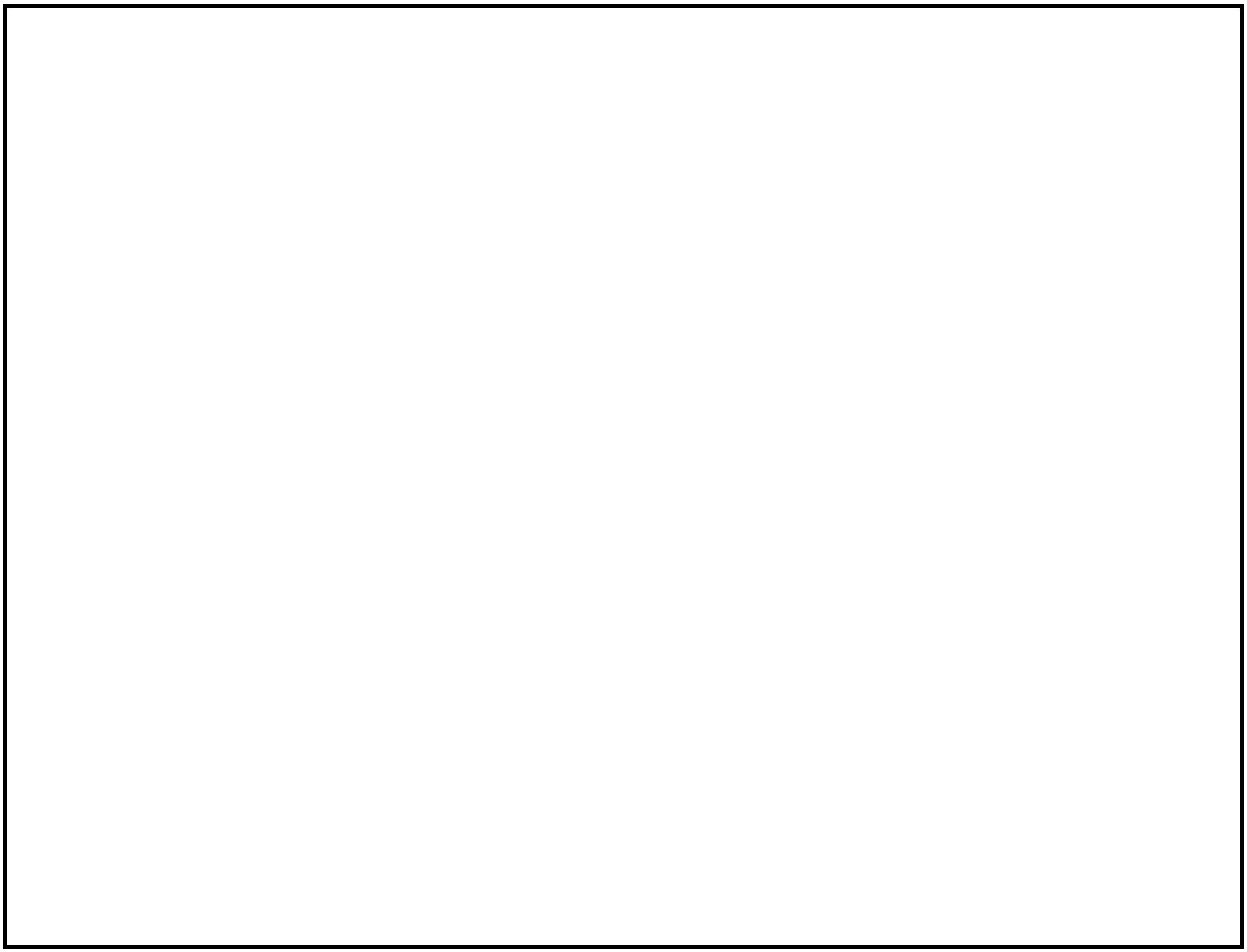
Handling Deadstock

Alberta Beef Producers

Fred Hays

November 15, 2013



Handling Deadstock- Table of Contents

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The cost to producers to deal with deadstock has increased since regulations were changed after the 2003 BSE situation. Prior to then renderers would usually have an on farm pick-up service for any dead livestock that was no cost to producers. Since BSE regulations changed that would not allow SRM material to be rendered with final byproducts being sold for supplemental livestock feed ingredients and fertilizer. This provided a source of income for the renderer. Today rendered material in Alberta is required to be put into a private landfill near Coronation, Alberta. This has increased the cost to the renderer.

This document is intended to address some of the main issues around carcass management[a]. More information about various processes is provided by the footnote references.

Present renderer pick up process

There are presently three pick up regions in Alberta[b].

1. Edmonton
2. Calgary
3. Lethbridge

Edmonton goes north to Barrhead and Westlock; west to Lodgepole; as far south as Highway 13 and east to Highway 36. Calgary goes as far north as Highway 13 and Claresholm; west to Rocky Mountain House; south to Turner Valley; east to Rockyford and Bassano. Lethbridge covers Brooks to Medicine Hat and Elkwater; Claresholm to Pincher Creek and Waterton.

Each plant has 3 to 4 trucks out daily. The cost for pickup is $0.09 a pound with a minimum charge of $75. Trucking costs are rising and deadstock volume continues to fall. Numbers picked up for rendering are presently at 45 percent of what they were prior to BSE. One Municipal District in the Lethbridge area pays for deadstock removal directly.

The plants remove the hide and render the carcass selling the hide and rendered fat and sending the leftover solids to a landfill.

Transport permits can be applied for over the phone and the permits can be faxed to the producer. Storage permits are harder to obtain. The application needs to be made in writing with a number of conditions that are required to be addressed. West Coast Reduction transportation and rendering permits are good for one year.

Some changes may be made to the program dealing with pick-up areas (reduced or increased) and costs to producers that could conceivably increase. For specific information West Coast Reductions (WCR) should be contacted.

Committee Members
Rick McKnight , Chair, Wildlife Working Group
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Gordon Graves Cow Calf Council

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[a] ABP appreciates the assistance from Dr. Reza Hejazi, A/Western Area Emergency Management Coordinator-CFIA, as well as Natasha Page and Giselle Beaudry, Waste Reduction Specialists with Alberta Environment and Sustainable Resources.
[b] Wildlife Working Group presentation by Geoff Smolkin, Director of Prairie Operations for West Coast Reduction, April 22, 2013.

Fred Hays, Policy Analyst

Specified Risk Materials

Specific Risk Material (SRM). Canada and the U.S are both considered as controlled Risk Countries for SRM. SRM is defined as the skull, brain, trigeminal ganglia (nerves attached to brain and close to the skull exterior), eyes, spinal cord, distal ileum (a part of the small intestine), and the dorsal root ganglia (nerves attached to the spinal cord and close to the vertebral column) of cattle aged 30 months or older[c]. All cattle carcasses are deemed to carry SRM unless this has been removed. Also, various tissues are considered to be SRM including aborted fetuses and placentas should be managed as SRM; these should not be included with manure[d] Therefore, whichever consideration for deadstock management is used, it is always dealing with SRM. Regulations were developed for dealing with deadstock as dealing with SRM.

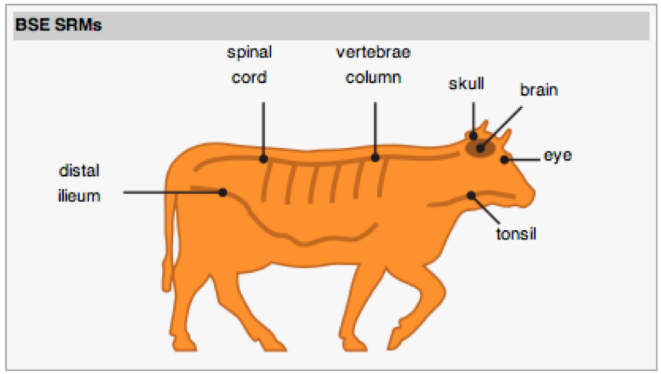

Figure 1. Source of BSE Prion Accumulation that forms SRMs.

In Alberta legal methods of carcass disposal are outlined in the Destruction and Disposal of Dead Animals Regulations (Animal Health Act, Alberta)[e].

Since BSE, and because of the increased cost for render pick-up, farms with beef cattle generally use on-site natural disposal as the preferred method. It is also generally preferred to prevent the spread of disease.

Infectious or Reportable Diseases. If an animal is known or suspected to have died from one of these diseases the owner must report this to the Chief Veterinarian within 24 hours[f]. They will recommend the method for disposal. For an animal that has been euthanized, owners need to prevent scavengers from gaining access to the dead animal. These animals cannot be disposed of by natural disposal. Any emergency carcass disposal can be guided by a producer's veterinarian or rural municipality. If the owner of a dead animal cannot be located or is unknown then it is the municipality's responsibility to dispose of it[g].

Dealing with Livestock Mortalities

Several reports have been prepared dealing with the management of livestock mortalities. Alberta Agriculture and Rural Development and the government of Saskatchewan prepared two good reports dealing with mortality disposal management[h,i]. This covers disposal options such as Natural Disposal, Carcass Burial, Rendering, Incineration and Composting. These are addressed in the Canadian Health of Animals Act and Regulations, and the Alberta Animals Health Act and Regulations. Some techniques have better biosecurity features than others. Other techniques are less expensive and more adaptable.

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[c] Specific Risk Material- Requirements for Slaughtering Cattle and Processing Beef. (2013) CFIA webpage http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/bse/srm

[d] Canadian Beef Cattle On-Farm Biosecurity Standard, Implementation Manual (2013) Canadian Food Inspection Agency.

[e] Animal Health Act. Destruction and Disposal of Dead Animals Regulation. Alberta Regulation 229/2000.

[f] Office of Chief Provincial Veterinarian for Alberta can be called at 1-800-524-0051.

[g] Public Health Act. Nuisance and General Sanitation Regulation. Alberta 243/2003.

[h] Livestock Mortality Management (disposal) Agdex 400/29-1. Alberta Agriculture and Rural Development, 2011(a).

[i] Managing Livestock Mortalities, Saskatchewan Ministry of Agriculture, Fact Sheet, http://www.agriculture.gov.sk.ca/mortalities

Natural Disposal

Alberta does allow carcass disposal by scavengers to deal with deadstock. However, because of the very high probability of spreading disease and creating a public nuisance, the method is not recommended. But because of generally low death rates and distances between farms and communities, and the general most accessible method it is, for practical purposes, the most widely used, in the country. Large feedlots that might experience larger total numbers of deadstock because of relatively large inventories may elect to use some other method.

The Alberta Regulation covering natural disposal is part of the Alberta Animal Health Act, Destruction and Disposal of Dead Animals Regulation, 229/2000.

This states: (6) Subject to subsection (2), a dead animal, other than inedible offal or condemned material, may be disposed of by natural disposal if:

A. the animal is disposed of on property owned or leased by the owner of the animal,
B. the animal was not euthanised with drugs or other chemical substances,
C. the total weight of the animals being disposed of at any one site does not exceed 1,000 kg,
D. there is a distance of at least 500 meters between disposal sites,
E. the disposal site is
   i. at least 500 meters from wells or other domestic water intakes, streams, creeks, ponds, water wells, springs and high water marks of lakes and at least 25 meters from the edge of a coulee, major cut or embankment,
   ii. at least 400 meters from any livestock facilities, including pastures, situated on land owned or leased by another person,
   iii. at least 400 meters from any residences,
   iv. at least 400 meters from any road allowance, and
   v. at least 400 meters from any provincial park, recreation area, natural area, ecological reserve, wilderness area or forest recreation area,
F. disposing by natural disposal does not create a nuisance.

Natural disposal: Advantages and Disadvantages

Advantages	Disadvantages
• Easy and inexpensive. • Little labour required.	• not legal in all provinces. • air, water and soil contamination. • increased populations of predators. • increased predation of cattle. • no disease control. • SRM still an issue.

If an owner wishes to transport a carcass to some other part of his farm that is connecting (contiguous) there is no problem moving it. However, if the property is not connecting and the owner needs to transport the carcass along a public road then a transport permit from CFIA is required. This is good for 48 hours. In this case the receiving location requires a CFIA permit that can apply for one year.

Hunting Offal

Since the BSE situation in 2003 with cattle regulation of dealing with deadstock has changed considerably, particularly because of the concern with SRMs and the infectious agent that causes BSE – prions. BSE is related to the disease category of Transmissible Spongiform Encephalopathies (TSEs) that causes Chronic Wasting Disease (CWD) in elk and deer and Creutzfeld-Jakob Disease (CJD) in people[j]. CWD can be transmitted from one animal to the next. It has been identified in deer in Alberta. Although the diseases are similar it is unlikely that cattle or people can be contaminated with CWD prion. Therefore, hunters leaving deer offal in the countryside should not be a problem for the cattle industry or to human health.

[j] Chronic Wasting Disease (CWD) of Elk and Deer. Alberta Agriculture, Agridex 663-43, 2008.

Incineration

One option dealing with livestock mortality involves incineration. Simple burning is not considered to be incineration; this requires the necessary equipment to attain temperatures greater that 850°C and provide oxygen. This will complete the burning process that reduces particulate and gas emissions. Incinerators must be loaded and operated using the manufacturer's recommendations. Ashes need to be removed frequently to maximize material combustion. These systems require a fuel source. Natural gas is suitable but may not be available in some areas. Diesel will burn hotter than natural gas, and is an option. Some can burn propane and others wood. For example, air curtain incinerators burn wood and will eliminate many carcasses very quickly. They must be operated in accordance to the Code of Practice for Small Incinerators[k] or Substance Release Regulation[l].

Incineration: Advantages and Disadvantages

Advantages	Disadvantages
• Complete reduction of volume. • Rapid oxidation to carbon and water. • Environmentally safe (may require an air permit). • Can dispose of mortalities as they are generated, therefore no temporary storage required. • Completely destroys infectious agents. • Deals with SRM. • Residue from properly incinerated carcasses will not attract insects or rodents. • System can be mobile. • A co-op could be formed to purchase an incinerator to be shared among farms.	• Major capital investment along with expensive fuel costs. • Must be maintained (burners wear out and soot must be scrubbed out of the system to prevent stack fires). • Ash has no fertilizer potential and there may be a trace of heavy metals from micronutrients fed to the animals. • Safety hazards associated with high temperature incinerators.

Carcass Burial

Burial of mortalities is an appropriate method of disposing carcasses when properly managed. The carcass can be disposed quickly and the potential nuisance is eliminated. A burial pit should be located in clay or till soils. Test hole should be dug to a depth of about 4 meters with a backhoe and wait 24 hours. If water appears in this test hole, an alternate location should be chosen for a burial pit. Sand and gravel soils should not be used for a burial pit. Any pit site should avoid flooding.

The depth of usable water source needs to be considered for the pit. The bottom of the burial pit and useable groundwater water source should be at least 4 meters apart. A good description of subsurface conditions may be available from records of any nearby wells.

Winter burial is a challenge. However, burial pits may be prepared in the fall and a final cover placed in the spring. Estimate the winter death loss and allow 0.75 cubic meters (1 cu. yard) of burial pit volume per 450 kg of carcass. A lid will protect mortalities from scavengers and prevent snow from filling the pit. The location must be accessible by equipment during winter conditions.

Alternatively, the carcass may be stored until spring at a site that is inaccessible to scavengers. A sheltered building, metal bin or a round bale enclosure with chain link provides good protection.

Burial: Advantages and Disadvantages

Advantages	Disadvantages
• Inexpensive (if using your own equipment). • Biosecure (no trucks coming from other farms to pick up carcasses). • Relatively quick disposal method • Convenient. • Ability to dispose of a great number of carcasses at one time	• Difficult to impossible in winter/ depth of frost an issue. • Can cause groundwater pollution. • No burial sites where bottom of pit is less than 1 m above the seasonal high water table. • Difficulties with public perception. • SRM still an issue.

[k] Code of Practice for Small Incinerators, Alberta Environment, 2005.
[l] AR 123/93 of the Environmental and Protection and Enhancement Act, Government of Alberta, 2006.

Burial Pit Management

Puncture the abdominal cavity of large ruminants to prevent bloating. Be careful to avoid contact with abdominal material. Cover the animals as soon as possible. As the burial pit fills, cover each layer of carcasses with at least 0.3 m (1 ft.) of soil. In the winter, 0.6 m (2 ft.) of straw is an acceptable interim cover. Maintain at least 1 m (3 ft.) between the top surface of the carcasses and the natural ground surface. Mound the final soil cover about 1 m (3 ft.) above the surrounding terrain to ensure that water does not pond above the burial pit.

Maintenance of the area around the disposal site may be required for several years until decomposition of the animals has occurred and the soil has finished settling. Fence the site if necessary. Unless the pit is in a cultivated field, seed the top of the burial pit to grass or other vegetative cover to prevent erosion and weed growth. If assistance is needed to position a burial site the local municipality would be able to help.

Holding Containers

Afterbirth and stillborn calves are considered SRM. Some producers use steel barrels and old culverts as containers for cattle afterbirth and stillborn calves. This is considered a temporary storage of SRM and not a form of composting. Compost requires sources of carbon, nitrogen and water to activate the process. Containers should be covered to prevent access by scavengers, and from leaking. The location of the container should be situated to drain if a leak were to occur. Some of the fluids are still considered SRM.

If quicklime is added to reduce odors it does impede natural decay. Some believe that quicklime will accelerate decomposition. However, quicklime actually preserves biological materials by dehydration and prevents bacterial growth for decomposition. If quicklime is used with SRM it will dehydrate the material still leaving SRM in the container. Also, although quicklime is very an effective disinfectant for many bacterial organisms, it is not very effective on FMD viruses, and not at all effective against prions[m].

At some stage the contents of the container will probably be removed. This material should not be dumped onto the manure pile because it is still classified as SRM. If it were to be left in the field it could still be infective as a mass of prions if present. The material could be handled in anyway that deadstock is managed as described including burying, incinerating at high temperatures or composting (process may be impeded). Containers should be burned at a high temperature or power washed with effluent poured into a burial pit.

Rendering

Rendering is the preferred method of managing mortalities. In fact, value-added products are produced from the rendering process. Also, the high temperature (about 130°C) will destroy most pathogens if any are present. The process temperature, length of retention time and sensitivity of the pathogen affect pathogen survival. Animals that died under suspicious conditions need to be evaluated to determine if rendering is an appropriate disposal option. Rendering may not destroy some disease organisms or toxins rendering.

Rendering: Advantages and Disadvantages

Advantages	Disadvantages
• The carcass is completely removed from the farm. • The rendering process destroys most diseases.	• Pathogenic transmission during pick-up and transportation is possible. • Increased cost for producers because of reduced market value of rendered products. • Not all locations are presently serviced by rendering company. • SRM still an issue.

Also, rendering may not be an option for some producers depending on location, type and volume of mortalities. Carcasses must be in good condition to be accepted for rendering.

[m] Glenda Dvorak and James Roth. Disinfection 101, Center for Food Security and Public Health, Ames, Iowa, 2005

In the winter, animals should be stored to prevent access by scavengers prior to pickup. A non-insulated building is ideal for storage, but a fence or bale enclosure also works. In the summer, cold storage will generally be required to hold the carcass before pickup.

Biosecurity is an important consideration: be aware that the rendering vehicle usually stops at several farms on its route. The pickup location should be separate from healthy livestock, convenient for both the driver and producer and screened from public view. Bins may be available from the rendering company to allow the carcass to be loaded easily. Otherwise, equipment such as a front-end loader must be made available.

Offsite Pick-up

There is some interest in having an offsite community carcass pick-up or common container where producers could take their deadstock to be picked up by the renderer or for delivery to a compost facility. This would increase the efficiency of collection services. Some consideration needs to be made for the equipment used for delivery and for the site itself.

CFIA has a guideline for deadstock management that deals with deadstock transport and common pick-up sites[n]. Equipment should be dedicated for this movement. Good equipment cleaning helps reduce biosecurity issues on the farm. Off-site locations for deadstock delivery and pick-up should have separate entries: one entry for communal delivery and one for pick-up. This helps reduce biosecurity issues for live cattle at the farm. Cost would need to be considered.

County Programs

Three Alberta Counties in southern Alberta have tried to address the financial part of render truck pickup. Cardston County developed a community compost program with producer-supported carcass pickup. The MD of Ranchlands has provided a 100 percent reimbursement for carcass pickup and the Cypress Hills County has provided a 50 percent reimbursement for carcass pickup.

Composting

This is a natural occurring process using bacteria, fungi and other microbes to convert organic material such as livestock carcasses into a stabilized humus-like material[o]. The microorganisms need to have four inputs: carbon (C), nitrogen (N), water, and oxygen (O_2). Generally, the carbon and nitrogen need to be provided in balance. A C:N ratio of about 30:1 at the beginning of the composting process works well. Carbon materials, such as manure bedding, straw, silage, old hay or sawdust, provide a good "recipe" or mixture (Table 1).

Some producers try to use nitrogen fertilizer as a source of nitrogen for the starter base. One problem with this is that fertilizer is a nitrogen source. What is needed is a

Table 1. Typical Compost Material Physiochemical Factors[a].

Material	% C	% N	C:N Ratio	% H_2O	Density kg/m^3
Beef Carcass[b]	37.5	7.5	5:1	75	1,040
Sawdust	56	0.1	511:1	39	417
Straw	56	0.7	80:1	18	80
Corn Silage	44	1.0	44:1	65	688
Hay	42	2.1	20:1	15	80
Shavings	64	0.1	641:1	15	80
Beef Manure[c]	43	2.7	16:1	74	871
MAP[c]	0	46	Mostly N	0.8	960
Good Compost	50	<2	30:1 -35:1	50-60	640

[a] from OMAFRA Composting of Cattle On-Farm (2010) Agdex 729/400 other than shown. C and N values are in dry matter basis.
[b] Carcass Disposal: A Comprehensive Review (2004) USDA Animal & Plant Health Inspection Service
[c]Mono-Ammonium Phosphate fertilizer

[n] Canadian Food Inspection Agency (CFIA). National Biosecurity Standards and Biosecurity Principles: Canadian Beef Cattle On-Farm Biosecurity Standard, 2012. http://www.inspection.gc.ca/animals/terrestrial-animals/biosecurity/standards-and-principles/beef-cattle-on-farm/eng/1347287842131/1347292248382 see section-Principle 2: Manage the Movement of People, Vehicles, Equipment and Tools.
[o] Disposal of Cattle Mortalities. Beef Cattle Research Council website. Kim Stanford, Alberta Agriculture and Rural Development, 2013. http://www.beefresearch.ca/research-topic.cfm/disposal-of-cattle-mortalities-55

carbon base to balance the carcass –nitrogen. Also, the dynamics of fertilizer is different than organic materials[p]. Although the theoretical number should be the same as calculated using the C:N ratio formulas, the nitrogen in fertilizers is released much more rapidly than that in organic nitrogen. This affects microbe nutrient availability dramatically. If this is to be used it should be at from one half to one third of organic base application. Composting changes of temperature should be monitored. Moisture at a level of no more than 50 percent of the total needs to be provided and oxygen needs to be incorporated by turning the material often. For a large livestock carcass turning would start three to six months after activation of the material[q].

Compost facilities need to be located certain minimum distances away from houses, roads, water, wells and pastures[r]. Information and assistance to locate a compost facility can be obtained from Alberta Environment[s].

The use of compost as fertilizer is regulated under the Fertilizer Act[t]. Compost that contains SRM cannot be sold; however, it can be used commercially with restriction under permit. On-farm compost can be used provided the product does not leave the premises on which the SRM is generated. CFIA's position, based on a BSE Risk Assessment (2006) indicated that SRM compost applied to land constitutes a very low-to-negligible risk with respect to BSE. However, CFIA has recommended to the provinces that compost produced from SRM not be applied to land such as pasture or stubble fields that will be directly grazed by ruminants for at least 5 years. This is to allow time for the potentially infective prions to travel below the soil surface (ABP note, 2006[u]).

Composting: Advantages and Disadvantages

• Advantages	• Disadvantages
• Relatively biosecure: Good disease control. • Relatively inexpensive; uses materials available on farm. • Can build compost as required year round. • Uncomplicated, requires little training • Relatively simple, can use available equipment • Residual material used as fertilizer (commercial sale regulated by the Fertilizer Act). • Less scavenging/predation.	• For intensive operations, there may not be sufficient land base. • Labour intensive. • Requires set-up of compost facility. • Requires a carbon source. • Compost requires management – monitoring temperatures and turning. • More difficult in wet climates. • Bones exposed at surface of pile do not degrade and may cause damage to spreading or harvesting. • SRM still an issue • SRM compost should not be put on pasture or other land accessed by cattle for five years. • Compost manure containing cattle carcasses cannot legally be removed for spreading on rented or neighbours' land.

Centralized composting of SRM or SRM-containing carcasses is highly regulated by the CFIA. Opportunities exist to have a community-composting site that can be managed and does not require deadstock owner facilities. Carcass pickup could be a challenge and an expense. However, a municipal approach could be successful[v]. At present, there is a problem with use of the compost material: it cannot be used on grazing land.

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[p] Cornell Waste Management Institute website http://cwmi.css.cornell.edu
[q] Livestock Mortality Composting for Large and Small Operations in the Semi-Arid West. Montana State University, about 2011.
[r] Large Animal Mortality Composting, Alberta Agriculture. Agdex 400/29-4.
[s] Standards for Composting Facilities in Alberta,, Alberta Environment, July 2007.
[t] Fertilizer Act and Regulations. T-4-120, Appendix A-Regulation Pertaining to Compost.
[u] Carcass Disposal Options for Alberta Beef Producers, ABP note in S:\0400-Animal Health and Welfare Department\BSE Testing & Feed Ban & Deadstock Disposal\Carcass Disposal Options\2006-11-11 Carcass Disposal Conference Call.doc.
[v] Cardston County in Southern Alberta has developed a community system.

Thermal Hydrolysis

Thermal hydrolysis uses high pressure and saturated steam to breakdown organic material such as carcasses that destroys all pathogens and prions while retaining nutrients that can be used for organic fertilizers and biogas. Temperatures in a reactor need to go to 180°C at a pressure of 12 bar for 40 minutes. Background studies and planning for a refining process have been developed for central Alberta although a facility does not presently exist. To date, several million dollars have been committed in grants and debt financing for the project. According to the business plan livestock carcasses would be picked up from farms with no cost to producers. Byproducts produced by the process could be used to manufacture liquid and dry organic fertilizer and produce biogas for electricity. This could be used to form a profit center to offset the cost of livestock pickup and refining costs of feedstock[w]. This has been approved, in principal, by CFIA as a way to destroy SRM prions[x].

Thermal Hydrolysis: Advantages and Disadvantages

Advantages	Disadvantages
• The carcass is completely removed from the farm. • The thermal hydrolysis process destroys all disease organisms including prions. • Costs for pickup would be gratis according to the business plan.	• Pathogenic transmission during pick-up and transportation is possible. • Not all locations would be serviced by thermal hydrolysis company. • The facility is presently a work in progress.

Biosecurity Risk

An emergency carcass disposal plan for municipalities was prepared by the Government of Alberta for situations when non-normal conditions could occur such as mass losses because of an epidemic situation[y]. The legal requirements for biosecurity risk are covered by Alberta's Animal Health Act.

Some other alternatives for carcass disposal were addressed although these may not be presently legal, depending on equipment availability and the quantity of carcasses to be handled. This includes alkaline hydrolysis and anaerobic digestion.

Overall, the conditions to be assessed are similar to those already discussed, other than possible numbers to be handled. The examples of risk and

Table 2. Biosecurity Issues Dealing with Deadstock.

HAZARD	Natural	Burial (Landfill)	Rendering	Composting	Incineration	Rendering plus Incineration	Thermal Hydrolysis**
Bacterial Diseases (most)	High Risk	OK	OK	OK	OK	OK	OK
Viral Diseases	High Risk	OK	OK	OK	OK	OK	OK
Toxins	High Risk	OK	Not-OK	Not-OK	OK	OK	OK
Prion Agents	High Risk	OK	Not-OK	Not-OK*	OK	OK	OK
Anthrax	High Risk	OK	Not-OK	Not-OK	OK	OK	OK

* New composting information from the Lethbridge Research Station in 2013 indicated that composting is effective in destroying prions. However, changes will be required to be made at the federal level for modification of Regulation.
** Planning and financing for new system is presently underway.

[w] BioRefinex Canada Inc., Business Plan, 2013.
[x] Canadian Food Inspection Agency (CFIA). 4.9 Thermal Hydrolysis. Non-published program. Personal communication with Dr. Reza Hejazi, 2013.
[y] Emergency Carcass Disposal Planning Guide for Municipal Districts and Counties (2008).

comparative ways to deal with deadstock from a biosecurity perspective were summarized. This summary information together with risk for natural disposal is shown in Table 2.

Natural disposal is considered to be high risk for all biological hazards. For example, anthrax is a serious infectious disease caused by gram-positive, rod-shaped bacteria known as *Bacillus anthracis*. Anthrax can be found naturally in soil and commonly affects domestic and wild animals globally. It can be devastating for cattle if they are infected Although it is rare, people can become ill with anthrax if they come in contact with infected animals or contaminated animal products. Still some cases have been reported in Canada, particularly in bison herds and occasionally in cattle. Soil can be contaminated with the bacteria for years.

The test of handling deadstock for cattle is shown with risk to anthrax and prion agents such as BSE[z]. Natural processing remains high risk for all hazards. Burial and incineration tends to deal with these issues well. There are still issues with cattle carcass rendering and composting, especially for some toxins, anthrax and prions. However, most bacterial and viral organisms are controlled well with these processes.

A summary of strategies to deal with deadstock, together with required regulations, possible permits to be obtained and ways to handle the byproducts is shown in the chart. Thermal hydrolysis has not been summarized because it is not presently available in Alberta.

[z] Tim Reuter and Kim Stanford (2013) Prion biodegradation by composting, Alberta Agriculture and Rural Development. Not published.

Handling Deadstock Chart- Alberta

Two strategies are required: one dealing with deadstock containment and another with deadstock destruction.

Requirements	On-Farm	Farm-non-contiguous property (see transport)[27]	Renderer pick-up	Waste Control Incineration	Landfill-public[28]	Composting-public	Composting-on farm	Collection/Storage Site-deadstock-Public	Carcass Transport to other sites farm & public sites
Process[29]	Natural Disposal Livestock Burial [30] Send to Rendering Composting[31] Biodigestion Storage	Natural Disposal Livestock Burial Send to Rendering Composting Biodigestion Storage	Rendering	Commercial Incineration Simple burn pile does not classify as incineration.	Landfill Depends on policy of MD Most MDs do not allow	Composting	Composting	Temporary Storage: requires CFIA permit	Carcass movement for rendering, burial, composting, other
Legislation & Regulations (mandatory) Government of Canada/CFIA Health of Animals Act and Regulations (Canada)									
Legislation & Regulations (mandatory) Government of Alberta	Alberta Animal Health Act and Regulations-Disposal of Dead Animals Regulation 229/2000 Natural disposal weight limit (1000kg), distances from water, wells, roads Distance from	Alberta Animal Health Act and Regulations-Disposal of Dead Animals Regulation 229/2000 Dangerous Goods Transportation and Handling Act and Regs Act (Ab)	Alberta Animal Health Act and Regulations-Disposal of Dead Animals Regulation 229/2000: pick up within 48 hours; Rendering-licensed	Waste Control Regulation[32] Substance Release Regulation Code of Practice: small incinerators	Waste Control Regulation-Class I or Class II landfill	• Disposal of Dead Animals Regulation • Alberta Environ. Protection and Enhancement Act • Waste Control Regulation[33] • Activities Designation Regulation[341] • Code of	Alberta Animal Health Act and Regulations-Disposal of Dead Animals Regulation 229/2000 Location of compost from houses, facilities and roads, pastures	Alberta Animal Health Act and Regulations-Destruction and Disposal of Dead Animals Regulation	Alberta Animal Health Act and Regulations-Disposal of Dead Animals Regulation 229/2000 Dispose by 48 hrs Alberta Dangerous Goods Transportation

[27] As defined by Health of Animals Regulations (Canada): Non-contiguous- land pieces that do not touch each other. Transport on public roads is allowed with permit.
[28] Owned by county or MD compared with private facility.
[29] Livestock Mortality Management (disposal), Agdex 400/29-1, Alberta Agriculture and Rural Development, 2011 (b).
[30] Livestock Mortality Burial Techniques (2011) Government of Alberta, Agdex 400/29-2.
[31] Large Animal Mortality Composting Agdex 400/29-4, Alberta Agriculture and Rural Development, 2011.
[32] Environmental Protection and Enhancement Act- Waste Control Regulation Alta Reg 192/1996.
[33] Includes CCME Guidelines for Compost Quality.

Requirements	On-Farm	Farm-non-contiguous property (see transport)[27]	Renderer pick-up	Waste Control Incineration	Landfill-public[28]	Composting-public	Composting-on farm	Collection/Storage Site-deadstock-Public	Carcass Transport to other sites farm & public sites
Legislation & Regulations (mandatory) Govt of Alberta (b)	facilities, pastures Storage 48 hrs One week enclosed, outside frozen, freezer	Distance from facilities, pastures Storage 48 hrs One week enclosed, outside frozen, freezer				Practice for Compost Facilities • Code of Practice for Responsible Livestock Development & Manure Management • Municipal Waste Facility Operator Certification • Guidelines for Landfills & Composting	Volume not to exceed 25% of total compost pile Covered by at least 15 cm material		& Handling Act and Regs Act
Conditions	Other than inedible offal or condemned material Consideration of disease situation. CFIA allows SRM site disposal scavengers. Composter requires carbon source. Consider cost differential	Other than inedible offal or condemned material SRM disposal on site by scavengers.	Prevent transport leakage	Ash little value as fertilizer	Material to be segregated All SRM to be covered	At present compost must be contained; cannot be spread on land.	Compost can be spread on crop land Should not be spread on pasture or other land used by cattle because of potential of prion and anthrax contamination	If greater than 48 hours: see containment	Possible with biosecurity cautions

Requirements	On-Farm	Farm-non-contiguous property (see transport)[27]	Renderer pick-up	Waste Control Incineration	Landfill-public[28]	Composting-public	Composting-on farm	Collection/Storage Site-deadstock-Public	Carcass Transport to other sites farm & public sites
Conditions	Do not use quicklime. Compost field application as nutrient source.								
Permits needed	None	CFIA Permits for travel on public roads(48 hrs). CFIA Permit for receiving site. Annual	CFIA Permit	Code of Practice Registration Environmental Protection and Enhancement Act	Annual permit	Annual permit Follow Code of Practice for Compost Facilities	None	CFIA permit	CFIA 48 hour permit
Records Needed	Advised	Advised	Yes	Yes	Yes	Yes	Advised	Yes	Advised
Containment	Distances-regulations	Distances-regulations	Shipping no leakage; Plant with temperature and pressure needed free from viable pathogenic organisms; records kept		Distances from boundaries	Either a building or open compost pile is allowed[35]. Windrowing allowed. Building, walls as per Code of Practice, Sec 6&7 Information-composter designs, bin structures obtained from AARD.	Can be used on fields as soil conditioner and nutrient source for crops. Should not be used in well travelled areas or cattle pastures.	If greater 48 hrs: Up to one week in containment Outside in winter Freezer Under direction of inspection (for special conditions or contain)	All public road transport requires permits

[35] Good composting requires control of water levels and temperature. Excess precipitation can affect compost action. Ground water control and monitoring may also require to be monitored. Predators can also be an issue.

Requirements	On-Farm	Farm-non-contiguous property (see transport)[27]	Renderer pick-up	Waste Control Incineration	Landfill-public[28]	Composting-public	Composting-on farm	Collection/Storage Site-deadstock-Public	Carcass Transport to other sites farm & public sites
Handling by-product	As SRM: CFIA recommends not to be on land grazed by ruminants for five years.	As SRM: CFIA recommends not to be on land grazed by ruminants for five years.	SRM material to landfill (presently only one site in Alberta)	Ash can be spread on land/ SRM free	SRM to be buried	Prions destroyed over 112 days[36]. Still require containment as per Regulation. To handle as SRM for spreading on agriculture land	As SRM: CFIA recommends not to be on land grazed by ruminants for five years. Cannot sell as compost for use on other farm land.	Front end loaders Not an issue.	Front end loaders Dump trucks Not an issue
Certified Operator	None	None	Registered	Registered	Fulltime certified	Fulltime certified	None	Part of permit	None

[36] Work done at ARD Lethbridge, Report June 24, 2013. CFIA still needs to develop regulations around this to be able to use compost on agricultural cropland.