

Supplementary Information for the OMVFSP

Supplement 1. Creating a negative MV Flock from “positive” flock genetics

This document is to help producers achieve a flock that is low-risk for infection with Maedi Visna (MV) but is not a required part of the program. In flocks with valuable genetics and a high prevalence of MV positive sheep, it may be desirable to establish a NEGATIVE flock from offspring of the POSITIVE flock, some of which may be born to POSITIVE ewes. The following outlines two methods as to how this might be done but does not modify or supersede the official program. It is recommended to work with your flock veterinarian on how to best do this.

1. Artificial rearing of lambs born to ewes in a test POSITIVE or unknown status flock.

- a. Lambs intended to be retained as replacements should be removed immediately at birth and preferably not allowed to suckle from the birth dam nor be cleaned by it because
 - i. There is a significant risk of MVV transmission from the milk or colostrum.
 - ii. There is a significant and higher risk of MVV transmission from the dam’s respiratory secretions or from secretions from other infected animals in the flock.
 - iii. There is also a risk of in utero transmission from infected dams to offspring, estimated at between 0% to 10%.
- b. Low risk colostrum is recommended to be fed to these lambs (Supplement 3):
 - i. Sheep colostrum from “B” or “A” status flocks,
 - ii. Heated treated colostrum from NEGATIVE ewes from within the POSITIVE flock
 1. Colostrum should be uniformly heated to 56°C and held at that temperature for 60 minutes to kill MVV. Temperatures higher than 60°C will destroy the antibodies in the colostrum.
 - iii. Cow colostrum from bovine leucosis virus (BLV) and Johne’s disease (paratuberculosis) low-risk herds. If bovine colostrum is used, the colostrum should be pooled to reduce the risk of bovine colostrum anaemia and should be from older cows vaccinated against clostridial diseases.
 1. It is *strongly recommended* to heat-treat cow colostrum, using the protocol above (1.b.ii.), if BLV or Johne’s disease status is unknown.
 - iv. Colostrum replacement products intended for use in lambs and fed according to label requirements as a minimum amount.
- c. Lamb milk replacer is suitable to raise the lambs until weaned onto dry feed.
- d. Artificially reared low-risk lambs *must* be housed separately from
 - i. The POSITIVE flock if those sheep are present on-farm.
 - ii. The NEGATIVE flock if those sheep are present on-farm.
 - iii. Any sheep with a pending status (e.g., resampling of POSITIVE or SUSPECT sheep, new introductions in an Isolation Facility)

- e. Infection with MVV may occur from transmission of the virus while in the womb, or from accidental transmission at birth. For this reason, the artificially reared lamb flock is considered a potential risk to the NEGATIVE flock until receiving a NEGATIVE test as described in [H.1.f](#).
- f. It is strongly recommended to manage these lambs as a group (i.e. no additions unless NEGATIVE status is confirmed) and house in an Isolation Facility.
 - i. The Isolation Facility must meet the protocols as set out in [Section B](#).
 - ii. If these lambs are to join a flock enrolled on the OMVFSP, they are to be treated as new introductions to that flock. When the lambs are ≥ 180 days of age, the group of lambs must undergo two negative tests between 8 to 12 weeks apart before entering the flock.

2. Establishing an MV Low Risk Flock from First-Time Lambing Ewes. (Figure 1)

This program is suitable for producers who wish to preserve flock genetics, have lots of barns and space but not labour. It requires that for 2 to 3 years, 3 flocks will need to be maintained for a period of time. The protocol is as follows:

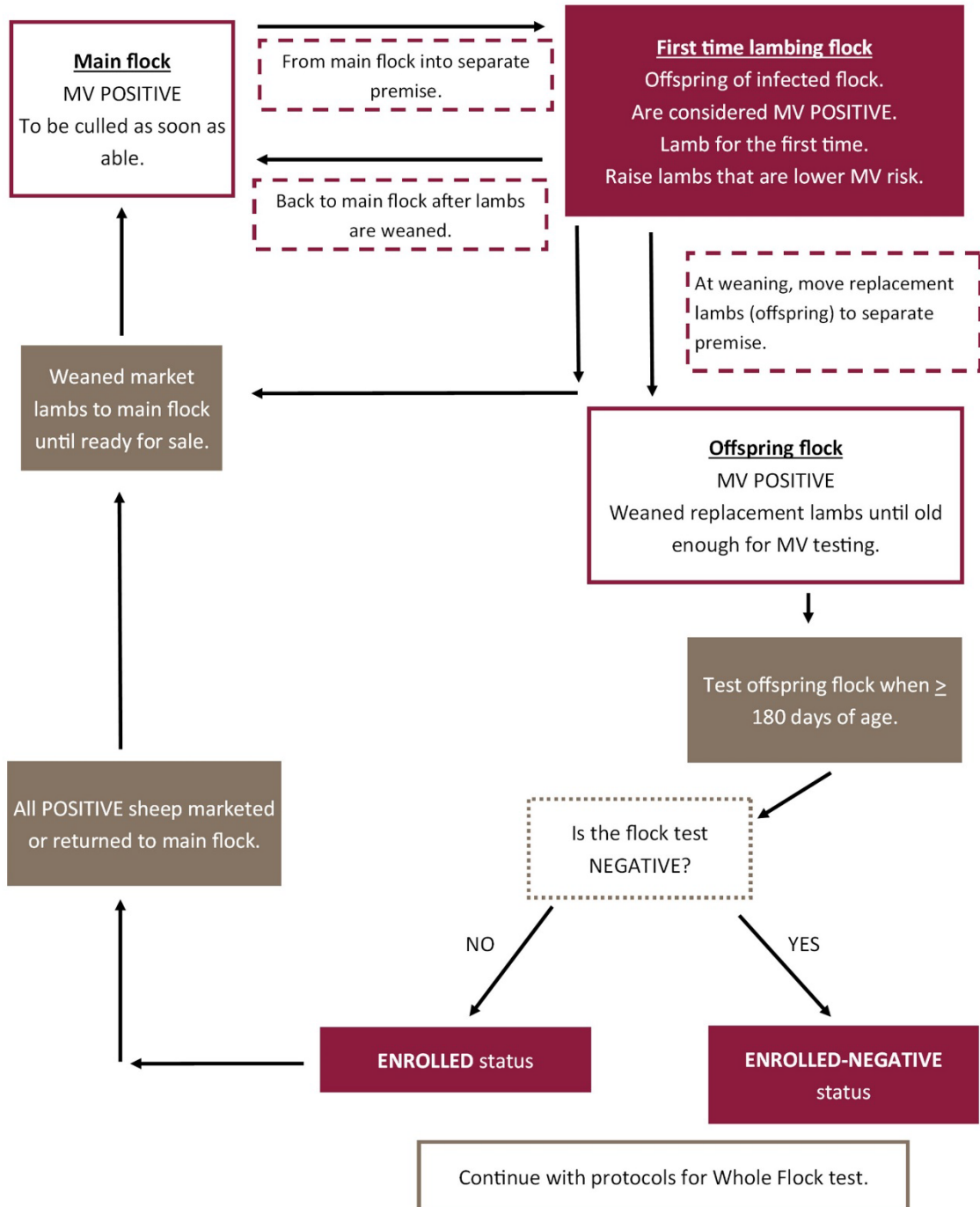
- a. First-time lambing ewes from main POSITIVE flock:
 - i. Pregnant ewe-lambs (that have never lambed before) are moved away from the main flock to lamb in a separate premise. They are to be managed as a separate flock following the guidelines available in Supplement 2.
 - ii. This group is considered MV POSITIVE but likely has a low-test prevalence of infection because of their age in comparison with their older flock-mates.
- b. The lambs born to the ewe-lambs, i.e. "Offspring" are raised by their dam until weaning.
 - i. At weaning (~ 2 months of age), the Offspring selected as replacements are moved to a different facility away from the main flock.
 - ii. Those not identified as replacements are marketed or sold.
 - iii. Their dams are returned to the POSITIVE flock when the lambs are weaned.
- c. Offspring of first-time lambing ewes:
 - i. These lambs have a lower risk of being infected with MVV but the risk is not "zero".
 - ii. This flock is to be treated as a separate flock ("Offspring Flock") and subjected to the same testing protocols as for the Whole Flock program ([Section D](#)), when they reach 180 days of age.
- d. Subsequent additions to "Offspring flock":
 - i. New lambs reared as outlined in [Section 2.a](#), may not enter the "Offspring Flock" until they reach 180 days of age and subsequently have had 2 NEGATIVE tests 8 to 12 weeks apart.
- e. POSITIVE flock disposal:
 - i. This flock can continue to produce market lambs but it is recommended to cull this flock as quickly as the producer can afford as it represents a potential source of infection for the "Offspring flock".

Supplement 2: Establishing a MV Low Risk Flock From First Time Lambing Ewes



Ontario Maedi Visna
Flock Status Program

Establishing a MV low risk flock from first time lambing ewes



Supplement 3. Flock management to lower risk of MVV infection in lambs

This information is offered to assist in properly rearing lambs from MV POSITIVE ewes but must be accompanied by proper testing as per the protocols of the OMVFSP.

Selecting suitable replacements

Because breaks in this program will occur, if the lambs did suckle the ewes or a lambing shift went awry, it is ideal to tag lambs differently (e.g., different coloured tags) to differentiate between those that are suitable replacements (i.e., made it through the “snatch and rear” program), versus those that should be sent to market or require further testing when they reach 180 days of age (i.e. either unsuitable as replacement stock or likely nursed from their dam).

Reduce exposure to MVV contaminated environment and infected animals

- Remove the lambs you wish to retain as replacements immediately at birth, this will prevent them from ingesting contaminated colostrum or milk or contacting respiratory secretions.
- If this cannot be done or done reliably in your management system, then lambs will need to be tested twice 8 to 12 weeks apart, when they reach 180 days of age and before entering the negative flock.
- Prevent lambs from nursing dams (e.g., cover teats) if you can't always be present at the time of birth.
- Move the lambs to a warm location, dry, immediately feed colostrum (see below for safe colostrum) and process as normally.
- Use washable tubs or disposable cardboard boxes with straw for absorption and traction for the lambs.
- Afterwards, move to the lamb rearing area. Until one week of age – try to keep in small groups (< 10 lambs per group).
- The person caring for the newborn lambs should change wash hands and wear disposable gloves before handling lambs after working with the infected flock.

Feeding “safe” colostrum and milk:

- Heat-treated colostrum from your infected flock.
 - The best ewes to collect colostrum from are healthy appearing older ewes that are test NEGATIVE.
 - Collect “first-milking” colostrum only. If able, test colostrum with Brix refractometer and only use if $\geq 19\%$ indicating minimal quality.
 - Firstly, clean the teats and udder . Hands should be clean or wear gloves.
 - Heat-treat colostrum by warming to 133 - 140°F (56 - 60°C) and hold that temperature for 60 minutes. If cooler, MV virus will survive. If hotter, the immunoglobulins in the colostrum will become inactivated.
 - Heat evenly in small batches, then freeze and label with the ID of the “donor” ewe. If that donor ewe later become MV positive, her colostrum should be discarded.
- Colostrum from cows.
 - Advantages: large volumes of good quality colostrum can usually be easily sourced.
 - Disadvantages: the immunoglobulins are not to the “farm bugs”; the cows may also be infected with bacteria that cause Johne’s disease; cows should be vaccinated against clostridial diseases during pregnancy; and rarely, anaemia may develop in lambs a few weeks after feeding cow

colostrum.

- Heat-treat first-milking cow colostrum as above. Obtain from healthy older cows. Label each batch with the ID of the donor cow.
- Use colostrum replacement products.
 - Advantage: labour savings as safe colostrum is always available.
 - Disadvantage: high cost, source of the colostrum is bovine so may not have immunoglobulins to the “farm bugs”; absorption may not be as high.
 - It is important to only use products licensed and labeled as colostrum replacement (not supplement)
 - Should be labeled with immunoglobins present as at least 10% of the volume by weight of the product.
- Freezing and thawing colostrum.
 - Freeze in volumes that will be easy to thaw (e.g., ice cube size).
 - Label containers using a permanent marker.
 - Store in a freezer at -20°C or colder.
 - Discard frozen colostrum after 6 months.
 - Thaw at room temperature or in the refrigerator (not the microwave). The thawed colostrum can be stored in the fridge for up to 1 week.
- Proper amount to feed of “safe” colostrum
 - In the first 24 hours, lambs should receive 20% of body weight (200 mL per kg bw).
 - This can be divided into 3 to 4 feedings with the first being within 2 hours of birth.
 - Use nipple bottle or if weak, esophageal feeding tube.
 - Make sure all feeding equipment is clean and disinfected between uses.
 - For commercial products, follow directions on the label as a minimum recommendation.

Supplement 4: Maintaining flocks of differing health status.

These producers will reduce the risk of disease being transmitted to a higher status flock. These protocols aren't specific to one contagious disease but can be used to assist in maintaining MV low risk status. It is strongly recommended that you use the Canadian Sheep Biosecurity Standard and Guide¹ to assist this process.

Buildings

- a. Separate buildings housing different status animals by *at least 5 metres* from other livestock buildings to reduce risk of transmission of aerosol borne viruses and bacteria.
- b. One exception to this is if the buildings have no internal access to each other and ventilation can only flow from the higher status flock (i.e., healthier) to the lower.

Leaving and returning to the higher status flock

- a. Sheep leaving the higher status flock for any reason cannot return to the higher status flock without a period of isolation, including rams.
- b. This period of isolation and the required testing protocol will vary with the disease under consideration.
- c. Please note that the required biosecurity precautions for a specific disease certification program ALWAYS supersede these recommendations.

Pastures and yards (corrals)

- a. Sheep of differing health status should not graze the same pastures during the same grazing season. This period of time may vary depending on the disease in question.
- b. Fences should be constructed so that there is no opportunity for physical contact between the two flocks, including equipment, water, feed, manure and run-off.

Protective clothing

- a. Separate boots, coveralls, hats, gloves and coats should be worn whenever working with the higher status flock.
- b. Hands and arms should be washed with disinfectant soap before working with higher status flock.

Entry biosecurity

- a. The main laneway to the buildings housing the higher status sheep should be gated with a locking device and clearly signed restricting admittance.
- b. Visitors from off-farm that need to have contact with flock (e.g., shearer, veterinarian, ultrasound technician), should wear clean outerwear and boots. Boots should be thoroughly washed prior to entry with a disinfectant soap or covered with plastic disposable boots. All visitors should first visit the higher status flock, following the protocol above, before visiting the lower status flock.

Vehicles and large equipment

- a. Trucks, tractors, manure removal equipment, feeding and watering equipment should not be shared between flocks, or come from off-farm unless firstly cleaned and disinfected.

¹ <https://inspection.canada.ca/animal-health/terrestrial-animals/biosecurity/standards-and-principles/eng/1344707905203/1344707981478>

- b. Livestock transport vehicles from off-farm should not enter any livestock management areas, unless firstly cleaned and disinfected. It is advisable to build a loading ramp away from any areas where sheep may reside.

Other equipment

Equipment routinely used in both flocks should be cleaned and disinfected between flocks or, if possible – equipment should be dedicated for use in each flock. Examples of such equipment include: ultrasound scanners, shearing equipment, board, clothing and footwear; animal health equipment such as tail dockers, castrating equipment, drench guns, automatic syringes; lamb tubes & artificial rearing equipment; warming boxes; and restraint and handling equipment. Use disinfection protocols listed below in this document.

Manure management

- a. Fresh manure from the lower status flock should not be spread on pastures or hay fields.
- b. Manure run-off must be contained so that it cannot reach yards, fields or contaminate water sources.
- c. Composting manure should be done for a minimum of 90 days and turned at least once to assure even heating.

Dead stock

- a. Carcasses, including aborted fetuses and placentas, must be removed immediately from livestock rearing areas including pastures.
- b. Proper disposal should be done according to provincial regulations.
- c. Carrion eaters (e.g., dogs, cats, coyotes, foxes, vultures, crows, gulls, hawks and eagles) must be prevented from scavenging.

Guardian livestock

- a. Use of guardian dogs, llamas and donkeys are acceptable ways of protecting livestock from predators. Dogs often travel from flock to flock within a farm and this is acceptable. Donkeys do not share diseases with sheep and can be moved from flock to flock although if foot rot is present in either flock, disinfection the donkey's feet prior to moving with zinc sulphate is recommended.
- b. Llamas can be infected with some sheep diseases, notably Johne's disease and caseous lymphadenitis. For this reason, it is recommended that llamas that come from sheep farms of unknown or lower health status not be used for predator protection in the higher status flocks.
- c. Guardian, working and pet dogs if allowed to scavenge dead sheep, can become infected with tapeworms (*Taenia ovis*, *Taenia hydatigenia*, *Echinococcus*). These tapeworms can be transmitted back to sheep causing damage to the carcass. *Echinococcus* is also a dangerous zoonotic infection in humans. If scavenging is suspected, dogs must be dewormed every 5 weeks with an antiparasitic drug called a cestocide. Contact your veterinarian for advice on proper preventive treatments.

Insect and vermin control

- a. Flies can spread disease. Control flies through prompt removal of manure from yards, using fly traps and fumigating if necessary.
- b. Rodent (rats, mice) and bird control (pigeons, crows, gulls) should be practised as they can spread disease.
- c. Screen windows and ledges that can be used for bird nests. Plug holes.

Shearing CLA negative flocks

- a. For closed flocks, the shearer represents a significant risk for the introduction of caseous lymphadenitis. The onus is on the flock owner, with the cooperation of the shearer, to ensure that the disease does not have an opportunity to enter the flock at shearingtime.
- b. The bacteria (*Corynebacterium pseudotuberculosis*) can survive for weeks and months in dried pus on shearing equipment and can invade slightly abraded and unbroken skin.
- c. For this reason, it is recommended that
 - i. The higher status flock have its own shearing equipment, shearing board, moccasins, table for tagging and folding fleeces.
 - ii. Coveralls or shearing pants as well as shirts, coats and hats used by the shearer and any assistants should be freshly laundered and not used in any other flock.
 - iii. Boots used by assistants should be freshly scrubbed and disinfected.
 - iv. Wool bags should either be new, freshly laundered or left outside the yard.
 - v. Before shearing, the shearer should wash his/her arms and hands with chlorhexidine soap.
 - vi. All nicks and abrasions post-shearing should be treated immediately with 2% iodine solution.

General Recommendations for Cleaning, Sanitizing and Disinfection

Cleaning = process of removing organic material from surfaces

Sanitizing = process of reducing the level of infectious organisms but not killing; this may be done by physical means

Disinfection = process of killing most infectious organisms using chemical or physical agents.

What follows is a brief overview of disinfection and disinfectant agents and there are many references available with more in-depth information.

Cleaning and Disinfection of a premises

- Remove all animals, utensils & equipment (e.g., feeders and waterers).
- Scrub and clean utensils and equipment with detergent soap. Rinse well.
- Make sure electrical outlets are covered.
- Wear protective clothing (boots, rubber gloves, coveralls, N95 mask).
- If waterers are not removable, empty completely and clean as above. Make sure they are rinsed well after disinfecting.
- Make sure run-off isn't available to livestock or contaminates water sources.
- Gently wet area to prevent dust (e.g., *Coxiella burnetii* (Q fever) is highly infective when inhaled in dust), knock down cobwebs after wetting.
- Scrub, scrape and flush away all gross organic material using a cleaner/sanitizer detergent compound.
- Rinse well. High pressure hot water will help to dissolve fats and other organic debris when cleaning and rinsing. The premises must be rinsed well to prevent inactivation of disinfectant. They must also be dry before applying disinfectant.
- Apply disinfectant and leave on for recommended time as outlined in the directions.

- Dirt yards that cannot be disinfected, should have organic debris scraped away and wet areas drained or built up. Fences around yards and outdoor equipment should be scrubbed and disinfected as above.
- Lamb milk feeding equipment - wash with detergent, rinse well and rinse with 2% hypochlorite solution (bleach).

Footbaths

- Locate at every doorway with a boot brush hanging nearby
- Boots should be scrubbed and washed every time an individual enters and exits the premises
- Change every 3 days or more frequently if become contaminated with organic material
- Do not add salt or antifreeze to prevent freezing.
- Should be a minimum of 10 centimetres (4 ") in depth

Equipment

Disinfection of equipment can be done with sodium hypochlorite (6% bleach) by mixing 1-part bleach to 2 parts water for a final solution of 2% sodium hypochlorite OR sodium hydroxide by mixing 80 grams of sodium hydroxide crystals with 1 litre of water to make a 2-molar solution. These agents are effective against most viruses, bacteria and the scrapie agent. Both can be used for disinfection of surgical equipment, docking and tattoo equipment, multi-dose syringes and work surfaces. Minimum contact time should be 10 seconds with the product being rinsed or wiped off after disinfecting. Chlorhexadine solution or soap is effective for disinfecting shearing blades.

Selecting a disinfectant

Disinfectants will not work well unless organic material is removed, the detergent flushed well and the premises dry. After that, the main considerations are environmental hazard, the agent to be killed, and availability and safety of the chemical – particularly whether it is safe in presence of animals. Read the directions well for preparation and use and acquaint yourself with the efficacy of the various compounds against bacteria and their spores, viruses, fungi and parasites and their eggs. Many of the compounds require prolonged contact time to be effective.

More advice can be found at the website of the World Organization for Animal Health (OIE)² and the Canadian Food Inspection Agency³. An explanation of different types of disinfectants and range of activity is provided by the Center for Disease Control (CDC)⁴.

² https://www.oie.int/fileadmin/Home/eng/Health_standards/tahc/current/chapitre_disinfect_disinsect.pdf

³ <https://inspection.canada.ca/preventive-controls/cleaning-and-sanitation-program/eng/1511374381399/1528206247934>

⁴ <https://www.cdc.gov/infectioncontrol/guidelines/disinfection/disinfection-methods/chemical.html>

Supplement 5: MVFSP Biosecurity requirements

This table contains a summary of biosecurity requirements for the MVFSP. More details on those requirements are provided in the protocols

| Biosecurity Requirements for the Maedi Visna Flock Status Program |
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| <p>C.5. Animal identification</p> <p>The identification information <i>must</i> be maintained by the flock owner / manager.</p> <ol style="list-style-type: none">The identification <i>must</i> be a permanent ID.Baseline information <i>must</i> be kept on each sheep in the flock.The non-CSIP or non-ATQ identification used in the MVFSP <i>must</i> be unique within the flock.The identification <i>must</i> be clearly legible to the reader. |
| <p>B.14. Isolation facility - a facility in which sheep are housed for a specific period of time during which they <i>must</i> have no direct contact with other sheep, shared feeders or watering equipment. The Isolation Facility <i>must</i> be:</p> <ol style="list-style-type: none">Separately ventilated or located at least 5 metres from high status flock, to minimize the risk of aerosol transmission of the MV virus.Have no direct inside communication with the main flockIf within the same building, have a solid partition between the facility and the main flock so there can be no movement of animals or air from the isolation flock to the higher status flock.Inspected and approved by a veterinarian or their designate RVT at the enrolment test. |
| <p>C.7.a. Surgical and medical equipment</p> <p>Surgical and medical equipment, that may become contaminated with blood or saliva <i>must</i> not be shared between the flock and any sheep housed in an isolation facility or part of another flock whose status is not "A", without first being disinfected.</p> |
| <p>C.7.b. Single-use needles</p> <p>Are <i>strongly recommended</i> for use in flocks with test positive animals.</p> |

Biosecurity Requirements for the Maedi Visna Flock Status Program

C.7.c. Personnel and visitors

- a. *Must* wear clean clothing that has not been in contact with any sheep infected with MVV or sheep of unknown MV status.
- b. All protective footwear *must* be cleaned prior to entering the flock by vigorous scrubbing with a disinfectant soap (e.g. tamed Iodine or creosote-based soap) and fresh water.
- c. Hands *must* be washed with a disinfectant soap prior to handling.
- d. It is strongly recommended to wear protective rubber gloves when handling sheep.

C.8. Transportation of sheep

- a. Livestock handlers *must* wear clean coveralls and boots as per C.7.c.
- b. All livestock carriers *must* be cleaned and disinfected before sheep are loaded.
- c. Sheep must be transported so that:
 - i. There is no contact with sheep or other livestock of unknown or lower status.
 - ii. They are not unloaded at any other livestock facility with sheep or other livestock of unknown or lower status en route to the new location.

C. 9. Sheep leaving and returning to the flock must

- a. Be housed in an approved Isolation Facility, and
- b. Have two Negative MV tests; the first may be on return and the second between 8 and 12 weeks after the first test date
- c. The Negative test results be obtained prior to being released from the Isolation Facility to the flock.
- d. On the next scheduled flock test it is *REQUIRED* that those animals be included in the flock test. **If an "A" status test, they *must* be tested in addition to the random sample.**

C.10. New additions to flocks enrolled in the MVFSP

- a. All sheep entering a flock enrolled on the MVFSP must be accompanied by an MVFSP transfer form.
- b. Sheep entering from an "A" status flock must have one Negative test while in an approved Isolation Facility and prior to entering an MVFSP flock.
- c. Sheep from any other flock must have two Negative tests while in an approved Isolation Facility prior to entering an MVFSP flock; the first may be on entry and the second between 8 and 12 weeks after the first test date.
- d. On the next scheduled flock test it is *REQUIRED* that those animals be included in the flock test.

Biosecurity Requirements for the Maedi Visna Flock Status Program

C.11. Qualifying of sheep to enter the flock from the Isolation Facility

- a. All sheep entering the Isolation Facility from outside the flock *must* undergo a MV test at entry.
- b. All sheep in isolation are treated as a group. The status of the isolation group is the same as the lowest status animal in the group.
- c. An Isolation Group test must include all sheep in isolation that are \geq 180 days of age.

C.12. Embryo status All embryos being implanted in recipients located in the enrolled flock *must* have

- a. Either originated from donors located in a Status "A" flock or
- b. Were handled in accordance with the protocol set out by the International Embryo Transfer Society for the sanitary handling of embryos.

C.13. Semen status All semen (fresh or frozen) being used in artificial insemination programs within the flock *must* have

- a. Originated from rams located in Status "A" flocks or,
- b. From countries declared free of maedi visna, or
- c. From rams collected in a Canadian Food Inspection Agency accredited AI Centre (ensuring that they have had at least one negative MV test prior to semen collection).

C.14. Offspring (lambs) of Positive ewes:

- a. Weaned lambs < 180 days of age from Positive ewes, it is strongly recommended to market these animals so as to reduce risk of MVV infection to the negative flock.