On-farm slaughter operation food safety

Learning module 5:
Safe red meat slaughter

Alberta

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1.0 Food safety principles of slaughtering red meat animals

This On-Farm Slaughter Operation (OFSO) safe red meat slaughter module provides information on:

- Responsibilities of an OFSO licensee for slaughtering red meat animals
- Typical slaughter controls required for safe red meat

Slaughter controls can include but are not limited to contamination that comes from the environment (e.g., feces and dirt) or from spillage of the intestinal tract of the animal.

OFSO licenses, issued by Alberta Agriculture and Irrigation, allow for uninspected outdoor slaughter of animals owned by the customers. The slaughter occurs on land owned, leased, or controlled by the licensee and may be conducted by any experienced individual approved by the licensee. The licence holder must read this module and pass the quiz. It is highly recommended that if the licensees do not conduct the slaughter themselves, they have the person who they trust to perform the slaughter also complete this module.

1.1 *E. coli* O157:H7 and where it comes from

Escherichia coli (*E. coli*) are bacteria commonly found in the digestive tract of warm-blooded animals. Until recently, *E. coli* O157:H7, a specific species of *E.coli*, was primarily associated with cattle but new findings show that other animals like pigs, goats and sheep can also carry the bacteria. Animals that appear healthy can be carriers of *E. coli* and they can spread it to other animals. Although most types of the bacteria are harmless, pathogenic (disease-causing) types such as *E. coli* O157:H7 can cause illness and potentially death in humans. Young children, the elderly and immunocompromised individuals are especially vulnerable to severe outcomes.

1.2 Controlling the spread of *E. coli*

E. coli is shed from the intestines of an infected animal through its feces; therefore, proper handling of feces in pens and barns, and control of the intestinal tract's contents during slaughter, are the keys to preventing contamination with this bacterium.

Animals' hides and hooves can carry feces and be source of contamination with *E. coli*. Therefore, shared living quarters, transportation, holding pens, and slaughter practices can all be involved with the transfer of feces from an animal to the environment, from the environment to an animal, or from one animal to another.

Spillage of intestinal contents during gutting is another main source of contamination with *E. coli*. Punctures occurring during gutting can leak bacteria, possibly contaminating the carcass, workers' hands, knives, equipment, and the slaughter environment.

Workers can also cause bacterial cross-contamination since they can transfer bacteria from their hands or clothing. Good handwashing practices are vital to controlling the spread of pathogens. Dedicated work clothing is another important control measure since workers or visitors can bring contamination from their home barns to the workplace.

Contaminated equipment used during slaughter and carcass processing can transfer *E. coli* to clean product. Proper cleaning and sanitation procedures before, during and after slaughter and processing helps to control its spread.

Aerosols and spray created during cleaning gives bacteria "wings," which allows it to travel through the air and land on clean surfaces. Minimize the aerosols created when washing dirty areas, particularly drains and floors.

2.0 Prepare your slaughter area

The conditions under which OFSOs operate, e.g., slaughtering outdoors, present distinctive risks that must be recognized and mitigated. Without proper planning and preparation, you could find yourself running around gathering your equipment, as it is needed and risk the spread of contamination as you enter storage areas with dirty boots, clothing, or unwashed hands. Therefore, it is very important to assemble all your tools before you begin slaughter. To help organize your slaughter and minimize cross-contamination opportunities:

- protect your slaughter site and equipment from contaminants that could include mud, dust, and pests
- gather the equipment that you need during slaughter, for example knives and utensils, buckets, soap, disposable wipes/towels, and anything else that you need for slaughter
- dedicate specific tools for slaughter only; keep them in good repair and stored in clean storage areas
- use stainless steel tables that are easy to clean and do not absorb blood or processing water. Avoid the use of wood.
- set up a hand-wash station that is easily accessible during slaughter. A water container with an on/off spigot to hold warm water placed on a table and an empty five-gallon pail placed below to collect the grey water is a simple temporary solution to hand washing outdoors. Ensure that you have adequate supplies of water, soap and towels, plus a container to discard used towels
- make sure that your water source, including ice, is potable and safe
- provide staff with appropriate clothing, for example, full-length vinyl aprons that can be easily cleaned and removed before using washrooms or entering a clean area
- assemble everything you need to prepare sanitizer solutions throughout the slaughter. A solution of 100-200 ppm food-grade chlorine is a good option, although it is important to check the strength with test-strips regularly as the efficacy reduces when organic matter (dirt) is mixed in. If the solution starts to get cloudy, discard it and use a fresh solution. Make a fresh batch every two hours or fewer.

3.0 Cross-contamination points and slaughter best practices

As the OFSO licensee, you are ultimately responsible for the safety of the products produced under your licence. This is true whether you conduct the slaughter yourself or whether you allow someone else to conduct it. As there are many opportunities for cross-contamination to occur during slaughter and processing, many proactive actions can prevent cross-contamination from happening. Sources of contamination include:

- animals being slaughtered – ingesta, feces, hair/tag
- other farm animals including dogs
- bodily fluids
- equipment (e.g., dirty utensils)
- stick wounds
- bruises
- broken bones
- necrotic tissue
- cysts and abscesses

Consider implementing the following best practices into your operation to prevent cross contamination from occurring.

3.1 Animal husbandry

Animals carrying pathogens can pass contamination to healthy animals through their feces; therefore, maintaining clean living conditions is important. Ensure pens have adequate clean bedding and proper water drainage to minimize pathogen growth. If an animal appears ill, separate it from the other animals.

3.2 Drug residues

It is important to know the drug history of animals presented for slaughter. If you raised the animals on your farm, you will have this information. However, if the animal was bought at an auction market, you must find out if drugs were administered to the animal and if the appropriate withdrawal time has been met for the drug before the animal is sold and slaughtered.

3.3 Broken needles

If you medicate your animals using needles, follow these guidelines to avoid a broken needle:

- use sharp needles
- do not re-use a needle more than 10 times
- do not re-use needles used for sick animals
- use the appropriate needle size
- inspect the needle after injection to ensure it is intact, make a note if it is broken and watch for it during processing or let the buyer know that it may still be in the meat
- discard bent needles and do not re-use them or attempt to straighten them

3.4 Animal health

Do not slaughter sick or emaciated animals, sell and slaughter only healthy animals.

Note: Some diseases that can affect human health are reportable. Familiarize yourself with reportable diseases and who to contact if something out of the ordinary is noticed prior to slaughter in this Reportable Animal Diseases factsheet.

3.5 Receiving and animal handling

Treat every incoming animal as though its hide is contaminated with feces or bacteria, even if you cannot see it. Keep pens and transport vehicles clear of fecal matter.

3.6 Withhold feed

Avoid feeding animals 12 hours prior to slaughter. When the intestine is empty, it lies flat and is less likely to be nicked with a knife or torn when the carcass is cut open, reducing the chance it can be transferred to the meat. Potable water should always be available.

3.7 Stunning

Prior to stunning, restrain the animals in a manner that limits their contact with the ground. When animals make contact with the ground after stunning, they can pick up contamination. If a firearm is used, check that the bullet does not fragment and that parts of the bullet are not embedded in meat that will be harvested for human consumption.

Note: if using a captive bolt for cattle over thirty months, clean it thoroughly before using it on other species as the bolt could become contaminated with brain matter and Specified Risk Material. Properly dispose of this waste material with other Specified Risk Material.

3.8 Sticking/bleeding

Sterilize the sticking knife prior to use on every animal. If using a scald tank, make the stick wound as small as possible to avoid contamination. Bleeding the animal off the ground is preferable to prevent contamination of the carcass and stick wound. If bleeding on the ground, choose a clean, well-drained location away from manure and other slaughtered animal waste. Collect the blood in a bucket and dispose of with other waste.

3.9 Hide removal

Use a dedicated clean knife to remove the hide and prevent the outside of the hide from contacting the exposed meat. Avoid flipping the hide or abruptly moving it in a way that may spread contamination through the air. Do not skin the animal while it is lying on the ground; use a hoist or a cradle. Keep hands and equipment clean. Ensure neck, front legs, or any part of the skinned carcass does not contact the ground when moving the carcass.

Note: During hide removal and at any time during carcass dressing, trim visible contamination rather than rinsing it off with water. Rinsing tends to distribute the contamination throughout the carcass instead of removing it. Avoid washing the carcass until all dressing is complete.

3.10 Scalding

Maintain a temperature of 60-62ºC (143ºF) depending on the size of the animal, with larger animals needing a higher temperature. Keep the scald tank as clean as possible by reducing the amount of dirt/feces that enters it. Check the temperature regularly with an accurate thermometer. Change the water when it is visibly dirty.

3.11 Evisceration

This may be the most important step in controlling bacterial contamination of the carcass and meat. Ensure proper incisions are made and tie/bag the rectum to decrease the chance of spilling the gastrointestinal contents onto the carcass and working environment. Clean all equipment, knives, and hands/gloves, etc., to prevent contamination between animals.

Note: Contamination of exposed meat can come from several sources during evisceration. Be aware of the following sources of contamination:

- feces – from a punctured intestine or bung that is not tied off
- ingesta – if the esophagus has not been tied off or if the feed withdrawal time was not long enough
- hide – be particularly diligent during initial cuts. A best practice is to shear the hair along the intended cut line prior to opening
- milk – when udders are removed. Spilled milk provides a perfect environment for bacteria to grow
- urine – if the bladder is punctured when opening the pelvic bone

3.12 Carcass splitting

Carcasses of cattle aged 30 months or older must be handled in a manner that controls portions of the carcass associated with Specified Risk Materials. This includes the skull, brain, trigeminal ganglia, eyes, palatine tonsils, spinal cord and dorsal root ganglia, as well as the distal ileum of cattle of all ages. For more information on handling and disposal of SRM, contact your local Canadian Food Inspection Agency or read their Guidance for Specified Risk Material resource. Cattle over 30 months of age should be processed at the end of the day while younger cattle and other species should be processed first.

Wipe down and sterilize the splitting saw blade with hot water (82ºC/180ºF) or with a chemical sanitizer and a clean cloth between carcasses. Dip the splitting saw housing in hot water/sanitizer between carcasses to prevent the spread of contamination from one animal to the next. When splitting cattle aged over 30 months, care must be taken not to damage the spinal cord.

3.13 Post-mortem examination

Once the carcass has been opened and the internal organs are visible, an examination of the organs will detect abnormalities or diseases that make the meat unfit for human consumption. Watch for signs such as swelling, discharge, tumors or growths, or anything else that appears out of the ordinary. If any observations are questionable, the carcass should not be allowed for human consumption or a veterinarian may be consulted for disposition.

3.14 Trimming

The trimming step is the final point for removing all contamination and meat that is not fit for human consumption. Wash and sanitize the knife after removing parts of contamination and then again between each animal.

Note: It is recommended to trim visible contamination instead of rinsing it, at any stage, because rinsing in ineffective in removing bacteria and will spread the contamination throughout the surface of the carcass.

Consider the following when conducting the final trim:

- stick wounds: remove approximately 2.5 cm (1 inch) of tissue around the stick wound to remove contamination that enters the carcass with the knife during sticking

- bruises: trim the visible bruise where blood has collected, as this provides an ideal growth environment for bacteria. Heavily bruised animals should not be used for human consumption
- broken bones: if the bone protrudes through the skin, infection may have developed and the fracture site must be removed. Fractured limbs should be removed completely and not consumed
- necrotic tissue: unhealthy tissue that has died due to infection or trauma must be removed
- cysts and abscesses: must be removed completely in a manner that does not puncture the growth. Remove enough tissue around the cyst or abscess to safely remove it in one piece

3.15 Carcass wash

This wash step is to remove bone dust and blood from dressing procedures and is not a substitute step for trimming contamination. Wash carcasses from the top-down and avoid contaminating already washed carcasses with overspray. Do not use high-pressure water that will splash water from the ground up onto the hanging carcasses as this could contaminate the carcass surface with dirt and bacteria from the ground.

3.16 Chilling/cooling

Rapid carcass cooling slows the growth of disease and spoilage causing bacteria that might remain. Cooler equipment must be capable of reducing the internal carcass temperature to 4°C (40°F) or less and maintaining those temperatures. When checking the internal carcass temperature, insert a clean, accurate thermometer into the centre of the thickest muscle of the carcass. Ensure carcasses are stored in the hanging cooler in a way that prevents them from touching other carcasses to allow for good airflow and efficient cooling. Proper air circulation will aid in reducing the moisture on the surface of the carcass that in turn helps to prevent the growth of bacteria.

3.17 Managing waste

Use clearly identified well-marked containers for temporary storage of waste from blood collection, trimming, evisceration, etc. during the slaughter day. Ideally, the containers have good fitting lids to keep out flies and other pests. When containers are full but not ready for final disposal, store them away from the slaughter area to avoid the possibility of cross-contamination.

4.0 Sanitary design

Effective cleaning and sanitation prevents pest infestations and sources of bacterial cross-contamination by removing meat and residues that attracts/nourishes pests and bacteria. It also protects the consumer from potential chemical and physical hazards. The chance of the procedures being successful is greatly increased when they are designed specifically for your operation and considers its design, construction, equipment, and maintenance.

4.1 Evaluate the sanitary design of your operation

Under your on-farm slaughter operation licence, all slaughter must occur outdoors and processing occurs indoors. This is an important point of separation. The slaughter component is considered the “dirty” part and the processing is considered the “clean” part.

A sanitary design is based on both the flow of the product and the movement of people. It considers who has to travel where to do what. Cross-contamination is the unintentional transfer of a hazard from a dirty surface to a clean one. For example, when someone from the slaughter area enters the processing area with dirty boots on the chance that they will spread bacteria is extremely high. This type of risk can be designed out of your operation in many ways:

A concrete pad is the preferred area to conduct slaughter because it is easy to clean and prevent the transfer of ground contamination onto the carcasses. If a concrete pad is not available, select a clean, grassy area freed from feces to conduct slaughter. The use of tarps or floor mats could work to protect carcasses dirt contamination.

- Create a distinct area designated as “dirty” for activities such as slaughter, bleed-out, scalding, and evisceration.
- Keep the dirty activities separate from the “clean” activities that include cooler(s), chilling tanks and packaging.
- Physically limit people (including those performing the slaughter and visitors) to certain areas. For example:
  - keep people from dirty areas of the operation separate from the clean areas
  - if people must move from the dirty area to the clean area, enhance separation between the two areas by:
    - requiring all people onsite to wash their hands upon entry to the clean area

    - providing foot baths for people to clean their boots
    - requiring people to change outer layer of clothing like smocks or coats
- Sanitizing stations and hand-wash sinks that are conveniently located makes it handy for people to wash their hands and sanitize small utensils frequently. People are more likely to use them if they are convenient.

4.2 Consider the equipment and materials used in your facility

Effective cleaning is improved when equipment is easy to access, designed to be cleanable, well-maintained, and dedicated to slaughter activities. For example, paint that breaks down and begins to chip after repeated cleaning and sanitizing can be hazardous to the consumer particularly if the paint is not safe for human consumption. In the construction or renovations of your operation, consider the following:

- Avoid using equipment that is painted and can chip. If this is unavoidable, monitor the equipment regularly for chipped/flaking paint. The monitoring should be done prior to using the equipment.
- Position the equipment so that it can be easily dismantled and thoroughly cleaned.
- Use stainless steel where possible to avoid equipment rusting.
- Ensure that all welds are smooth and continuous to prevent meat residues being caught, which makes it harder to clean.
- Avoid using wood in the facility because it can splinter or crack, is very difficult to clean, and it can harbor bacteria.
- Ensure all meat contact surfaces are constructed with materials that will not contaminate the meat. Ask your supplier for materials that are approved for food use.
- Surfaces that are not in direct contact with meat, such as floors, walls, tables, racks, etc., must be easy to clean, nonporous, and able to withstand the cleaning and sanitizing process.
- Dedicate saws, knives, and other equipment to the slaughter operation and do not use them for other purposes on the farm.

4.3 Other things to keep in mind

Slaughter at OFSOs occurs outdoors and this presents distinctive risks that do not occur under other licensed slaughter that takes place inside a clean and well-maintained building where the environment can be controlled. The risks of outdoor slaughter must be recognized and controlled. Consider these opportunities for reducing cross-contamination in your operation:

- Regularly clean trailers that haul live animals from the auction market or other locations to reduce the dirt and feces transfer between animals and loads.
- Separate cattle from other animals if you have a mixed farming operation to reduce the transfer of bacteria.

Avoid conducting slaughter in areas where there are accumulated feces on the surrounding ground; conduct your slaughter on clean grass or a concrete pad.

- Prevent contact of the carcass with the ground at any point during slaughter.

Keep live animals out of the processing area. This includes pests, dogs, and other pets and animals intended for slaughter or other livestock.

- Limit the handling of animals by people who visit the farm as they can transfer bacteria from animals they touch to the slaughter and processing equipment, and possibly to their homes.
- Provide hand-washing stations, like those found at petting zoos, if you do permit visitors (especially children) access to live animals or areas where animals are held, slaughtered, or processed. Supply hand-wash stations with soap, water, paper towels, and a garbage bin.
- Maintain appropriate educational signage throughout the facility to guide your employees and visitors in safe animal and food handling practices.

5.0 Water source

Water can become contaminated with bacteria such as E. coli or chemicals like arsenic, uranium, or lead. The Canadian government has set limits of contamination and detail can be found at Canadian Drinking Water Guidelines. Municipal water supplies are routinely tested for contamination by the municipality and alerts are issued when a problem is discovered. Private sources such as wells and dugouts are your responsibility to monitor.

Particular attention must be paid to water sources that are near areas of animal husbandry as fecal matter can seep into the source. It is a good practice to house animals far away from the water source or preventing access to the water source, i.e., fencing. Environmental emergencies like flooding, fires, and drought, can also affect water safety.

Best times to test a water source are:

- early spring just after the thaw
- after a rainy season
- after a long dry spell or drought
- after heavy rains and floods
- after the well has not been used for a long period of time.

For more information on maintaining safe well water, view the following resources:

- Working Well – Resources | Alberta.ca
- Be Well Aware: Information for private well owners | Canada.ca
- Be Well Aware: Ensure your well water is safe during and after emergencies | Canada.ca.

5.1 Water used as an ingredient or processing aid

Water and ice are used as raw materials in many production processes, for example, ice used to cool meat while grinding, water used to disperse additives, etc. Ice and water used as an ingredient or that comes in direct contact with food must be made from potable water and protected from impurities.

Ice-making machines must be cleaned regularly to avoid contamination of dirt or bacteria.

5.2 Water used for chilling

As the water used for spraying carcasses comes into direct contact with the meat, it must be safe water and meet the guidelines for safe drinking water (potable).

5.3 Water used for cleaning

Cleaning chemicals are often diluted with water and then rinsed with water, for this reason, all water used in sanitation procedures must be free from contamination and potable.

5.4 Water used for personal hygiene

As hands must be regularly washed to maintain sanitary processing, the water used by staff for personal hygiene must be potable. If not, employees' hands could transfer contamination from the water to the meat.

6.0 Waste disposal

Operators of OFSOs must dispose of their slaughter waste and dead animals that are not processed for consumption according to Disposal of Dead Animals Regulation (DDAR) by on-farm composting, burning, or by burial.

6.1 On-farm Composting

Where one or more dead animals are composted in an open outdoor or indoor compost pile:

- the volume of dead animals must not exceed 25% of the total volume of the compost pile
- materials may not be removed from the compost pile until the dead animal(s) are composted to the extent that:
  - the generation of odours by the compost are minimized
  - the compost will not contaminated surface water or groundwater
  - the compost will not attract vectors of disease, and
  - the use of compost will not cause or contribute to the spread of disease, cause scavenging or create a nuisance

An outdoor farm open compost pile must be:

- at least 100 m from any well or other domestic water intake, stream, creek, pond, spring, river, irrigation canal, dugout or other water source and the high-water mark of any lake
- at least 25 m from the edge of any coulee or embankment
- at least 100 m from any residence
- designed in a manner that will exclude scavengers
- at least 100 m from the boundary of any land owned or leased by a person other than the owner of the dead animal, unless the owner or leaseholder of the land has consented in writing to the outdoor farm open compost pile being located closer to the boundary,
- at least 300 m from any provincial highway, and
- designed such that the dead animal or animals are covered with at least 60 cm of composting material.

An indoor farm open compost pile must be in a building that has:

- an impervious floor, and
- adequate drainage control to prevent the contamination of surface water or groundwater from the compost effluent.

For additional information on the composting process, see On-farm composting.

6.2 On-farm burning

Burning on-farm can be done as an open fire or in an incinerator, and there must be no remains left after burning.

Burning of a dead animal and parts may only occur if done in accordance with the Substance Release Regulation (AR124/93) or the Code of Practice for Small Incinerators. Contact Alberta Environment and Parks for additional information about requirements associated with burning. Contact your municipal district regarding burning permit requirements.

6.3 On-farm burial

Burial requires great care in site selection because as carcasses decompose they release materials that potentially enter groundwater. Burial sites should be located in low permeable soils. Areas with a high groundwater level or shallow aquifer must be avoided.

An OFSO may dispose of dead animals by burial in a farm burial pit if the total weight of all animals in the pit is between 100 kg and 2500 kg. (**Note**: the total weight of dead animals is determined by adding the weight at the time of burial of each dead animal buried in the pit to the weight at the time of burial of each dead animal previously buried in the pit).

The requirements for the farm burial pit include:

- at least 1 m above the seasonal high-water table

at least 100 m from any well or other domestic water intake stream, creek, pond, spring, river, irrigation canal, dugout, or other water source and the high water mark of any lake

- at least 25 m from the edge of any coulee or embankment
- at least 10 m from any other farm burial pit
- at least 100 m from any residence
- at least 100 m from the boundary of any land owned or leased by a person other than the owner of the dead animal, unless the owner or leaseholder of the land has consented in writing to the pit being located closer to the boundary,
- at least 300 m from any provincial highway, and
- covered with:
  - a minimum of one metre of compacted soil, if no additional dead animals are to be buried in the pit, or
  - a wooden or metal lid that is designed to exclude scavengers and quicklime is applied to the dead animal or animals in sufficient quantities to control flies and odour, if the weight limit established by clause (a) has not been reached and the owner intends to bury additional dead animals in the farm burial pit.

- One or more dead animals may be buried in a farm burial pit if:
  - the total weight of the dead animals buried in the pit does not exceed 100 kg

An OFSO may dispose of dead animals by burial in a farm burial pit, if the total weight of all animals in the pit is less than 100 kg, and the pit is:

- at least 50 m from any well or other domestic water intake, stream, creek, pond, spring, river, irrigation canal or other water source and the high-water mark of any lake
- at least 25 m from the edge of any coulee or embankment
- at least 100 m from any residence situated on land owned or leased by a person other than the owner of the dead animal,
- at least 3 m from any other farm burial pit
- covered with a minimum of one metre of compacted soil, and
- has not been used for the burial of a dead animal during the previous 5-year period

For more information, see Livestock Mortality Management.

7.0 Quiz

After completing learning module 5: safe red meat slaughter, and Module 4: safe poultry slaughter, please complete the quiz for modules 4 and 5.

For more information on safe red meat slaughter, please contact agi.foodsafety@gov.ab.ca.