are lighter along their toplines, around their muzzles, and around their udders. The skin on their body usually has black pigment. Calves are born a light brown colour. Mature cows are about the same size as Jerseys, weighing 450 kg to 500 kg. Newborn calves weigh approximately 30 kg.

### Origin:

This breed is the only dairy breed to have been developed in Canada, or any of North America. Its descendants came from France in 1608 to 1610. Since there were so many of them during the mid 1800s, the Canadian Parliament discouraged people from breeding them, so by 1880 there were very few in existence. In 1886 a herd book was established to help maintain the breed. In the 1970s Brown Swiss were introduced to the breed to improve milk quantity but was stopped to prevent the breed from complete extinction. To help maintain the breed, the Ministry of Agriculture established a support program called Project Embryo Plus. This program involves flushing 100% purebred females to 100% purebred males

### Distinguishing Characteristics:

The unique history of this breed resulted in its being granted official heritage status by the Quebec government in 1999. It is known as a hardy animal that can thrive in low management, pasture grazing systems.

### Breed Association:

The French Canadian Cattle Breeders' Association, formed in 1895. Since this breed is considered to be a Rare Breed, information is also available from Rare Breeds of Canada.



## **Guernsey**

### **Descriptive Traits:**

Guernsey's are a golden fawn colour with white markings. The shade of fawn can range from very light brown to brownish red. They are medium sized cattle, about the same size as the more common Ayrshire, with mature animals weighing from 550 kg to 700 kg.

### **Origin:**

Guernsey cattle were developed on the Isle of Guernsey, in the English Channel off the coast of France. The breed was developed by monks who brought cattle with French bloodlines to the Island. In 1819 a law was passed on the Islands prohibiting live cattle from being imported to the Islands, resulting in a pure population of the breed on the Isle of Guernsey.

The first Guernsey cattle arrived in Canada by accident when a ship heading for the New England states was forced to land in Nova Scotia. The residents were impressed by the animals, so in 1878, the first official importation of Guernsey cattle to Canada was made by the Prime Minister, Sir John Abbott. The breed started in the Maritimes and traveled over land to other parts of the country.

### **Distinguishing Characteristics:**

Guernsey's are most well known for the distinctive golden colour of their milk, which is caused by a very high content of Beta Carotene. Most Guernsey cows are A2 carriers or A2 homozygous.

### **Breed Association:**

The breed is represented in Canada by the Canadian Guernsey Association.



## **Milking Shorthorn**

### **Descriptive Traits:**

Milking shorthorns are red and white. Their markings can vary from almost a solid roan colour to very speckled roan and white. They are medium sized animals.

### **Origin:**

The breed was established in the 1700s in Northwestern England. In Canada, the breed was known as Dual Purpose Shorthorns until the early 1990s when the name was changed to Milking Shorthorns to reflect the dairy genetic focus of the breed.

### **Distinguishing Characteristics:**

Shorthorns are well known for their feed efficiency, maternal instinct, soundness and longevity.

### **Breed Association:**

The breed is represented in Canada by the Canadian Milking Shorthorn Society.



## Jersey

### Descriptive Traits:

Jerseys range from light fawn to dark brown in colour, with or without white markings. They are also characterized by their dark hooves and muzzles. Jerseys are the smallest of the common dairy breeds, weighing 400kg to 500kg as mature animals.

### Origin:

Jersey cattle were developed on the Isle of Jersey, in the English Channel off the coast of France. Early ancestors are believed to have originated in Africa, which explains the high tolerance to heat and humidity that the breed has developed. In 1819 a law was passed on the Islands prohibiting live cattle from being imported to the Islands, resulting in a pure population of the breed on the Isle of Jersey.

Jerseys were first brought to Canada in 1868. They came to Quebec and the American Jersey Cattle Club processed registrations until a Canadian Association was founded in 1901 and started its own herdbook in 1905. The breed was very popular in the 1950s and 1960s when there was an All-Jersey milk program but declined when this program ended until Multiple Component Pricing helped to renew its popularity.

### Distinguishing Characteristics:

Jerseys are well known for having the highest percentages of fat and protein in their milk. Their small size results in easy calvings.

### Breed Association:

Today, while provincial and regional organizations exist in Atlantic Canada, Ontario, Quebec, and the Maritimes, the national breed association is known as Jersey Canada.





## Holstein

### Descriptive Traits:

Holsteins are usually black and white, although some can be red and white, or carry red and white genes (called red carriers). Adult females weigh approximately 625 kg and are, on average, 58 inches tall at the shoulder. When they are born, calves weigh about 40 kg.

### Origin:

Holsteins were imported from Holland (now called the Netherlands) in the 1880s as Holstein-Friesians. Today, 95% of the dairy cattle in Canada are Holsteins, with provincial organizations throughout the country, as well as the national organization that maintains the breed's herd book, Holstein Canada.

### Distinguishing Characteristics:

Holsteins give the highest volume of milk, fat and protein of any of the dairy breeds.

Breed Association: Holstein Canada.

### Share It!

If you could have any breed of dairy cow on your farm, which breed would you choose and why? What would be your second choice?

## Registration - Not just a birth certificate

Registration of animals is optional in Canada however roughly 80% of Canadian dairy animals are registered. Registrations have several advantages but the main advantage is the genetic evaluation that comes with the registration. By having the parentage information, Lactanet is able to do basic genetic analysis on your calf, providing you valuable information that can be used for breeding and herd management.

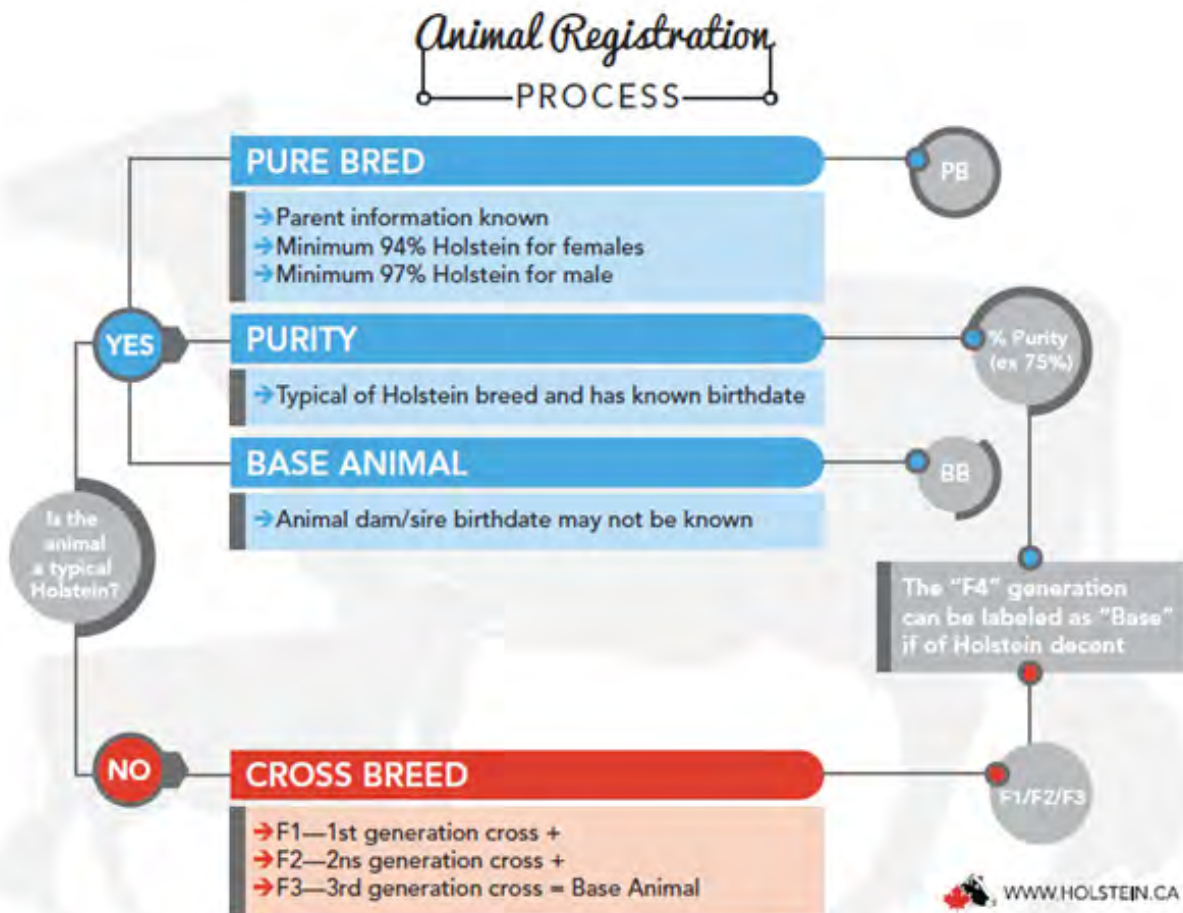
### Do It!

Create a chart of the pros and cons of registering a dairy animal in Canada.

Not all animals can be registered as purebred. Cross breeds occur when you breed one bred to another (example a Holstein cow to a Jersey Bull). Cross breeding of dairy breeds could be done for a variety of reasons including size, milk component and getting new genetics into the herd. In Canada it is become more common to cross breed with beef cattle as away to produce less replacement animals. Beef cross breeds are then raised for beef production either on farm, or more commonly at a veal or beef facility.

If an animal is a crossbred, or not purebred the family can grade up over time. In the case of Holsteins, a female must be 94% Holstein and males 97% to be considered purebred. This will vary based on breed.  
Jersey - 96.9%  
Ayrshire - 87.5%

This is an example of how to upgrade a family over several generations (Holsteins):



## Breeding for Success

When breeding cattle, it is important to have as much information on the animal as possible in order to make an informed decision. Using the animal's genetic evaluation as well as other breed improvement tools such as classification, milk recording and genomic testing can provide insight on the best sires.

Not all traits are passed on at the same rate. The likelihood that the trait will be passed on is referred to as heritability. The heritability of traits will vary based on breed. The following tables from Lactanet outline trait heritability for all breeds.

### Share It!

How do you make breeding decisions on your farm?

## Heritability Estimates Used for Genetic Evaluation in Canada - December 2016 -

Production Trait	HO	AY	JE	BS	GU	CN	MS
Milk Yield	28	32	33	28	31	31	31
Fat Yield	26	26	27	22	25	25	25
Protein Yield	26	29	29	25	28	28	28
Fat Percentage	Not Directly Used – Literature estimate is ~50%						
Protein Percentage	Not Directly Used – Literature estimate is ~50%						

Functional Traits	HO	AY	JE	BS	GU	CN	MS
Metabolic Disease Resistance	7	7	7	Not evaluated			
Mastitis Resistance	12	12	12	Not evaluated			
Somatic Cell Score	18	16	18	19	18	18	18
Lactation Persistency	20	23	21	17	21	21	21
Herd Life	10						
Calving Ability	3	4	2	3			
Daughter Calving Ability	7	5	9	7			
Milking Speed	14						
Milking Temperament	13						
Daughter Fertility	4	4	3	4			
Body Condition Score	24	19	18	18			

Major Type Trait	HO	AY	JE	BS	GU	CN	MS
Conformation (Final Score)	21	20	18	19			
Rump	23	14	13	14			
Feet & Legs	12	15	13	14			
Mammary System	24	18	16	17			
Dairy Strength	24	21	16	19			

<b>Descriptive Type Trait</b>	<b>HO</b>	<b>AY</b>	<b>JE</b>	<b>BS</b>	<b>GU</b>	<b>CN</b>	<b>MS</b>
Angularity	17	16	15	16			
Stature	45	38	36	37			
Height at Front End	24	18	18	18			
Chest Width	18	15	9	12			
Body Depth	29	28	27	27			
Loin Strength	19	15	17	16			
Pin Width	31	31	15	23			
Rump Angle	39	34	30	32			
Bone Quality	26	35	19	27			
Foot Angle	9	6	13	10			
Heel Depth	7	7	7	7			
Rear Legs Side View	20	20	18	19			
Rear Legs Rear View	11	18	7	12			
Udder Depth	42	32	38	35			
Udder Texture	14	16	10	13			
Median Suspensory	17	17	14	16			
Fore Attachment	24	26	25	25			
Fore Teat Placement	30	27	27	27			
Teat Length	30	31	22	27			
Rear Attachment Height	23	24	24	24			
Rear Attachment Width	20	21	17	19			
Rear Teat Placement	29	28	25	27			

There are several tools available to producers to help informed breeding decisions:

1. Registrations - full family tree and genetic evaluations. By registering animals you have the ability to see a full pedigree. For more information on how to read a pedigree, see the Holstein Canada sheet - How To Read A Pedigree in additional resources.
2. Milk Production Records - milk recording in Canada is provided by Lactanet (formally CanWest DHI and Valacta). Information from these tests help calculate genetic evaluations, provided up-to-date production records and allow you to see if your animal is meeting their genetic potential.
3. Classification - Official Classifications are provided by Holstein Canada for all dairy breeds.
4. Bull Proofs and Genetic Indexes - These values are made up of performance data and genomic information. The more data that goes into this information the more accurate the data is. These inform producers of the animal's potential performance in all traits.
5. Genomic Testing - See above for more information.

### Experience It!

Invite someone from Lactanet (CanWest DHI), Holstein Canada, Holstein Ontario, a dairy farmer or someone involved in the breeding industry to your meeting to discuss tools available for making sound breeding decisions for a dairy herd.

## Canadian Indexes and Genetic Values

Canada has two national indexes, Lifetime Performance Index (LPI) and Pro\$. Other genetic values can be broken into production, type/conformation and functional/health and fertility.

LPI has been around for many years. It looks at several different traits and the expected response one trait will have on another. LPI is made up of production traits, durability traits and health & fertility traits. Each breed has a different emphasis. Lactanet publishes the actual breakdown of the LPI algorithm annually.

Breed	LPI Constant (average)	Production	Durability	Health & Fertility
Ayrshire	1945	46	32	22
Brown Swiss	929	55	27	18
Canadienne	933	55	30	15
Guernsey	637	50	35	15
Holstein	2044	40	40	20
Jersey	1062	55	30	15
Milking Shorthorn	1063	56	30	14

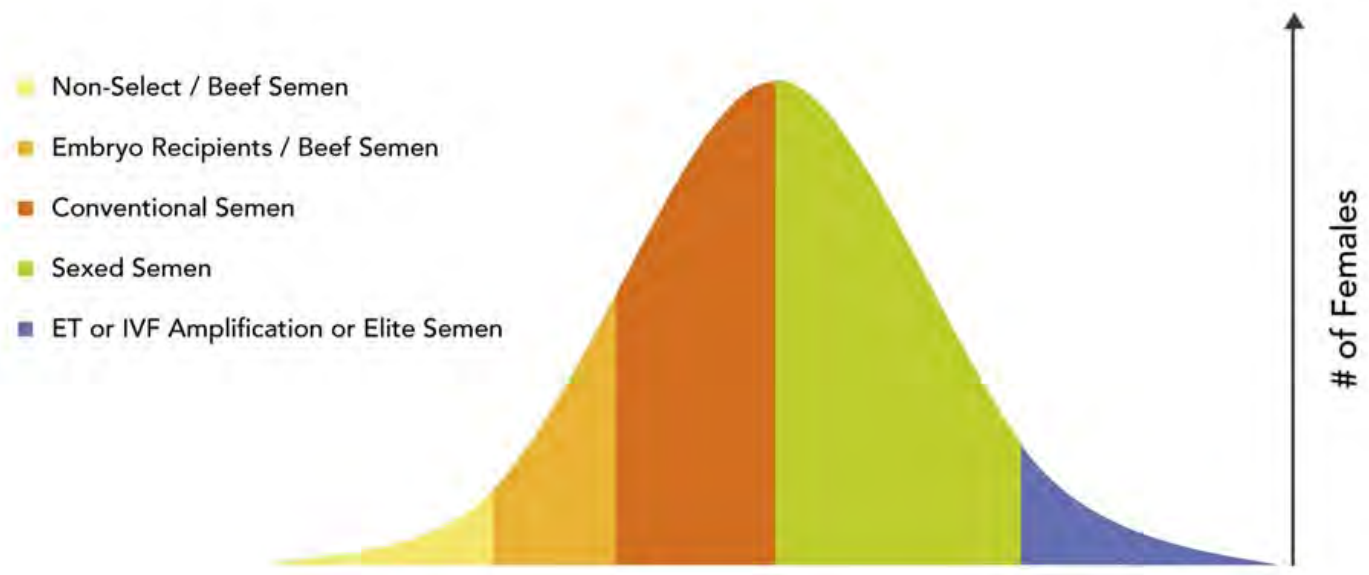
Pro\$ (pronounced pro-dollar) was introduced in 2015. It is currently only available to Holsteins, Jerseys and Ayrshires. Pro\$ is an index focused on profitability. The value is derived from DHI profit data coming directly from Canadian dairy farms. Pro\$ looks at correlations between traits and then makes a prediction of

additional profit offspring will make to 6 years of age. The formula for Pro\$ was created by Lactanet (formally Canadian Dairy Network), however is not published. The average Pro\$ value is zero. Animals can be above 0 (better than average) and below 0 (poorer than average). When looking at Pro\$ values, a sire with Pro\$ of \$1000 is expected to have daughters that are going to make \$1000 more profit by 6 years of age than the average bulls.

Both LPI and Pro\$ take all different types of traits into consideration. When looking at what index is a better fit for your goals, it is important to look at what your goals are, what traits you value most and what your breeding priorities are (are you more type? Or production?). Both indexes breed for balance and functional animals.

## Mating Strategies - how to maximize your goals

Most breeding strategies are based on two things: keep the high genetics, cull the lower genetics. Depending on the calf market, most producers will aim to only breed the number of females that are needed as replacements. This has grown the use of beef semen within the industry. When looking at the genetic values they typically fall in a bell curve distribution (see below). Animals with low genetic merit (bottom 25-50%) should not have their genetics move forward within the herd. These animals are ideal for beef semen or as embryo recipients. The animal will continue to produce milk however she will not have any offspring join the herd. Animals with higher genetic merit for your herd should have their genetics continue in the herd. These are the animals which you would breed to sexed semen or use as embryo donors. All other animals, where you are impartial if their genetics continue should be bred to conventional semen.



When selecting the right sires for your herd, there are several things to look for:

- What are your herd's weaknesses? Breeding with bulls who will improve these traits is called corrective mating. When using this approach remember that change takes time, and you cannot change every trait at once!
- Inbreeding levels should be kept low. In the past inbreeding (also known as linebreeding) was more common to get faster genetic progress for some traits. Now inbreeding is discouraged as it can cause some negative effects.
- Reliability of sire information (and dam for that matter) gives us more confidence in the decision that we are making when breeding. The more information/data an animal has, the higher the reliability.

- Young Sire vs Proven Sires - young sires are sires who are available, however have not had enough daughters in production to reach proven status. Proven bulls have a certain amount of daughters in a certain amount of herds. Bulls can get proofs for many things but a fully proven bull will meet the requirements for both production and type.

Criteria for an Official Bull Proof by Trait Within Breed Grouping									
Trait	Holstein			Ayrshire and Jersey			Guernsey, Brown Swiss, Milking Shorthorn and Canadienne		
	Daughters	Herds	Reliability	Daughters	Herds	Reliability	Daughters	Herds	Reliability
Production <sup>(1,2)</sup>	20	10	70%	20	10	65%	10	5	50%
Somatic Cell Score	If production proof is official			If production proof is official			If production proof is official		
Lactation Persistency									
Type <sup>(2)</sup>	20	10	60%	15	10	55%	10	5	40%
Herd Life	If type proof is official			If type proof is official			If type proof is official		
Milking Speed	10	10	55%	10	10	55%	10	5	40%
Milking Temperament	10	10	55%	10	10	55%	10	5	40%
Daughter Fertility	20	10	45%	20	10	35%	15	5	25%
Calving Ability	10	10	70%	10	10	60%	10	5	40%
Daughter Calving Ability <sup>(3)</sup>	10	10	55%	10	10	50%	10	5	35%
Body Condition Score	20	10	60%	15	10	55%	10	5	40%
Mastitis Resistance <sup>(4)</sup>	20	10	45%	20	10	35%	Not Available		

Note 1: Production daughter minimums refer to daughters past 90 DIM in all breeds except Holsteins where it refers to daughters past 120 DIM.

Note 2: Bull proofs for Production and Type are published only when both sets of criteria are met, except for Milking Shorthorn and Canadienne breeds.

Note 3: Daughter Calving Ability also requires an official proof for Calving Ability since it is calculated as the maternal effect plus half the direct effect.

Note 4: The minimum criteria for receiving an official proof for Mastitis Resistance are applied to the evaluation for Clinical Mastitis in first lactation.

NOTE: note 3 is no longer required  
 Bull proof requirements outlined and reported by Lactanet

**Do It!**

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.



## Activity #1 - Reading Genetic Indexes

<h1>Do</h1>	<p>Time: 15 minutes</p> <p>Materials: a cow's and heifer's genetic evaluation</p>	<p>Assign each group a different section of the genetic evaluation:</p> <ul style="list-style-type: none"> <li>▪ Basic information</li> <li>▪ Canadian Indexes</li> <li>▪ Production information</li> <li>▪ Type Information</li> <li>▪ Functional Traits (health and fertility)</li> </ul> <p>Have the group evaluate the animal within the section, have the groups present their findings to the rest of the club</p> <p>Take this a step further by comparing a young heifer and a mature cow</p>
<h1>Reflect</h1>		<p>To familiarize members with the components of a genetic index and to help members practice their presentation skills</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>Why is a cow's genetic index (or a bull proof) a useful tool?</p> <p>Why is it important to look at each of the different sections (i.e. production, conformation, health traits, etc.)?</p> <p>When can you use these presentation skills in other areas of your life?</p>

## Activity #2 - Genomic vs. Proven

<b>Do</b>	Time: 5 minutes Materials: reference guide, chart paper	Compare the difference between genomic sires and proven sires as a group. What causes a bull to become proven?
<b>Reflect</b>		To illustrate the difference between genomic sires and proven sires
<b>Apply</b>	Prompting questions	What would you choose to breed with? Why? Why might a farmer prefer a proven bull?

### Activity #3 - Who's the Best?

<b>Do</b>	Time: 20-30 minutes  Materials: Bull proofs, female genetic evaluation	Use your female genetic evaluation to pick some traits that you would like to improve.  Using the bull proofs provided, who would be the best match for that animal?  When looking at bull proofs it is important to look at only a few traits, as traits are related to each other (breeding for one, will breed for another)
<b>Reflect</b>		Learn how to select the best bulls to meet your goals.
<b>Apply</b>	Prompting questions	Why did you choose the bull you did?  What traits did you want to improve and why?



Section 4 **Animal Housing**





## Meeting 1 - Making Cow Comfort A Priority

### Setting Objectives:

To understand the importance of cow comfort and how it can adversely affect an animal if it is not a priority.

### Suggested Learning Outcomes:

- Learn the necessities of cow comfort and the importance behind it.
- Understand the requirements under proAction for cow comfort within feed, water, manure removal, ventilation and bedding

### Suggested Roll Call Questions:

- What do you think cow comfort means?
- What are some things you would do to increase cow comfort?
- If you could change one thing within your barn to make cows more comfortable, what would it be?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"> <li>• Cow Comfort</li> <li>• Feeding</li> <li>• Water</li> <li>• Manure Removal</li> <li>• Ventilation</li> <li>• Stall Base</li> </ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Creating Cow Comfort - All ages have basic needs

Animals have the same basic needs that humans do – food, water, shelter from the cold and heat, and a dry place to live. Think about your own house. Do you have air conditioning in the summer? Heating in the winter? Do you have your own space or do you share a room? All of these factors and more affect how happy you are in the space you live in.

Just like people, cattle will be happier and healthier if they have a good place to live. Animals may not be able to tell you if they do not like where they are but they show you in other ways by getting sick or staying healthy, growing slowly or quickly, and being energetic or sluggish.

Cattle have the same basic needs throughout all stages of their lives: adequate food and water, comfortable and dry surroundings, a well-ventilated area and frequent manure removal. The most comfortable cows,

heifers and calves will grow, thrive and be more productive than ones who are less comfortable. Cow comfort is affected by many different factors:

1. Feeding Systems
2. Water
3. Manure Removal
4. Ventilation
5. Stall Base
6. Bedding

## Feed

Every living thing needs an energy supply to live. Cows get their energy from feed. Cows require different types of feed at different stages of life. Ensuring that an animal gets enough feed and the right feed is important for animal health and welfare. In order to meet the Dairy Code of Practice and comply with the proAction program:

- If feeding medicated feed, Best Management Practices (BMP's) need to be in place. These include abiding by withdrawal times, administering as per instructions and feeding feedstuffs that have been approved by CFIA. For a full list of BMP's visit the proAction website at: <https://www.dairyfarmers.ca/proaction>
- Ensuring only feedstuffs meant for dairy are fed to your cattle. It is often that farms may have feed for other, non-ruminant animals (dogs, cats or other livestock). Often these foods not meant for dairy can contain ruminant by-products, which if fed to cattle can be harmful.
- Have proper Standard Operating Procedures for colostrum management. Calves need to be fed enough, high quality colostrum to kick start the animal's immune system. For more information on feeding colostrum, check out the nutrition resource guide.
- Young animals need to be given the nutritional requirements required to grow and maintain health. Work with your nutritionist to make sure your heifers needs are being met!
- Lactating animals need to be receiving enough food to maintain body condition of 2.25 or greater. (it is not a proAction requirement, however the current code of practice for dairy suggests that a BCS over 4 can also be problematic)
- Best practice suggests that in free stall environments, 24 inches (60cm) per cow of bunk space needs to be provided for lactating cows and 30 inches (76cm) provided for pregnant dry cows.

## Water

Water is important not only for growth but for milk production. Ensuring that all animals, regardless of stage of life, have plenty of clean, good quality drinking water is an important part of the proAction Animal Care pillar. In order to meet the Dairy Code of Practice and comply with the proAction program:

- Plenty of good quality drinking water must be readily available to all calves over 10 days of age, heifers, bulls, dry cows and lactating cows.
- During the cold where water may freeze, calves in the weaning process or weaned calves must be offered water at least twice a day if there is not water available in the pens at all times
- Water bowls should be cleaned regularly, and have water changed when needed.

### Share it!

There are a variety of watering systems available in barns. What type of watering system do you have in your barn?



# Manure Removal

Manure removal is important to reduce the smell and ammonia levels, reduce the number of flies and to keep animals clean and healthy. Proper manure management will help keep housing areas dry, and limit contamination and infection. The Code of Practice requires manure must be removed from alleys and beds to keep cows clean. Under the proAction requirements:

- Lactating cow's legs, udders and flanks should be clean from manure
- Cleanliness scoring should be done to determine if manure management is an issue on the farm. Ideal scores are a 1 or 2 (see cleanliness graphic to follow)

The cleanliness of cows has a significant impact on udder health and more particularly on the rate of environmental mastitis. Maintaining a clean udder and legs helps reducing the spread of environmental pathogens to the teat canal. Depending on what part of the cow is soiled, it is possible to determine what areas of the barn have an inadequate level of cleanliness, therefore appropriate corrective action can be taken.



### Udder cleanliness

(back and sides)

is an indicator of the cleanliness of stalls and bedding. (Examine right before milking)

If the standard is not met, check:

- Cleanliness of stalls
- Amount of bedding
- Need to shave/singe udder hair
- Manure consistency

### Hind legs cleanliness

is an indicator of the cleanliness of alleyways and the length of tie stalls.

If the standard is not met, check:

- Cleanliness of alleyways and exterior areas
- Cleanliness of holding area
- Dimension of stalls
- Manure consistency

### Flanks and hips cleanliness

is an indicator of the cleanliness of stalls and bedding.

If the standard is not met, check:

- Cleanliness of stalls
- Amount of bedding
- Manure consistency

Adapted from fact-sheets produced by the Faculty of Veterinary Medicine, University of Wisconsin, and Pfizer Animal Health. Most photos courtesy of Pfizer Animal Health.

Photo credits: *Less Mastitis, Better Milk* (Pierre Lévesque, 2004), distributed by Hoard's Dairyman (www.hoards.com).

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01/09/10

Source: Canadian Bovine Mastitis and Milk Quality Research Network (CBMQRN)

**Experience It!**

Invite someone from Dairy Farmers of Ontario (or someone familiar with proAction) to your meeting to discuss proper cleanliness of cows.

## Ventilation

Ventilation allows for fresh air to come into the barn. This keeps cows cool in the summer and removes moisture from the air in the winter. Ventilation removes ammonia from the barn and keeps a proper humidity which is good for both the cows and the people working within the facility.

One of the main purposes of ventilation is temperature control. Cattle can withstand temperatures as low as -30oC easier than dealing with heat over 25OC (young stock do have a lower threshold for dealing with cold temperatures). Proper ventilation can reduce heat stress on the animal. Heat stress results in production loses and can cause fertility issues. As temperature is so affected by humidity, ventilation lowers the risk of heat stress. Supplemental ventilation is beneficial when the temperature humidity index is above 68 THI (temperature humidity index). The Temperature Humidity Index (THI) is a measure that accounts for the combined affects of the environmental temperature and the relative humidity on cattle/livestock. It can be used to assess the risk of heat stress and prevent other major effects from the weather.

There are a several different types of housing environments:

- **Cold Environment** - ventilation is the result of natural air flow. In the winter, these barns stay close to the temperature outside. In the summer, air inlets are opened as much as possible for maximum air flow and cooling. Many new barns are being constructed with curtains over openings that can be raised or lowered depending on the temperature outside.
- **Warm Environment** - the barn is kept ventilated and at a more constant temperature by mechanical ventilation and insulation. Mechanical ventilation is more expensive than natural ventilation because it results in monthly electricity bills.
- **Modified Environment** - a combination of mechanical and natural ventilation is used to regulate the barn. An example would be a barn that has fans for mechanical ventilation as well as adjustable curtains for natural air flow.

### Do It!

Make a list of pros and cons of each type of ventilation system.

### Experience It!

When touring various barns during this project, take note to the type of ventilation system installed in the barn. Which system do you like best? Which system do you think is the best for the animals in the barn?

### Experience It!

Invite an engineer or salesperson from a building company that specializes in barns. Have them discuss various types of ventilation systems and the pros and cons of each.

## Stall Base and Bedding

Stalls or packs in a barn can be compared to a bed/couch in your home. Some are better than others, but at the end of the day they are where you lie down, relax and sleep. The bedding material would be considered the sheets. Whether stalls or pack, bedding needs to be low impact, comfortable, clean and dry. Stall bases are typically made up of one of the following:

- Sand
- Rubber mats over concrete
- Mattresses over concrete

### Research It!

What is the cost of sand vs. rubber mats vs. mattresses? Is there evidence that one of these stall bases is better than the other for cow comfort?

Bedding is required in all types of bases to keep animals comfortable, dry and clean. The amount of bedding will depend on the base type however all stalls/packs should have enough bedding to limit rubbing of hocks and knees. When selecting a base and bedding option there are many things to consider: cost, animal preference, cleanliness, potential for injury, availability and maintenance.

There are many types of bedding be used in dairy barns including:

- Recycled paper products (shredded paper/cardboard)
- Wood products (recycled wood products, sawdust/shavings)
- Manure solids (separated manure solids or composted manure)
- Other organic products (peat moss, straw, soybean hulls)
- Sand

Sand bedding has become very popular with many producers and research shows that it is the most natural, comfortable and low impact style of bedding. When building new barns or modifying barns, the majority of producers are now considering sand.

Regardless of bedding types, ensuring that there is the proper system to manage the manure is a very important part of manure management and cleanliness of the barn.

### Debate It!

Which type of bedding do you think is best? Why? Be prepared to defend your answer.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Cleanliness Scoring

<b>Do</b>	Time: 10-15 minutes Material: Cows at a variety of cleanliness levels, record sheet (provided below)	Using the reference manual, complete a cleanliness evaluation on 5-10 animals within the herd  Keep record of the animals in the record sheet below  Take it a step further: change something in the management and come back in 4 and 8 weeks to determine if there have been any changes
<b>Reflect</b>		Members will learn how to complete cleanliness assessments and discuss why it may be important
<b>Apply</b>	Prompting questions	What can the cleanliness assessment tell us about the management of the herd?  If an animal is dirty, what would you recommend the producer do to fix the situation?

## Cleanliness Evaluation

Animal ID	Udder Score	Feet Score	Flank Score

## Activity #2 - Building Cow Comfort

<b>Do</b>	Time: 15 - 20 minutes Materials: cow comfort worksheet, pen/pencil and reference manual	Go through each aspect of cow comfort and highlight one or two ways that you address this on your farm (or the farm you are visiting)
<b>Reflect</b>		Learn how producers address cow comfort in a variety of housing types
<b>Apply</b>	Prompting questions	Why is cow comfort important?  Is there an area on your farm where you would like to improve cow comfort?

	Current Practice	Why it's Important
<b>Feed</b>		
<b>Water</b>		
<b>Manure Removal</b>		
<b>Ventilation</b>		
<b>Stall Base</b>		
<b>Bedding</b>		





## Meeting 2 - Housing for the Whole Family

### Setting Objectives:

To understand the requirements needed for proper housing for calves and heifers.

### Suggested Learning Outcomes:

- Learn the fundamentals behind calf and heifer housing.
- Look at different housing options for that age group and determine the benefits of each type.

### Suggested Roll Call Questions:

- How do you house your calves?
- What are the different types of housing for young stock?
- What do you think are the benefits of loose housing vs individual housing of young stock?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>▪ Cow Comfort</li><li>▪ Feeding</li><li>▪ Water</li><li>▪ Manure Removal</li><li>▪ Ventilation</li><li>▪ Stall Base</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Housing Calves

Calf housing varies based on farmer preference. When it comes to calf housing there are two large things to decided: outside vs inside and individual vs group housing.

#### Outdoor (cold) housing

As calves do not need to be kept as warm as humans, many people house their calves outside. Calf hutches are a very common form of cold housing. Hutches can be stored directly outside or some dairy farmers put them within a roofed structure for additional protection from the elements.

Calf hutches can be for one calf (typically 1.2m by 2.4m) or for multiple calves/mega hutches (3m by 3m). Hutches always need a layer of sand, gravel or stone for drainage of fluids and a layer of straw or shavings for comfort. Each hutch needs room for water, grain and milk. Some hutches allow calves to go outside of the hutch with chains or fences. Other hutches allow the animal to just move around inside the hutch. Hutch



### Research It!

Find out the cost to purchase a new calf hutch. Are there different types at different price points?

placement should depend on the weather. In the summer hutches should be placed in a shaded area, and in the winter they should be oriented so that wind and snow can not blow onto the calf and into the hutch.

### Indoor (warm) housing

Warm environments occur in heated barns with a mechanical ventilation system. Typically, the temperature inside is 10oC with humidity of less than 80%. Most warm environments have individual pens with solid sides.

### Individual Housing

In individual housing systems, calves are raised in their own space. This takes the form of a calf hutch or an individual calf pen. In these systems calves are fed individually, and do not have the ability to mix in with other calves. Individual housings are a good way to limit disease between young calves, as calves are not exposed to other animal's feces and other contaminants. Once a calf moves out of an individual calf housing, it should be cleaned and disinfected before the next calf moves in.

### Group Housing

Group housing is becoming more popular for unweaned animals. It uses less space, allows for using free choice feeding robots (however there are robots for individual feeding) and is typically a smaller time commitment. One thing that should be noted is that group housing can cause disease to spread easier, and therefore sick animals should be moved to individual housing until better.

Whether in group or individual housing, under proAction calves need to be able to see one another. When a calf or group of calves moves out of that area, the pen/hutch should be fully cleaned and disinfected.

### Debate It!

Choose a type of calf housing (individual vs. group) or (outside vs. inside) and defend your choice with reasons why your choice is the best choice.

## Heifer Housing

Once a heifer is weaned from milk, they are moved to heifer housing. This change can be a lot depending on calf housing (example: going from individual housing to group housing!). Heifer housing typically has the following features:

- Separation – group by age and size and keep dry cows and heifers separate.
- Easy movement from one group to another – as heifers get older or bigger they need to be able to move into the next age or size grouping area.
- Easy observation – you must be able to watch heifers for health disorders, eating problems and signs of estrous (heat).
- Feed bunks that are suitable for the height and size of the heifers.
- Areas for treatment and breeding – heifers need to be vaccinated, treated when they are sick and bred when they are ready. Self-locking head gates or other means of confinement may be necessary to be able to hold the heifers in these instances.
- Easy removal of manure and bedding – heifers need to be kept clean and dry to remain healthy.
- Water available.
- Natural ventilation.
- Space for exercise.

For ease of management, grouping heifers together is a great idea. Heifers should be grouped according to size and age. This limits bullying and ensures that the animals get the proper nutrition for their stage of life. The ideal grouping of animals would be no more than three months separating the oldest and the youngest animal in the group. Depending on available space and herd size here is a potential grouping option:

- Group 1: 0-3 months
- Group 2: 3-6 months
- Group 3: 6-9 months
- Group 4: 9-12 months
- Group 5: 12-15 months
- Group 6: 15-18 months
- Group 7: 18-21 months
- Group 8: 21 months to calving

As heifers grow, so does their space needs. Another thing that determines the space needs is breed. For example, Holsteins and Brown Swiss will need more space than Jerseys.

An example for space requirements for larger breeds can be found below:

Age	Estimated Weight	Max animals/group	Max age spread	Max weight variation (kg)	Min. width for animal to eat (cm)	Min bedded area/ animal (sq m)	Suggested stall size (cm)
0-2 months	(kg)	1	n/a	n/a	n/a	2.8	Do not use
2-4 months	Birth weight - 79	7	1 month		46	2.8	Do not use
4-8 months	79 - 136	Based on management and calving rate	4 months	91	38	3.7	Do not use
8-12 months	136 - 227	Based on management and calving rate	4 months	91	43	4.6.	175 x 91
12-16 months	227 -317	Based on management and calving rate	4 months	91	48	5.6	213 x 101
16-20 months	317-408	Based on management and calving rate	4 months	91	56	6.5	244 x 109
20 months to 1 month pre-calving	408-499	Based on management and calving rate	4 months	91	61	7.4	259 x 114
Pre-calving 2-4 weeks	499 - 590			91	76	11.1	274 x 122

1 These numbers represent the space occupied along a feed barrier by an animal while eating. Whether all animals can access feed at the same time is controlled by the total length of feed barrier available to the group and the number of animals. Floor plans that do not allow all animals in a pen to eat at the same time require appropriate feeding management. Once animals are accustomed to group living and eating the number of animals that are allowed to eat at the same time should be determined by feeding and management decisions. See DIP 831 Fenceline Feed Barriers (page 251) and DIP 832 Individual Feeding Fronts for Baby Calves (page 256) for recommended types, sizes and construction of feed barriers for calves and heifers.

2 Animal cleanliness and pack maintenance frequency and labor are directly related to space provided per animal.

\*\* Chart modified from PennState Extension\*\*

Source: 2008. Graves, R. E., J. T. Tyson, D. F. McFarland, T. H. Wilson. Penn State Housing Plans for Calves and Heifers, NRAESD201. Page 278.

## Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity 1: Building a Calf Barn

<b>Do</b>	Time: 20 - 30 minutes  Material: Collect household and craft items such as cardboard, construction paper, popsicle sticks, noodles, pipe cleaners, buttons, markers, glue and scissors	<ul style="list-style-type: none"><li>• Work in small groups</li><li>• Based on lessons about calf housing, members should try to construct the ideal calf barn. They can base it on their own farms, pictures they've seen in books or their imaginations!</li><li>• Encourage unusual ideas, such as the calf barn of the future</li><li>• Once the groups have finished their calf barns, have them present their ideas to the rest of the club members, and explain the features they have put into their models.</li></ul>
<b>Reflect</b>		To practice teamwork and get members thinking about the aspects of an ideal calf barn
<b>Apply</b>	Prompting questions	What elements of ideal calf housing were they able to incorporate?  What may have been missing?  Did you and your group members have any disagreements when you were trying to create the ideal calf barn? Why or why not?

## Activity 2: Calf Barn Inspection

<b>Do</b>	Time: 45 Minutes  Materials: Copies of the “Calf Barn Inspection Report” worksheet on the following page, paper and pencils, discuss the meeting with the host farmer to make sure it is okay for the members to look at the calf housing and rate it on an ‘inspection report’	<ul style="list-style-type: none"><li>• Break into small groups and go to the calf housing section</li><li>• Complete the Calf Barn Inspection Form</li><li>• Rate each section, and provide recommendations and feedback</li></ul>
<b>Reflect</b>		This activity involves exploring an existing calf facility and determining how it meets the criteria for an ideal calf barn.
<b>Apply</b>	Prompting questions	Did any group rate one aspect higher or lower and why?  Why is calf housing important?  How can a producer use these reports to make management decisions

# Calf Barn Inspection Report

Farm:

Inspectors:

Type of Housing:

Date:

Inspect the calf housing and rate it according to each of the characteristics with one being desirable and 5 being undesirable. Include reasons for your ratings in the Comments column. First, write a few points under each characteristic that would give the housing a high rating.

	Rating (1=low, 5=high)	Comments
<b>Easy to clean</b>	1 2 3 4 5	
<b>Low cost</b>	1 2 3 4 5	
<b>Flexible</b>	1 2 3 4 5	
<b>Well ventilated</b>	1 2 3 4 5	
<b>Individual</b>	1 2 3 4 5	
<b>Dry</b>	1 2 3 4 5	
<b>Comfortable</b>	1 2 3 4 5	
<b>Easy to work in</b>	1 2 3 4 5	
<b>Easy to observe calf</b>	1 2 3 4 5	



### Activity 3: Constructing a Calf Barn

<h1 style="text-align: center; color: white;">Do</h1>	<p>Time: 50 minutes            Materials: paper and pencils, measuring tapes and binder twine            OR computer software</p>	<ul style="list-style-type: none"> <li>▪ Divide into groups and assign a different calf housing facility:               <ul style="list-style-type: none"> <li>o Hutches</li> <li>o Cold environment</li> <li>o Warm environment</li> <li>o Group housing</li> </ul> </li> <li>▪ To plan the facility, the group needs to brainstorm everything they should consider before starting to build. They can also “interview” the owner of the farm to find out his or her requirements for a calving facility, such as the number of calves housed at one time.</li> <li>▪ Let the planning begin! Groups can walk the farm property looking for a good site. They can also lay out the building using the binder twine and the measuring tape to see how big it will actually be. Alternatively use a computer software and design a building to scale</li> <li>▪ Present your housing to the group</li> </ul>
<h1 style="text-align: center; color: white;">Reflect</h1>		<p>During this activity, the members learn about farmstead planning, and put their analytical skills to use by coming up with a new calf housing facility for the farm at which the meeting is being held.</p>
<h1 style="text-align: center; color: white;">Apply</h1>	<p>Prompting questions</p>	<p>What were obstacles that you needed to overcome to complete your calf-housing plan?</p> <p>What other things, other than location, did you take into consideration when designing your calf facility?</p>



## Meetings 3 and 4 - Making A Home - For Milking Cows

### Setting Objectives:

In order to maximize animal welfare, cow comfort is a top priority for dairy farmers. Knowing what to look for and the importance of a well set up housing and milking system is imperative for the utmost in cow comfort.

### Suggested Learning Outcomes:

- Determine how to assess animals for comfort using the proAction Animal Care Assessment tools.
- Look at the different types of housing and milking systems within a dairy, and the benefits of each.

### Suggested Roll Call Questions:

- How do you tell if your cows are comfortable?
- How do you house your milking cows?
- What makes up the milking system in your barn? (type for younger members, parts for older members)

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	<ul style="list-style-type: none"><li>▪ Meeting Topics and Activities</li><li>▪ Determining if animals are comfortable</li><li>▪ proAction Animal care assessments</li><li>▪ Milking cow housing systems</li><li>▪ Milking systems to suit your barn</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Housing Milking Cows

Animal welfare has become more of a focus in the last 10-15 years of dairy farming. Cow comfort is greatly linked to profitability. When considering milking cow housing, it is important to look at feed and water systems, ventilation, manure removal and stalls/bedding.

#### Looking at Cow Comfort

Making sure cows are comfortable is important, however it can be hard to do when you can't ask them! Cows that are uncomfortable can have lost milk production, increased risk of infection (due to uncleanliness) and other physical issues.

proAction's Animal Care module contains an animal welfare assessment to determine if the basic comfort levels of the cow are being met. Cattle assessments are completed by a third party once every two years for a full validation. In years that a farm does not have a full validation it is recommended that you do a self evaluation using the same telling points.

### Experience It!

Have a senior 4-H dairy club member, dairy farmer or a veterinarian review the various factors that are assessed in the proAction Animal Care module.

When looking at Animal Welfare Assessments you look for injuries, body condition score and lameness.

## Injuries

When looking at injuries, cattle assessments look at the state of the hocks, knees and necks.

When looking at the hocks, look at the tarsal joint not the point of the hock. Injuries to the hock can show the abrasiveness of the resting surface, stall design and overall poor cow comfort.

The hock injuries are scored on a scale of 0-3. Both hocks are scored, and the score of the worst of the two hocks is recorded.

When looking at the knees you are looking at the front of the knee on the joint. Knees are scored on a scale of 0-3. Looking at the knees gives an indication of the comfort of the resting surface. Both knees are scored, and the score of the worst of the two knees is recorded.

Figure 16: Area assessed during hock scoring

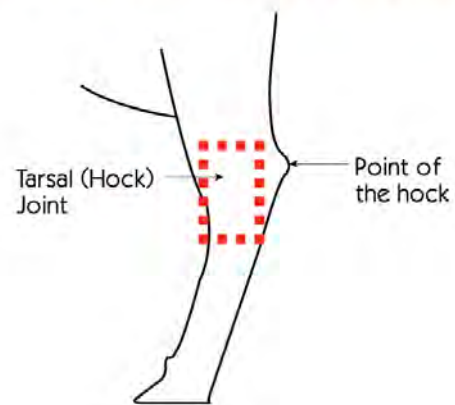


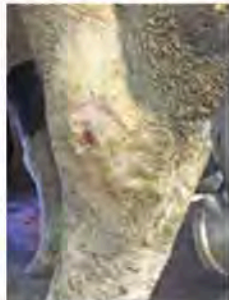







Figure 17: General description of hock injury scores

				
No swelling. No hair is missing, some hair loss or broken hair.	No swelling or minor swelling (< 1 cm). Bald area on hock.	Medium swelling (1 to 2.5 cm) and/or lesion or scab on bald area.	Major swelling (> 2.5 cm). May have bald area/lesion.	
<b>Score 'A' Acceptable</b>		<b>Score 'R' Requires corrective action</b>		

**Reference:** Gibbons J., E. Vasseur, J. Rushen, A M de Passillé 2012. *A training program to ensure high repeatability of injury of dairy cows*. Invited paper to Animal Welfare 21:379-388 No swelling.

Figure 19: General description of knee injury scores

Score 'A' Acceptable	
No swelling. No hair is missing, some hair loss or broken hair. 	No swelling. Bald area. 
Score 'R' Requires corrective action	
Broken skin or scab and/or swelling (< 2.5 cm). May have bald area 	Major swelling (≥ 2.5 cm). May have bald area/lesion. 

**Reference:** Gibbons J., E. Vasseur, J. Rushen, A M de Passillé 2012. *A training program to ensure high repeatability of injury of dairy cows*. Invited paper to Animal Welfare 21:379-388.

The neck gets injured when the bunk/neck rail/chains is the improper height or length. When scoring the neck look at the neck crest, the section between the ears and withers. The neck is scored on a scale of 0-2.

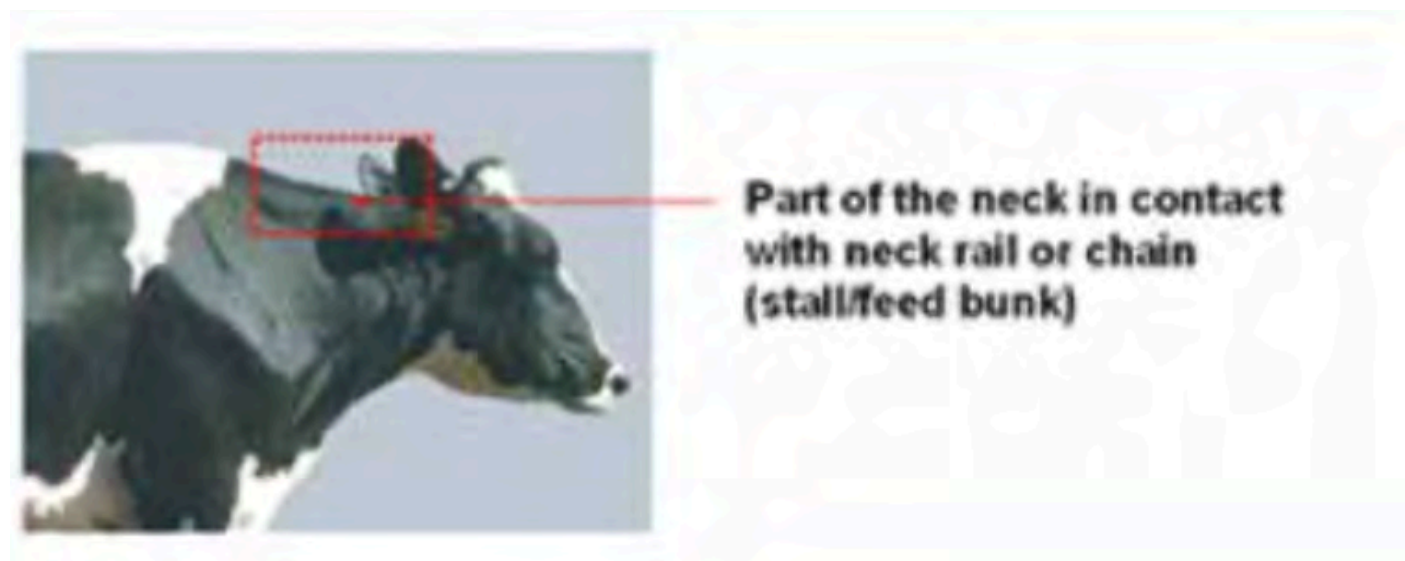
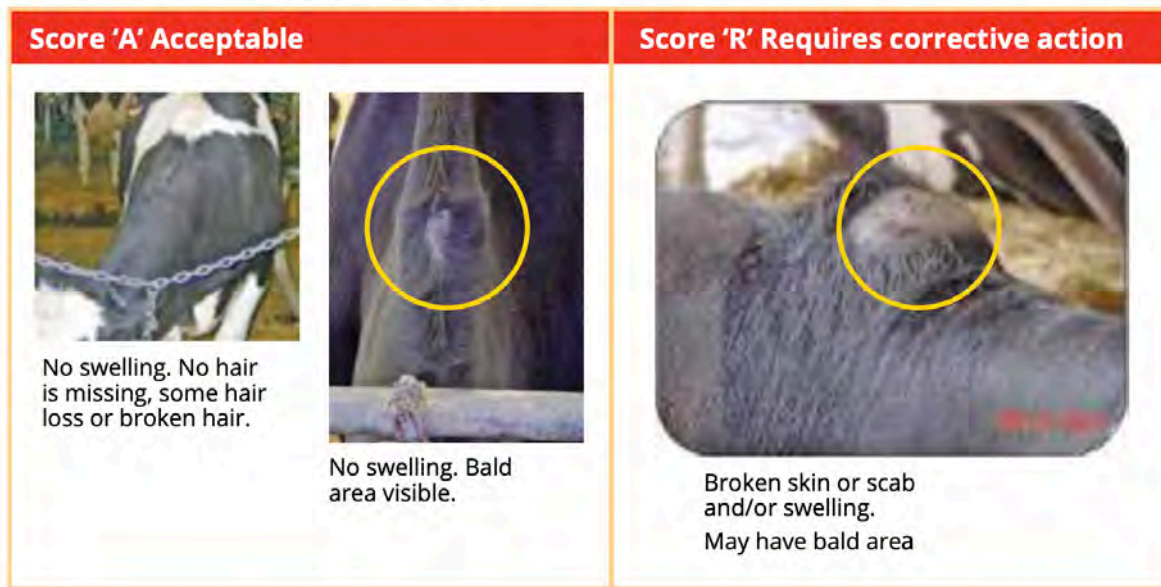


Figure 21: General description of neck injury scores



Reference: Gibbons J., E. Vasseur, J. Rushen, A M de Passillé 2012. A training program to ensure high repeatability of injury of dairy cows. Invited paper to Animal Welfare 21:379-388.

## Body Condition Score

Body Condition Score (BCS) is a tool that can determine if the animal is getting enough or too much feed. When looking at what is too fat or what is too thin there are several places on the animal's body to look: The hook bones, the pin bones and the short ribs.

Animals are considered too thin if they score a 2.0 or less. Currently under proAction there are no penalties for animals that are over conditioned (too fat), however animals that are over condition can have health and reproduction problems.

	Acceptable				Requires corrective action	
<b>BCS</b>	3.0	2.75	2.5	2.25	2.0	< 2.0
<b>Pelvic area</b>	V	V	V	V	V	V
<b>Hook bones</b>	rounded	angular	angular	angular	angular	angular
<b>Pin bones</b>	padded	padded	angular, fat palpable	angular, no fat palpable	angular, no fat palpable	angular, no fat palpable
<b>Ribs</b>	corrugations non visible	corrugations non visible	corrugations non visible	corrugations visible 1/2 way between tips and short ribs	corrugations visible 3/4 way between tips and short ribs	corrugations visible 3/4 way between tips and short ribs
					thurl non prominent	thurl prominent

Source: Vasseur E., J. Gibbons, J. Rushen, A. M. de Passillé, 2014. Development and implementation of a training program to ensure high repeatability of body condition score of dairy cows. J. Dairy Sci. 96:4725-4737.

The BCS is on a scale of 1 (too thin) to 5 (too fat), with an ideal of 2.5 – 3.0. For a more detailed look at BCS, check out the Quick Guide to Body Condition Scoring in additional resources or in the Health section of this resource book.

## Lameness

Lameness determination will differ between free-stall and tie-stall environments. Gait scoring is used for all animals in free stall housing (including pasture). It is the easiest and most accurate way to conduct lameness scoring. Tie stall lameness scoring is quite different as animals are unable to walk around.

Gait Scoring is done on a scale of 1 to 5. When doing a gait score, animals should have enough room to walk five full strides. Surfaces should be flat (no cross overs) and not sloped. When gait scoring 1-2 are acceptable, 3 is monitor (under proAction marked as acceptable) and 4-5 require corrective action as they are lame.

Score	Description	Behavioural Criteria
<b>1 (sound)</b>	Smooth & fluid movement	<ul style="list-style-type: none"> <li>• Flat back when standing or walking</li> <li>• All legs bear weight equally</li> <li>• Joints flex freely</li> <li>• Head remains steady as the animal moves</li> </ul>
<b>2</b>	Ability to move freely not diminished	<ul style="list-style-type: none"> <li>• Flat or mildly arched back when standing and walking</li> <li>• All legs bear weight equally</li> <li>• Joints slightly stiff</li> <li>• Head remains steady</li> </ul>
<b>3</b>	Capable of locomotion but ability to move freely is compromised	<ul style="list-style-type: none"> <li>• Flat or mildly arched back when standing, but obviously arched when walking</li> <li>• Slight limp can be seen in one limb</li> <li>• Joints show signs of stiffness but does not impede movement</li> <li>• Head remains steady</li> </ul>
<b>4</b>	Ability to move freely is obviously diminished	<ul style="list-style-type: none"> <li>• Obviously arched back when standing and walking</li> <li>• Reluctant to bear weight on at least one limb, but still puts some weight on limb when moving</li> <li>• Strides are hesitant and deliberate and joints are stiff</li> <li>• Heads bob slightly as animals moves in accordance with the sore foot hitting the ground</li> </ul>

5 (severely lame)	Ability to move is severely restricted. Must be vigorously encouraged to stand and/or move	<ul style="list-style-type: none"> <li>▪ Extreme arched back when standing and walking</li> <li>▪ Inability to bear weight on one or more limbs</li> <li>▪ Obvious stiff joints</li> <li>▪ Obvious head bobs when moving</li> </ul>
<p><b>Source: University of British Columbia Animal Welfare Program Dairy Farmers of Canada</b>  <b>Taken from Alberta's Humane Handling of Dairy Cattle - Standards for the Transportation of Cull Animals, original source: University of British Columbia Animal Welfare Program</b></p>		

In stall Lameness is determined by looking at an animal standing for a period of 60 seconds and seeing if they exhibit certain behaviours: edge, weight shift and rests (uneven weight). The animal is then shifted from side to side to see if the movement is even, uneven, severely uneven. If two or more of these behaviours are present, the animal is deemed lame.

### Do It!

Practice assessing cattle in a dairy barn. Be prepared to justify why you chose the scores on your assessment.

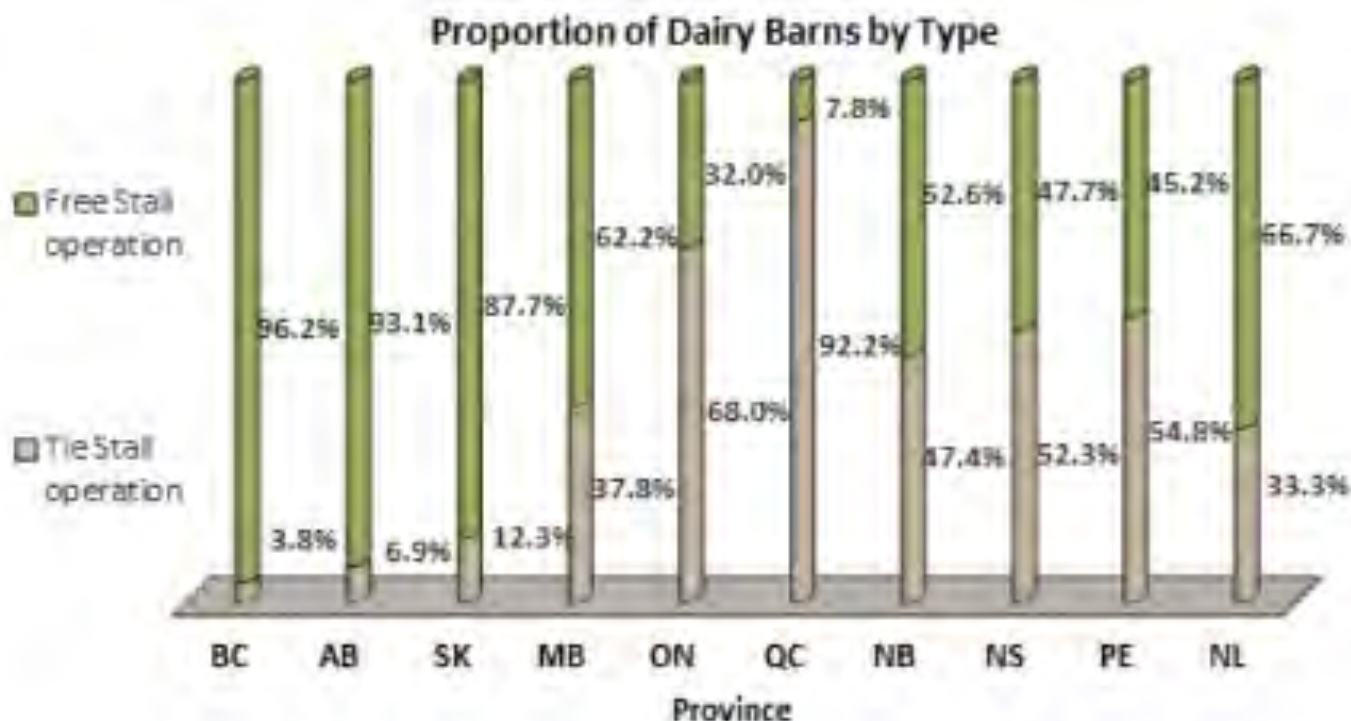
Behaviour Indicator	Description
<b>Standing Post (voluntary movements)</b>	
<b>EDGE</b>	<p>Placement of one or more hooves on the edge of the stall while standing stationary.</p> <p>Standing on the edge of a step when stationary, typically to relieve pressure on one part of the claw (Figure 1). This does not refer to when both hind hooves are in the gutter or when cow briefly places her hoof on the edge during a movement/step.</p>
<b>WEIGHT SHIFT</b>	<p>Regular, <b>repeated</b> shifting of weight from one hoof to another. Repeated shifting is defined as lifting each hind hoof at least twice off the ground (L-R-L-R or vice versa).</p> <p>The hoof must be lifted and returned to the same location and does not include stepping forward or backward</p>
<b>REST (UNEVEN WEIGHT)</b>	<p>Repeated resting of one foot more than the other as indicated by the cow <b>raising</b> a part or the entire hoof off the ground. This does NOT include raising of the hoof to lick or during kicking (Figure 2).</p>
<b>Cow moved from side to side</b>	
<b>UNEVEN MOVEMENT</b>	<p>Uneven weight bearing between hooves when the cow was encouraged to move from side to side. This is demonstrated by greater <b>rapid movement</b> of one hoof relative to the other, or by an evident <b>reluctance to bear weight</b> on a particular foot.</p>

\* table from DFC, Quick Guide to Stall Lameness Scoring



## Housing Design

Dairy facilities in Canada typically fall into one of three categories: Tie Stall, Free Stall or Pack Barn. Though tie stalls are still a common occurrence in Canada, free stall and pack barns are quickly increasing in popularity. Housing style for dairy barns is really up to farmer preference, cost and the labour needed.



Regardless of housing style, cow comfort and welfare need to be considered when building or retrofitting a barn. Whether tie-stall or free-stall, when designing a barn, there are several things to consider:

- Partitions – the dividers between stalls should be wide enough apart for the animals to get up and down freely. Lunge space should also be provided. Dividers encourage cows to lie straight, keeping the area cleaner. Dividers with posts that extend back into the platform the cow stands on can allow the cows' legs to get caught. Suspended or flexible dividers are more suitable.
- Stall size – must be adequate for comfortable resting positions and adequate lunge space for rising.
- Slope – a downward slope to the back of the stall allows the stall to drain towards the gutter or scrape alley and keeps the stalls cleaner.
- Freedom from obstructions that prevent lunging and other normal behaviour.

### Tie Stall Barns

In tie stall barns, each cow is tied to its own stall, and is not able to constantly roam. As animals can not walk to feed and water, the feed and water is brought to her. This is the same for milking equipment in most cases. In many tie stall environments, cows are let outside for exercise, depending on the weather. Typically, tie stall barns are used for smaller herd sizes. As herd sizes increase and there becomes more emphasis on mobility and animal welfare there are fewer and fewer tie stall barns being built in Canada. Some countries have banned the building of tie stall barns.

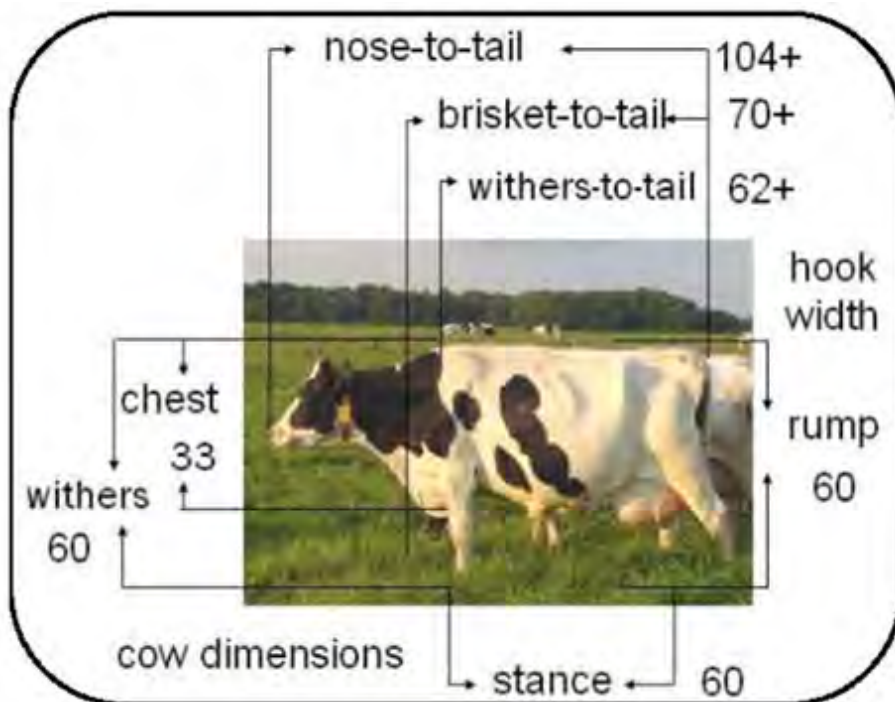
#### Talk About It!

There are still many farmers in Canada that use a tie stall barn for their dairy cows. Discuss why a farmer would want to have a tie stall operation for their dairy farm. What are the advantages?

## Free Stall Barns

Free stall barns allow cows to roam freely through the barn. Some producers refer to this style as loose housing. There are separate areas for feed, water, resting (stalls) and milking that the cows move to. Milking in free stall environments is done through milking parlors or by a Voluntary Milking System (robots). Free stall barns are increasing in popularity across the country and are seen in medium to large herd sizes. Many farmers are now retrofitting older tie stall barns into free stall environments.

- Regardless if you are building a tie stall or free stall barn, there are several things to consider when building stalls.
- Stall size - the size of stalls should be based on the cow's body dimensions. (See table below for body dimensions for mature Holsteins and estimated ratios to rump height and hook-bone width.
- Cows need room to lunge when standing up
- There should be some sort of brisket locator to ensure that animals do not stand too far into the stall (this helps keep stalls clean)
- Obstructions within the stall should be avoided.



Body Dimension	Inches	Proportions
Nose-to-tail	length 102 (range 96-110)	1.6 x rump height
Imprint length - resting	72 (68-76)	1.2 x rump height
Imprint width	52 (48-54)	2 * x hook- bone width
Forward lunge space	24 (23-26)	0.4 x rump height
Stride length when rising	18	0.3 x rump height
Rump height - mature	Median 60(range 58-64)	
Rump height -Lactation 1	Median 58, top 25% - 59	
Stance - front-to-rear feet	60 (range 58-64)	1.0 x rump height
Withers (shoulder) height	60 (range 58-64)	1.0 x rump height
Hook-bone width	26 (range 24-27)	

## Pack Barns

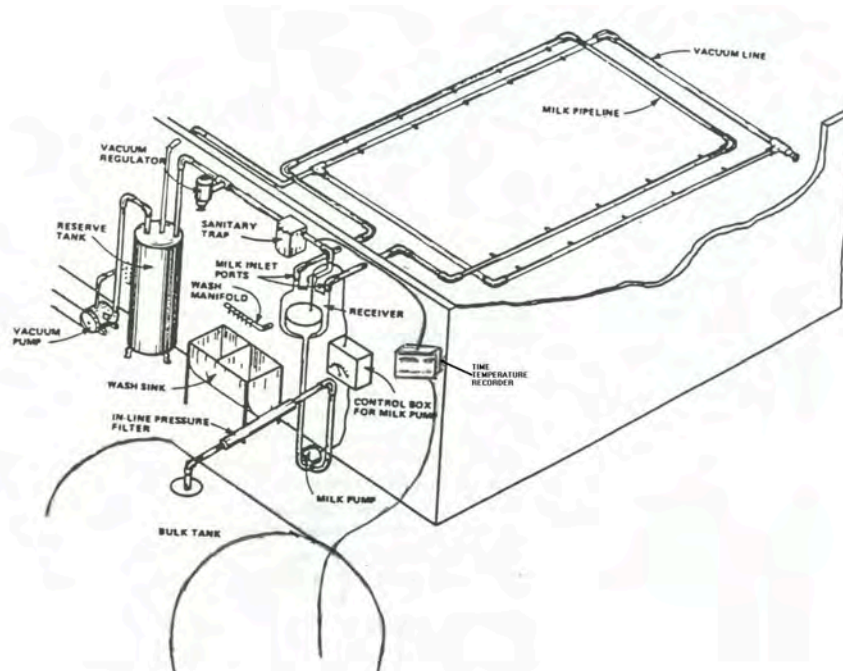
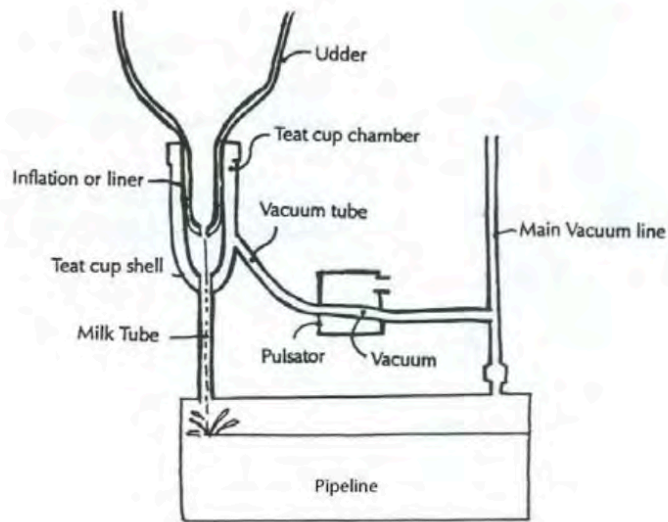
Pack barns do not contain any individual stalls and have a large bedded area where animals can rest. Similar to free stall barns, this is a form of loose housing. Feed, water, milking equipment and resting areas all have their own designated space and the animal is free to roam between them. Packs are typically made of shavings or compost. Bed packs should have fresh bedding added regularly to keep them clean and dry.

Each style of housing has its own advantages and disadvantages. When building a new facility or retrofitting an already existing facility, work with an engineer or housing consultant to create the best facility for the cows and your needs.

## Milking Systems

The type of milking system that you choose to use will greatly affect the barn design. Regardless of type of milking system, they all have the same goals: get milk to flow and massage the teat to avoid pain in the milking process.

Milking systems work through a gentle vacuum. This stimulates the teat and helps milk the cow out. Most milking units are designed very similarly (see below). As technology advances, milking units are able to do more and more. Some milking units can clean the teat, stimulate milk drop down and even apply teat dip.



## Parts of Milking Systems

Name	Job
<b>Vacuum parts (pump, hoses and regulator)</b>	Controls the amount of air and the vacuum in the milking system.
<b>Pulsator</b>	Creates and controls the milking cow cycle electronically - air-vacuum-air-vacuum. The starting and stopping of the air vacuum control this.
<b>Automatic Takeoff</b>	When the milk flow stops, the take off unit will turn the milking unit off and will automatically remove it from the cow. This is an optional but common feature
<b>Teat cup shell and liners</b>	The shells are typically made of stainless steel and the liners from rubber or silicone. The liners go on the cow's teats and inflate and collapse with the vacuum cycle. Both rubber and silicone liners need to be replaced according to the recommendations of the providing company.
<b>Milk Claw</b>	Catches the milk from the udder. From here it goes into a hose which takes it to the pipeline.
<b>Pipeline</b>	The pipeline carries the milk from the claw into the receiver jar, then from the receiver jar into the bulk tank. The length of the pipeline will depend on the barn style and layout. In tie stall barns it carries from each stall to the milk house, whereas in parlour and robots it takes it from the milking area into the milk house. Pipelines are stainless steel and are easy to clean and disinfect. They slope toward the milk house to utilize gravity when moving milk.
<b>Receiver Jar</b>	Milk is held in the receiver until there is enough to mechanically move it to the bulk tank.
<b>Bulk Tank</b>	A refrigerated tank that holds and agitates the milk after milking. The bulk tank cools milk and maintains it at a temperature between 1 - 4°C until pick up by the milk truck.
<b>Time Temperature Recorder (TTR)</b>	A monitor that keeps track of the pipeline and the bulk tank temperatures. It also tracks milking and washing times. If something is irregular it will notify the needed parties. TTR are required under proAction.
Note: The required equipment will vary from farm to farm. The above are typical parts you will see at most dairy farms.	

### Do It!

Print out and put all of the names of the parts of a milking system into a dish (or hat or anything that will hold the pieces of paper). One by one have members draw out a piece of paper and explain what the part does. If possible, have members point out the milking system part where it appears in the barn/milk house.

## Sanitization

All dairy facilities must follow food safety protocols when it comes to sanitation of the equipment. As dairy is a product that humans consume, proAction requires following cleaning protocols that meet food safety standards.

## Pre-Milking

Under proAction requirements, all dairy farms need Standard Operating Procedures for the pre-milking process. These must contain enough instruction that a relief milker can set up the equipment and sanitize equipment while still ensuring the safety of the worker, the cows and the milk.

When it comes to cleaning milking systems, the same guidelines apply for automatic and manual wash systems. All cleaning products need to be approved according to the accessible milk cleaning and sanitization chart. Cleaning and sanitization charts should include:

- Product name and volume of product. These products need to be approved for use in food establishments or recommended to clean dairy equipment by the manufacturer.
- The volume of water needed to dilute the product for cleaning purposes
- Water temperature
- Water analysis (pH)

Each farm may have slightly different procedures depending on products being used. A typical and recommended sanitation process is:

Cycle	Purpose	Temp. Range	Best Management Practices
<b>Pre-Rinse milk line</b>	Removes 90-95% of milk solids and warms up the milk line	Lukewarm water (35-60oC). Temperature must remain above 35oC until the end of the cycle	-Don't recycle water -Ensure water is not above 60oC as it could bake the milk proteins into the line
<b>Chlorinated Alkaline Detergent wash</b>	Removes fat and protein through the detergent	Minimum starting temperature of 70oC	-Follow detergent recommendation for volume of detergent, volume of water and water quality -follow SOP and manufacturer's instructions -pH should remain between 11.0 and 12.0 -wash cycle should last between 5 and 10 minutes -minimum of 20 slugs/ wash

<b>Acid rinse</b>	<ul style="list-style-type: none"> <li>-Neutralises detergent residues</li> <li>-prevents build up of mineral deposits</li> <li>-lowers bacterial growth between milking</li> <li>-reduces damage to rubber parts from the high alkalinity and chlorine from previous cycle</li> </ul>	Warmer than 43oC at the end of cycle to ensure milk particles can not redeposit on surfaces that contact fresh milk.	<ul style="list-style-type: none"> <li>-acid rinse pH should be less than 3.5</li> <li>-add acid to acid rinse after each milking</li> <li>-never mix an acid detergent with a chlorine-based product (could produce a very toxic lethal gas)</li> <li>- acid rinse should last between 3-4 minutes</li> </ul>
<b>Sanitizer</b>	Disinfects system prior to milking	Follow manufacturer's recommendation (typically ~ 43oC)	<ul style="list-style-type: none"> <li>Use a solution of 100-200 ppm chlorine</li> <li>-cycle should run just before milking (recommended 20 to 30 minutes) for 3 to 4 minutes</li> </ul>

\*Adapted from proAction Reference Manual, July 2019 edition

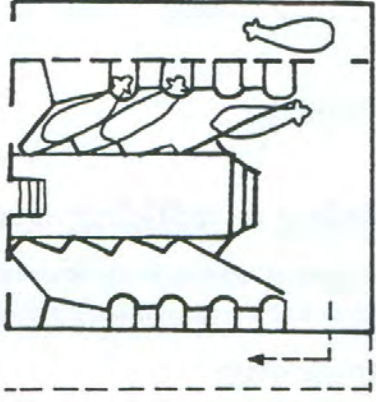
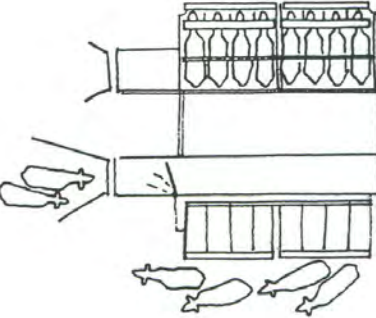
Bulk tanks also need to be washed and sanitized after milk has been picked up (every 2 days) before new, fresh milk comes into the tank.

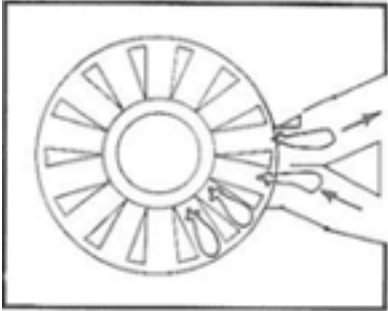
### Share It!

What is the standard operating procedure for cleaning and sanitizing the milking system at your farm?

## Types of Parlours

There are many different types of parlours that are in use. The most popular in Canada are double herringbone and parallel designs, however rotary parlours and swing parlours can be found. Regardless of the type of parlour, a holding area is required by the parlour in order to direct cattle into the parlour.

<p>Double Herringbone</p>	 <p>The diagram illustrates a double herringbone parlour layout. It shows two rows of stalls facing each other. A dashed line at the bottom indicates the parlour pit. A side panel on the right side of the stalls is shown in a raised position, similar to a garage door, with an arrow pointing to its upward movement. Cows are shown in the stalls, and a dashed arrow at the bottom indicates the direction of exit.</p>	<p>The cows are milked in groups, so all cows in the group must be finished milking before any of them can exit the parlour. The cows enter at one end and exit at the other, so there is some time delay as the cows must leave in single file and the next group of cows must enter in single file. In rapid exit herringbone parlours, the side of the stalls furthest from the parlour pit lifts up like a garage door so that it is out of the way and the cows can turn around and leave at the same time. This reduces the time required for milking from that of a regular herringbone parlour.</p>
<p>Parallel Parlours</p>	 <p>The diagram shows a parallel parlour layout. Cows are standing perpendicular to the parlour pit. Milkers are positioned behind the cows, between their rear legs. The stalls are arranged in a row, and the cows are facing away from the pit. A dashed arrow at the bottom indicates the direction of exit.</p>	<p>The cows stand perpendicular to the parlour pit, so the shortest amount of time is needed to move from cow to cow. Milkers are attached to cows from behind, between their rear legs, unlike in-barn pipelines, or herringbone where the milkers are attached from the side of the cow. There is less chance of the operator being kicked or of the cow kicking the milker off. However, the operator needs to guard against defecation. Splash guards will reduce this issue. The cows are milked in groups, so slow milking cows hold up the entire group. Most of these parlours have a rapid exit design so that the transition time is minimized between groups of cows.</p>

Rotary parlours		<p>Cows stand on a rotating circular platform, past a stationary central pit. Typically, animals walk from a holding area into a stall - the stall is part of a circular steel platform with stalls arranged all around the circumference. When a cow stands in a stall, her head faces towards the inside of the circle. Once a cow stands in a stall, the circular wheel rotates a few feet until the cow is situated in front of the operator. The milking claw can be placed on the cow and the platform is then be rotated another few feet so that the milking claw can be placed on the next cow. When a cow is finished milking, an automatic takeoff removes her milking claw and she can exit when her part of the circle comes around to the exit gate.</p> <p>Internal rotary parlours - the milker is on the inside of the ring</p> <p>External Rotaries - the milker is on the outside of the ring</p>
Swing Parlors		<p>These are uncommon. These parlours are built similar to other parallel or herringbone parlours however there is only one row of milking units. Milking units are swung from one side of the parlour to the other.</p>

### Research It!

How many different types of milking parlours are currently on the market? Which companies currently sell these systems and what is the cost? Besides cost, what are the similarities and differences between each of these systems? Create a chart to compare the similarities and differences. Be prepared to present these findings to the group.



## Automatic Milking Systems

Automatic Milking Systems (AMS) or Voluntary Milking Systems (VMS) are more commonly known as Robotic milkers. Each robot can milk about 60 cows per day. Once a producer has more than 60 milking cows, additional robots, and grouping options are needed. Robots have greatly gained in popularity over the past 10 years. In Canada there are roughly 760 robotic dairy farms, representing just shy of 10% of the total milking herds. The large majority of robotic dairy farms are free stall or pack barn based, however there are some producers who have put robots into a tie stall barn.

### Research It!

What types of robotic milking systems are on the market? Which companies currently sell these systems and what is the cost? Besides cost, what are the similarities and differences between each of these systems? Create a chart to compare the similarities and differences. Be prepared to present these findings to the group.

Robotic dairies typically group animals by production to get the most efficiency out of the robotic milker as opposed to lactation or stage of lactation. There are several things to consider when housing animals in a robot facility.

- Animal traffic: robot facilities can be free flow or directed flow
  - Free Flow allows cows to wonder throughout the pen, and to the robot at any time
  - Directed/Guided flow allows cows to go through the pen in one direction, which will force them to go through the milker to get to feed or to lie down (depending on layout)
- Location of milking units is important not only for cows, but for you to perform maintenance on. When choosing a location, it is important to think of the ventilation in the barn and the flow of manure
- Grouping - is each robot going to have its own group or will there be one larger group with access to several robots.

There are several different layouts for robotic barns, all with advantages and disadvantages. When putting robots into a barn, placement should be highly considered both for efficiency of the robot but also for ease of use to the producer.

Robotic milkers, like any type of milking system have pros and cons. Robotic milking systems allow cows to work on their own schedule, and are less labour intensive on the farmer, making them a great option for families. Some producers do experience an increase in SCC when they move to a robot, but through proper management, this can be brought back down.

### Debate It!

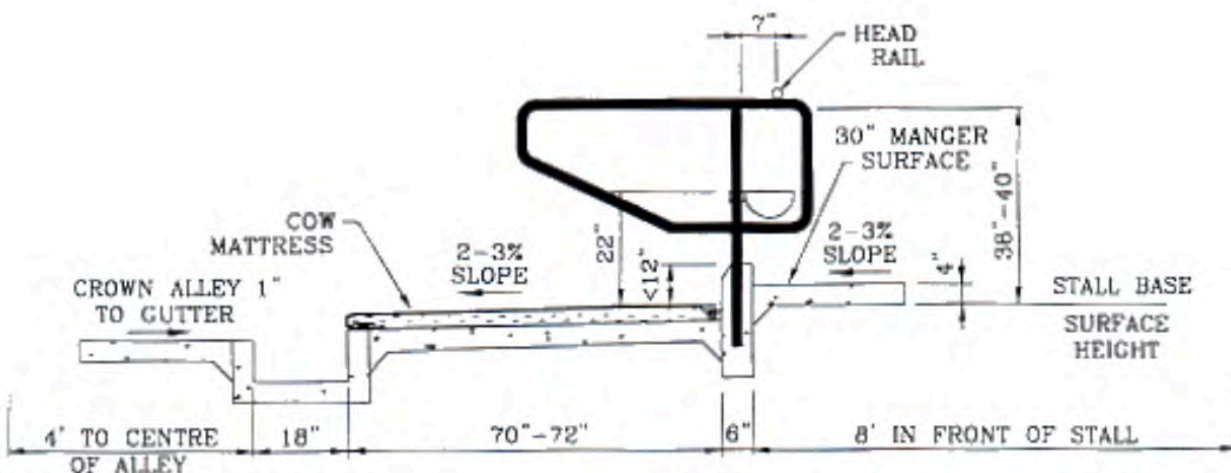
Choose a type of housing and/or milking system for dairy cows and debate why you think it is the best system for a dairy farm.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Determining Stall Size

<h1>Do</h1>	<p>Time: 15 - 20 minutes</p> <p>Materials: tape measures, pencils, and copies of the "Tie Stall Sketch" Worksheet from the following page</p>	<p>Ask members to measure the dimensions of a stall in a tie stall barn as shown on the worksheet.</p> <p>Have members compare these measurements to the ideal measurements found in this meetings material.</p>
<h1>Reflect</h1>		<p>To compare a real stall to the ideal measurements and discuss how changes could be implemented to increase cow comfort.</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>Do the stalls resemble the ideal barn stalls?</p> <p>What could the farmer do to improve cow comfort?</p>



## Activity #2 - Comparing Milking Systems

<b>Do</b>	Time: 15 minutes Materials: resource manual, chart paper	Compare the different types of milking systems. Create a pro and con list using the chart paper.  As a small group, what type of facility would you want in your barn?
<b>Reflect</b>		Members will learn the benefits of different milking systems
<b>Apply</b>	Prompting questions	What did you consider when making a pros and cons list?  Why would you put your chosen system in over the others?

### Activity #3 - Milking Time SOP

<b>Do</b>	Time: 15 minutes Materials: SOP template worksheet (found on the next page), writing utensil	Create an SOP for milking within your barn's milking system, a neighbour's milking system or a fictitious scenario.
<b>Reflect</b>		Members will learn and understand the importance of having standard operating procedures in place for a milking system.
<b>Apply</b>	Prompting questions	Did you find this SOP easy or difficult to fill out?  Which factors were the most important to consider when creating the SOP?  Is there anything you have thought of and would like to add to your SOP after discussing it as a group?

## Standard Operating Procedure Template

SOP #:	Title of SOP:	
Basic Information (age range and method)		
Medications to use (if applicable)		
Product	Dosage	Meat withdrawal
Before you start - what should you get ready?	Step 1:  Step 2:  Step 3:	
Completing the procedure or process (what steps do you take)	Step 4:  Step 5:  Step 6:  Step 7:	
After Care (both clean up and checking on the calf)	Step 8:  Step 9:	
Safety Risks of the procedure or process		



## Meeting 5 - Feed and the Farmstead

### Setting Objectives:

To appreciate the value of having good feed storage systems, a proper system for feeding cattle and the risks associated with working with various types of feeds, storage and feeding systems.

### Suggested Learning Outcomes:

- Look at how feed is stored and prepared.
- Compare different types of feed storage, feeding units and layout options.
- Learn about the safety risks associated with feed storage and how to work with fermenting feed.

### Suggested Roll Call Questions:

- What are some of the safety concerns around feed?
- What are the different types of feed storage you see on your farm/a farm?
- What could happen if you had poor feed storage?

### SAMPLE MEETING AGENDA

Time: 1 hours, 30 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>▪ Feed Storage types</li><li>▪ Feed out systems</li><li>▪ Safety in the feed room</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information



#### Housing Feed

Cows are not the only thing that needs proper housing. Feed that is stored improperly will spoil or lose nutritional value. Feed storage also needs to be easy for the farmer and equipment to access.


#### Share It!

What types of feed storage do you have on your farm?

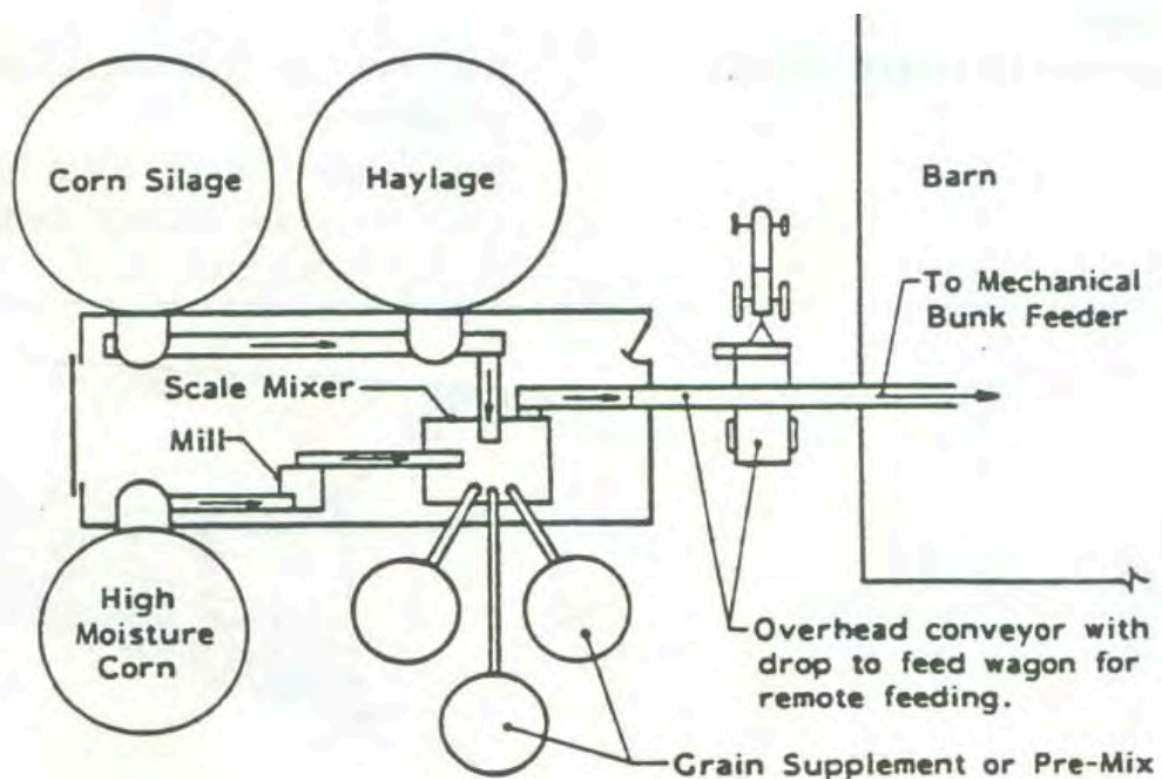
There are several different types of feed storage. The type of feed storage is highly dependent on the facility and what type of feed you need to store.

<p>Tower Silo</p> 	<ul style="list-style-type: none"> <li>▪ Corn silage</li> <li>▪ Haylage</li> <li>▪ High moisture grains</li> <li>▪ Corn cob meal</li> </ul>	<ul style="list-style-type: none"> <li>▪ Top unloading so that the feed put in last gets used first</li> <li>▪ Need to remove 5-10cm daily in winter and 7.5-10cm in warm weather to avoid spoilage</li> <li>▪ Silo height determined by amount fed annually (or what the silo holds)</li> <li>▪ Fill with blower from self unloading truck or wagon</li> <li>▪ Well suited to mechanical unloading</li> <li>▪ Need to be well maintained</li> </ul>
<p>Sealed Silo/ Oxygen Limiting Silo</p> 	<ul style="list-style-type: none"> <li>▪ High moisture grains</li> <li>▪ Corn silage</li> <li>▪ Haylage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Bottom unloading so that the oldest feed gets used first</li> <li>▪ Expensive but convenient</li> </ul>
<p>Bunker Silo</p>	<ul style="list-style-type: none"> <li>▪ Corn Silage</li> <li>▪ Haylage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Adaptable to self feeding</li> <li>▪ Difficult to mechanize</li> <li>▪ Pack and cover to reduce losses</li> <li>▪ Packing usually occurs with a tractor</li> <li>▪ Polyethylene plastic with recycled tires on top is a common cover.</li> <li>▪ Reduces losses but is expensive</li> <li>▪ Labour intensive for packing, snow removal, covering</li> <li>▪ Unload with tractor, unloader or by self feeding</li> </ul>
<p>Silage Bags</p>	<ul style="list-style-type: none"> <li>▪ Corn Silage</li> <li>▪ Haylage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Inexpensive</li> <li>▪ Great for temporary storage or excess storage</li> <li>▪ Require lots of ground space</li> <li>▪ Can be prone to rips</li> <li>▪ If properly managed, offers smaller shrink</li> <li>▪ Waste plastic from the bags is becoming difficult to recycle</li> </ul>
<p>Dry Storage (lofts, pole barns, tarp barns)</p>	<ul style="list-style-type: none"> <li>▪ Dry hay</li> <li>▪ Dry grains</li> <li>▪ Supplements</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lofts (hay mow) are located above the milking herd</li> <li>▪ Pole/tarp barns are a separate building which are relatively inexpensive</li> <li>▪ Feed needs to be moved to into the main milking barn/section</li> </ul>



 <p>Grain Bins</p> <p>Flat Bottom Bin</p> <p>Hopper Bottom Bin</p>	<ul style="list-style-type: none"> <li>• Cereal grains</li> <li>• Dry corn</li> <li>• Supplements</li> </ul>	<ul style="list-style-type: none"> <li>• Using augers to connect bins to each other and to feeding system makes grain transfer fairly easy</li> <li>• Two types of bins: gravity flow unloading with hopper bottom and auger unloading with flat bottom bins</li> <li>• Grain dryers are often used to speed drying of grain before storage</li> </ul>
<p>Commodity Storage</p>	<ul style="list-style-type: none"> <li>• Distillers grain</li> <li>• Mixed grain</li> <li>• Other feed additives</li> </ul>	<ul style="list-style-type: none"> <li>• Covered area to reduce spoilage</li> <li>• Can be in small, concrete bunker like areas or in organized piles</li> <li>• Important to keep on top of rodent and pest control to limit contamination and loss</li> </ul>

One farm may have several different types of feeding storage, as cows require many different feeds. Below is an example of a facility with several storage types. Bunker silos are becoming increasingly popular, typically replacing tower style silos.



### Research It!

Create a pros and cons chart of the four types of feed storage for corn silage/haylage (tower, sealed, bunk and silage bags). Once the chart is made, find out the price of each type of feed storage, ensuring that the sizes of each will hold approximately the same amount of feed.

## Making Feed

Most farms feed once or twice a day. When it comes time to feed, the different ingredients are brought to the cows in either a TMR (total mixed ration) or PMR (partial mixed ration) depending on the barn and farm management.

Loose housing environments typically mix feed in a large mobile mixer. This mixer will have a scale and will chop and mix the feed into a TMR. Some facilities will have a mechanized system, robots or will use loaders to get feed into the mixer. Once the feed is in the mixer, it is mixed and delivered to the animals.

Tie stall environments have the feed brought into a feed room to be mixed or fed separately. The cows are fed by power feed carts (small standalone TMR mixer), computerized/robot feeders or push carts.

### Experience It!

Tour a farm to see their feed storage areas. Ask questions as to why the feed storage and feeding system was set up the way it is and if the farmer could re-build their barn, would they do anything differently with storage and feeding systems.

## Safety First

The feeding areas are some of the most dangerous parts of the farm. Each year several people are victims of farm accidents in Canada. In order to prevent farm accidents, it is important to be aware of the potential hazards and have safe operating procedures.



### Check It Out!

Visit the YouTube Channel for Workplace Safety & Prevention Services to view their library of Stop Think Act Farm Safety videos: <https://www.youtube.com/playlist?list=PL5FjdkloWJyfBB5vBd2Lc30gIiq5lvme3>

**Flowing grain** - when working with grain bins, it is important to be aware of flowing grains. It can take less than 10 seconds for someone to be completely buried in grain. To prevent being buried, never enter a grain bin while it is being loaded or unloaded, never walk across stored grain, always have another person spotting you while working with grain bins and if possible use a harness when entering grain bins.

## Share It!

Do you know of anyone who has been injured while working with silos or grain handling systems? If comfortable, share with the group what happened and what the results of the situation were.

**Silo gas** - Silage and haylage need to ferment to make the feed more digestible. The fermentation process releases nitrogen dioxide (NO<sub>2</sub>). As this gas is heavier than air, it settles near the ground. This gas is colourless, yellow-brown or reddish colour. It can be odourless or smell like bleach. This gas is extremely lethal and can kill someone within seconds. There are several safety rules that you should follow:

- Warning signs need to be posted near the silo
- Do not enter the silo for 3 weeks after filling to avoid access to gas
- Ask your fire department if they have pressure demand remote breathing equipment available in the case of emergency
- Do not enter the silo to level it by hand
- Ventilation is very important - when filling and during fermentation, seal the feed room to keep the gas out of the milking barn
- Ensure everyone knows of the risks and has seen your farm's SOP.

Other silo dangers - tower silos and grain bins have ladders that can be reached from the ground. If needing to climb the silo, ensure there is another person nearby and attach yourself with a harness. All electrical cords should have locked switches to prevent someone from turning on the augers while you are working in or around the silo.

## Experience It!

Invite some to your meeting from your local Farm Safety Association or from an equipment dealership that sells silos and silo equipment and have them speak about safety.

**Equipment Safety** - there are several pieces of equipment that contain moving parts. These all have hazards and dangers associated with them. Augers, power takeoffs and other motorized equipment have protective shields around the motors and other moving parts. It is important to keep your limbs away from moving parts and to wear tight clothing as loose clothing can get caught in the equipment.

## Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Looking at Feed Storage

<h1>Do</h1>	<p>Time: 15 minutes</p> <p>Materials: You could either get the host farmer to discuss the different feed storage options that he or she uses OR gather pictures of different feed storage facilities (a Youth Leader could collect photographs)</p>	<p>Option 1 – Discussion Only During the activity ask questions about what these structures store, the labour required to use them, and the equipment and maintenance each storage facility needs.</p> <p>Option 2 – Working in pairs or teams, have members look at the characteristics of different feed storage facilities. Have each group come up with advantages and disadvantages of their storage area. Have groups present their findings to the whole club. You may want to start a large chart on which each group could record. The chart on the following page contains some of the points you might hear.</p> <p>Option 2 with a twist – Members could present their type of feed storage as an advertisement, trying to sell that storage system to the other members. Knowledge of disadvantages could be used to minimize their impacts or to prepare for questions that other members may ask</p>
<h1>Reflect</h1>		<p>Whether on a farm or in a meeting room, this activity will give members a sampling of different feed storage facilities.</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>How do feed storage facilities affect feeding programs?</p> <p>What different types of feed storage is on your farm?</p>

## Activity #2 - Safety Around Feed Storage

<h1 style="text-align: center; color: white;">Do</h1>	<p>Time: 30 minutes</p> <p>Materials: Farm Safety materials – examples can be found at:</p> <p>Canadian Agriculture Safety Association:  <a href="https://www.casa-acsa.ca">https://www.casa-acsa.ca</a></p> <p>Or</p> <p>OMAFRA:  <a href="http://www.omafra.gov.on.ca">http://www.omafra.gov.on.ca</a></p> <p>Or</p> <p>Safe Work Manitoba:  <a href="https://www.safemanitoba.com">https://www.safemanitoba.com</a></p> <p>Or</p> <p>Workplace Safety &amp; Prevention Services  <a href="https://www.wsps.ca/Farm-Safety-Products/FarmSafe-Plan.aspx">https://www.wsps.ca/Farm-Safety-Products/FarmSafe-Plan.aspx</a></p>	<p>Discuss the dangers certain storage facilities present to farmers and visitors to the farm</p> <p>Each group should present a role play about silo gas or grain bin safety to the rest of the club. The role play can involve someone “saving the day” or someone making a dangerous mistake. But be sure that each group does something a little different. Some example situations are:</p> <ul style="list-style-type: none"> <li>▪ you catch your neighbour playing in an empty grain bin</li> <li>▪ when you’re filling a grain bin, someone decides to climb up and check its progress</li> <li>▪ you’re filling the silo today</li> <li>▪ a couple of weeks after you fill the silo, your neighbour wants to climb inside to see what it looks like</li> <li>▪ someone’s trapped in a silo</li> <li>▪ someone’s trapped in a grain bin</li> </ul>
<h1 style="text-align: center; color: white;">Reflect</h1>		<p>Members will learn to avoid dangerous situations. The discussion will point out the hazards of feed storage facilities and the precautions farmers and 4-H members can take to prevent accidents</p>
<h1 style="text-align: center; color: white;">Apply</h1>	<p>Prompting questions</p>	<p>Why is having a safety plan in place important on a farm?</p> <p>How do you teach people who visit your farm about safety?</p> <p>How do you avoid dangerous situations on your own farm?</p>

### Activity #3 - Farm Safety Poster

<b>Do</b>	Time: 10 - 15 minutes Materials: Craft supplies	Create a safety poster promoting farm safety.  Choose a farm safety concern that you feel your farm has and highlight the risks. Show how you can prevent farm accidents
<b>Reflect</b>		Members will learn about farm safety on their farm
<b>Apply</b>	Prompting questions	Why did you choose to highlight your aspect of farm safety?  Where would you post these posters?







## Meeting 6 – To Build or Not To Build – What You Need To Know

### Setting Objectives:

To consider all factors when thinking about building a new dairy barn or retrofitting an older barn.

### Suggested Learning Outcomes:

- Learn how to do farmstead planning.
- Look at the importance of location when building barns and feed storage.
- Learn about the environmental impacts that dairy farming has on the environment and how the Canadian dairy industry is making a healthier environment.

### Suggested Roll Call Questions:

- What are some steps you take to make a greener environment on your farm?
- How has dairy advanced to put more emphasis on the environment?
- What would be some things you would look at if you were building a dairy barn at your farm?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Importance of location</li><li>• Building a healthy environment</li><li>• How dairy farmers have reduced their carbon footprint</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Putting it all together

There is lots to think about when building a new facility. Everything highlighted in the Dairy housing section are things that need to be considered. When building a new facility or retrofitting an older facility there are several things to consider before you even break ground!

1. What are your goals? What does the building need to do? What will it hold?
2. Collect information. Go to farm tours, read magazines/websites and talk to contractors.
3. Plan it on paper. How do you want the facility to be laid out?
4. Lay it out to scale. Sometimes our eyes are bigger than our stomach. Can the facility actually fit on your property?

### Location, Location, Location

Some locations are better than others when building a new facility. When picking a location for your new

barn consider:

1. Topography - is the ground sloped? Or level?
2. Soil - it needs to be deep enough for a foundation however you will not want to use your best crop land for the building.
3. Climate - this looks at the direction of the wind, the amount of sunlight and therefore what type of ventilation you will need.
4. Existing buildings - you will likely want your new barn to blend with the facilities that are already in place. This will make it easier to feed and clean.

Once you have a location picked out and have set your goals for the facility it is time to look inside. There are lots of decisions to make to ensure cows are comfortable and workflow is optimal. Things to consider are:

- Feed storage and how you plan to feed animals
- Manure removal and storage
- Water placement
- Utilities
- Access to other buildings
- Ventilation
- Environment

## Retrofitting

Retrofitting is typically a less expensive way to make major changes to your facility. By retrofitting, you use the original building and change the interior to meet your needs. When doing a renovation, consider:

- Location - if you don't like where the barn is, it is likely easier to knock it down and start from the ground up.
- Current use - will you continue to use this building for its current use? Will you ever use it this way again?
- Building structure - in order for a retrofit/remodel to work the building needs to be of sound structure. If a building is cracked, falling down or needs major repairs it is likely best to build a new facility
- Ventilation - natural ventilation is best! For optimal ventilation the building should be 15m away from trees/silos and 23m from other buildings
- Size - will there be enough room for animals
- Cost - retrofitting/remodelling is a cheaper option than building new, however renovations can often cost 10-20% more than the estimate

### Check It Out!

Search online for videos of dairy barn tours that show various types of barns throughout the building process.

### Experience It!

Invite a contractor from a company that specializes in building dairy barns and/or an agricultural engineer to discuss the various factors to consider when building a new barn or retrofitting an older barn. Also, find out why they choose the career that they have and what training they have had over the years.

## A Healthy Environment

Maintaining a healthy environment is something all farmers consider. Environment is the final pillar of proAction and came into validation starting in September of 2021. Over 70% of all Canadian dairy producers have an environmental farm plan which is an action plan to mitigate, manage and address environmental risks on the farm.

Many producers have nutrient management plans or work with advisors to improve the nutrient use and efficiency both in animal feed and crop management. As more research and technology comes onto the dairy farm, precision agriculture becomes more and more common.

The main environmental concerns in the dairy industry are water quality, air quality and soil quality.

**Water Quality** - Water is one of the most important resources on a farm. Its purposes include drinking, cleaning, and cropping. Since dairy cattle drink 50-130 litres of water daily and 87% of the milk they produce is made up of water, it is an absolute necessity.

Dairy farms must be designed in a manner that does not pollute waterways. This is important not only for the farmer and his or her cows, but for the rural homes around the farm that need their water to be safe and taste good.

Water on the farm can become contaminated from three sources:

1. Manure
2. Wash water from the milk house
3. Pesticides used to kill bugs and weeds

**Air Quality** - There is no doubt about it, farms can smell bad! People and cows do not like the smell of manure. Bad odours can cause mood changes and upset stomachs.

Air quality can also be affected by dust and other gases in the barn. Grain, hay and dried manure affect the air inside barns. Cows and farm workers breathe in those particles, potentially resulting in breathing problems and aggravating existing allergies. Even more dangerous than dust particles are gases from manure and silage fermentation, which can kill people and animals.

**Soil Quality** - Maintaining and improving soil quality means that crops grown will be better with fewer inputs of fertilizers. Growing crops in a more productive and less expensive manner means that animal feed costs are lowered. Implementing a crop rotation plan on your farm, where different crops are rotated from field to field each year helps to keep the soil healthy.

Soil erosion is another problem that can be minimized by ensuring that land is not left bare. Leaving corn stubble on the land over the winter and planting cover crops helps to reduce erosion by wind and water. Creating windbreaks by planting trees is another way to reduce soil erosion. Trees provide added benefits as they provide shelter for grazing animals and help to clean the air. Trees use up carbon dioxide and release oxygen.

## Reducing our Environmental Impact

There are many ways dairy farmers work at reducing their environmental impact. These improvements are done both through breeding animals and changing management practices.

**Greener Cows** - through breeding technology today's cows are 3 times more efficient than they were 50 years ago. These changes have been made through improving cow comfort, better management and improved feed efficiency through selective breeding. Increasing the efficiency has allowed Canadian dairy farms to reduce the amount of Green House Gases created in producing 1 L of milk. As cows produce methane gas and manure nitrous oxide, the fewer cows we need to milk and the lower the impact on the environment

**Water Conservation** - In order to produce milk, cows need to drink a LOT of water (the equivalent to 1 bath tub a day!). Dairy farming uses less than 0.03% of the country's fresh water sources. Canada uses less water for dairy production than many other places in the world due to our climate and regular rain.

**Reducing greenhouse gas emissions** - dairy production represents about 1.3% of Canada's total greenhouse gas emissions. This is largely due to how efficient and productive our cows are. Another way the dairy industry has reduced greenhouse gas emissions is through the adaptation of new technology and environmental practices. Producers empty manure storage to enrich the soil in fields, do crop rotations, are reducing the amount of tilling required on the field and have created a more efficient milk transportation system.

**Responsible fertilizer and pesticide use** - though manure is applied to the field, some additional fertilizer may be needed to ensure it has all the nutrients and minerals needed. Farmers have to be trained and pass an exam about responsible pesticide use on the farm in order to use and buy pesticides. Currently over 90% of Canadian producers have completed this process. Reduction of pesticides and other additives is the biggest impact we can make. An increasing number of farms are transitioning to organic production or are using better practices to reduce the amount of pesticides used on farms.

**Recycling and technology** - dairy farmers are looking at different and new ways to recycle and use technology to reduce their impact. Some farms are putting in bio digesters which turns manure into electricity. Some have put up windmills or solar panels to create greener energy. Most producers are working with agronomists to create nutrient management plans to minimize contaminants on the dairy farm. There are constantly new ways dairy farms can be more efficient and improve their environmental impact.

**Share It!**

Share one way/item that a dairy farm can recycle.

## **Nutrient Management Plans**

NMP's are developed to protect water, soil and air quality, maximize crop production and reduce odours. Nutrient management plans in order to be effective need to:

1. Have at least 240 days of manure storage
2. Minimum Distance Separation - A specified distance between new barns and existing homes or businesses that is determined by the number of animals the barn could hold, the type of manure produced, the size of the expansion and other factors.

3. A formal plan including:
  - a. Soil test results
  - b. Nutrient storage areas (i.e. for fertilizers and manure)
  - c. When and how to apply nutrients to crops
  - d. Manure test results
  - e. Contingency plans in case a problem arises
  - f. Manure spreaders that calibrate for accurate nutrient application
  - g. Good neighbour policy

### Talk About It!

Does your farm have a Nutrient Management Plan in place? If you aren't sure, find out when you go home. If your farm has NMP plan, what does it look like?

## Manure Storage

Manure is approximately 85% wet matter and 15% solids. This means that manure can be handled as a solid, semi-solid or liquid. When more bedding is used for the animals, the manure becomes more solid.

**Liquid Manure Storage** – This can be handled on the farm in several ways:

- Rectangular storage below a slatted floor barn
- Circular concrete storage in the ground
- Silo-type concrete or steel storage above the ground
- Earthen storage in clay soil
- Concrete structures may be covered or uncovered

**Solid Manure Storage** – A concrete slab surrounded by a curb to hold in the liquid is sufficient to store solid manure. The curb prevents seepage of liquid into the soil and groundwater. Solid manure must be controlled to reduce flies and smells.

How much manure storage do you need? As a rule of thumb, a 625 kg cow produces 0.07 m<sup>3</sup> of manure each day (0.075 m<sup>3</sup> if a lot of bedding is used). There are several online calculators to determine how large a storage unit you may need.

### Figure It Out!

Find an online calculator for calculating the manure storage needed for a 100 cow dairy herd.

**Spreading Manure** - Farms do not have enough space to store manure forever, so it must be removed eventually. There are a few things to remember when spreading manure on your farm:

- Know the best time and amount to spread on your land.
- Apply it evenly.
- Recalculate the amount of commercial fertilizers that will be needed to grow your crops.
- Apply manure when crops are growing and need the most nutrients.
- Do not spread manure if it is going to rain because this causes runoff which can pollute water and prevent crops from getting the nutrients they need.
- Avoid spreading in the winter months.

### Research It!

Unfortunately, stories about improper spreading of manure can make it into the media. Do a media scan to see if you can find an article where a farmer didn't follow proper procedures and ran into issues when spreading manure.

## Wash Water

Manure and wash water are the main sources of waste on the dairy farm. Milk house waste contains detergents and acids that are necessary to clean milking equipment. Farms produce about 15 kg of wash water per cow per day. For example, a 100 cow herd uses 1500 litres of wash water each day or 547,500 kg each year. If it is not disposed of properly, it can pollute streams and groundwater. In streams, it causes algae to grow, which uses up some of the oxygen that fish need to survive.

There are different ways to handle milk house wash water:

- Adding it to the liquid manure storage system
- Storing it separately
- Treating it with a septic system and treatment trench - this method should only be used by small farms and is difficult to properly manage

### Experience It!

Tour a farm to see their feed storage areas. Ask questions as to why the feed storage and feeding system was set up the way it is and if the farmer could re-build their barn, would they do anything differently with storage and feeding systems.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Building a Farmstead

<b>Do</b>	Time: 15 - 20 minutes Materials: Paper, pen or computer software	Think about all you have learned about animal housing over the last several meetings  Create a farm plan taking into consideration calf, heifer, lactation cows, dry cows, feed storage and milking systems  Draw or map out your dream farm. This can include where your house will be, laneways and other buildings  Present the farm plan to the group
<b>Reflect</b>		For members to understand the purpose of different areas on a farm and their location relative to one another.
<b>Apply</b>	Prompting questions	What did you consider when building a farm plan?  How would you integrate your home into this plan?

## Activity #2 - My Space - Your Space

<b>Do</b>	Time: 20 minutes  Materials: Paper and pencils, My Space - Your Space worksheet (found on the next page)	Members are responsible for planning the new dairy farm, with several components included (as outlined in the worksheet). The components are to be put into the squares of the grid.
<b>Reflect</b>		For members to apply their knowledge about farmstead planning by assessing an existing farmstead
<b>Apply</b>	Prompting questions	Was it difficult to fit the parts of the farm into the grid?



## My Space - Your Space Worksheet

Assume you are responsible for the settlement of a new area. Put each of the items on the following list in the squares or plots in the graphic below.

Item	Squares Needed
Milking Cow barn	2 squares
Fields	4 squares
Calf housing	1 square
Homestead	1 Square
Feed storage	2 squares
Pasture	1 square
Machine Shed	1 square


### Activity #3 - Manure Handling

<b>Do</b>	Time: 10 minutes Materials: Pen and paper	Assign each group one type of manure handling method: solid or liquid. Give each group some paper and ask them to write down at least three advantages and three disadvantages of their method. The groups can then come together and share their answers.
<b>Reflect</b>		To teach members different ways of handling manure (solid, liquid, semi-solid)
<b>Apply</b>	Prompting questions	What type of manure storage do you have at home? What s your preferred manure system and why?

## Activity #4 - Creating an Environmental Farm Plan

<h1>Do</h1>	<p>Time: 1 hour Materials: "Improving the Environment" worksheet (found on the following page); farm environmental resources (i.e. OMAFRA Factsheets) and 4-H Dairy Resource Guide; pens or pencils.</p>	<ul style="list-style-type: none"> <li>• Divide the members into small groups. Explain that they will create their own version of an Environmental Farm Plan using the worksheet as a starting point.</li> <li>• Give them the choice of studying the farm they are on now or focusing on one of their home farms. They can focus on areas such as manure management, wash water, silo seepage, erosion and chemical use. (Giving each group a couple of areas to focus on will save time). They can also include timelines and future goals for the EFP.</li> <li>• After the groups have worked for 40-45 minutes, they can come back together to discuss their EFPs</li> </ul>
<h1>Reflect</h1>		<p>Members learn how to make a farm environmentally safe</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>Why is having an EFP an effective way to keep a farm's environment healthy? Why would a farmer spend valuable time creating an EFP?</p>

## Improving the Environment Worksheet

Use the following template to:

- Describe the current condition of the area.
- Describe the environmental problems this area presents.
- Describe how you'll act to correct the problem.
- Write down anything that could prevent you from acting (i.e. no money).
- Then, set out a timeline to complete the action

Condition of...	Problem area	Action to fix	Barrier to the solution	Timeline





Section 5 **Marketing & Regulations**







# Meeting 1 - Milking For All Its Worth

## Setting Objectives:

To appreciate the importance of the udder on a dairy cow and the proper method for collecting milk.

## Suggested Learning Outcomes:

- Learn about how milk is made and collected on a dairy farm.
- See how different parts of the udder have different jobs and the importance of a good milking procedure.

## Suggested Roll Call Questions:

- What are some steps you take when prepping cows?
- Why do you think a proper milking procedure is important?
- How do cows know when it is time to get milked?

## SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Udder make up</li><li>• Milk let down</li><li>• Milking procedures</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

## Topic Information

### From Farm to Fridge

Canadian dairy producers pride themselves on the quality of Canadian milk. Programs like proAction ensure that the cows are happy and healthy and that consumer knows that their milk is of the highest quality.

### Making and Collecting Milk

Milking cows is a full-time job, 365 days of the year. Both the producer and their cows work everyday to fill the tank. Dairy cows are constantly making milk, whether they are in the parlour or not. Eating, drinking, chewing and laying down are all important in making milk.

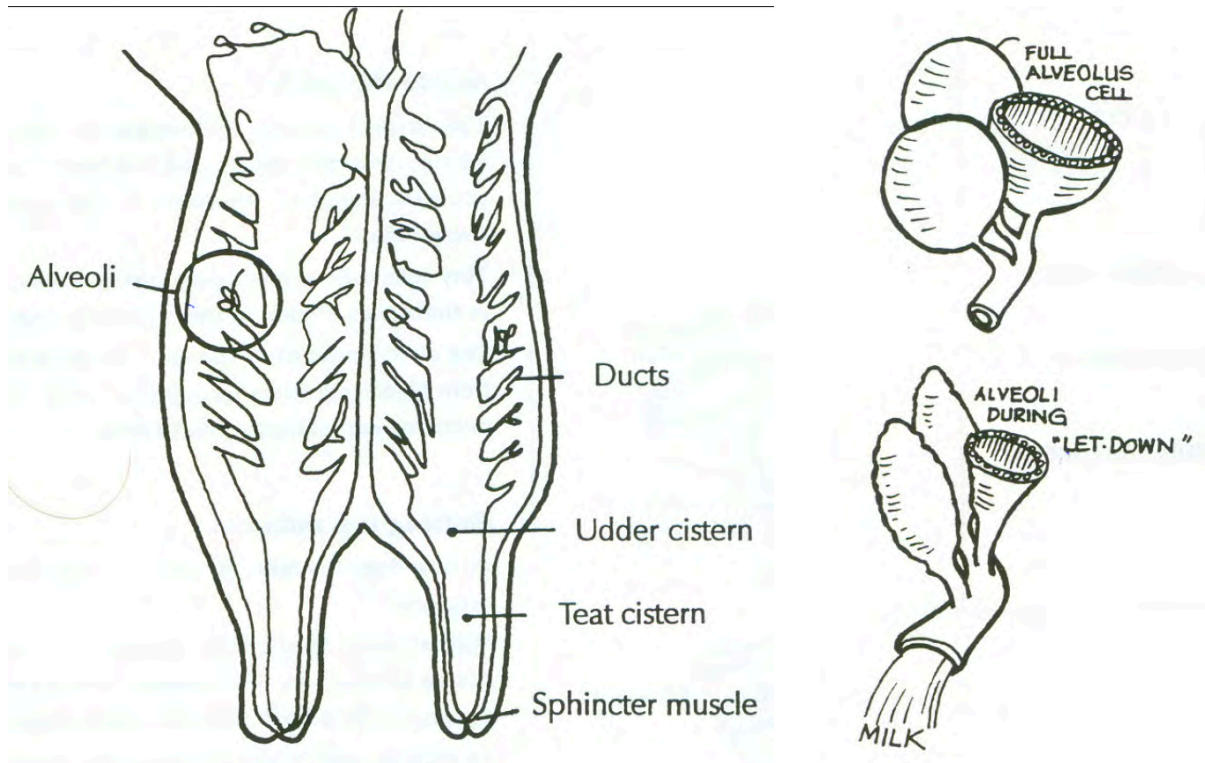
### The Udder - The Milk Making Machine

The udder is made up of 4 distinct glands called quarters. Each quarter is full of milk producing tissue. Though they seem like different compartments of the udder, they are all connected. The milk made in each quarter stays in the same quarter until it is milked, however because all the quarters are connected, viruses, diseases and antibiotics can pass from one quarter to the next.

## Experience It!

Invite a veterinarian to your meeting to discuss udder health.

Each quarter is made up of thousands of tiny cells called alveoli. To produce 1 single drop of milk, it takes thousands of healthy cells. Cells need energy, which comes from the blood flowing through the udder. The nutrients in the blood pass through the blood and into the cell.



## Ask About It!

When showing dairy cows, the udder is one of the factors that is judged. What are the qualities/criteria that a judge looks for in the 'perfect' udder?

## Judge It!

After determining the criteria for judging udders on cows, judge the udders of four cows. Be prepared to give your reasons for your placings.

## Getting the Milk Out

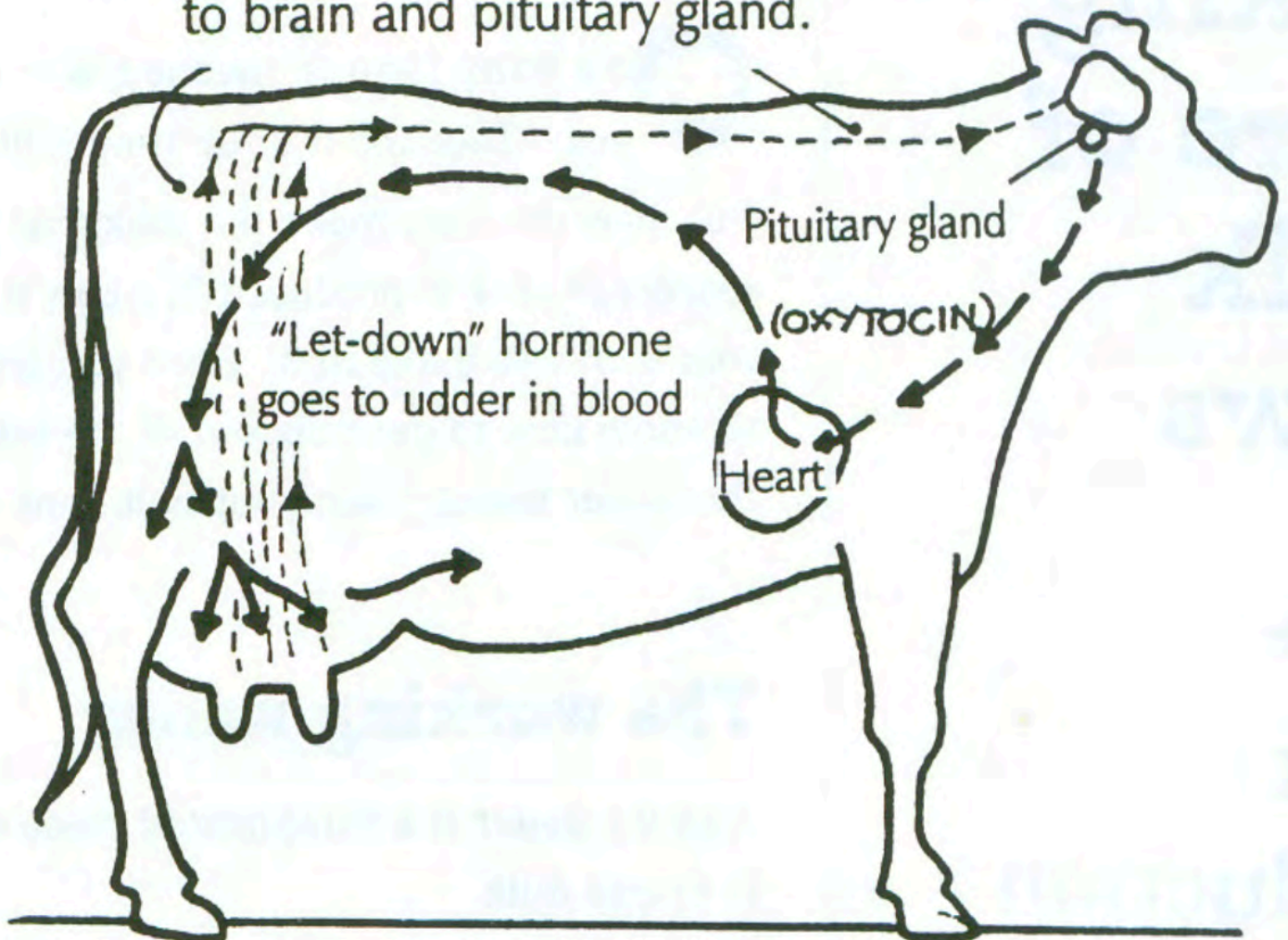
Milk let down is an involuntary reflex action that a cow has no control over, just like when you automatically drop something hot that you pick up.

## Experience It!

If you haven't milked a cow before, visit a farm at milking time and ask to help with washing and massaging the udder before the milking claw is put on the udder.

When it is time for a cow to be milked, washing and massaging the udder sends a message to the pituitary gland in the cow's brain telling her to start letting down her milk. In response, the pituitary gland sends a hormone called oxytocin through the blood to the udder. When it reaches the udder it sends a signal to 'squeeze' the milk out of the alveoli cells. When the milk leaves the cells, it travels down through the udder cistern into the teat cistern. The teats fill with milk and then the milking claw can be attached. The teat opening is held shut by a sphincter muscle at the bottom of the teat. When the milking claw is attached, the sphincter opens, letting the milk flow out. Cows who leak before the milking claw is put on them are often high producing cows with a lot of pressure on their teats or animals that have a weak sphincter muscle that cannot be kept completely closed.

Nerves carry message of stimulation  
to brain and pituitary gland.



Cows need to be milk consistently to get the most production and for them to remain healthy. When milking cows adhere to the following steps.

1. Keep clean - make sure before you get started that you are clean. A lot of producers wear gloves while milking.
2. Milk at the same time every day - most farms milk cows 2 or 3 times per day, at the same time everyday. Some cows within a robotic milking system will go to the robot up to 4 or 5 times a day. When milking cows they should be clean, dry and in a low stress environment
3. Wash teats with a pre-dip solution or warm sanitizing solution - this kills all bacteria and also stimulates the cow to let down her milk.
4. Dry teats with a clean rag or paper towel - this prevents the pre-dip from getting in the milk line. Using a fresh towel between each cow limits spread of bacteria
5. "Strip" the cow into a strip cup to look for any abnormalities in the milk - this will show if an animal has clinical mastitis. It also further stimulates the udder.
6. Attach the milking claw 30-40 seconds after washing - when it comes to milking cows timing is everything. By putting the milker on too early she may not have let all her milk down, too late and she may have stopped the process of letting milk down
7. Adjust milker if needed - the milker should sit squarely under the udder. Adjust the milker if there is a "squawking" noise, if the hoses are dragging on the ground, or if the hoses are pulling on the udder.
8. Remove the claw when milking is complete - many farmers have automatic take off. A milker needs to be removed to avoid "over milking" the animal. A typical cow will milk out in 5-8 minutes. Before removing the claw, turn the vacuum off.
9. Dip the teats with a post dip solution.

### Debate It!

Do you think it is better to milk a cow twice a day or three times a day? Choose either two times or three a day and defend your choice.

### Do It!

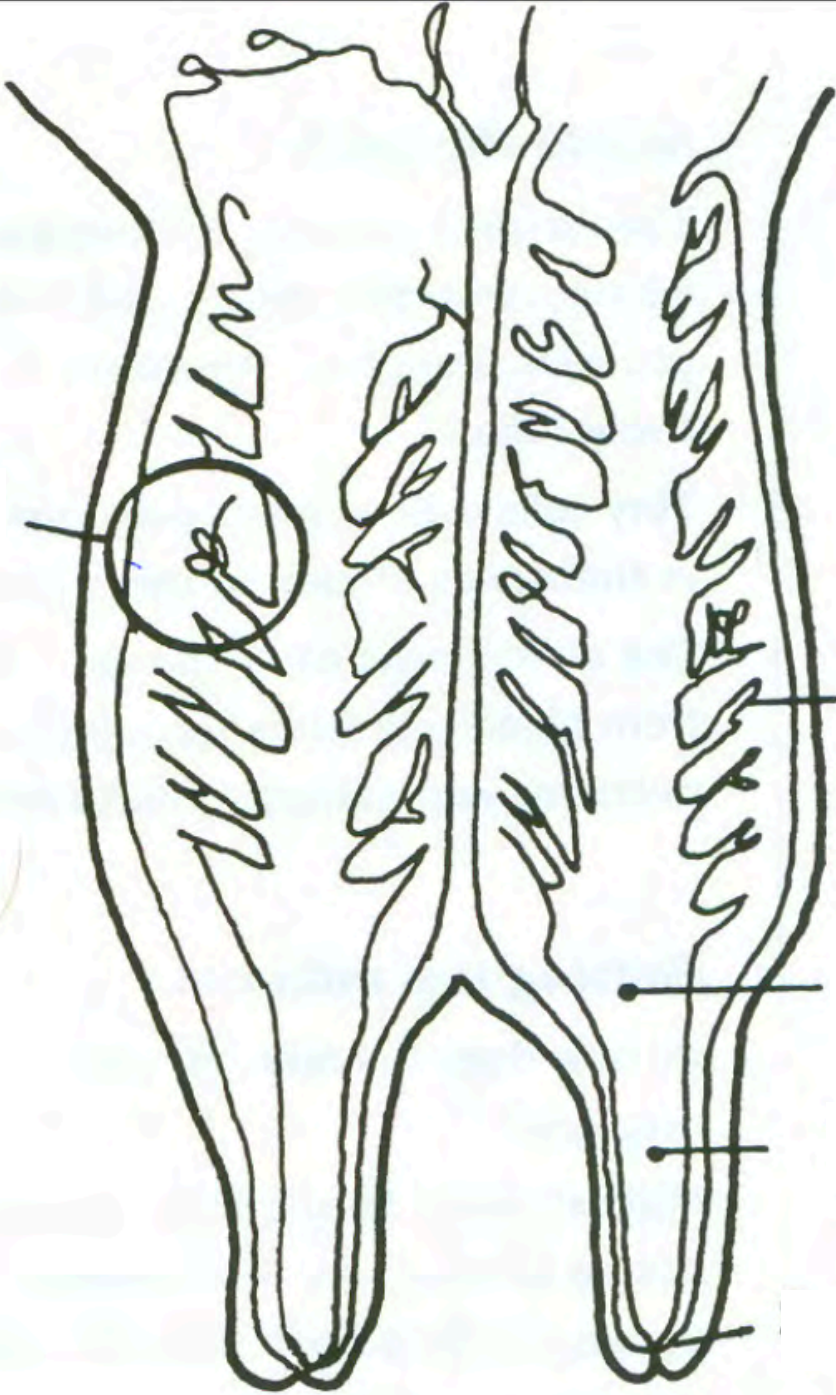
Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Label the Udder

<b>Do</b>	Time: 10 minutes  Materials: pen and paper, Parts of the Udder worksheet (found on the next page)	On the worksheet provided, label the various parts of the udder. Use the 4-H Dairy Project Reference manual as a guide.
<b>Reflect</b>		Members will learn about the parts of the udder.
<b>Apply</b>	Prompting questions	Why is it important to know the various parts of the udder?  Why is udder health so important?  How does the health of the udder affect the overall health of the cow?

## Parts of the Udder Worksheet

Using the Reference Manual as a guide, label the parts of the udder.



## Activity #2 - Milking Procedures

<b>Do</b>	Time: 15 to 20 minutes  Materials: pen and paper	Have the farm you are visiting to walk through their milking procedure. Come prepared with questions like:  What do you use to sanitize the equipment? What are your prep procedures?  How long does it take your animals to milk out?
<b>Reflect</b>		Members will learn about different milking routines
<b>Apply</b>	Prompting questions	How do these milking procedures differ from yours?  Why is a good prep routine important?





## Meetings 2 and 3 - The In's and Out's of proAction

### Setting Objectives:

To gain an understanding of the Dairy Farmer's of Canada (DFC) proAction program.

### Suggested Learning Outcomes:

- Learn about the proAction program and all the regulations Canadian dairy farmers comply with.
- Examine why Canadian milk is some of the best quality milk in the world.

### Suggested Roll Call Questions:

- Why are rules and regulations important in dairy (or any food product)?
- What are some things that you feel dairy farmers should do to make sure Canadian milk is a high-quality product?
- What does your farm do for proAction?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"> <li>• The 6 pillars of proAction</li> <li>• Milk Quality</li> <li>• Food Safety</li> <li>• Animal Care</li> <li>• Traceability</li> <li>• Biosecurity</li> <li>• Environment</li> </ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### proAction

Dairy Farmers of Canada (DFC) requires all dairy producers to follow the proAction requirements. proAction is made up of 6 pillars. Each pillar has a list of requirements that producers need to meet in order to ship milk and receive no penalties. The 6 pillars are:

1. Quality Milk
2. Food Safety
3. Animal Care
4. Traceability
5. Biosecurity
6. Environment

Because there are many pillars of the proAction program, DFC and the provincial milk boards have rolled this program out in stages over several years. All modules of proAction will be fully required and in compliance by September 2021. Producers undergo full validation once every 2 years. In the years where producers are not under full validation, they are required to do self-validations to stay on track.

### Experience It!

Invite a representative from the proAction program as a guest speaker at your meeting. Find out why the proAction program is important for the dairy industry.

## Creating Quality Milk

There are several requirements under the Milk Quality pillar of proAction. In order for Canadian dairy producers to ship milk they must meet the following requirements:

1. Inhibitors
  - a. Milk must be free of substances that inhibit bacterial growth in raw milk, this includes vet drug residues. If any inhibitors are present, penalties will be applied. Losses and cost may also be charged to the offending producer when a tanker truck is contaminated, if the farmers milk sample is in the penalty range.

### Research It!

Find out what type of penalties are issued when an inhibitor is found in the milk.

2. Bacteria
  - a. There are two methods of measuring bacterial level in Canada. The first method is called bactoscan. Milk must contain less than 122,000 individual bacterial cells (IBC) per mL. The second method is called Standard Plate Loop Count with a threshold of 50,000 CFU/mL
3. Abnormal Freezing Point
  - a. Milk has a freezing point of less than -0.506oC. A penalty will be applied If the cryiscpe result is greater than the specified level for Abnormal Freezing Point (AFP) of 0.507oC
4. Somatic Cell Count
  - a. Milk must contain less than 400,000 individual cells (IC) per mL. A sample that reaches a IC/mL of 399,000 puts producers in the penalty range.

## Food Safety

The Food Safety regulations contain 43 different regulations. As milk is meant for human consumption, it needs to follow similar protocols to other food products, including having a HACCP plan. The food safety

regulations are broken down into several different sections:

1. Dairy Facilities and Pesticides
2. Feed and Water
3. Traceability
4. Biosecurity and Animal Health
5. Medicines and Chemicals used on Livestock
6. Milking management
7. Cooling and Storage of Milk
8. Facility and Equipment Sanitation
9. Use of Water for Cleaning Milk Contact Surfaces
10. Handling and Shipping Animals
11. Staff Training and Communication

These 11 sections make sure that equipment is sanitized, milk is contaminant free and that the product is food grade.

### Research It!

Choose one of the sections within the Food Safety pillar. Find out what a farmer has to do for the section you chose in order to be in compliance with proAction. Be prepared to present your findings to the rest of the group.

## Animal Care

The Animal Care module ensures that animals are being treated ethically on the farm. Animal Care ensures that animals have enough feed, water, bedding and space. It also looks at animal-based measurements to assess the physical state of the animals. Animal care looks at the following major categories:

1. Cattle Housing
2. Feed and Water
3. Biosecurity and Animal Health
4. Handling and Shipping Animals
5. Staff Training and Communication

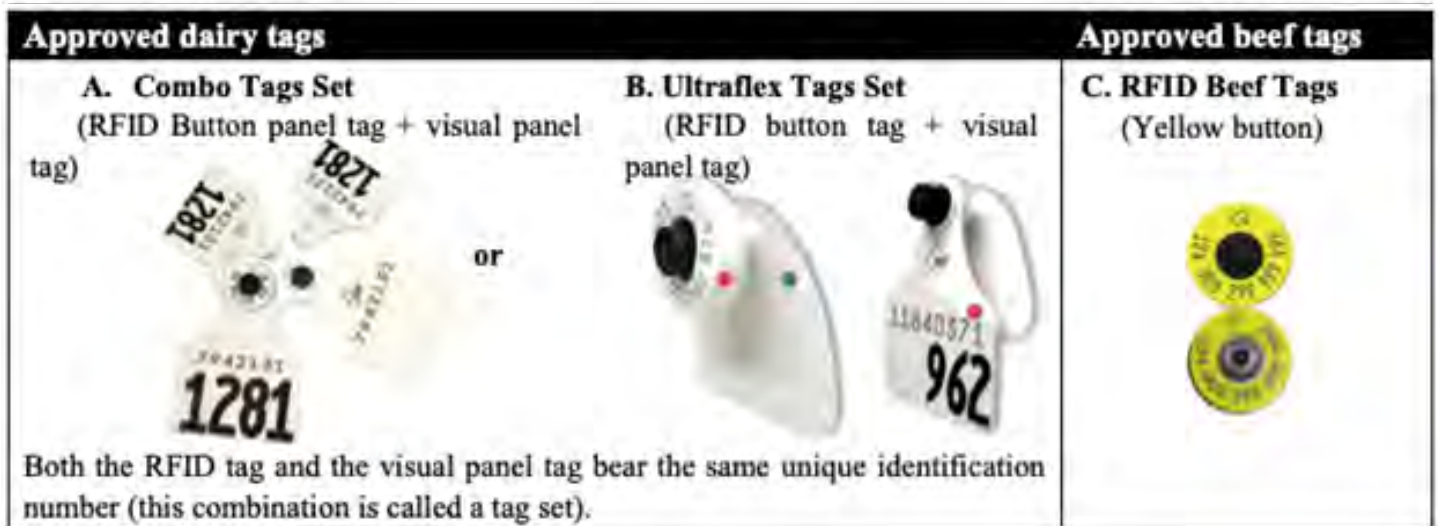
For a full out line of all Animal Care requirements please see: Animal Care Quick Tips

## Traceability

In order to limit the spread of disease, Canadian dairy animals need to be traced throughout their life. The traceability module has 8 requirements and which can be summarized as record and report.

1. **Premises ID** - all farm properties that will house animals require a Premises ID. This helps to label every area an animal can be within her life.
2. **Animal Identification** - all animals that are destined for dairy are required to be dual tagged with

Nationally approved tags (in Ontario, these are NLID tags). Animals destined for beef must be tagged with Nationally Approved Beef Tags.



- 3. Tag Activation** - In order to activate tags, animal births must be recorded in the on-farm records within the first 7 days of life. Animal births need to be reported to a National Livestock Database within 45 days of birth or before the animal leaves the farm of origin, whichever comes first. As of June 2020, DairyTrace is the approved dairy livestock database.
- 4. Animal Movement** - When animals are moved from location to location, movement needs to be recorded on-farm and reported to the national dairy base. This is considered Animal move-in. The animal ID number, date of movement, PID of arrival and departure farm and the licence plate of the moving vehicle all need to be recorded and reported on farm within 7 days of move-in (or before the animal leaves, whichever comes first).
- 5. Tag Retirement** - when an animal dies, the animal tag gets retired. This occurs when the death is recorded and reported to the national data base. It is the responsibility of the premises of which the animal passes to report the animal death.

It should be noted that animals that get exported across national borders are recorded in the national database under the animal movement section. It is considered an import/export as opposed to an animal movement.

### Check It Out!

When travelling to cattle shows, what is the protocol for traceability for the shows that you attend? What documentation do you (and the person who is transporting your animal) need to have and what are the responsibilities of the show you are attending?

## Biosecurity

The goal of Biosecurity is to prevent outside diseases from coming into the dairy farm, and to limit any diseases on your farm from leaving. Biosecurity is broken into 3 main sections:

1. Cattle Health Management - Ensures that your farm has gone through a biosecurity risk assessment and

that incidences of disease on your farm are recorded. It also requires you have an SOP for vaccinating cattle.

2. Cattle Additions and Management – aims at limiting the disease coming onto the farm through new animals in the herd. It requires an SOP for the treatment of new animals or returning animals to limit disease spread.
3. Personnel, Visitors, Vehicles and Equipment – An SOP is required to prevent and limit disease coming on farm by people and equipment. Signage regarding biosecurity should be posted at the main entrance of the farm, and visitors should log in upon arrival and sign out when leaving.

### Share It!

What do your SOP's look like for your farm for vaccinations and treatments of cattle?

## Environment

Environment is the final module to come out under the proAction program and will not be in place until 2023, with initial validations starting in 2021. There are many parts of the environment pillar that are still under consideration, however Environmental Farm Plans will become a requirement to recognize and address environmental risks on your farm.

### Research It and Do It!

What sections will need to be followed by dairy farmers in the Environment pillar? Choose a section and prepare a presentation for your group about the requirements of that section in order for a farmer to be in compliance within the proAction program.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Completing an Animal Care Assessment

<b>Do</b>	Time: 30 minutes  Materials: milking cows, pen, cattle assessment work sheet	Assess 5 to 10 animals based on the Animal Care Assessment guidelines  Mark down: injuries, lameness and BCS.  For free stall herds lameness should be a gait score and for tie stall mark down the behaviours the animals show
<b>Reflect</b>		Members will learn how the animal assessors conduct Animal Welfare Assessments
<b>Apply</b>	Prompting questions	Why is it important to check animal welfare?  Where did your animals need improvement?  How can you improve animal welfare on the farm?

## Animal Assessment

Animal ID	Hock Score	Knee Score	Neck Score	BCS	Lameness

## Activity #2 - Self Evaluation

<b>Do</b>	Time: 30 - 40 minutes  Materials: proAction Self Evaluation sheets or Quick Guide, pens and pencils	Divide the club into groups and give each group a different pillar to evaluate: <ul style="list-style-type: none"><li>▪ Milk quality</li><li>▪ Food safety</li><li>▪ Animal Care</li><li>▪ Traceability</li><li>▪ Biosecurity</li></ul> As some sections have more needs than others, adjust group size, or proportion of the evaluation to complete Have each group talk about what they had to look at and where they could find the information
<b>Reflect</b>		Members will get an understanding of what is required by the proAction program
<b>Apply</b>	Prompting questions	Why are programs like proAction important? What do you feel is the most important module?  How do regulations like proAction affect management decisions?



### Activity #3 - Showing Our Quality

<b>Do</b>	Time: 30 - 40 minutes  Materials: craft supplies, poster board	Divide the club into groups and give each group a different pillar to promote: <ul style="list-style-type: none"><li>▪ Milk quality</li><li>▪ Food safety</li><li>▪ Animal Care</li><li>▪ Traceability</li><li>▪ Biosecurity</li></ul> Each group should create an awareness poster aimed at producers of why the Canadian dairy industry is one of the best of the world. Base your poster after the pillar assigned.
<b>Reflect</b>		Members will get an understanding of what is required by the proAction program. Members will also learn to promote the Canadian dairy industry in a positive way
<b>Apply</b>	Prompting questions	Why is it important to show consumers that farms have to follow proAction? What are some different ways you can promote the Canadian dairy industry?



## Meeting 4 - The Supply Management System for Milk Production

### Setting Objectives:

To gain an appreciation for Canada's supply management system for milk production and the role milk boards play within this system. To gain an understanding of international trade agreement and their effect on the Canadian dairy industry.

### Suggested Learning Outcomes:

- Learn about the importance of milk boards and what they do.
- Learn how Canada's supply management system works and how quota is distributed.
- Look at the international trade agreements Canada has reached with other countries.

### Suggested Roll Call Questions:

- What do you think provincial milk boards do?
- Why do you like, or dislike, the supply management system?
- What are some different ways of expanding your dairy farm?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Provincial milk board rolls and importance</li><li>• Supply Management/Quota System</li><li>• Buying quota</li><li>• International trade agreements</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Provincial Milk Boards

Similar to how Canada has a national milk board, each province has a provincial milk board as well. Dairy Farmers of Ontario has its own regulations that Ontario dairy farmers need to comply with. This typically comes in the form of farm access: are roads clear and wide enough for milk trucks to make it to the barn safely?

Fluid milk production is also regulated by the provincial board, working within National guidelines.

Some milk boards work together to create common rules and guidelines. Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island all belong to a regional pool called P5 to share things like promotional costs and transportation cost.

## Dairy Farmers of Ontario

DFO has the authority to administer quota under the Milk Act. This also means that they can adjust provincial quota based on Ontario's supply and demand needs.

DFO also provides the proAction validators for the province. This ensures that all Canadian producers are producing Grade A quality milk. DFO sells milk to processing facilities to create all our delicious dairy product. It also works at promoting milk and educating consumers on the benefits of milk and the quality of Canadian milk.

DFO creates and maintains the rules and regulations for:

- Quota Policies
  - Administering
  - Quota and production requirements
  - Payment for milk
  - Buying and selling quota
  - Quota exchange
  - New entrance requirements
- Raw Milk Quality
  - Penalty and quality recognition
  - Inspection
- Milk transport
  - General information
  - Maintenance of farm yards, lanes and entrances

For more information on provincial regulations, visit the DFO website at [milk.org](http://milk.org)

## Quota System

Canada is unique as it is one of the only countries in the world that has a quota/supply management system for dairy cattle. The quota system works on supply and demand, limiting production to ensure that all Canadian Dairy producers receive a fair price for milk. This allows the dairy industry to sustain itself without the need of government subsidies.

### Find Out!

Who is the proAction validator in your area?

### Research It and Share It!

When did Canada first implement the Quota System for the dairy industry? What did it look like and why was it implemented? Be prepared to share your findings.

There are three pillars that make up the foundation of the Canadian Supply Management System:

1. Production Planning
2. Producer price setting
3. Import controls

There are many positive things that come out of having a supply-managed system.

For producers:

- They receive a fair price for milk which is enough to cover the costs on an average dairy farm
- They don't rely on government subsidies
- Transport cost of milk is minimized
- Ensures a stable income for producers
- Allows for smaller farms to remain profitable

For processors:

- They know exactly how much milk will be arriving daily
- Milk is tested before arrival and therefore quality is high
- Low risk

For consumers:

- Canadian milk is available all year
- Stabilizes milk prices – limiting swings in milk price.
- Consistent, high quality product

### Talk About It!

Are there any negatives about having a supply management system for the dairy industry in Canada? If so, what could be done to change the system to get rid of these negative factors.

## Buying Quota

There are three ways that milk producers can obtain quota:

1. From family members
2. From the sale of an existing operating dairy farm to a new farmer
3. From buying it on the Quota Exchange

### Check It Out!

What was the price of quota on the Quota Exchange last month? Has the price changed much within the last year? If it has, what factors have caused the change in price?

The Quota Exchange is the most common way to obtain quota. Farmers phone or go online to enter bids for quota. The exchange is a monthly process, so bids can be made during the last 10 days of any month. A computer program matches the amount of bids to the amount of quota being sold and establishes a price for the quota, based on the bids entered by both buyers and sellers. In Ontario, anyone who bids at or above that price, called the market clearing price, receives the quota they bid for. In Ontario, bidders pay the amount they bid for the quota, even if the market clearing price is less than their bid. This is called a “pay

what you bid” program. Funds collected through this program (in Ontario) are used to finance initiatives that will benefit all dairy producers. Alternatively, the money is re-distributed evenly to all quota holders in the province.

## Shipping Within Quota

Since 1997, quota has been issued to farmers on a daily basis and administered each month. Monthly production is compared to the monthly quota holdings of the farmer. A farmer’s daily quota is multiplied by the number of days in the month and when compared to the amount of milk shipped that month. This comparison establishes whether a producer is under or over quota.

Quota is calculated in kilograms of butterfat per day. Thus, farms strive to produce an amount of milk each day that meets their daily quota. This requires good management skills because the amount of milk and the butterfat in it are affected by nutrition, health, animal genetics, breed, weather, lactation number, stage of lactation and many other factors.

Since it is difficult to ship exactly the right number every month, milk producers can earn credits. Credits can be earned in the following ways:

1. Production Incentives – when milk supply is low in the province or country, producers are allocated days of quota credits so that they can produce more milk and help the overall milk supply meet its demand. Usually these credits are given in the fall and are called ‘Fall Production Incentives’; however, the milk regulatory agency may do this at any time based on market and/or production signals.
2. Under-Production Credits – producers can carry forward up to a set number of days (30 days in Ontario) of unused daily quota so that it can be used in another month. For example, if a producer ships less than their amount of quota one month, they are allowed to ship that same amount over their quota holdings in another month or over the course of several months.
3. Over-Production Credits – producers can borrow up to a set number of quota days (20 days in Ontario) in order to receive payment for milk produced over their quota holdings. Over- production credits are “paid back” when a producer ships volumes of milk under his/her quota. If a farmer exceeds the 20 days of over quota credits, he or she is ‘fined’ through a reduction on his or her monthly milk cheque for shipping the excess milk.

When milk is shipped, it first fills the monthly quota, then any incentives, then any under-production credits.

## The Milk Cheque

Dairy producers receive monthly milk cheques based on the quantity, composition, and quality of the milk they produce.

Profit on the dairy farm is the difference between the milk cheque and the cost of production. Operating a well-managed farm producing a lot of high quality, high component milk will result in the highest possible milk cheque. If production costs are also kept low, this will increase the amount of profit for the dairy farmer.

The payment for milk produced is based on a system called Multiple Component Pricing. Milk consists of 87% water - the farmer is not paid for this. Payment is made for the amounts of butterfat, protein, and other solids in the milk. The price of each of these components varies month to month, based on how much milk is being used and what products processors are using it for. Processors pay more for milk they are using for fluid milk than for some other dairy products; milk that is used for animal feed is even less expensive. Pricing is also dependent on market growth, long-term sustainability, increased efficiency and the number of other agricultural opportunities available.

The price schedules and quantities of milk sold for each purpose are factored in to result in the 'blend price' that producers receive for their milk. In June 2020, milk producers in Ontario were paid at the following rates:

Butterfat: \$10.64/kg  
Protein: \$7.82/kg  
Other Solids: \$1.42/kg

\* Dairy Farmers of Ontario: <https://www.milk.org/Corporate/Producers/PrdMilkPrices.aspx>

Just like any other pay cheque, the milk cheque is subject to deductions. Deductions are made for things like administration fees, marketing, research, milk transportation and promotion.

### Check It Out!

Take a look at the breakdown of your farm's milk cheque – look at each of the deductions for administration fees, marketing, research, milk transportation and promotion. How much money does this work out to per cow?

Deductions are also made when producers ship milk that does not meet high quality standards. It doesn't pay to cut corners when it comes to things like cleanliness, maintenance and repair!

## Solids- Not-Fat (SNF) to Butterfat Ratio (SNF:BF)

Breeding and encouraging animals to produce high protein milk has led to an excess of protein production compared to butterfat. To combat this and encourage more butterfat production in comparison to protein and other solids, DFO imposed a ratio cap of SNF:BF content in 2020 (originated in 2006). This also has an impact on the sale price of within-quota milk. The maximum SNF:BF ratio that Ontario producers can be paid for is 2.30 (formally 2.35). This means that the milk produced can contain 2.30kg of solids that are not fat for every kg of butterfat produced. This ratio cap can be changed as deemed appropriate by the Regulatory Agency.

## Milk Classes

All milk products can be broken down into classes. These separate the different types of products into groups, which can then be used to organize product and trade. The milk classes and examples of what falls in each class are as follows:

<b>Class 1</b>	1a) Milk and any components that are processed to produce milk or milk beverages for retail in food service	1b) Cream with a butterfat content of 5% or more for retail in food service  1c) Milk processed to make a new product that fits into class 1a or 1b
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<b>Class 2</b>	2a) Milk and any components used to produce all types of yogurt and yogurt based products (excluding frozen yogurt)	2b) Milk processed for: ice cream, frozen dairy, sour cream, milkshake mix, fudge, puddings, soup mix and Indian sweets
<b>Class 3</b>	3a) Milk and components that are processed into cheese, excluding those outlined in 3b, 3c or 3d	3b) Cheddar cheese, stirred cheese curd, cream cheese, creamy cheese bases or mixes, cheddar and cheddar-type cheeses sold fresh  3c) Asiago, feta, gouda, Havarti, parmesan, Canadian style munster, swiss cheese, all mozzarella except those in 3d, brick cheese, Colby, farmer cheese, jack cheese, paneer, monterey jack  3d) Mozzarella to be used on only fresh pizzas (conditions apply)
<b>Class 4</b>	4a) Milk and components used to make: butter and butter oils, all powders except those in class 7, all powders with over 4% butterfat and packaged for retail, liquid MPC and MPI made from whole milk or partly skimmed milk, concentrated milk, all products not elsewhere stated	4b) Milk and components that are processed to produce sweetened or unsweetened concentrated milk for retail  4c) Milk and components used to produce new dairy products for retail or service other than those in class 1c and are approved  4d) Milk and any components that are included in month-end inventories and accountable losses
<b>Class 5</b>	5a) Milk and components that are processed to produce cheese for further processing if the Canadian Dairy Commission has issued a permit under the Special Milk Class Permit Program	5b) Milk and components to produce dairy products, other than cheese, destined for further processing if the Canadian Dairy Commission has issued a permit under the Special Milk Class Permit Program  5c) Milk and components that are process to produce dairy products, for use in the confectionery sector, if the Canadian Dairy Commission has issued a permit under the Special Milk Class Permit Program  5d) Milk and any components that are processed to produce dairy products that are exported within the limits for subsidized exports set out in Canada's Schedule to the World Trade Organization's Agreement on Agriculture, if the Canadian Dairy Commission has issued a permit under the Special Milk Class Permit Program.

Source: Milk Act/Loi sur le lait R.R.O. 1990, REGULATION 753, GRADES, STANDARDS, DESIGNATIONS, CLASSES, PACKING AND MARKING International Trade Agreements



## CUSMA, TPP and CETA

The supply management system limits the amount of dairy products that are imported from other parts of the world. Agreements like CUMSA, TPP and CETA has given some countries limited access to our market before they are taxed.

**CUSMA** – Canada United States Mexico Agreement, replaced the NAFTA (North American Free Trade Agreement) in November of 2018. This agreement gave these countries new market access to certain dairy products (amongst other food products) before tariffs are applied. This agreement also eliminated class 6 and class 7 of milk, allowing the US to export skim milk powder, milk powder, milk protein concentrates and baby formula to Canada.

**TPP** – Trans Pacific Partnership was introduced in December of 2018. This act gave up 3.25% of the Canadian dairy access to countries that are apart of the TPP.

**CETA** – Canada-EU Comprehensive Economic and Trade Agreement started in September of 2017. As a part of this agreement, Canada allowed for 17.7 million kilograms of cheese to enter the Canadian dairy market, tariff free.

### Discuss It!

Choose one of the current International trade agreements and discuss its effect on the Canadian dairy industry. Has it affected the amount of milk shipped from Canadian farms in the past year? Has it affected the price paid for milk? What is the effect on consumers? If possible, have someone from Dairy Farmers of Ontario speak at your meeting about how international trade agreements affect the entire dairy industry.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - DFO and Milk Marketing

<b>Do</b>	Time: 30 minutes	This discussion could be led by a volunteer or youth leader or a member of the local dairy producer committee. The following questions should be discussed: <ul style="list-style-type: none"><li>▪ What is the DFO (or your provincial equivalent)?</li><li>▪ When was it formed and why?</li><li>▪ How does it market milk in Ontario?</li><li>▪ Do other provinces or countries have similar systems?</li><li>▪ How does DFO advertise milk and why?</li><li>▪ What have been some of the recent changes made to DFO policies?</li></ul>
<b>Reflect</b>		Members should discuss DFO (Dairy Farmers of Ontario) and its role in milk marketing to help understand the purpose of the organization. In other provinces, substitute with your provincial equivalent.
<b>Apply</b>	Prompting questions	Why is it important to know how your provincial milk commodity organization functions?  How do you contact your provincial organization if you have questions? Who should you talk to?

## Activity #2 - Guest Speakers

Have your local milk board representative come and talk to your club about:

- The responsibilities of the milk boards
- How the quota system works
- International trade agreements
- Securing the future for Canadian dairy farmers



## Meetings 5 and 6 - Marketing Milk and More

### Setting Objectives:

To gain an awareness of how milk is processed and marketed, the nutritional benefits of milk, by-products from cattle and niche markets within the dairy industry.

### Suggested Learning Outcomes:

- Learn about the health benefits of dairy and what makes it so good for our diet.
- Look at how milk is marketed and the different by-products that come from dairy.

### Suggested Roll Call Questions:

- What are some other products that will come from a dairy farm, other than milk?
- What are some of the vitamins and minerals in milk?
- Why is milk important to a healthy diet?
- What types of niche (specialty markets) markets do you think there are for dairy products?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Marketing milk</li><li>• What makes milk a good part of your diet</li><li>• By-products of dairy</li><li>• Niche Markets</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Marketing Canadian Milk

##### Management of Milk Marketing - Past & Present

In 1965, the Ontario Milk Marketing Board (OMMB) was formed. Prior to its formation, farmers and processors did not know if they would be able to sell and buy enough milk each day. Consumers never knew what milk products they could buy or what they would cost on a given day. Prices constantly fluctuated and were inconsistent from one geographical area to another. The OMMB fixed these problems by creating a quota system and based the price of milk on how much it cost the farmer to produce it.

In 1980 the quota exchange began as a way to transfer quota between producers and give it equity.

In 1995, the OMMB and Ontario's cream producers combined to form Dairy Farmers of Ontario (DFO). DFO manages the milk produced by Ontario dairy farmers. It ensures that the amount of milk produced by dairy

farmers is equal to the amount of milk processors require to make enough dairy products for producers to buy. This is called supply-management. DFO is governed by a Board of Directors that consists of elected dairy farmers from across the province.

The National Milk Marketing Plan is an agreement between federal and provincial agencies that determines the target amount of industrial milk to be produced by Canadian farmers and allocates provincial market sharing quota (MSQ). The Canadian Dairy Marketing Regulations Act and Canadian Dairy Commission Act are the federal legislations that the National Milk Marketing Plan falls under when working with the provinces.

## Encouraging Milk Consumption

DFO encourages people to drink milk by advertising and educating the public about the health benefits of drinking milk and by addressing consumer concerns and misconceptions. This is done through school education programs, as well as advertising in a number of media outlets.

Dairy Farmers of Canada's "Blue Cow Logo" is an easy sign to tell if a dairy product is Canadian. Though it is not required to have the Blue Cow logo, many dairy processors include the logo as a way to signal Canadian products to producers. Both DFC and DFO do a lot of marketing in encouraging consumers to look for the Blue Cow when buying dairy products.



### Take a Tour!

Visit a local grocery store and see how many products you can find with the Blue Cow logo.

### Research It!

Find out what a food company that produces a dairy product needs to do in order to be able to use the Blue Cow logo on their product.

## You Can be a Milk Marketer!

By choosing milk as part of your own healthy diet, and informing people you know about misconceptions surrounding milk, you can have a positive impact on milk sales.

When people hear the same positive messages about milk from dairy farmers they know, dieticians, doctors, educational programs and advertising, they are more likely to act on the messages by purchasing milk products than if they only heard the messages from one source. Promoting common themes throughout the agri-food sector is referred to as integrated marketing.

## From Cow to Carton

Even fluid milk has several 'stops' to make between the farm gate and the grocery store. The most important step to remember is that of pasteurization. This is the process of heating and then immediately cooling the milk to kill bacteria. This process was developed in the 1860's by Louis Pasteur and since 1938, Ontario

legislation has required that milk be pasteurized prior to consumption. The Health Protection and Promotion Act makes it illegal to sell or give away raw milk.

**On the farm:** Milk travels from the cow through a pipeline into a bulk tank. The bulk tank is like a large refrigerator that keeps the milk cold and stirred until it is picked up by the milk truck driver.

**Milk pick up:** Every two days, a milk truck arrives to pick up the milk on the farm. A milk truck is like a bulk tank on wheels that can hold the milk picked up at many farms. It keeps the milk clean and cold on the way to the dairy. The milk truck driver (Bulk Tank Milk Grader) also takes a milk sample so that milk composition and quality can be tested.

**Processing plants:** Milk is processed into different milk products at the dairy. When it arrives, it is pumped from the milk truck into an even larger storage tank. The milk is tested for flavour, odour, milk fat and bacteria. The milk is pasteurized, homogenized and processed into ice cream, yogurt, cheese, etc.

**Ready to eat!** After processing, milk is packaged into containers which are stamped with a 'Best Before' date. The packages are then shipped to grocery stores. Milk cannot be sold by the grocery store after the 'Best Before' date, but if you have already purchased it, you should be able to keep it in your refrigerator for a few days longer than that.

## Processing milk in 3 steps

### Step 1: Pasteurization

This is the heating of milk to a high temperature and then quickly cooling it to eliminate bacteria. There are three methods:

1. High Temperature Short Time (HTST): milk is heated to 72°C for 16 seconds then cooled to 4°C
2. Batch-Holding Method: milk is agitated and heated to 62°C and held there for 30 minutes before cooling to 4°C
3. Ultra High Temperature (UHT): milk is heated to 138°C-158°C for one or two seconds and then cooled. Unopened products made this way will keep for months without refrigeration.

### Step 2: Homogenization

Milk from the bulk tank is a heterogeneous mixture. If it sits without stirring the cream will separate and rise to the top. To keep this from happening with milk in the store, it is homogenized. A homogenizer forces milk through tiny holes, breaking up the fat globules (cream). When the fat particles are smaller, they stay mixed evenly in the milk instead of rising to the top.

Fat is also removed from the milk at the dairy and put back in at different levels to make different fluid milk options available to the consumer (i.e. 1%, 2%, whole or skim). Skim milk has almost all of the fat removed from it.

### Step 3: Vitamin Fortification

This means that vitamins are added to the milk. Vitamin D is added because it works closely with calcium to grow strong bones and teeth, and its addition to the milk helps your body absorb the calcium found in the milk. Vitamin A is also added to low fat milk products. It is a fat-soluble vitamin that is lost when fat is removed from the milk; thus, some must be added back in to get the benefits of Vitamin A, which helps improve eyesight in poor lighting and fights infection.

### Experience It!

Tour a milk processing plant. Take note to the various jobs within the plant from the time you enter the door until the tour is finished.

### Judge It!

Provide four different types of milk (e.g. whole, skimmed, 2%, 1%, buttermilk, half & half cream, 35% whipping cream). Create a list of criteria for milk to be judged by and then taste each of the four sample. Place the milk based on the criteria and be prepared to give reasons for the placings.

## Why Milk?

Milk contains 15 essential nutrients that our bodies need to thrive. Essential nutrients cannot be produced by the human body and therefore we need to consume them through our diet.

<b>Nutrient</b>	<b>What Your Body Needs It For...</b>
Calcium	Required for bone and tooth growth and strength. Helps with nerve impulses, hormone function, blood clotting and muscle contraction
Vitamin D	Enhances calcium and phosphorous utilization in the formation of healthy bones and teeth
Phosphorus	Aids in energy release and tissue formation
Vitamin A	Helps bone and tooth development. Promotes night vision. Maintains health of skin and membranes
Riboflavin (Vitamin B12)	Maintains healthy skin and eyes. Releases energy within cells.
Protein	Builds and repairs body tissue. Builds antibodies (fights infection).
Magnesium	Aids in the formation of strong bones and teeth. Needed for tissue formation and energy release within the cell
Carbohydrates (Mostly Lactose - sugar)	Supplies the body with energy
Vitamin B6	Assists in the formation of red blood cells
Vitamin B12	Contributes to red blood cell formation
Available in smaller amounts	
Thiamin (Vitamin B1)	Role in production of energy in body cells. Aids in a normal growth and appetite
Folic Acid (Folacin)	Aids in formation of white and red blood cells
Zinc	Aids in energy release and tissue formation
Niacin (Vitamin B3)	Helps with normal growth and development. Maintains nervous system and gastrointestinal tract
Pantothenate	Involved in the release of energy from carbohydrates as well as the breakdown of fat



## Experience It!

Invite a nutritionist to speak at your meeting about the nutritional benefits of milk and milk products. Find out what education the nutritionist received in order to work in the field of human nutrition.

## Marketing More than Milk

On the vast majority of farms, milk is the primary income for the dairy farm, however dairy farms can also get income from the sale of animals, depending on the market.

Most farms have too many replacement animals and need to sell the animals they don't want in their herd. Typically, animals can fit into one of four categories if being sold:

1. Breeding stock (live animals and embryos)
2. Cull Cows
3. Bulls/semen
4. Bull calves

**Breeding Stock** - Canadian cattle are known as some of the best in the world. Due to this, Canadian genetics is sought after all over the world. To increase the value of your cattle if wanting to sell genetics:

- Register your cattle - this guarantees the animal's age and pedigree
- Complete supervised milk tests (official milk recording)
- Be a part of the Classification program
- Market your animals and be involved with the industry

**Cull Cows and Bulls** - typically sold for beef when older. Young heifers can be sold to other dairy farms who need replacements and bull calves are typically destined for beef via the veal market or are raised as steers to a finishing weight of 725 kg.

## By-Products

Most cull cows and bulls go for meat. There are other products besides meat that come from cattle. Products made from cattle can be found in many different parts of your life, such as:

- Medicine and health
- Food
  - Gelatin
  - Marshmallows
  - Gum
- Household and personal items
  - Clothing
  - Pet food
  - Paint brushes
  - ...And lots more

- Mechanical and chemical items
  - Brake fluid
  - Sand-paper

### Look It Up!

There are many, many products that come from cattle besides meat. Find at least 10 more products that aren't listed in this meeting. Compare your list with others in your group and create a comprehensive master list of animal by-products.

## Niche Markets and Organic Dairy Production

As a way to meet consumer demands there have been several niche markets come into the dairy industry over the past several years. Organic dairy production has been around for a long time however, it is greatly increasing as consumer demand increases.

As most niche and organic markets can be more expensive to produce, farmers typically get a premium for that milk.

### A2A2 Milk

A2A2 milk is relatively new in the Canadian market. As all milk is pooled at major processors (meaning that A1 and A2 milk are mixed), all A2A2 products will be made at a private facility. A2A2 milk is thought to be easier to digest as it contains two A2 beta caseins as opposed to milk that contains A1 beta caseins. There is still a lot of research to be done on the benefits of A2A2 milk, however countries like Australia, New Zealand and the USA all sell A2A2 milk at most grocery stores for a premium.

### Research It!

Is there a private facility in your area that only processes A2A2 milk? If so, what type of premium do they pay for A2A2 milk? If not, where is the closest facility to where you live that would process this type of milk?

## Organic Milk Production

Organic milk production has been increasing in popularity for many years. Organic dairy production has additional regulations it needs to follow to comply with the Organic standards. Farmers that produce organic milk are paid a premium. Organic milk contains the same essential nutrients and is subjected to the same quality tests that conventional milk is subjected to.

Cows in an organic facility are fed organic feed, are not given antibiotics (and if they are given antibiotics

to save their life, the cow is sold to conventional dairy farm) and have some restrictions on which drugs they can receive. In Canada, as of 2020, there are 246 organic dairy producers, that collectively produce 1,306,870 hectoliters of milk per year (2018 statistics). Ontario has 82 organic producers which produce 340,849 hectoliters of milk per year.

### **Experience It!**

Visit an organic dairy farm. Find out what they do differently that makes them an organic farm and find out why they chose to produce organic milk.

### **Do It!**

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Milk Nutrient Comparison

<b>Do</b>	Time: 10 minutes Materials: empty pop, juice and milk containers	Using the chart below, have members compare the nutrients found in milk, pop and juice.
<b>Reflect</b>		To compare the nutrients in various beverages
<b>Apply</b>	Prompting questions	Which beverage is more nutritious?  Which do members prefer to drink?  Did the members look at serving sizes? If both beverages had the same serving size, how would they compare?

	<b>Milk</b>	<b>Pop</b>	<b>Juice</b>
<b>Calories</b>			
<b>Protein</b>			
<b>Carbohydrates</b>			
<b>Fat</b>			
<b>Sodium</b>			

## Activity #2 - Taste Testing

<b>Do</b>	Time: 10 - 20 minutes Materials: various dairy products, "dairy substitutes", cups and paper & pen	Conduct blind taste tests of the products. Can the members tell what the product is?
<b>Reflect</b>		To taste the differences between different types of milk products (i.e. varying fat percentages) and/or products that are and are not made from milk (i.e. real versus imitation mozzarella cheese)
<b>Apply</b>	Prompting questions	Which tastes better, real or imitation cheese? Higher or lower fat milk?

### Activity #3 - Niche Markets

<b>Do</b>	Time: 30 minutes Materials: Niche Markets worksheet (found below) cups and paper & pen	Visit a dairy farm that is not a conventional dairy farm. This could include: organic, A2A2 or a farm with an on farm processing facility. Ask the producers the questions on the Niche Markets worksheet.
<b>Reflect</b>		To gain an appreciation for various types of dairy farms.
<b>Apply</b>	Prompting questions	Did any of the producer's answers surprise you?  Would you consider changing your farm to any of these types of unconventional dairy farms?

## Niche Markets Worksheet

Visit a dairy farm that is not a conventional dairy farm. This could include: organic, A2A2 or a farm with an on farm processing facility. Ask the producers questions to find out the information below:

How long they have been selling to a niche market?	
Why do they sell to a niche market?	
Are there additional requirements they must meet?	
Are there any additional things they need to do at chore time?	
What are some of the challenges they face selling to a niche market?	







Section 6 **Business**





## Meetings 1 and 2 - Record Keeping on a Dairy Farm

### Setting Objectives:

To appreciate why good record keeping is imperative for a farm's success.

### Suggested Learning Outcomes:

- Learn about the importance of record keeping on a dairy farm.
- Explore voluntary breed improvement services like milk recording and classification.

### Suggested Roll Call Questions:

- What breed improvement services do you use on your farm?
- How does your farm keep records?
- What type of records do you think farmers should keep on a dairy farm? Why are they important?

### SAMPLE MEETING AGENDA

Time: 1 hour, 30 minutes plus activities

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Basic record keeping</li><li>• Lactation curves</li><li>• Milk recording services</li><li>• Classification</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Record Keeping on a Dairy Farm

Recording keep is a very important part of dairy farming. Not only is it better for management (can you imagine trying to remember everything?), it is a part of the proAction program. Producers can then use these records to make management decisions. Most animal records are kept in an on-farm management computer software like DairyComp 305 or kept as hand-written records. There are many different software programs available, many of which can be connected to the robots or milking parlour.

#### Share It!

What type of records are kept on your farm? Do you have handwritten records or do you use a computer program? If using a computer program, which program do you use? Do you like this program?

**Health records** – include instances of when cows are sick, the cause and how the animal was treated. This is required to show the vaccinations that the animals were given as a part of proAction.

**Breeding records** – this includes calving date, heat dates, breeding dates, how many times she was bred and the sire information. This can give the producer an idea if the animal is reproductively sound. If she is not, it is likely that she will need to be culled.

**Calving records** – this helps the producer keep track of animals within their inventory and is required by proAction. Records should include parentage, date of birth and ear tag number. It should also be noted if the animal is a multiple birth or born stillborn.

**Milk production records** – this is an optional record provided by Lactanet or computer software like T4C or DelPro. For official milk records, Lactanet needs to collect the samples, or in the case of a robotic farm, needs to validate the milk meter within the robot. The amount of milk a cow gives can give insight into the health of the animal, the stage of lactation and your management program. Animals that have dramatically dropped in production either need to be dried off if at the end of the lactation or culled if having unsolvable health issues.

**Classification Records** – classification looks at the physical structure of the animal, comparing it to the ideal. This can give the producer an idea of what he/she needs to breed for to make a better next generation. Classification for all breeds is offered through Holstein Canada. Additional information on Classification can be found later in the manual.

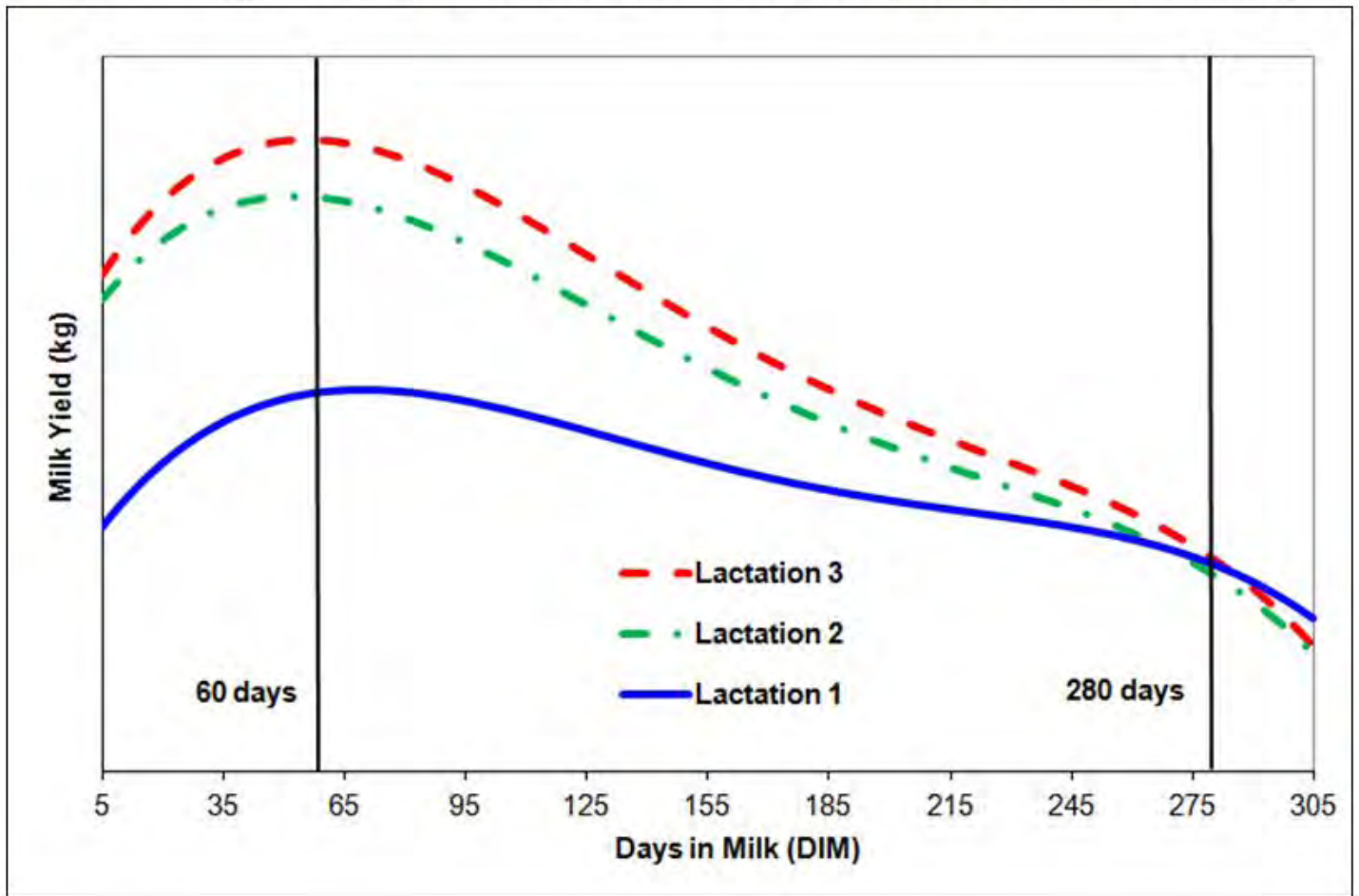
**Financial Records** – this is important for budgeting, income and expense records and keeping track of assets and liabilities. Financial records are required for any farm hoping to get a loan or government grant.

**Lactation Curves** – The cycle of a lactation

Similar to heifer growth charts, lactation curves monitor the milk production of a herd or animal throughout their lactations.

A typical lactation curve looks like the example below. Lactation curves are able to show farmers when an animal is in peak lactation (typically 30 to 60 DIM). It is the goal of dairy farmers to maintain this peak as long as possible, before the milk production drops as she reaches later in her lactation. Once a cow has been bred and is pregnant you will see a drastic drop in milk production, as the cow is putting energy into creating a new calf, not just producing milk.

**Figure 1: Typical Holstein Lactation Curves and Measure of Lactation Persistency**



A lactation curve will vary based on several factors including: genetics, nutrition, reproduction status, health and general farm management. If a farm differs from a typical lactation curve, it is a sign that something in the management may need to change in order to maximize milk production.

### Do It!

For one of the cows in your herd, measure her milk yield each day for an entire lactation. Plot her yield, using a computer program of your choice, to see how she compares to the typical lactation curve found in this Reference Manual.

## Milk Recording

Milk recording through Lactanet is a popular way to keep production records of your herd. A Lactanet representative will come to your farm every 5 to 8 weeks, take samples and record the amount of milk each milking cow gives. Many producers also have Lactanet register their animals with Holstein Canada and digitize records found in a Lactanet Log Book. Some farms collect their own samples and give them to the Lactanet representative to take to the lab.

Milk samples are then sent to the lab and can be tested for a variety of things such as: components, SCC, pregnancy, ketosis, etc.

Many robot and parlours offer milk recording services, however unless the milk meters in the robot or in the parlour are calibrated on a yearly basis, the milk tests will be for management only and will not count as official records.

For more information on milk recording, contact:

Lactanet

1 800 549 4373

info@canwestdhi.com

www.lactanet.ca

### Experience It!

Invite the Lactanet representative for your area to a meeting. Find out what their job looks like and what training they have.

One of the features/reports that Lactanet provides is benchmarking, against your own herd and against the national herd. They provide information like milk values, udder health and reproduction statistics.

There are several reports available to producers which look at the herd.

Herd Summary & Monitor Reports are broken into 6 different sections:

- 1. Stage of lactation** – broken down by stage of lactation. Typically also includes daily fat and protein yield, as well as other options
- 2. Lactation Group Profile** – BCA's, milk volume projection and estimated milk values are given by lactation group
- 3. Standard milk graph** – is adjusted to the cow's 2nd lactation at 150 DIM with component tests of 4.0% fat and 3.3% protein. This standardizes the herd to show progress of the herd without the bias of changing DIM and number of first lactation animals
- 4. Lactation Ratings** – provided for milk, fat and protein and indicates the accuracy of the records.
- 5. Production Averages** – shows the current, rolling and actual herd BCA's. The current data is based on test day information. The rolling herd average is based on a rolling 12-month history of herd production and is broken down by breed. Annual averages are historical records of the past 12 months of production
- 6. Test Day Summary** – actual test day production numbers and projected BCA's based on production to date in the current lactation.

Herd monitor reports also enable you to compare your herd to the DHI benchmarks and enter farm goals. Management trends for production levels, somatic cell count, Milk Urea Nitrogen (MUN) test levels, herd age, age at first calving, milk value, days open, and linear score can also be calculated.

**Hotsheet Report** – Warns farmers of low milk, fat or protein production, abnormal protein:fat ratios or high somatic cell counts

**Cow Summary/Monitor Reports** – these reports show information similar to that in the herd summaries, but information is given on an individual cow basis. The charts show test day milk, fat and protein production data, cow production to date, projected production and BCA's, days in milk, lactation number, age at calving, and other management information.

**Cow Income Monitor Reports** – shows the economic impact of each individual cow's performance

**Milk Urea Nitrogen Test Reports** – MUN test reports indicate the amount of undigested protein found in the milk. Protein is broken down in the rumen and if it is out of balance with dietary energy, the MUN test will be elevated. This report can help you and your nutritionist with ration balancing.



**Somatic Cell Counts** – somatic cells are white blood cells produced by the cow's immune system. It is used to identify cows likely to have mastitis. Cows should be checked if they have SCCs above 200,000. Linear scores for SCC are good indicators of udder health for the entire herd.

**Certificates of Production and Cow Profiles** – when animals have completed their records, these reports are generated to show individual cow production levels, BCA's, lactation curves, and the animal's deviation from other animals in the herd.

### **An Important Part of Production Records – BCA's**

BCAs (Breed Class Averages) were first developed in the 1950's to compare the productivity of cows of different breeds and ages. A BCA is a comparison of a cow's production to other animals of her breed and age. BCA's are created for milk, fat and protein. They are compared to standards that indicate the average yield for a cow that is a particular breed, age and month of calving.

Individual animals are compared to herd averages to get their deviations from the herd average. This data can be very useful. For instance, if a herd has low production yields and an individual cow has average production for the breed, but has high positive deviations from herd average milk, fat, and protein, she is probably a good cow that would do well on another farm that would achieve higher production levels.

### **Classification**

Classification is when an independent and objective classifier from Holstein Canada visits your farm to assess the conformation of individual animals. This is an optional form of record keeping for farmers but it is one that can have many benefits. The most profitable cows are ones that have functional type traits that permit adequate milk production and allow them to remain in the herd for a long time.

Classifying helps farmers determine which cows are the best ones to keep in their herd and which cows will best meet their goals. Conformation is one basis of high production. Cows that have desirable physical traits eat more roughage, transmit desirable characteristics to their offspring, and improve their production levels as they get older.

#### **Experience It!**

Invite a classifier from Holstein Canada to your meeting. If possible, have your meeting at a dairy barn so the classifier can discuss traits of various cows in the barn. Find out what background the classifier has and what training they received before becoming a classifier.

Classification can be a useful management tool in several ways:

- breeding and raising the type of animals you want to work with
- providing information to make profitable decisions
- providing information to help improve your herd through corrective breeding

There are other benefits to this service as well. Artificial insemination units often provide financial incentives

to help herds classify because it helps their bulls obtain proofs by providing more daughter information. Cows and heifers from classified families have higher Lifetime Profit Indexes (LPI's), Pro\$ and Estimated Breeding Values (EBV's) than unclassified ones. Semen companies also provide computer generated genetic matings for classified herds. In addition, animals that are classified have higher resale values than those that are not classified. Cows that are classified higher tend to produce more milk and be more profitable than cows with lower classifications.

Animals of each dairy breed are evaluated compared to their breed scorecards, which have been developed based on the True Type Model. The classifier looks at the breakdown of four major composite traits: mammary system, feet and legs, rump, and dairy strength. While the same 25 traits are assessed for each breed, different goals, strengths and weaknesses of the breeds have led their classification committees to create slightly different scorecards. Each trait is assessed based on a linear system, rated 1-9 based on measurements and visual assessments.

Each breed re-evaluates the ideals and the traits annually. As the breed progresses, weightings of traits will change, new traits will be added and ideals will adjust. Adjustments are typically made in June of each year. Each breed determines what adjustments will be made, therefore not every score card will change equally.

Cows are scored out of 100%. Their point value determines what "class" they are in. Many producers are moving away from the class and are focusing more on points as the difference between classes is 1 point!

### **90+ Points - Excellent (EX)**

In Canada a cow can only reach a score of 90 or more in her third lactation. Once a cow is classified at 90 points, she will achieve multiple excellence during other lactations. She can only gain one excellence per lactation. This would be signified like: EX 90 - 2E.

### **85-89 Points - Very Good**

The highest score a fresh heifer can score is VG-87 and requires a revisit. In her second lactation the highest score a cow can get is VG-89

### **80-84 Points - Good Plus**

### **70-79 Points - Good**

### **Below 70 Points - Fair**

#### **Try It Out!**

Try your hand at classifying cattle. Choose four cattle from a herd that has been recently viewed by a classifier. Without looking at the cow's records, assess a score for each cow and then see how close your scoring is to the score the classifier assigned to the cow.

#### **Do It!**

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - Learning about Lactation Curves

<b>Do</b>	Time: 15 - 20 minute  Materials: example of a cow's production data and production charts from DHI. Pencil/pen	Using a cow from a DHI Cow Summary Report, ask members to complete charts of milk and component production.
<b>Reflect</b>		Members will gain a better understanding of what a lactation curve is, why it is shaped the way it is, and where the data comes from to create it.
<b>Apply</b>	Prompting questions	After how many days in milk did the cow reach peak milk production?  Did the cow have a persistent lactation curve? In what months were her fat and protein percentages the lowest? The highest?  How could you feed the cow differently to alter her production numbers in a future lactation?

## Activity #2 - Types of Records on the Farm

<b>Do</b>	Time: 20 minutes  Materials: a variety of records, DHI reports, ear tags, breeding records or a breeding wheel, health records, etc.	Hand out different types of records a farm would keep (milk records, classification, financial, medical, breeding, etc.)  Every group should answer: <ul style="list-style-type: none"><li>▪ what is the record they have</li><li>▪ how is it used</li><li>▪ why is it important</li></ul> Have each group highlight the features of their report to the club
<b>Reflect</b>		A session of show and tell that helps members become familiar with the different types of records that farmers keep
<b>Apply</b>	Prompting questions	Why are there so many different types of records for a farmer to use?  Have you ever used a record to make a decision? What was the record and what kind of decision did you make?

## Activity #3 - Reading DHI Reports

<h1>Do</h1>	<p>Time: 15 minutes</p> <p>Materials: paper and pencils, sample DHI milk test report</p>	<p>Give each group a sample of a DHI report. Using the report have them answer:</p> <ul style="list-style-type: none"> <li>▪ The top three producers based on Milk kg under Test Day information</li> <li>▪ The top three producers based on Deviation from Current BCA under Lactation BCA</li> <li>▪ The top three producers based on Projected or Actual BCA under Lactation BCA</li> <li>▪ Which cow had the highest percentage of fat in her milk on test day?</li> <li>▪ Which cow had the lowest percentage of protein on test day?</li> <li>▪ Which cows have had the most calves?</li> <li>▪ Why would a cow not have any projected BCA information?</li> <li>▪ Why has an animal been flagged for questionable production?</li> <li>▪ Who has been in milk the longest (most DIM)?</li> <li>▪ Which cow might you want to test for mastitis based on her Somatic Cell Count?</li> </ul>
<h1>Reflect</h1>		<p>For members to understand how to read a DHI report.</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>Explain that knowing how to read a DHI report provides information that you can use to improve many different aspects of your farm's management, from feeding to genetic improvement. Discuss answers to questions</p>

## Activity #4 - Become a Classifier

<b>Do</b>	Time: 20 - 30 minutes  Materials: Score card (breed dependent), Holstein Canada Classification poster, Actual classification results, pen/pencil	Look at the breed score card and the classification poster/trait breakdowns ( <a href="https://www.holstein.ca/Public/en/Services/Classification/Breakdown_of_Traits">https://www.holstein.ca/Public/en/Services/Classification/Breakdown_of_Traits</a> )  Do your best walking through the traits and classifying a cow in the barn. Once you are done, compare your results to the latest classification results for that animal.
<b>Reflect</b>		Learn about the classification program and how classifications are done
<b>Apply</b>	Prompting questions	Why is classification important?  How can an animal's physical structure affect her daily life?







## Meetings 3 and 4 - Managing the Money and People on Your Farm

### Setting Objectives:

To appreciate the importance of making sound financial decisions for a dairy farm.

### Suggested Learning Outcomes:

- Learn about the importance of finances on a dairy farm.
- Learn how to build budgets, make financial statements and how to use financials to make decisions on the farm.

### Suggested Roll Call Questions:

- What are some important pieces of financial information farmers should keep track of?
- Who can a farmer call if they are wanting help planning for the future?
- What are examples of things a farmer may have to budget for?

### SAMPLE MEETING AGENDA

**Time: 1 hours, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Importance of Financials</li><li>• Types of statements</li><li>• Loans and grants</li><li>• Making financial decisions on the farm</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Financial Management - Managing the Money and People on Your Farm

Operating a farm is like operating any other business. It involves managing money, staff, keeping track of daily operations as well as looking ahead to the future.

#### Budget Your Money

A budget is a plan. Farmers create budgets to plan how much they will have to spend on feed costs, veterinary bills, housing, equipment, etc. Comparing expenditures to budgeted amounts allows farmers to keep track of their spending throughout the year.

#### Experience It!

Invite an accountant that specializes or is familiar with accounting for farm businesses to discuss proper book-keeping for farms. Find out why the accountant chose the career they have and what their day-to-day job looks like.

## Financial Statements

Financial statements include a balance sheet and an income statement, among other things. A balance sheet shows the 2 “O’s” – what is owed and what is owned – at a particular point in time. Money and other items owned are listed as assets, while debts are listed as liabilities.

### The Farm Income Statement: Income vs Expenses

Part of the reason for operating any business is to make money. Money made that is not used to offset an expense is referred to as net income. Gross income is the total amount of revenue earned by the farm.

$$\text{Gross Income} - \text{Expenses} = \text{Net Income}$$

Farm Income Statements can be used to develop monthly budgets. They focus on everything that earns money (revenue) and that money is spent on (expenses). Expenses do not include purchases that will last longer than one year such as tractors, buildings, land, tile drainage, etc. Those items are assets that you will have in the future.

The net income is what the farmer uses to pay him or herself. In order to have money to live your daily life, save for the future, or have some extra money left over, the gross income must exceed expenses. It is recommended on farms that your expenses should not exceed 75% of your gross income. Thus, for every \$1.00 the farm earns, you should have \$0.25 left over after expenses. When expenses are lower, farmers have more money available to them. When expenses exceed the gross revenue, the farm is not making enough money to pay the bills.

In order to supplement income some farm families have a person with another job outside of the farm. Many times in this case, money made by the farm goes back into the farm, and the family lives off of the off-farm pay cheque.

#### Check It Out!

For samples on how to create income statements and other important financial documents, OMAFRA has a great online calculator (Ontario Farm Accounting Workbook) available on their website: <http://www.omafra.gov.on.ca/english/busdev/downtown.htm>

## Debt & Loans

When money is borrowed from a bank, a person, or another lending institution, the arrangement for money borrowed is called a loan, which is a type of debt. Loans can be short term or long term. Most farms have both types of loans. A mortgage on a farm is spread over many years and is referred to as a long-term loan. In contrast, a loan that a farmer gets to help pay to plant his or her crop is a short-term loan because it will be repaid in a few months when the crop is sold.

On a dairy farm, experts recommend that total debt should not be more than \$1.00 per litre of milk shipped. Farmers shipping 500,000 litres of milk per year should not have a debt exceeding \$500,000.

### Check It Out!

What is the current cost of farms in your area (dollars/ acres)? What is the mortgage rate currently at?

When seeking a loan, you must have all of your financial paperwork in order. You will need current and past financial statements, a business plan, proof of loan security and a good credit history. Remember that discussions with your banker are subject to negotiation. Pricing interest rates and terms with other banks and credit unions may help as well. Their first offer isn't necessarily their best offer!

### Experience It!

Invite an agricultural bank account manager to your meeting to discuss what they look for from farmers that are seeking a loan. Find out why the agricultural bank account manager chose the career they have and what their day-to-day job looks like.

## Savings

The most financially successful people save at least 10% of their income. For every dollar earned, \$0.10 would go in the bank. The rest would then be used to pay bills and other expenses.

## Year End Procedures

After the farm's fiscal year has ended, you should evaluate if you met your goals. This will help you plan for the next year. Most farmers have their finances reviewed by an accountant at the end of the year.

### Share It!

Does your farm have their finances reviewed by an accountant? If not, who reviews the farm's finances?

### Discuss It!

Does it pay to have finances reviewed by an accountant?

## Insurance

All farms should pay into insurance. What if a drought damaged all of your crops? What if you lost your barn in a fire?

Without insurance it would cost so much to rebuild a facility or recover from a loss that it would be hard for most people to continue farming. Purchasing insurance provides peace of mind and should ensure that if something happens to your farm or animals you will receive compensation to fix it. You need to figure out how much and what types of insurance you need. This is one area where it is important to ask experts, such as insurance brokers, for advice. Liability insurance for farm employees is another type of insurance that can prove very useful, if a farm worker is injured on the job.

### Experience It!

Invite an insurance broker to the meeting to discuss the different types of insurance available and what the insurance policies look like. Find out why the insurance broker chose the career they have and what their day-to-day job looks like.

## Management Decisions on the Farm

Your financial statements can be used like tools to help you make management decisions on your farm. There are two ways to make money in any business:

1. Increase revenues
2. Cut expenses

Often, increasing revenues is done by expanding your barn (or building a new one) and purchasing more cows and quota. There are many factors to consider in determining if this will be a profitable decision.

If you were thinking of expanding your milking herd from 80 cows to 180 cows there are some things you would need to know. Some of the questions you should research are:

- How much quota will you need to buy and at what price?
- How long will it take me to expand (at what rate can I afford to expand)?
- What is your projected income?
- How much will more cows and building material cost?
- Do you need to build a new facility or can you adapt an existing barn?
- Do you require more feed storage facilities?
- Do you require more machinery and equipment?
- Do you have enough land to support more cows?
- Do you have enough time to manage the increased workload, and if not, are good employees available?
- What will the cash flow be after paying taxes?
- How risky is your investment? Are you willing to accept the risk of the project failing and losing a lot of money?

### Let's Figure It Out!

Answer the above questions if you were to double the number of cows that are currently being milked on your farm. Be prepared to share your answers. Are there any other questions you would need to answer before deciding to go ahead and expand?

## Incorporated vs Not Incorporated Farm Business

A **corporation** is a registered business and is a legal entity. All of the assets of the business (barns, equipment, land) are owned by the business. People, family members and other partners, own shares of the business. The main benefit of a corporation is limited liability. This protects the shareholders from liability. An example of this is if the business got sued, the only things at risk are property of the business not personal assets.

**Sole proprietary or personal business** is an unincorporated business and for all tax purposes it is considered "personal income". You personally own the company assets. For smaller businesses this is a simpler business model and can have lower tax rates than a corporation (depending on income level). In this model all of the business is run under personal taxes.

There are pros and cons to each business model. To determine what model is best for you, work with your farm advisor team.

### Debate It!

Is it better for a large dairy farm to be incorporated or unincorporated? Be prepared to defend your answer of choice.

## Activity #1 - Learning to Budget

<b>Do</b>	Time: 60 minutes  Materials: paper and pencil	<ul style="list-style-type: none"><li>• Start out by asking members what they think a budget is and why it's important. Introduce the concepts of saving, income and expenses. Ask members what they think each of these terms mean.</li><li>• Ask members to create a budget for themselves. First, they must decide what they are budgeting for; for example, to buy a calf, to rent a video game, to buy a book. Then have them list all of their "Income" and "Expenses." For example, "income" may be an allowance, or money they get from doing odd jobs. "Expenses" may include school snacks or gifts. From this list, they can decide how much to budget for savings and for the "goal" they've decided to budget for.</li><li>• Now, as a group, get the members to create a budget for raising a 4-H calf. First, brainstorm with the group all of the costs a calf will incur; for example, cost of purchase, feed, vet bills, housing, equipment such as halters and feeding utensils, labour and so on. Work through how to figure out these costs with the members. The feed cost is fairly straightforward to figure out, while the housing cost may not be.</li></ul>
<b>Reflect</b>		To teach the members the importance of budgeting and how to create a budget for themselves
<b>Apply</b>	Prompting questions	Why is having a budget important?  How does having a budget help you achieve goals?  What are the reasons people create a budget?

## Activity #2 - Managing Finances

<h1>Do</h1>	<p>Time: 60 minutes</p> <p>Materials: chart paper and markers, paper and pens, copies of factsheet containing the Balance Sheet and Farm Income Statement examples (found on the following pages)</p>	<ul style="list-style-type: none"> <li>▪ First, have members brainstorm the things they think belong in a Financial Statement. Have a volunteer record these ideas on the chart paper. After the group is done brainstorming, try to put their ideas into categories, such as assets and liabilities, income and expenses.</li> <li>▪ Make sure members have the examples of the financial statements. From these examples, they can create their own financial statements. They could be based on their current situation or a future situation, such as when they're in university or college.</li> <li>▪ Once members have completed analyzing their financial situations, get them to find areas they can improve. For example, are they spending 50% of their income on clothes, and saving almost nothing? What's wrong with this?</li> <li>▪ Now, members can put their financial knowledge to use by trying to convince a banker to loan them some money for a specific item such as a car, a bike, tuition, or a trip. They have to provide valid reasons, based on their finances, why they would make a good loan candidate.</li> <li>▪ You can split up the members in pairs to carry out this activity, each of them taking turns playing the banker and the customer. The banker has to give valid reasons for accepting or turning down the loan application, and the customer has to give valid reasons for being a good loan candidate, as well as trying to get the best possible loan deal from the banker.</li> </ul>
<h1>Reflect</h1>		<p>Members will learn advanced concepts of managing, such as developing financial statements</p>
<h1>Apply</h1>	<p>Prompting questions</p>	<p>How do financial statements and income statements help you manage your money?</p> <p>Why is being able to manage money important?</p> <p>What can you achieve by being a good money manager?</p>

**TABLE 2 FARM BALANCE SHEET;  
DECEMBER 31, 2019.**

NUMBER OF FARMS	Bottom 15	Middle 38	Top 15	All 68
<b>A. WITH ASSETS AT MARKET VALUE</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
Machinery and Equipment	444,697	746,434	812,609	694,472
Personal Equipment	5,200	6,368	459	4,807
Land and Farm Buildings	4,418,907	4,293,085	7,666,339	5,064,940
Farm House & Personal Structures	355,802	243,128	169,218	251,679
Dairy Cows	104,283	143,555	282,310	165,500
Dairy Heifers	55,703	83,263	155,088	93,027
Other Livestock	277	2,963	14,467	4,908
Feed, Crops, Supplies, Inventory	75,669	127,422	181,115	127,850
Milk Quota	1,352,528	2,001,309	3,920,112	2,281,461
<b>Total Assets</b>	<b>6,813,066</b>	<b>7,647,527</b>	<b>13,201,717</b>	<b>8,688,644</b>
<b>B. WITH FIXED ASSETS AT COST LESS DEPRECIATION<sup>1</sup></b>				
Machinery and Equipment	328,001	440,821	526,673	434,872
Personal Equipment	5,710	8,816	879	6,380
Land and Farm Buildings	1,947,890	1,705,681	2,971,013	2,038,227
Farm House & Personal Structures	206,569	150,433	117,448	155,540
Dairy Cows	104,283	143,555	282,310	165,500
Dairy Heifers	55,703	83,263	155,088	93,027
Other Livestock	277	2,963	14,467	4,908
Feed, Crops, Supplies, Inventory	75,669	127,422	181,115	127,850
Milk Quota	228,056	821,184	1,727,980	890,375
<b>Total Assets</b>	<b>2,952,158</b>	<b>3,484,138</b>	<b>5,976,973</b>	<b>3,916,679</b>
<b>C. LIABILITIES</b>				
Operating & Short-Term Trade Credit	31,680	70,589	221,271	95,245
Intermediate & Long Term Loans	573,240	1,317,621	3,398,324	1,612,398
F.C.C. Loans	441,045	976,162	497,552	752,546
<b>Total Liabilities</b>	<b>1,045,965</b>	<b>2,364,372</b>	<b>4,117,147</b>	<b>2,460,189</b>
<b>D. OWNER'S EQUITY</b>				
(A) Assets At Market Value	<b>5,767,101</b>	<b>5,283,155</b>	<b>9,084,570</b>	<b>6,228,455</b>
(B) Fixed Assets at Cost	<b>1,906,193</b>	<b>1,119,766</b>	<b>1,859,826</b>	<b>1,456,490</b>

<sup>1</sup> Depreciation was not subtracted from the cost of the farm house, land, milk quota, or personal equipment.



**TABLE 1 FARM REVENUE AND EXPENSES; 2019.**

	<b>Bottom 15</b>	<b>Middle 38</b>	<b>Top 15</b>	<b>All 68</b>
<b>REVENUE</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
Milk Sales	378,445	576,497	1,151,638	659,678
Cow & Bull Sales	16,246	24,570	42,950	26,788
Calf & Heifer Sales	3,155	5,500	8,657	5,679
Crop Sales	41,354	66,790	37,990	54,827
Other Farm Income	26,277	84,152	54,025	64,740
<b>Total Cash Revenue</b>	<b>465,477</b>	<b>757,509</b>	<b>1,295,260</b>	<b>811,712</b>
Inventory Change				
Dairy Enterprise	5,887	3,114	17,267	6,848
Replacement Enterprise	-2,042	-3,310	14,852	976
Other Livestock	30	-25	2,427	528
Feeds, Crops, Supplies	-17,661	-4,543	1,291	-6,150
<b>Total Farm Revenue</b>	<b>451,691</b>	<b>752,745</b>	<b>1,331,097</b>	<b>813,914</b>
<b>EXPENSES</b>				
Dairy Cow Enterprise				
Cow & Bull Purchases	5,067	2,484	2,972	3,162
Commercial Feed Purchases	56,917	97,908	187,759	108,686
Milk & Livestock Marketing	24,484	36,537	76,024	42,589
Breeding Fees	7,868	7,749	13,322	9,004
Stable & Milkhouse Supplies	11,631	11,335	20,935	13,518
Vet. and Drugs	12,641	15,338	24,418	16,746
Other Dairy Expenses <sup>1</sup>	14,270	16,828	26,105	18,310
Replacement Enterprise				
Cattle Purchases	1,103	105	63	316
Feed Purchases	11,110	19,498	21,789	18,153
Other Direct Heifer Expenses	2,885	4,431	4,061	4,008
Crop Enterprise				
Grains and Forages Purchases	5,665	19,175	42,206	21,275
Seed	16,058	20,480	24,285	20,344
Fertilizer	14,061	23,162	26,907	21,980
Sprays	4,040	6,251	8,657	6,294
Custom Work	17,936	28,264	64,278	33,930
Gas & Diesel Fuel	15,078	20,069	22,929	19,599
Machinery Repairs	20,676	40,074	33,666	34,381
Other Crop Expenses <sup>2</sup>	3,330	4,388	4,576	4,196
Other Farm Expenses				
Direct Expenses Non-Dairy Livestock	20	2,337	1,348	1,608
Direct Expenses Other Crops	10,167	24,053	10,729	18,051
Wages & Salaries	38,027	49,657	83,237	54,499
Land Rent	4,082	9,135	13,716	9,031
Interest Paid	37,214	80,855	120,949	80,073
Real Estate Taxes	9,188	12,007	15,466	12,148
Telephone & Hydro	12,315	14,397	23,058	15,848
Insurance	8,958	13,746	17,410	13,498
Equipment & Building Repairs	23,704	29,463	47,136	32,091
Other General Cash Expenses <sup>3</sup>	8,138	10,275	15,183	10,886
<b>Total Cash Expenses</b>	<b>396,633</b>	<b>620,001</b>	<b>953,184</b>	<b>644,224</b>
Building Depreciation	34,888	28,201	53,549	35,268
Machinery Depreciation	36,119	48,987	55,903	47,674
<b>Total Farm Expenses</b>	<b>467,640</b>	<b>697,189</b>	<b>1,062,636</b>	<b>727,166</b>
<b>Net Farm Income</b>	<b>-15,949</b>	<b>55,556</b>	<b>268,461</b>	<b>86,748</b>

<sup>1</sup> Other Dairy Expense include registration/testing fees, building rent, straw & bedding, & livestock insurance for the dairy herd.

<sup>2</sup> Other Crop Expenses include crop insurance, seed cleaning, twine, propane for corn drying & miscellaneous crop expenses.

<sup>3</sup> Other Overhead Expense includes hardware, car expenses and miscellaneous expense.



## Meeting 5 - The Dairy Industry - Finding Where You Fit In

### Setting Objectives:

To have an understanding of the hiring process for a dairy farm and an awareness of the variety of jobs available within the dairy industry.

### Suggested Learning Outcomes:

- Learn about how to find outside labour and making sure your needs are met.
- Look at different careers outside of the farm but still in the dairy industry.
- Discuss the different types of roles that support dairy farmers.

### Suggested Roll Call Questions:

- What is an example of a job off the farm that supports dairy farmers?
- What type of jobs could a dairy farmer be hiring for?
- What is your hopeful career path?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• Hiring employees on the farm</li><li>• The dairy industry's financial impact</li><li>• Careers in agriculture</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### You Be the Boss

##### Hiring Farm Employees

When farms grow, farmers often do not have enough time to do all of the chores themselves, so they must hire employees. Before hiring staff, make sure that you have examined your budget and can afford to hire some help. Sometimes hiring someone can help your farm make even more money by making it run more efficiently. For example, if an employee is hired to fix machinery, more jobs can be accomplished because the machinery is in good working order. It might even cost more to fix broken machinery that is not maintained than it costs to hire an employee.

Finding the right person is important. This often takes some time and requires knowledge of the characteristics you are looking for in an employee. This includes finding someone who will work well with your personality type and management style.

Advertising in local or farm publications, on websites or social media is a good way to find someone. There are six important items that a job ad should include:

- Job title (i.e. relief milker, herdsman)
- Positive things about your farm (i.e. expanding family business, modern dairy facility, century farm) that will attract a potential employee to it
- Job description (i.e. record keeping, milking cows, cleaning milking parlour, hours of work required)
- Positive things about working on your farm (i.e. working independently or as a team, flexible hours, modern equipment, etc.)
- Information on wages and benefits (i.e. housing, insurance, use of farm vehicle)
- How to apply (i.e. email, telephone, in person)

### Do It!

Create a job ad for a fictitious job position at a dairy farm. Be sure to include all six important items listed above.

Prior to interviewing employees, create a list of questions that you would like to ask them. Similarly, interviewees may have prepared questions to ask you as well.

### Do It!

Create a list of questions you want to ask in the interview for the person you are going to hire for the job ad you created.

### Experience It!

In partners, do mock interviews using the list of questions you have created. Be sure to give the interviewee the job ad before starting the interview so they know what job they are 'applying' for.

Once you have hired a new team member it is important to touch base with all of your staff to ensure your needs and expectations, as well as theirs, are being met. Once a farm has 5 or more staff, a full safety program and plan is needed. For more information on hiring an employee or building a Health and Safety Plan visit the Canadian Agriculture Human Resource Council's website at: <https://cahrc-ccrha.ca/>

## Working in the industry, off the farm

The Canadian dairy industry is a multibillion-dollar industry (2019 net farm cash receipts for dairying was \$6.64 billion! – Stats Canada). There are many ways to work within the dairy industry without working on a dairy farm. The dairy industry creates lots of jobs both on and off farm. Canada has just over 10,000 dairy

farms, employing 18,805 on farm jobs and an additional 24,956 jobs in manufacturing.

Canada has 523 dairy processing plants (as of 2018) and contributes an additional \$14.8 billion in manufacturing shipments. The AI and genetics industry are also major contributors to the industry with net exports equaling \$148.9 million.

## Careers in Agriculture

There are other careers related to the dairy industry in some way that require post-secondary education of some nature. Think about the people who come to visit your farm or that you contact for reasons related to your farm - all of them have a job that is related to the dairy farm in some way because dairy farmers are their customers:

- Agriculture Banking
- AI technicians
- Breed Associations
- Nutritionist
- Crop Advisor
- Milk Recording Representatives
- Vets
- Financial consultants
- Relief worker
- Milk transport
- ... many more!

### Experience It!

Invite a guest to your meeting from a company that provides a service to the dairy industry (i.e. financial institution, milk transport company, feed company nutritionist) and have them speak about what they look for in an employee and what the hiring process looks like for their company.

There are also jobs that relate to the industry but are not in direct contact with producers. Examples include:

- Policy analyst
- Journalist
- Researcher
- Extension and education

### Check It Out!

Do a search online for jobs in the dairy industry in your area. Find at least five different types of jobs. Keep track of which websites were the most helpful in locating these job ads.

### Do It!

Remember, with any tour that you might take during this project that you are a guest. Be polite, respectful and grateful to the host(s) that have opened up their facility for your 4-H club to tour.

## Activity #1 - You're Hired!

<b>Do</b>	Time 10-15 minutes  Materials: paper and pen	Brainstorm different positions that your dairy farm may need to fill. Talk about: <ul style="list-style-type: none"><li>▪ Tasks that need to be completed</li><li>▪ How many hours you can provide</li><li>▪ Pay range</li><li>▪ Responsibilities</li><li>▪ How to apply</li></ul> Create a job posting for your new position
<b>Reflect</b>		To teach members how to create a job posting for their dairy farm
<b>Apply</b>	Prompting questions	Why is a good job posting important?  How can you promote your job posting?  What are your hiring requirements?

## Activity #2 - Careers in Agriculture

<b>Do</b>	Time: 10 minutes Materials: chart paper and markers	Ask the club to follow the path of milk from the farm to the grocery store, thinking of all of the jobs involved along the way. Write down their suggestions.  Encourage members to think outside the box at every step of the way and consider options that are not obvious (i.e. janitors at a processing plant, custom cropping companies).
<b>Reflect</b>		To help members explore the different career options in the dairy industry, and agriculture in general.
<b>Apply</b>	Prompting questions	What career do you see yourself in?  How will you get to your career goals?





## Meeting 6 - Transferring the Farm to the Next Generation

### Setting Objectives:

To understand the process and challenges of creating a farm succession plan.

### Suggested Learning Outcomes:

- Learn about succession planning on the farm and planning for the next generation.
- Learn how to build a basic succession plan.

### Suggested Roll Call Questions:

- Why are succession plans important?
- Do you hope to take over the family farm?
- What do you think are some key things to consider when taking over the farm from your parents/relatives?

### SAMPLE MEETING AGENDA

**Time: 1 hour, 30 minutes plus activities**

Welcome, call to order, pledge		10 minutes
Roll call		10 minutes
Parliamentary procedure	Minutes and Business	10-15 minutes
Topics and Activities	Meeting Topics and Activities <ul style="list-style-type: none"><li>• What is a succession plan</li><li>• How to build a succession plan</li><li>• Where to go for help in building a succession plan</li></ul>	45-50 minutes + Activities
At Home Activity	Review what activities/projects members are to complete at home	5 minutes
Wrap up, Social time and adjournment		10 minutes

### Topic Information

#### Getting ready for the next generation

You or one of your farming friends may be considering taking over the family farm someday. In order to ensure a smooth transition from one generation to the next, it is important to create a Farm Succession Plan. This reduces the possibility of fights among siblings or extended family when it comes to the day-to-day operation, management, and distribution of farm assets.

#### Share It!

If you are comfortable sharing with the group, share if your farm has a succession plan in place and what that plan looks like. Was it an easy process to create the succession plan?

Succession plans have three main purposes:

1. Transfer of labour and task from one generation to the next
2. Transfer decision making and control from one generation to the next
3. Transfer ownership from one generation to the next

Since every farm business is unique, there is no standard way to design a succession plan, however, there are some basic steps to follow for any plan:

**Preliminary Step** - involves communicating ideas with family members, setting goals and objectives, deciding who the successor(s) will be, and making sure that the goals of the retiring and succeeding generations can fit together into a plan that will work. For example, if the retiring generation wants the farm to be carried on as a purebred dairy operation focusing on elite genetics, and the successor wishes to turn it into a commercial operation, they may not be able to come to an agreement.

**Step 1 - Collect and Analyze Information** - it is important to know all details of the farm business, both operationally and financially, before deciding if succession planning will be financially and logistically feasible.

**Step 2 - Generate Options** - brainstorm about different ways the plan could be put together to best suit the needs of everyone involved.

**Step 3 - Make Preliminary Decisions** about how the farm transfers will be made.

**Step 4 - Develop a plan** and review it. Common elements of a plan include:

- Description of business
- Goals and expectations (both business and personal)
- Retirement plans for the retiring generation
- Successor Development Plan to give the new generation some initial direction
- Farm Business Plan because if the farm will continue it needs some future direction
- Operating Plan to define everyone's roles and responsibilities
- Outline the transfers of management, control and labour
- Description of the transfer of ownership
- Timeline of the entire transfer
- Communications strategy to ensure that everyone works together
- Contingency plan in case something does not work as originally thought

**Step 5 - Implement the plan** and monitor its progress to ensure that the transition from one generation to the next goes smoothly. Some components of the plan may need to be reworked if there are problems when it is put into practice. Make sure that everyone agrees to any changes that are made.

### Talk About It!

Creating a Farm Succession Plan can be a difficult and intimidating process. Why is it such a hard process for families to complete? What could go wrong?

### Research It!

Are there statistics available for how many farms are transferred each year in Canada? Within those statistics, does it give an average age for someone that is taking over the family farm?

Change is often difficult since people get used to doing things the way they have always done them. It will take time for everyone to adjust to the farm transfer and will involve many difficult personal and financial decisions along the way. Remember that you do not have to do it all yourselves. There are many advisors who specialize in farm succession planning that could help to ensure that all details of the farm business are accounted for in the plan. Since it is often difficult mixing business with family, involving an objective third-party advisor will be beneficial because they have no emotions attached to the business.

### Experience It!

Invite a guest to your meeting that specializes in farm succession planning. Have them explain their process for helping farm families with farm transfers.

## The Dos and Don'ts of Succession Planning

### DO:

- Recognize that succession planning takes time and a lot of effort. It won't happen over night.
- Start planning early. Things may take longer than expected and plans can change.
- Keep communication with the family (and all associated parties) open. All parties involved should be aware on how things will unfold in the future.
- Consider each person's opinions and goals.
- Have a team of 3rd party, professional advisors. These people are experts and are unbiased. They keep emotions out of the process and put the business first. Your team should include lawyers, accountants, financial advisors and bankers.
- Consider any tax implications - have your goal be "do things efficiently and effectively" not "I don't want to pay taxes".
- Ensure all parties take ownership of the plan. This is a family plan. Family members need to buy into it to be effective.
- Write it down. By writing it down, all parties will know exactly what the plan is and there will be no surprises in the future

### DON'T:

- Procrastinate. Plan early for the future
- Be afraid to ask questions. Succession planning can be very complicated and detailed. It is important to understand what is happening and why certain things are happening.
- Assume you know how other people feel or what other people's goals are. Keeping communication lines open, and expressing your goals is important to creating a plan that works for all.
- Forget to share the responsibilities. Both generations need to be involved in succession planning to make the transition easier on both parties.
- Forget to plan for your future - consider other investments your life might have (homes, families, retirement).
- Use just one advisor. Have a team of experts to help you through the process

## Experience It!

Invite a farm family that has successfully completed the transition of their farm from one generation to the next. Find out how the process worked for them and what challenges they had along the way.

## Succession Planning and Taxes

Transfer of farm businesses can have very complicated taxation. For information on what type of tax exemptions and tax credits apply, as well as other information about taxation on the farm visit: <http://www.omafra.gov.on.ca/english/busdev/facts/16-039.htm> or view the Taxation on the Transfer of Farm Business Assets to Family Members fact sheet by OMAFRA attached as an appendix.

## Mental Health in Agriculture - Research It and Discuss It!

With all of the challenges that farmers face, one challenge that isn't typically talked about enough is the mental health of farmers. Farming provides some unique challenges that aren't found in other industries such as isolation, weather, markets, working with living beings and pressures from social media to name some. Find at least three online mental health resources/phone numbers to call that are specific to agriculture that you could recommend. Share these findings with the group. Was it easy or difficult to find these resources? Are any of the resources local/specific to the area you live in?

Always remember, if you are in an immediate mental health crisis, call 911.

## Mental Health in Agriculture

Farm life can be very rewarding, but it also comes with its own set of challenges. Isolation, stress, fatigue and other factors can take their toll on mental health. It's okay to ask for help. If you or someone you know is struggling - reach out, check in and lend an ear to listen. We all deserve to get the help and support we need in times of distress.

Source: Ontario Federation of Agriculture

Online Mental Health in Agriculture Resources:

Dairy Farmers of Ontario website Mental Health page:

<https://www.milk.org/mentalhealth/>

Stress - Farming & Mental Health video (created by Canadian Centre for Health & Safety in Agriculture & Farm Credit Canada, 2018) (17 minutes long):

<https://www.youtube.com/watch?v=-SiPQcKtiGw>

Mental Health Matters series of videos (created by the Ontario Federation of Agriculture, 2020):  
<https://ofa.on.ca/mental-health-matters/>

Making headway on mental health in agriculture podcast featuring Dr. Andria Bitton-Jones, 2019 (25 minutes long):  
[https://www.youtube.com/watch?v=wWogGwISizQ&feature=emb\\_logo](https://www.youtube.com/watch?v=wWogGwISizQ&feature=emb_logo)

Mental Health in Agriculture video (created by the Listowel Agricultural Society, 2020 (7 minutes long):  
[https://www.youtube.com/watch?v=LaTUvo3I8cE&feature=emb\\_logo](https://www.youtube.com/watch?v=LaTUvo3I8cE&feature=emb_logo)

Impact Farming Show - A Farmer's Journey Through Stress, Depression, and Anxiety podcast featuring Gerry Friesen, 2019 (43 minutes long):  
[https://www.youtube.com/watch?v=Sn0d20DIQVc&feature=emb\\_logo](https://www.youtube.com/watch?v=Sn0d20DIQVc&feature=emb_logo)

### Check It Out!

Search online for additional videos, podcasts and resources on the topic of Mental Health in Agriculture.

## Activity #1 - Considering Succession Planning

<b>Do</b>	Time: open discussion at the meeting	Imagine that you are going to take over your family farm. Think of all of the aspects of the farm that you would have to consider if you were going to transfer labour, decision making and ownership. Would you be able to do this now or would you require more knowledge and training?
<b>Reflect</b>		For members to consider the many aspects of managing and running a farm and how that would affect succession planning
<b>Apply</b>	Prompting questions	<p>Are there a lot of things to think about when taking over a farm?</p> <p>Are you planning to take over your family farm at some point?</p> <p>Taking over a farm requires a lot of planning. Is this a process that your family should do on its own? Who might your family consult when considering succession planning?</p>