

## SECTION VI: TREATMENT AND CONTROL OF MASTITIS IN DAIRY SHEEP

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## 1. VETERINARY DRUGS APPROVED FOR USE IN LACTATING DAIRY SHEEP

There are **no** veterinary medicines in Canada that are approved for use in lactating dairy sheep, where the milk is intended for food. This means that all drug use is “extra label” and that there are no published withdrawal times for milk. This presents a dilemma to sheep producers and their veterinarians who wish to effectively treat and control infections in their ewes and yet be assured that appropriate withdrawals for milk and meat are followed so that no **residues** enter the food chain (see Section V.5). Along with working closely with your flock veterinarian with whom you have a valid veterinary-client-patient relationship (VCPR) (Section VI.1.2), this section will help to give you advice on how to best accomplish this goal.

### 1.1 WHAT IS EXTRA LABEL DRUG USE (ELDU)?

#### 1.1.1 DEFINITION

As defined by Health Canada<sup>1</sup>, Extra-Label Drug Use (ELDU), or “off-label use” is:

*“The use or intended use of a drug approved by Health Canada in an animal in a manner not in accordance with the label or package insert. It also includes the use of all unapproved drugs, including unapproved bulk active pharmaceutical ingredients (APIs) and compounded drugs.”*

Although defined by Health Canada, this is a term that is used worldwide.

While we traditionally think of ELDU in terms of using a drug not approved for use in sheep as a species (e.g. approved for cattle but not sheep), it also includes using it differently than the directions on the label, i.e.:

- Different dose (e.g. using a drug at 3 mL/45 kg when it is labelled at 2.5 mL/45 kg)
- Different frequency (e.g. giving a drug twice per day when it is labelled at once per day)
- Different route of administration (e.g. giving the drug under the skin when it is supposed to go in the muscle)
- Different duration (e.g. if the label says only to give for 3 days and it is administered for 5 days)
- Different indication (e.g. when it is labelled to treat pneumonia and it is used to treat mastitis).
- Different class of animal (e.g. when it is labelled for use in a lamb and it is used in a lactating dairy ewe)

#### 1.1.2 REGULATORY ISSUES

Prescription veterinary medicines can only be purchased from a veterinarian and with a valid veterinary-client-patient relationship (see Section VI.1.2). Written instructions for ELDU need to be provided by your veterinarian when the drug is dispensed when different from the label. The veterinarian and producer are responsible for making sure the drug is used correctly and drug residues do not enter the food chain.

If the drug is purchased at a Livestock Medicines Outlet (i.e. over-the-counter medications), and it to be used extra-label, it is strongly advised to only use with a veterinary prescription (required by those on the Canadian Sheep and Lamb Food Safe Farm Practices program). N.B. In Quebec, all livestock medicines are purchased from a licensed veterinarian. Inappropriate ELDU may result in:

<sup>1</sup> <http://www.hc-sc.gc.ca/dhp-mps/vet/label-etiquet/index-eng.php>

- Residues in the milk which is dangerous for people and will harm cheese production
- Residues in the meat, which is dangerous for people
- Inappropriate treatment of animals resulting in treatment failure and/or adverse reactions in the sheep
- Risk of development of antimicrobial resistance (AMR) because of failure to treat the infection correctly or over-treatment resulting in AMR in other bacteria in the animals.

### 1.1.3 HOW ARE WITHDRAWAL TIMES DETERMINED WITH ELDU?

#### MAXIMUM RESIDUE LIMIT (MRL)

As defined by Health Canada<sup>2</sup>, Maximum Residue Limit (MRL) is:

*“The amount of residue that could remain in the tissue or food product derived from a food producing animal that has been treated with a veterinary drug.”*

The MRL for a drug or chemical is usually measured in very tiny amounts, e.g. ppm (parts per million), and is determined through scientific experiments as being the highest level of a drug or chemical that is safe for a person to consume daily over their life-time with no risk to their health.

Withdrawal times are calculated as the amount of time that it takes for that drug to leave the body of a treated animal to at least as low as the MRL. Sheep often **metabolize** and **excrete** drugs differently than cattle or goats, so we can't assume that because the withdrawal for cattle is a certain time-length, it will be the same for sheep.

#### MINIMUM DETECTION LIMIT (MDL)

This is a property of the test being used to detect presence of a drug in the milk. The test can detect presence of a drug down to a certain limit. Usually this level is lower (i.e. less) than the MRL established for drugs approved for use in lactating dairy animals (in Canada – this is limited to dairy cows).

#### USING WITHDRAWALS LISTED FOR OTHER SPECIES OR SHEEP IN OTHER COUNTRIES

As no drugs are approved for lactating dairy sheep, the processor will use the MDL as the MRL. This value is likely lower than the published MRL for dairy cows. Because of this, withdrawals approved for dairy cows may result in a **positive test** for dairy sheep. When selecting a milk test to use at home, make sure its MDL is as low as that which is used by the processor.

#### THINGS THAT MAY PROLONG A WITHDRAWAL PERIOD FOR MILK

- The sheep is milked once/day versus twice/day
- Milk volume per day is low, e.g. at the beginning and end of lactation resulting in concentration of a drug in the milk
- The drug is administered incorrectly (e.g. subcutaneous versus intramuscular) resulting in the drug being poorly absorbed and eliminated

<sup>2</sup> <http://www.hc-sc.gc.ca/dhp-mps/vet/mrl-lmr/index-eng.php>

- Too large a volume is administered in one spot, again resulting in the drug being poorly absorbed and eliminated
- Injections are given in the same place on the animal, again resulting in the drug being poorly absorbed and eliminated
- The ewe is ill which might harm its ability to properly metabolize and eliminate the drug
- And of course, giving too high a dose, increasing the frequency of treatment, prolonged administration, etc.

## CANADIAN gFARAD

The Canadian gFARAD<sup>3</sup> (global Food Animal Residue Avoidance Database) is an initiative based at both the University of Saskatchewan (Saskatoon, Saskatchewan) and the University of Guelph (Guelph, Ontario). CgFARAD provides information on food animal residues from drugs and other chemicals used in the food production industry. In order to help determine an appropriate withdrawal for meat or milk from a food animal species, veterinarians can submit a request to CgFARAD, and then relay this valuable information onto their respective clients, to ensure that all appropriate withdrawal times are being taken before milk or meat is put into the food chain.

Fig. 1.



Issues with CgFARAD include: turnaround time may be days to several weeks depending on availability of information; limitations of available information, i.e. sometimes they are unable to determine a withdrawal based on information published; and the potential cost. Currently the service is not charged but a lack of government funding for this program is a threat.

### 1.1.4 IS THIS DRUG SAFE TO USE?

Despite the fact that there are no drugs approved for use in lactating dairy sheep in Canada, we must be sure that any drug which is used can be administered safely to the animal, it is effective for the disease being treated, and that we can properly estimate a safe and reasonable withdrawal for milk and meat.

#### DRUG IDENTIFICATION NUMBER (DIN)

A drug identification number (DIN) is a specific number that is allocated to each drug that is approved for use through the Veterinary Drug Directorate, Health Canada<sup>4</sup>. This code is located on the label of each approved drug, with the three letters “DIN”, followed by an eight-digit number. DIN codes can be used in many cases, such as recall of drug products, and quality monitoring of drug products.

If you have purchased a drug and it does not have a DIN on the label, then it does not meet the legal requirements of being used as a drug in Canada. This applies to both human and veterinary drugs.

<sup>3</sup> <http://www.cgfarad.usask.ca/>

<sup>4</sup> [http://www.hc-sc.gc.ca/dhp-mps/prodpharma/activit/fs-fi/dinfs\\_fd-eng.php](http://www.hc-sc.gc.ca/dhp-mps/prodpharma/activit/fs-fi/dinfs_fd-eng.php)

### THE LABEL OF A VETERINARY DRUG IN CANADA

A drug sold in Canada must have a label attached to it and is accompanied by a package insert or box containing additional required information. When you purchase a drug, save all the inserts and boxes and do not “repackage” drugs into other containers.

The following information should be kept where it can be readily consulted. A good practice is to keep a binder of labels, inserts etc. where you store your livestock medicines. This information can also be readily found through accessing the Canadian Compendium of Veterinary Products website<sup>5</sup>.

In addition to the requirement of a DIN – which must appear on the drug label, clear and up-front, the label must contain:

- 1) The words “**For Veterinary Use Only**”, i.e. not to be used in humans
- 2) “*Pr*” means that it is by veterinary prescription only i.e. must be prescribed by a veterinarian licensed to practice in the province in which the animal resides. If no “*Pr*” is present on the label, then no prescription is required
- 3) Brand name of the product – registered with the Veterinary Drug Directorate, Health Canada. It is accompanied by the name of the manufacturer and its Canadian address.
- 4) A list of medicinal (active) ingredients and their concentration in the product (e.g. mg of drug “X” per mL of product). Often preservatives, diluents and other non-medicinal ingredients are included – although some are proprietary and may not be explained in full.
- 5) Formulation indicates if it is an injectable product, intramammary, oral or topical.
- 6) Instructions for administration
  - a) Dosage - usually in mL or mg of product per measure of the animal’s body weight; e.g. 3 mL per 45 kg bw or 2 mg/kg bw.
  - b) Route of administration (e.g. oral, in feed or water, topical, intramammary, intravenous, intramuscular or subcutaneous)
  - c) Frequency and duration of treatment (e.g. once/day for 3 days)
  - d) Animal and class of animal (e.g. lambs)
  - e) Indication (e.g. for the treatment of pneumonia)
- 7) Warnings and cautions about
  - a) Health hazards for humans and animals either through direct contact (e.g. may burn if get the drug in your eyes), adverse reactions in animals (e.g. may be harmful to the fetus of pregnant animals, e.g. do not administer to horses), or through residues in food products.
  - b) Withdrawals for meat
  - c) Withdrawals for milk if allowed for use in lactating dairy animals
  - d) Restrictions, e.g. do not use in lactating dairy animals
- 8) Production lot number (important for recalls or if an adverse reaction occurs)
- 9) Expiry date (important because the drug won’t work if too old)
- 10) Storage information (e.g. must be refrigerated at < 4°C; do not freeze; do not expose to sunlight)

### USING DRUGS NOT APPROVED FOR USE IN CANADA

At this point, it is legal for producers to purchase drugs from outside Canada for “own use”, i.e. to use in the treatment of their own animals<sup>6</sup>. **This is not in compliance with the Canadian Sheep and Lamb Food Safe Farm Practices program.** Possible issues arising from using these drugs include:

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<sup>5</sup> <http://cdmv.naccvp.com/?u=country&p=msds>

- The product does not contain the level of drug indicated on the label;
- The product contains **adulterants** which may be harmful to the animal or to people;
- The product is expired and has been repackaged;
- The product has **not been shown** by properly conducted science to be effective or safe in animals and humans;
- The quality of the manufacturing process of the product is poor or unregulated.

## 1.2 WHAT IS A VETERINARY – CLIENT – PATIENT RELATIONSHIP (VCPR)?

The Veterinary-Client-Patient Relationship<sup>7</sup> (VCPR) is a key component of ELDU, and is outlined by Health Canada as:

- *“The client (owner or owner's agent of the animal [s]) has given the responsibility of medical care to the veterinarian and has agreed to follow the instructions of the veterinarian, and;*
- *The veterinarian has assumed the responsibility from the client for making clinical judgment regarding the health of the animal(s), the need for medical treatment, and for ensuring the provision of ongoing medical care for the animal(s), and;*
- *The veterinarian has sufficient knowledge of the health status of the animal(s) and the care received or to be received. The knowledge has been obtained through a recent examination of the animal(s) and the premises where they are (it is) kept or through a history of medically appropriate and timely examinations and interventions, and;*
- *The veterinarian is readily available, or has made the necessary arrangements with another veterinarian, for ongoing medical care in case of adverse reactions or therapy failure.”*

Without having a reliable VCPR, the prescription of ELDU could pose potential health issues for both treated animals, and subsequent human health from consumption of these food products.

## 2. DETECTING RESIDUES OF DRUGS AND CHEMICALS IN MILK

For product safety, it is important to test milk for drug and chemical residues in milk before it is sent for processing for human consumption. In addition to regulatory standards, which require milk to be tested before processing, testing milk on-farm can be a good screening method to avoid shipping potentially contaminated milk.

### 2.1 REGULATORY TESTING VERSUS ON-FARM USE OF KITS

At this time, Ontario has not laws governing sheep milk but in other jurisdictions by law, milk must go through regulatory testing before it is accepted for milk processing. These samples are sent to an accredited laboratory<sup>8</sup> so residue results are as accurate as possible. Bulk-tank milk samples are taken on-farm at milk pick-up by a certified bulk tank milk grader. When the tank trucks arrive at a processing plant, a milk sample is taken from the truck which represents a sample from all the farms picked up on that route that day. The milk will not be processed if it tests positive for any drug residues. If the milk from the truck is positive, the milk samples collected on-farm will be tested. The farm that is positive for drug residues will be financially penalized.

<sup>6</sup> [http://www.hc-sc.gc.ca/dhp-mps/vet/faq/faq\\_unapproved-nonapprouves\\_drugs-medicaments-eng.php](http://www.hc-sc.gc.ca/dhp-mps/vet/faq/faq_unapproved-nonapprouves_drugs-medicaments-eng.php)

<sup>7</sup> [http://www.hc-sc.gc.ca/dhp-mps/vet/label-etiquet/pol\\_eldu-umdde-eng.php#fnb3-ref](http://www.hc-sc.gc.ca/dhp-mps/vet/label-etiquet/pol_eldu-umdde-eng.php#fnb3-ref)

<sup>8</sup> For Ontario, this is the AFL, University of Guelph <http://www.guelphlabservices.com/AFL/raw.aspx>



Milk delivered in frozen containers will be sampled and pooled once the milk has thawed. Again, any positive samples will be discarded and likely the producer will be financially penalized.

### 2.1.1 ON-FARM TESTING OF MILK

There are many easy-to-use test kits available to purchase to test milk on-farm for presence of inhibitors. Most veterinarians also offer a service to their dairy clients using these tests. These kits allow sampling of both individual animals, and bulk tank samples to test for drug residues. However, these tests are 100% accurate and may not be in agreement with the tests run by the processor or regulator. They can provide guidance, however should be used with caution.

Kits currently available for use in dairy cows in Canada include:

- Charm Cowside II test<sup>9</sup>. It is a quick screening test for milk.
- Charm ROSA<sup>10</sup> milk tests. There are several tests to detect many different antimicrobials at different MRL's.
  - The Charm SL<sub>3</sub> Beta Lactam test has been accepted by the Food and Drug Administration in the USA for use in both sheep and goat milk **and is the only one recommended for use in dairy sheep at this time** (Fig. 2)
  - Common beta-lactam antibiotics include penicillin, ceftiofur (e.g. Excenel), cephalosporins (e.g. Cefalax, Cefadri), cloxacillin (e.g. DryClox), amoxicillin
- IDEXX SNAP Antibiotic Residue test<sup>11</sup>
- Delvotest SP, DSM<sup>12</sup>
- Neogen BETASTAR PLUS<sup>13</sup>

Fig. 2.



These tests will detect milk at varying MDL's, some of which may be higher or lower than the dairy cattle MRL for milk. Because not all tests will detect all classes of antibiotics, consult your flock veterinarian to discuss which test(s) to use for routine screening for inhibitors (antibiotics) in sheep milk.

### 2.2 TESTING A BULK TANK SAMPLE VERSUS AN INDIVIDUAL ANIMAL

An on-farm kit has the ability to sample both bulk tank milk, milk from a container or bucket, and milk from individual ewes. Testing of milk either in the tank or bucket is very useful if a treated animal has accidentally been milked and that milk commingled with milk from other ewes. If the milk sample tests positive for drug residue, the producer has the option to discard the milk from the tank or bucket and clean the milking equipment before milking the rest of the flock, not only to prevent treated milk from being shipped, but to not lose the milk from the rest of the ewes in the flock.

<sup>9</sup> <http://www.charm.com/en/products/charm-inhibition/cowside-ii/cowside-ii-learn-more.html>

<sup>10</sup> <http://www.charm.com/products/rosa-milk.html>

<sup>11</sup> [http://www.idexx.ca/view/xhtml/en\\_ca/dairy/snap.jsf](http://www.idexx.ca/view/xhtml/en_ca/dairy/snap.jsf)

<sup>12</sup> [http://www.dsm.com/markets/foodandbeverages/en\\_US/products-overview/delvotest.html](http://www.dsm.com/markets/foodandbeverages/en_US/products-overview/delvotest.html)

<sup>13</sup> [http://www.neogen.com/FoodSafety/BS\\_Index.asp](http://www.neogen.com/FoodSafety/BS_Index.asp)

Individual animal testing can be used for a variety of common instances on-farm, which is why purchasing a residue kit is so beneficial for producers. The following are situations where testing milk is beneficial:

- When ewes are added to the flock and the treatment history of the flock of origin is not well documented
- If a ewe lambs earlier than expected, and dry period mastitis treatment (Section VI.5) withdrawal is in question
- With any ELDU
- If a treated animal loses its treated identification, or record
- If an animal is treated with multiple drugs at once

### 2.3 ACCURACY OF TESTING

Laboratory testing has the highest level of accuracy testing drug residues. With on-farm sampling kits, the accuracy is not 100% accurate, i.e. a test may be positive when the milk is OK – or of more concern, the test may be negative when the milk contains antibiotics. Additionally, kits cannot test all drugs used in livestock, so it is important to identify which drugs are being screened for to select the kit that is most appropriate for each flock.

## 3. AVOIDING RESIDUES OF DRUGS AND CHEMICALS IN MILK

There are many ways to avoid residues in milk, and the main factor is proper communication on-farm. It is important to ensure that all identification protocols are done correctly, and all employees on-farm are aware of these protocols so the milk is safe for human consumption.

### 3.1 VETERINARY PRESCRIPTION ONLY

Treat dairy ewes using only drugs that are prescribed by a licensed veterinarian with an appropriate VCPR. This is especially important for dairy sheep producers, as all drugs are used through ELDU.

With a prescription, veterinarians are required to indicate proper milk and meat withdrawal for each drug prescribed. This is also a requirement for the Canadian Sheep and Lamb Food Safe Farm Practices program.

### 3.2 ANIMAL IDENTIFICATION

#### 3.2.1 IDENTIFY ANIMALS FOR MANAGEMENT PURPOSES

Animals should have permanent IDs to identify them from the flock at any time, not only to distinguish between treated animals, but also to help in day-to-day flock management (Fig. 3). The identification should be:

- Unique within the flock (e.g. no instance of 2 ewes with the same tag and colour)
- Useful for managing that animal and accurate recording keeping
- Easy to read from a distance – front, side and ideally back of the animal, or electronically

Fig. 3.



- Have longevity, i.e. not fade, not break and become unreadable
- Not cause infection of the ear
- Be redundant, e.g. if one tag falls out, there should be another ID on that animal that will allow accurate identification and retagging

### TYPES OF PERMANENT AND UNIQUE ID SYSTEMS

Not only is proper identification essential in a flock for management purposes, it is also required by law (Canadian Sheep Identification program, CSIP<sup>14</sup>) to properly tag sheep before they leave a farm. The pink Ketchum Kurl-Lock metal tags can still be used but can no longer be purchased. They are not useful as a management tag.

The CSIP radio frequency identification (RFID) tag will soon be the only type of tag allowed and is available as a button (Allflex) or folded (Shearwell) tag (Fig. 4). When combined with a panel tag, it can be read visually and by electronic scanners.

Similar panel tags can be purchased from agricultural stores, and each animal's unique ID, can be written on the tag, and inserted in the ear. This is not compliant with CSIP requirements, but is a good tool for managing a flock.

Fig. 4. Approved CSIP tags



#### 3.2.2 IDENTIFYING TREATED ANIMALS

Treated animals should also be identified so that the milker can quickly and accurately distinguish them prior to milking. The ID should be:

- Readable from the back / side of the ewe depending on how the ewe is milked
- Not be obscured with manure, mud, long wool, milking or other parlour equipment
- Be semi-permanent, i.e. should be readable for at least 2 months but should be removable after the withdrawal period has ended
- Be easy to interpret as indicating a treated animal

Additionally, treated animals should have a unique management tag so that written or electronic treatment records can be kept.

### LEG BANDS

Leg bands are ideal systems in milking parlours, as milkers can easily identify animals when they arrive to be milked (Fig. 5). These bands should be colour coded to minimize confusion about why this animal is being flagged as a concern. E.g. red can mean treated as a lactating ewe; yellow can mean dry-treated; blue can mean a ewe infected with the contagious bacteria *Staphylococcus aureus* (i.e. a “staph” ewe).

Fig. 5. Examples of leg bands



<sup>14</sup> [http://www.cansheep.ca/cms/en/Programs/CSIPPrograms\\_new/CSIPProgram\\_new.aspx](http://www.cansheep.ca/cms/en/Programs/CSIPPrograms_new/CSIPProgram_new.aspx)



- Drug administered
- Date of first administration, and each follow administration, if required
- Date that the milk can return to the bulk tank, after the milk withdrawal is met

There are a variety of ways that drug use can be recorded, such as the following, and should be consistent on-farm:

- Binder containing up-to-date treatment records. The treatment records provided through the Canadian Sheep and Lamb Food Safe Farm Practices program are ideal for this purpose (Fig. 6).
- Electronic record management software, such as Ewebyte<sup>15</sup>, to easily record treatments, and allows for monitoring previous health records in one animal.
- A whiteboard or chalkboard that is placed in the parlour

### 3.4 COMMUNICATING THE INFORMATION TO PREVENT ACCIDENTS

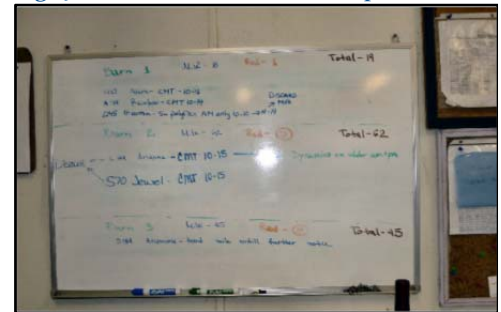
One of the primary reasons to have good communication between employees during milking is to avoid accidents, mainly milking a treated animal into the bulk tank. There are a variety of ways to improve communication between employees, and it is imperative that they are consistent.

#### 3.4.1 COMMUNICATING IN THE MILKING PARLOUR

Many treatment decisions are made in the parlour, whether to treat mastitis or dry a ewe off. Ways to make sure these decisions are properly recorded and communicated in the parlour:

- A whiteboard / chalkboard in the parlour can be used to quickly write down treatment events as they are done
- The treatment records (written or on the computer) should be kept near-by (e.g. barn office) so they can be kept up-to-date at the end of each milking and can be quickly referenced if there is a question about an animal during milking
- Veterinary prescriptions which include information on how and when to administer a drug, and on withdrawal times – should be stored with the treatment records for quick reference
- The methods of identifying a treated ewe (e.g. leg bands) should be kept in the parlour and information on what each colour means

Fig. 7. Communication in the parlour



#### 3.4.2 MILKING TREATED ANIMALS SEPARATELY

Treated animals can be housed in a separate pen so they can be milked after milking the rest of the flock. The pipelines should be first removed from the bulk tank, and treated milk can be emptied directly down a drain. This group should be milked last in the flock to avoid contamination of the milking units and the pipeline with treated milk.

<sup>15</sup> <http://ewebyte.com/>

### 3.4.3 MILKING TREATED ANIMALS INTO A BUCKET

If separate housing for treated ewes is not an option, treated animals can be milked into a separate bucket. When doing this, the milking units are unhooked from the main pipeline, and hooked into the bucket, which prevents treated milk from being mixed in the bulk tank.

When an identified ewe is found in the parlour, the unit should be changed over to the bucket, and all routine milking procedures should remain consistent with what is normally done.

After milking this ewe is complete, the milking claws should be rinsed thoroughly with a hose, to make sure any residue is removed from the unit. Keeping a spare claw reserved just for treated animals is recommended. The milking unit should be reattached to the main pipeline after it has been completely rinsed for the next ewe. Treated milk from the bucket should be poured out, and the bucket rinsed thoroughly. Treated ewes can also be hand-milked into a bucket (Fig. 8). Wash hands before and after milking.

Fig. 8. Hand or bucket milk treated animals



## 3.5 STORAGE OF LIVESTOCK MEDICINES

The storage of drugs is imperative to maintain the efficacy of these treatments. If they are damaged in any way due to poor storage, these drugs may not treat the animal properly, and will not cure the disease, as intended.

In general, livestock medicines should be stored in an accessible place in the barn, such as the office or milk house (Fig. 9). Ideally, it should be kept in a shelving unit to keep them organized, and a door should be on the unit to keep the livestock medicines protected. In addition, a log of these drugs is a beneficial to maintain proper inventory. The Canadian Sheep and Lamb Food Safe Farm Practices program provides these records (Fig. 10) and guidelines for drug storage. Make sure that the Lot number is recorded from each Animal Health Product so that proper tracking can be done.

Fig. 9. Store medicines correctly



### 3.5.1 LACTATING VERSUS DRY

Drugs that cannot be used in lactating dairy ewes should be stored separately from those for which a veterinary prescription exists for use in lactating ewes. They should be stored in a separate cupboard which is clearly marked on the outside as to which class of medicine it contains (See Section V.5) It is not uncommon (for example) for a lactating animal to be accidentally treated with a an intramammary “dry cow” product. If this happens, the milk may need to be discarded for up to a month!

### 3.5.2 BOXES, INSERTS AND LABELS

As outlined in Section VI.1.1.4, there is very important information required by law present on the label, box or insert in which the drug was purchased. That information should be kept in the binder with the treatment records where it can be quickly referenced and not discarded.



### 3.5.5 LIGHT

For many medications, it is important to keep them away from direct light or sunlight, as this could damage the drug. These drugs should be stored in a storage unit equipped with a door, so they can be shut out from the sun (Fig. 9). If stored on a shelf, keep in the box.

### 3.5.6 EXPIRY DATE AND DRUG INVENTORY LOG

All drugs have an expiry date, and should not be used passed this time point. A log with an inventory of drugs and their corresponding expiry dates should be updated regularly so expired products can be disposed of and replaced with newer products (available from the Canadian Sheep and Lamb Food Safe Farm Practices program) (Fig. 10). This log should include **batch and lot number** as well in case of recall.

### 3.5.7 AVOID CONTAMINATION OF THE DRUG WITH BACTERIA

Drugs containing bacteria will not work and can be harmful to the animal. For injectable drugs in particular, it is critical to keep the drug sterile. **DO NOT EVER:**

- Insert a used needle into the bottle –use sterile needles to withdraw
- Leave a needle in the bottle between uses – it allows bacteria to enter
- Insert a syringe top into the bottle, the hole it makes is large and allows bacteria to enter
- Leave the bottle where flies and dust can contaminate the rubber stopper – next time you put the needle in, you will push bacteria in with it
- Remove the rubber stopper to withdraw the drug – the stopper is important in keeping the drug sterile
- Return unused drug in a syringe to the bottle – you cannot be sure that drug is still sterile

An open bottle should be stored properly. A clean cotton swab with isopropyl alcohol (same as you use to disinfect the teat to take milk samples) can be used to disinfect the rubber stopper. Some vaccines indicate to discard after opening. This is because bacteria readily grow in the vaccine. Follow directions!

## 3.6 ADMINISTRATION OF DRUGS

### 3.6.1 ROUTE OF ADMINISTRATION

It is important to follow labelled directions of each drug to ensure that it is being administered properly.

For treating pathogens in the udder specifically, antibiotics can be administered by intramammary route.

Fig. 11. Refrigerate drugs properly





- Intramammary (IMM): Only drugs labelled for IMM should be administered this way. See Section VI.4.2 for instructions on how to do this.
- Intramuscular injections (IM): For meat quality purposes, this injection is primarily done in an area of lesser value, such as in the neck (Fig. 12).
- Subcutaneous injections (SQ): The drug is injected underneath the skin, in the neck or axilla (under the front leg) of the ewe (Fig. 13). Skin can be tented prior to injection to reduce risk of injecting too shallow or deep. If both SQ and IM are offered as choices to deliver the drug, select SQ, as it is less damaging.
- Intravenous injections (IV): It is rarely necessary to give a medication intravenously. It is important to be trained on how to give IV injections by a veterinarian to ensure that the drug is being administered properly.

Fig. 12. Site of intramuscular and subcutaneous injections

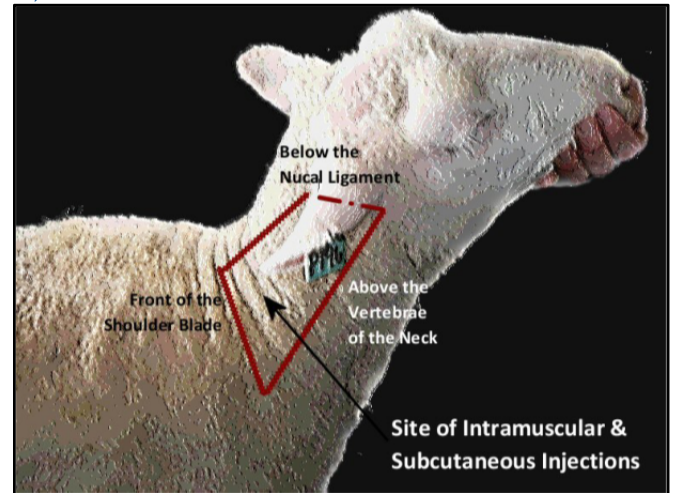


Fig. 13. SQ injection in the neck (left) or axilla (right)



### 3.6.2 EQUIPMENT USED FOR ADMINISTRATION

#### SINGLE - USE SYRINGES

Single-use syringes should always be used for treatments, unless treating a large number of animals at one time (e.g. vaccinating the flock against clostridial diseases, see Section 1.2.1.1). By using these syringes only once, it decreases the chance of contamination of the drug, and infection of the ewe. Syringes come in many sizes: 1 mL; 3 mL; 6 mL; 12 mL; 20 mL; 35 mL; 60 mL. The size of the syringe used should match the volume to be administered. E.g. don't use a 12 mL syringe to administer 2 mL of a drug – it can't be done accurately.

Two different syringe tips are available; a regular tip syringe and a luer lock syringe. Needles are placed directly onto the regular tip syringes, while with luer lock syringes; needles are twisted onto the tip of the syringe to lock it in place so there is less chance the needle will fall off when administering drugs or vaccines.

#### AUTOMATIC SYRINGES

This type of syringe is used when injecting a large number of animals with the same amount of drug or vaccine, within a short time-period

Fig. 14. Automatic syringe



(e.g. an hour). It is set up to deliver the same volume each time you squeeze the trigger. For this reason, it is difficult to change the volume easily between animals. The same needle is often used for several sheep in a row. Discard immediately in a sharps container if the needle becomes contaminated, bent or dull. Automatic syringes require careful washing and disinfection after use, and proper storage where it is dry and dust free. Regular maintenance is required to replace worn out parts.

### SINGLE – USE NEEDLES

The type of needle used on a sheep depends on the size of the animal, and the viscosity (thickness) of the drug being injected. Higher gauge number = small bore size of the needle. For lambs, needles should be a gauge of 20-22, and a length of ½ to 1 in. For ewes, a gauge of 20-18 and a length of ¾ to 1 in is generally used. If treating IM, the needle should be longer to properly penetrate the muscle, and for SQ (e.g. for vaccinating), the needle can be shorter. Using a longer needle increases the risk of breakage if the animal should move.

Fig. 15. Disposable needle



Usually the cap on the needle and sometimes its hub are colour coded but the colours may vary with the manufacturer. It is best to read the label on the box, or right on the cap to make sure you are using the correct gauge and length.

Don't reuse needles. It is very difficult to effectively clean the inside of a needle where there may be residual drug and bacteria. Resterilizing the needles will cause them to become dull and increases the risk of breakage. In the scheme of things, a sterile needle is a cheap investment.

### HOW TO AVOID INJECTION SITE ABSCESES

- Prevent contamination of the drug with bacteria as covered in Section VI.3.5.7.
- Always use sterile needles and syringes.
- Only inject sheep when they are dry. Wet wool and wet skin can easily contaminate the needle when making the injection. If you are planning to vaccinate (for example), keep the sheep indoors if the weather is wet.

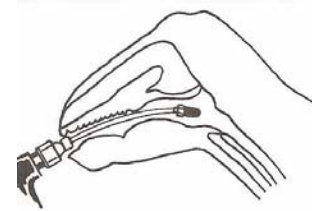
Fig. 16. Injection site abscess



### DRENCH GUNS

Drench guns are used to administer treatment orally to sheep. Only relatively small amounts of treatment can be used with a drench gun, with volumes of <30 mL. This liquid is inserted into the animal's mouth over the back of the tongue, and is then swallowed into the rumen (Fig. 17). Injectable products should not be administered as a drench! Generally anthelmintics (dewormers) are administered in this way. Oral antibiotics are NOT recommended for the treatment of mastitis or other bacterial infections in sheep.

Fig. 17. Tip of drench gun over back of tongue



### 3.7 THE CANADIAN SHEEP AND LAMB FOOD SAFE FARM PRACTICES PROGRAM

The Canadian Sheep and Lamb Food Safe Farm Practices (FSFP) program which has been mentioned many times in the document, provides rules and guidance for sheep producers to assure animals and their products are safe for the public. All documents are available for download from the web<sup>16</sup> or ordered from the office of the Canadian Sheep Federation<sup>17</sup>.

This program identifies good production practices (GPPs) either as “must do’s” or “recommended”. To help with implementing these practices, record keeping is required to ensure that all GPPs are being conducted properly. The program includes dairy sheep production.

#### 3.7.1 ADVANTAGES

One of the major benefits of this program is improvement of consumer confidence in the product that they are buying. It can increase confidence between producers and processors, and product sales can be expanded within agricultural sectors, and internationally. In addition, flock management can improve dramatically with accurate record keeping of animal health events.

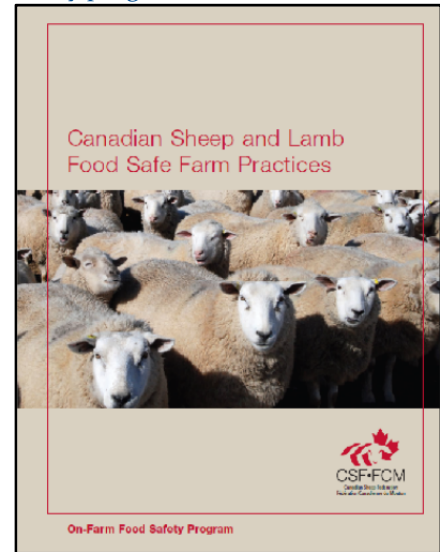
#### 3.7.2 HOW TO BECOME TRAINED

There are three methods that are currently available for producers to take the FSFP training course. These include in-person training sessions, online training, as well as mail-out training. These training courses provide a comprehensive background on how to apply these practices to individual flocks to ensure that all is being done to minimize food safety hazards. The majority of this training focuses on GPP’s, and how to maintain good record keeping.

#### 3.7.3 HOW TO BECOME CERTIFIED

In order to be certified, your farm will need to successfully complete an audit. Complete the training course, and then implement good production practices and record keeping on-farm. Once one full cycle (from one lambing to the following lambing) has passed, complete the self-assessment form included in the program to determine if you are ready for an audit. Contact the CSF and the auditor will come to the farm to review the records. If the audit is passed, your farm is certified. Certification with the FSFP program is annually renewed in a four-year cycle: Year-1 is a complete audit; Year-3 is a review of on-farm records; and Year-2 and Year-4 are a “self-declared” assessment of the progress and compliance of the program.

Fig. 18. Canadian sheep on-farm food safety program



<sup>16</sup> <http://www.cansheep.ca/cms/en/Programs/FoodSafeFarmPractices/FoodSafetyFarmPractices.aspx>

<sup>17</sup> Barb Caswell, National On-Farm Food Safety Coordinator. Phone: 519-824-6018 / 1-888-684-7739; Fax: 1-866-909-5360. [barbara@cansheep.ca](mailto:barbara@cansheep.ca)

### 3.8 IF TREATED MILK GETS INTO THE BULK TANK

There are some things that producers can do to avoid the chance of this milk being transported for processing.

- If milking into a tank. The most prudent action is to stop milking the remainder of the flock, take a sample for testing at the laboratory, and dump the suspect milk. Once the tank and equipment have been cleaned and sanitized, proceed with milking the rest of the flock.
- Using an on-farm milk testing kit may help make decisions as to whether the milk is safe, but these kits are only moderately accurate and so the risk is that the result may be a false negative (i.e. the milk is positive when the test kit is negative).

## 4. TREATING MASTITIS IN A LACTATING DAIRY EWE

### 4.1 SELECTING AN ANIMAL FOR TREATMENT

#### 4.1.1 SEVERE CLINICAL MASTITIS

Ewes with severe cases of clinical mastitis should always be treated, especially if the case of mastitis becomes systemic (See Section II.2.1.1). Systemic antibiotics (e.g. injected rather than infused into the udder) and supportive therapy, such as pain management therapies and intravenous fluids should be administered as prescribed or performed by the flock veterinarian.

#### 4.1.2 MILD TO MODERATE CLINICAL MASTITIS

Ewes with mild to moderate clinical mastitis generally show changes in their milk composition due to infection, and sometimes have heat and hardness in their udder, but have no systemic signs (See Section II.2.1.2 and 2.1.3). Intramammary antibiotics can be administered to help clear the infection; however, supportive therapy is generally not administered.

#### 4.1.3 SUBCLINICAL MASTITIS

Subclinical mastitis is usually treated with an intramammary product after diagnosed using laboratory culture (See Section II.5). Some forms of subclinical mastitis respond well to intramammary treatment during lactation and others are better cured during the dry period.

### 4.2 ADMINISTERING AN INTRAMAMMARY TREATMENT

Intramammary treatments come in pre-packaged “mastitis tubes” which are sterile. The mastitis ointment is a specially formulated combination of antibiotics and pastes, which are not irritating to the udder tissues. Each tube has a tip (teat cannula) designed to fit into the teat orifice of a dairy cow. The teat cannula has a cover to keep the end sterile. A plunger at the other end of the tube allows the ointment to be squeezed into the teat and udder cistern.

Some products are intended to use in lactating animals and do not persist in the udder. Others are specially formulated to be administered at the end of lactation and the antibiotic persists in the udder while the ewe is dry. **Do not** use a lactating product at dry off (it won't work as well). **Never** use a dry product in a lactating animal – it will persist for possibly weeks in the milk and lead to antibiotic residues.

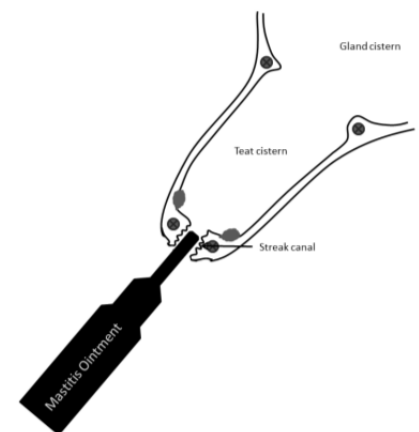
#### 4.2.1 PREPARING THE TEAT

Before administering an intramammary treatment, it is important that the teat is disinfected properly so potential pathogens do not enter the teat canal. After milking, teats should be dried with clean clothes or towels and the teat end and orifice disinfected with alcohol swabs (For teat anatomy, see Section I.1.1). This is very important if there is damage or scar tissue on the end of the teat –usually teeming with billions of bacteria if not properly cleaned. If after scrubbing the teat end, the swab is dirty, get a new one and repeat until the swab appears clean. Then you are ready to treat the gland.

#### 4.2.2 INSERTING THE TIP OF THE MASTITIS TUBE INTO THE TEAT

When inserting the tip of the mastitis tube into the teat end, it is important that the cover remains on the tube for as long as possible to avoid contamination. The end of the teat should be gently held using clean, gloved fingers, stabilizing the teat end. The tip should be partially inserted into the teat opening only 1/8 in (5 mm), to decrease the chance of more bacteria being pushed up the streak canal and into the udder (Fig. 19). The teat opening of a dairy ewe is smaller than a dairy cow and so more prone to damage, so insertion should be done very gently.

Fig. 19. Insert tip of mastitis tube into teat opening but no further



#### RESTRAINT OF THE EWE WHILE TREATING

Restraint of the ewe is very important. Some ewes will get upset, moving and jumping around when treated – risking contamination of the teat cannula and teat end. Restraint can be done while the ewe is in the milking stall – have an assistant push the ewe against the side of the stall while you immobilize the teat end and insert. This will stop her from jumping. Or if preferred, when the ewe leaves the milking parlour, have an assistant tip her onto her rump exposing the udder. She will struggle less while you disinfect the teat and insert the tube.

#### 4.2.3 ALWAYS ADMINISTER THE WHOLE TUBE INTO THE GLAND

Even though the ewe's udder is generally smaller than that of a dairy cow it is important to use the entire contents of the mastitis tube when treating a ewe. The tube is intended to be used in its complete form and only delivering 50% of the antibiotic will decrease its efficacy. Additionally, splitting tubes between two glands or two ewes should never be done as it greatly increases the risk of transmitting pathogens or contaminants from one gland to another, quickly erasing any imagined savings.

#### 4.2.4 TREAT BOTH GLANDS OR ONE?

Although both glands from a treated animal cannot be milked into the tank when one is treated, it is not necessary to treat both if only one has mastitis. Treating uninfected glands is an additional cost. In addition, it is important not to over-treat animals if not required. Overuse of antibiotics can cause yeast infections in the gland (Section II.3.2.2).

Antimicrobial resistance (AMR) occurs when a bacterial species has become resistant to the effects of a specific antibiotic. The most common reason for AMR to develop is prolonged use of an antibiotic, usually when the antibiotic is not needed; or prolonged use at a dosage which is too low. Resistant

bacteria can be transmitted between people and animals. Antimicrobial resistance has been documented in mastitis organisms (e.g. methacillin resistant *Staph. aureus* or MRSA which is an important human pathogen), so being selective with antimicrobial treatment and not over or under-treating is strongly recommended.

#### 4.2.5 REPEATING INTRAMAMMARY TREATMENTS

This should only be done under the advice of the flock veterinarian as repeating treatments during lactation or during the dry period will affect milk withdrawal times. Ewes with *Staph. aureus* can benefit from repeated antibiotic treatment, as this consistent influx of antibiotics in the udder has a greater chance of curing the infection than only one dose of antibiotics. This treatment strategy has the greatest efficiency in younger ewes that are early in lactation, when *Staph. aureus* infections are generally just acquired.

#### 4.3 ADMINISTERING A PRODUCT SYSTEMICALLY

To treat systemic effects of mastitis infections, such as symptoms found with gangrenous mastitis, treatment with systemic antibiotics, e.g. by intramuscular or subcutaneous injection can be beneficial but should only be done on the advice of the flock veterinarian.

### 5. DRY PERIOD MANAGEMENT OF MASTITIS

#### 5.1 DRYING EWES OFF

The dry-off period for ewes should not be shorter than two months of duration to allow for the ewe's udder to rest and prepare for lambing (Section 1.1.2.3 and 1.2.4). To dry a sheep off, milk production should be minimized, either by natural progression of the lactation or manually, by altering feeding management. Once milking has ceased, never evacuate the udder unless clinical mastitis has occurred. It is important to not disturb formation of the keratin plug, which naturally forms in the teat during the drying procedure (see Section 1.2.4).

Dry ewes should be penned in a separate housing environment than the lactating flock. This will allow for different nutrition and will prevent accidental milking of treated animals.

#### 5.2 DRY PERIOD TREATMENT OF EWES

It has been shown in both dairy and meat sheep that using a dry treatment product can decrease SCC, cure existing mastitis infections, prevent new infections acquired during the dry period and increase milk production in the following lactation.

#### 5.2.1 CURING EXISTING AND PREVENTING NEW INFECTIONS IN THE DRY PERIOD

When ewes are treated with antibiotics at dry-off, there is a strong likelihood this treatment will rid the mammary gland of any existing infections. This is because the antibiotic will be in contact with the bacteria for weeks, rather than – as in the case of treating during lactation – only for a few hours. The antibiotic will also not be diluted with milk so will be more concentrated.

Dry treatment can also help to prevent new infections from occurring during the dry period. The biggest risk periods are a) the few days after milking stops – when the keratin plug in the teat is still forming, and b) as the udder fills just before lambing. Most infections picked up at this time are from

the environment, e.g. dirty bedding, wet and muddy pastures – especially around watering troughs, standing water (e.g. ponds and puddles), fly bites etc.

Teat sealants can prevent bacteria from entering the teat during these high-risk times. External sealants coat the teat and act as a barrier to bacteria until the keratin plug is fully formed in the teat (See Table III.1). However, there is a chance that the sealant may rub off as the ewes lie down, lessening its barrier function. A more effective method is an internal teat sealant (OrbeSeal®, Zoetis Canada), which essentially acts as an artificial keratin plug until it is fully formed. Consult your flock veterinarian before using any of these products.

### 5.2.2 SELECTIVE VS BLANKET TREATMENT AT DRY-OFF

With **selective treatment**, only ewes that have been identified as having udder problems are treated with antibiotics at dry-off. This dry-off technique is beneficial in flocks with a very low prevalence of mastitis, a consistently low SCC and good environmental management of mastitis. Not only does this save on the cost of antimicrobials, but it also decreases unnecessary antimicrobial treatments.

**Blanket treatment** refers to the treatment of every ewe at dry-off. This type of dry-off practice is beneficial for flocks with more prevalent and chronic infections as well as increased SCC. Although this method is more expensive, there is a greater chance that these treated ewes will have improved udder health in their subsequent lactation.

### 5.2.3 SYSTEMIC TREATMENT DURING THE DRY PERIOD

Although intramammary antibiotics have traditionally been used during the dry period to control pathogens, it has been shown that use of an injectable antibiotic tilmicosin (Micotil®, Elanco Animal Health) has been beneficial. If injected subcutaneously one month prior to lambing, it has been shown that ewes have less udder abnormalities at the end of that lactation, and their lambs perform better than ewes that were not treated with systemic antibiotics. However, no work has been done to show it is of benefit in dairy ewes, nor has an appropriate milk withdrawal been established. Do not use unless under the advice of your flock veterinarian.

**Please note: NEVER use this product in goats as it is very toxic to those animals. Only administer to dairy ewes on the advice and supervision of your flock veterinarian. As the drug is also dangerous to humans, read the directions for administration carefully before using.**

## 5.3 ENVIRONMENT FOR DRY EWES

Although ewes do not have the exposure of pathogens due to milking during the dry period, there is still a great chance that animals can be exposed to multiple environmental pathogens during the dry period. It is important to maintain a clean and dry environment for ewes so they are not exposed to increased pathogen counts due to manure, urine and excess water. To decrease stress amongst these dry ewes, housing them in a separate pen than the lactating string will minimize disruptions in their daily routine, allowing them to rest in preparation for lambing.

Fig. 20. Dry ewe housing



## 6. ERADICATION OF MAEDI VISNA FROM THE FLOCK



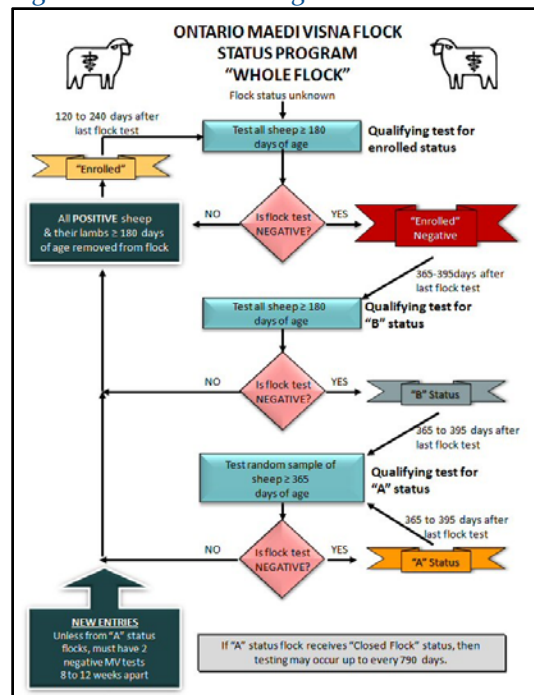
In sheep flocks, it is imperative that maedi visna (MV) infection is properly controlled and eradicated. In Canada, there are two control programs, including one in Ontario (the Ontario Maedi Visna Flock Status Program<sup>18</sup>) – administered by the Ontario Sheep Marketing Agency. This program allows for the eradication of MV and maintenance of a low-risk flock. Advantages to maintaining a low risk status include:

- Improved milk production – up to 15% more milk is produced from uninfected ewes than in infected, healthy appearing ewes in the same flock.
- Lower culling rates. Ewes with MV are more likely to leave the flock prior to 5 years of age, when a ewe should be at her most productive. Reasons for leaving include poor milk production, weight loss, pneumonia, poor reproductive performance.
- Better value of breeding stock. Ewe lambs to be sold are more valuable if from a low-risk flock.

There are a few methods that have shown to be successful in trying to eradicate MV in dairy flocks. These include the following:

- Culling ewes that have tested positive for MV
- Only allow lambs that are MV-negative to be used as replacements in the flock
- Removing lambs from MV-positive ewes before they have a chance to nurse
- Feed purchased colostrum or colostrum and milk from MV-negative ewes to removed lambs. If this is not an option, then pasteurize colostrum and milk from MV-positive ewes before feeding to their lambs.

Fig. 21. Maedi Visna Program



## 7. ENVIRONMENTAL CONTROL OF MASTITIS

Environmental management is imperative on-farm to try and control mastitis caused by environmental pathogens. Manure and urine should be cleaned from the housing area regularly, so udders are not exposed to potentially harmful pathogens. Ewes should have adequate bedding in their pens as well, not only for increased comfort, but to ensure that they are not lying on the barn floor, which can be a breeding ground for pathogens. Pens should not be over-crowded, as it is imperative that each animal has adequate space to lie down. If they don't, there is a greater chance that the animal will have to lie in excess manure, which will increase their chance of acquiring an infection.

Fig. 22. Wet and dirty environment is a risk for mastitis



<sup>18</sup> [http://www.uoguelph.ca/~pmenzies/mv/OMVFSP\\_Index.html](http://www.uoguelph.ca/~pmenzies/mv/OMVFSP_Index.html)



Recommendations for environment and housing are provided in Table II.2.

If ewes are housed outdoors, particularly during the summer months, keeping them away from areas filled with excess mud is very important to control environmental mastitis. If ewes spend a large amount of time in these mud-filled areas, they are at risk for environmental infections. The heat of the summer increases the number of pathogens present, so this is an important thing to address in a pasture. If there is a large mud-filled area, moving ewes to a different pasture, or closing off this section should be done.

### 7.1 PSEUDOMONAS

*Pseudomonas aeruginosa*, an important cause of severe mastitis in ewes (see Section II.3.2.1) is found in water sources around a barn. It is commonly seen in contaminated wash water in a milking system; in the water trough; ponds etc. Anywhere there is standing water may be a source of infection to the ewe. This bacterium is usually resistant to most antibiotics and so treatment will not cure these infections.

### 7.2 LISTERIA

*Listeria monocytogenes* has been previously discussed as related to feeding (Section I.2.4.6) but ewes may also become infected from the environment. *Listeria* causes mastitis but is also commonly shed in the milk without signs. Outbreaks of listeriosis in humans causing severe gastrointestinal illness and even death have been linked to eating sheep cheese. *Listeria* prefers dirty, wet conditions and readily grows in feed and manure even at cool temperatures. Contamination of the udder is associated with udder infections and contamination of the milk if the udder is not properly cleaned and disinfected (Section III.1.1).

Fig. 24

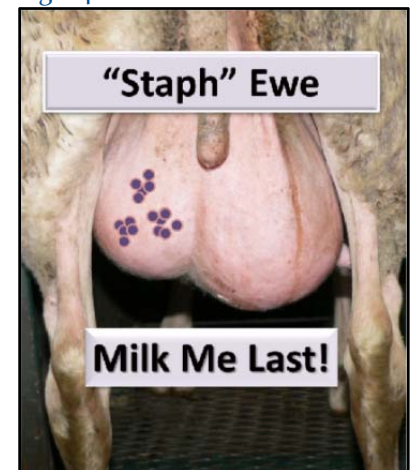


Fig. 23. *Listeria* may grow in hay fed on wet, dirty ground



## 8. CONTROLLING A STAPHYLOCOCCUS AUREUS MASTITIS PROBLEM IN THE FLOCK

*Staphylococcus aureus* has been mentioned many times in this course and it is the most common cause of clinical mastitis, and one of the most important mastitis pathogens overall in sheep. *Staph. aureus* is the most common cause of gangrenous mastitis. If your flock is experiencing cases of this – even one or two per year – it is likely that many more ewes are actually infected in the flock.

Because it is contagious from ewe-to-ewe and from people-to-ewe, identifying infected ewes, preventing transmission and appropriate treatment and culling of infected animals are all crucial to its control. Infected ewes are often called “staph” ewes. The following measures are recommended with input from the flock veterinarian:

- Culture all ewes with clinical and sub-clinical mastitis to detect “staph” ewes
- Identify “staph” ewes (Section VI. 3.2.2) and milk separately, either by bucket milker but ideally after the rest of the flock is milked

- Aggressively treat on the advice of your veterinarian - newly identified “staph” ewes, particularly if they are recently fresh ewe lambs
- Perform follow-up culturing to determine if cured
- Blanket dry treat all ewes as not all “staph” ewes can be identified by culture
- Always wear gloves to milk ewes to prevent transmission from people to ewes
- Do not allow lambs to nurse ewes, particularly if infected with contagious ecthyma (orf, soremouth) (Section II.4.5.2)
- Prep the udder and teats carefully as outlined in Section III.1.1.
- Make sure milking equipment is properly calibrated and maintained to prevent vacuum fluctuations and back-jetting of the milk from ewe-to-ewe
- If new cases of “staph” continue to happen, consider culturing the entire milking flock to detect all “staph” ewes
- Culture all “staph” ewes at lambing to determine if dry treatment has cured the infection
- Cull ewes with a history of clinical mastitis due to “staph”, particularly if udder damage remains. This includes ewes with a history of gangrenous mastitis
- Cull ewes which do not respond to treatment, i.e. are still culture positive for “staph”
- Monitor the flock using bulk tank culture (See Section II.6)

## 9. WHEN SHOULD EWES BE CULLED BECAUSE OF MASTITIS?

Mastitis is one of the most common reasons for a ewe to be culled from the flock while still a potentially profitable ewe.

### 9.1 INCURABLE INFECTIONS

When ewes are infected with incurable contagious infections, particularly *Staph. aureus*, culling these animals may be an option to improve udder health for the entire flock. *Pseudomonas* infected ewes should also be culled.

Ewes with incurable environmental infections or udder abscesses should also be culled because of risk to the healthy flock and lost milk production.

Ewes which have lost a gland to mastitis and / or teat injury – but which have a healthy gland, may also be good candidates for culling. Even though the other gland will compensate somewhat – it is difficult for that ewe to be as productive as a ewe with two healthy glands. Be aware that blind glands may contain abscesses which may break and drain.

### 9.2 REDUCED MILK PRODUCTION

Ideally, most culls in a flock are because of low production rather than disease such as mastitis. Culling based on milk production is flock-dependent and is based on the number of profitable ewes in the flock, as well as the cost of production per ewe. If milk production is less than the cost of production for each ewe, it is in the producer’s benefit to cull her from the flock. If milking numbers are to remain stable in the flock, room needs to be made for new ewe-lambs to enter the flock.

## 10 GENETIC SELECTION FOR RESISTANCE TO MASTITIS

### 10.1 SELECTION BASED ON LOW SOMATIC CELL COUNTS

Although heritability of SCC levels is low and therefore genetic progress will be slow, there is no evidence that by selecting low SCC ewes, unfavourable traits such as low milk production or components will increase.

### 10.2 GENETIC MARKERS FOR RESISTANCE IN MASTITIS

Much work has been done on markers for mastitis resistance in dairy cattle but much less so in dairy sheep. Additionally, resistance to clinical mastitis is believed to be differently regulated than for low SCC. It is likely that resistance is not located on one gene and so genetic selection will be complicated.

The most studied “candidate genes” in dairy cattle are the MHC (major histocompatibility class) II DRB<sub>3</sub> alleles. It is likely that the effect of resistance is through the immune system. However, insufficient work has been done in dairy sheep to say how useful genetic markers will be in the future.

## 11 ORGANIC MILK PRODUCTION

The organic food industry has become a growing interest for consumers. The premise of this industry is described by the Government of Canada Organic Production Systems General Principles and Management Standards (CAN/CGSB-32.310-2006):

*“Organic production is a holistic system designed to optimize the productivity and fitness of diverse communities within the agro-ecosystem, including soil organisms, plants, livestock and people. The principal goal of organic production is to develop enterprises that are sustainable and harmonious with the environment.”*

Organic production requires that practices are being done to ensure that animals are able to perform their natural behavioural processes, while still ensuring their health and animal welfare. There are many specific practices that must be adhered by, and are listed below as outlined in the document referenced above:

- Sheep must have access to an appropriate amount of outdoor pasture, with 2.5 m<sup>2</sup>/head, and 0.5 m<sup>2</sup>/head for lambs, and indoors, ewes must have 1.5 m<sup>2</sup>/head, and 0.35 m<sup>2</sup>/head for lambs
- In addition to pasture, ewes must be supplemented with organically grown feed as their form of nutrition. Sixty-percent of their diet must be hay, fresh/dried fodder or silage-based, with 15% of the total feed having a forage length of over 10 cm
- Organic animals should not be given synthetically made allopathic (*i.e. conventional*) veterinary drugs or feed additives, such as antibiotics or parasiticides. However, vaccines can be administered, if required. In addition, phytotherapeutic (*i.e. herbal or botanical*) or homeopathic treatment can be used if they are deemed necessary
- If physical changes are required in a flock, such as castration or tail docking of lambs and ear tagging should be accompanied by anaesthetics or pain mitigation drugs
- Sheep that are used for milk production must be milked in a continuous organic system for one year before they are considered for use in organic milk products. Any breeding stock that is purchased must also be confirmed organic
- Record-keeping is very important on organic farms, and all information, such as feed records and disease treatments must be logged in detail

Some of these recommendations are difficult to adhere to when you have a sheep which is ill. It is advised that you do not forgo appropriate treatment of an animal in order to adhere to these organic standards.

If you are considered changing to an organic dairy operation, it is strongly advised to read the document in full as there are many restrictions that must be adhered to. They can be ordered or found at:

<http://www.tpsgc-pwgsc.gc.ca/ongc-cgsb/programme-program/normes-standards/comm/32-20-agriculture-eng.html>

