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GOVERNMENT OF INDIA

DEPARTMENT OF ANIMAL HUSBANDRY & DAIRYING

GUIDELINES ON DISPOSAL OF ANIMAL CARCASS AND DISINFECTION

Good planning for timely and safe disposal of animal carcasses and related materials along with disinfection of premises is necessary to prevent the spread of disease and to ensure the safety of the community, other stock and environment. Improper disposal of carcasses can result in public outrage, site contamination, ground water contamination, environment contamination, public health issues, and the disease spread through scavengers, mosquitoes and vermin. The overall goal of any animal carcass disposal and management plan is to ensure clean and safe disposal of all materials in a manner that protects human, animal, and environmental health.

These guidelines in brief can be used as ready reckoner and will help the states/UTs and other stake holders for safe and secure disposal of animal carcass, animal waste including the disinfection procedures and hygienic measures.

A. Disposal of Dead animals and related materials

Arrangement for safe disposal of carcass and related materials by following zoo sanitary measures are to be made by respective State/UT AH Departments. State/UT AHDs shall constitute Animal Carcass Retrieval Teams and provide requisite training to team members with awareness to all stakeholders.

1. Regulations and jurisdiction

The requirements for disposal of carcasses and other potentially contaminated fomites in case of infectious and contagious diseases are provided in the Prevention and Control of Infectious and Contagious Diseases in Animals Act, 2009' and Prevention and Control of Infectious and Contagious Diseases in Animals (Form of Vaccination Certificate, Manner of Post Mortem Examination and Disposal of Carcass) Rules, 2010. Proper disposal of the carcass is mandatory as per Act and the destruction and disposal of the animals and material shall be documented by the Animal Husbandry Department officials. States may also follow the provisions of India Code Disposal of Dead animals and may involve NGOs and cooperatives. Advance cooperation between the Veterinary Service and other relevant government bodies is necessary for proper disposal of dead animals. State AHDs should identify the disposal sites in advance and develop them scientifically with buffer zones.

2. Preparedness

The disposal of animals in the event of a disease outbreak or disposal of animals in the event of natural disasters such as floods should proceed with the minimum delay. The success is determined by the structures, policies and infrastructure established in advance including financial preparedness (means a compensation or insurance mechanism, an access to emergency funding). Standard operating procedures should be developed (including documented decision-making processes, training of staff). A well-informed spokesperson should be available at all times to answer enquiries.

The management of resources should address items like personnel and PPE, transport, storage facilities, equipment (such as mobile handling facilities for animals, disinfection equipment), fuel, protective and disposable material and logistical support. Special equipment such as trucks, tractors, bulldozers, and front-end loaders should be available. Early detection of new infections, pathogen inactivation, immediate and safe culling and disposal of infected animals (wherever required as per policy and plan) and rapid removal of the dead animals are important.

Disposal should be organized in such a way that the workers are safeguarded against the risks of handling decomposing dead animals. Special attention should be given to zoonotic aspects. Workers should receive appropriate training and be sufficiently protected against infection with protective clothing, gloves, face masks, effective respirators, goggles, vaccination, and effective anti-viral medicines. Workers should also receive regular health checks.

Farmers will be sensitive to the safety measures taken to prevent spread of the disease by disposal method selected and the transport of the dead animals to the disposal site. Adequate compensation of owners for the loss of animals along with awareness will increase the acceptability of farmers.

Steps shall be taken to minimize the risks posed by wildlife and to the wild life. The dead animals and related materials including the burial sites shall be protected from wild animals and scavengers at all times.

3. Disposal methods

There are different methods for disposal of dead animals and related materials which also depends on factors like site (Soil topography, area, subsequent use of site and site security with warning signs), animal species, number of animals, space and equipment needed, pathogen and its ability to persist or spread, environmental issues (water source contamination, air quality, local weather conditions, scavengers and vector problem etc.), biosecurity and public health issues (PPE including physical and psychological issues, movement control, cleaning and disinfection), transport of infected material and carcass.

General precautions

- Unauthorized and unrestricted access of disposal sites to humans, pets, wild animals, domestic animals, birds shall be prevented.
- Rodent and insect control measures should be considered to prevent disease transmission risk from disposal sites.
- In case of delay disposal, the carcass and related material should be disinfected, covered and kept in cold condition.
- Disposal site should be selected in consultation with local bodies and pollution control board.
- Proper biosecurity measures including PPE to persons handling the carcass and involved in disposal and disinfection measures shall be ensured at all times.
- In case of infectious diseases, the carcass disposal should be divided into high risk (animals died of infectious diseases like Highly Pathogenic Avian influenza, Foot and mouth Disease, Lumpy Skin Disease, Classical Swine Fever, African Swine Fever, New castle Disease, Glanders and killed to eradicate epizootics) and low risk categories based on zoonotic importance and transmissibility to other animals. High risk category carcass and material should be disinfected and preferably incinerated, otherwise burned in pits or buried.

- The carcass transport vehicle should be leak proof, clean and disinfected (before loading and unloading) and carcass should not be sliced before loading.
- The vehicle should not be overloaded and driven slowly.
- Staff should carry approved disinfectant and equipment to handle spills during journey.
- Small carcasses (if required) may be placed in a plastic trash bag (industrial strength bags with 3mm thick plastic) or water-tight barrel for transport to disposal area. In case of delay disposal, carcasses may be stored in a top-loading chest freezer.
- Disposal should be done under the supervision of State AHD and local bodies and disposal sites should be maintained and monitored for eventual rehabilitation.
- For mass burial, the site shall be at least two hundred fifty meters away from human habitat.
- Equipment used to handle carcasses or compost should not be used to handle feed unless cleaned and disinfected.
- Steps should be taken to prevent wildlife, rodents, pets, and other scavengers from contacting carcasses and spreading disease or becoming ill.

Different methods for disposal of dead animals and related materials are as under

a. Burial

From a biosecurity point of view, burial is a viable option, but groundwater contamination needs to be checked. Burial site selection should be away from water courses, drainage etc. The record of all burial pits shall be maintained.

Burial sites and process

- The site should not be in a drinking water catchment area and near to coast and should be away from towns, dwellings, roads and free from underground pipelines, power and telephone lines (local bodies and pollution authority should be consulted). For proper management, pits should be dug on a common land within the infected zone in limited numbers.
- The site should be on soils of low permeability with significant clay content (lining pits with clay soil may be considered). The pits should not be on a slope greater than 6% and digging of 5 meter depth is possible.
- The groundwater table level should be minimum of 6 meters below the lower level of deep burial pit.
- The watercourse should be away from the burial sites such as lakes (1000 ft), rivers (400 ft), tube well (200 ft)
- Pit should be 2 meter deep and half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of pit with soil. On each occasion when waste is added to the pit, a layer of 10 cm soil shall be added to cover the waste.
- Burial pit/trench should be at least 2.3 meter (not more than 3 meter) wide and 3 meter deep (7x9 ft). The length should be as per the number of carcasses.
- A floor space of 1.3 m²(15 ft²): May accommodate mature bovine/equine carcass, 5 mature pigs/sheep, 100 mature chickens/40 mature turkeys. For each additional meter (3 ft) in depth, the number of animals per 1.3 m² of floor space may be doubled. The weight of dead animals in the pit should not exceed 2500 kg.
- Land requirement of 1.5 cubic meters for adult cattle carcass, 0.3 cubic meter for pig/sheep carcass and 1.0 cubic meter for 200 chickens may be considered.

- The carcasses should be covered with at least 400 mm soil with unbroken layer of slaked lime -Ca (OH)₂ (avoid lime in Anthrax carcass). Lime should not be placed directly on carcasses, because in wet conditions it slows and may prevent decomposition.
- Burial pit should be covered with at least 2 m (6 ft) soil. Soil should not be compact. During closing the pit surplus soil should be heaped over it as overfill. Lime should be added to pits, to prevent earthworms from bringing contaminated material to the surface after pit closure.
- No person should enter the trench more than 1.5 meters deep without stabilizing the sides.
- All the remnant feed and soil upto 2 inches deep must be disposed off along with the carcass
- The buffer zone with green belt should be maintained in consultation with local bodies and pollution authorities.
- The pit sites should be fenced and permanent warning signboard should be fixed in all the pit sites. The pits should be monitored at regular intervals to check any sinking, water accumulation etc. and if necessary, steps be taken as mentioned above.
- There should be no accumulation of water during rainy season at the disposal site.
- No crop should be grown further for at least one year on the pit site.
- All the pits should be dug one day in advance of the disposal and while digging pits, it should be ensured that no water is oozing out of the pit.
- After the operation clean and disinfect all equipment and area.
- Stabilize the surface of the excavated area in accordance with local requirements and ensure regular inspections for maintenance.
- Monitor ground water quality and fence the area with visible sign of restricted entry.

Post-care of landfill/burial site

- Maintenance of integrity and effectiveness of final cover, making repairs and preventing damage to final cover.
- Proper marking and security should be ensured.
- Monitoring leachate collection system following the requirement.
- Monitoring of groundwater in and around the landfill.
- Maintaining and operating the landfill gas collection system to meet the standards.

b. Landfills/Subsurface disposal

This is similar to burial. Carcasses are layered between compacted soil and solid waste materials. Established sites should have minimal potential risks to groundwater, surface water and other environmentally sensitive areas. Landfill design incorporates liners, leachate containment systems and gas collections systems to minimize environmental impacts. May require 3-5 cubic yards of cover materials per 1000 carcass. The recommended height for a pile is 5-7 feet.

Considerations

- Monitor frequently and the initial core temperature should be between 135-140⁰ F.
- On-site biosecurity risks associated with transport should be controlled.
- Affected by weather and ambient temperature and therefore need to be protect from wind, rain, drying conditions and scavengers.

c. Incineration

Incineration: Incineration is thermal destruction of carcass by using high-temperature (>850°C) combustion (by using fuels like diesel, natural gas, electric energy) to convert carcasses to inert gases and sterile ash as well as deactivate pathogens. Incineration shall be practiced only on-site by agencies and institutes that have adequate trained manpower in operating the rendering plant. The site identified for incineration shall be at least two hundred fifty meters away from human habitat. Three methods used are fixed whole carcass incineration, mobile air curtain whole carcass incineration, municipal incinerators. Gasoline or other highly explosive accelerants should NEVER be used. Firefighting officials should be notified and involved in planning and procedure. Fire retardant equipment and protective gear should be available to personnel. Air pollution control devices should be installed under the approval of pollution authority/CPCB.

Advantage of Incineration

- Complete reduction of volume with rapid oxidation to carbon and water
- Environmentally safe (pollution norms to be followed)
- No problem related to insect and rodent

d. Burning

Burning of carcasses within a farm on pyres is also a common waste treatment practice that involves combustion of organic substances contained in waste material. It is not suitable for large volume of material.

Burning sites and process

- Should be approved by appropriate authorities.
- Burning should be away from public view and on flat, open ground with legal approvals.
- Fire bed burning should be at a right angle to the prevailing wind.
- Remove all vehicles, personnel, and other equipment well away from the fire bed
- Burning space: 8x3 ft. for each mature cattle/horse, 5 mature pigs/sheep, 100 mature chickens and 40 mature turkeys. Also at least 1 meter fire bed length may be assumed for 1 adult cattle carcass/5 swine/sheep carcass/200 chickens.
- In pyre burning: Place carcasses on top of solid fuel with sufficient airflow, on their backs lower and alternating head to tail. (Approximately one cord of wood (128 cubic feet or 3.4 meter³) is required per 500 kg of carcass)
- Burn pit: The pit should be 0.5 m deep and extended 0.75 m beyond each end of pyre. The pit should be 25 cm wider than the pyre on each side. The bottom of the pit should be covered with accelerant (diesel, kerosene etc. in less quantity to avoid contamination), soaked wood, hay, straw etc. Solid fuels should be used to maintain combustion. Pieces of heavy timber are placed across the pit to support the pyre.
- Two goats, sheep or swine carcass may be placed on top of each bovine carcass.
- The trench should be filled with mud after entire carcass is burnt.
- Do not use tyres, rubber, plastic and similar materials for burning.
- Handlers and supervisor should use PPE
- Firefighting equipment should be readily available.
- After the operation clean and disinfect all equipment.
- Dispose ash in accordance with legal requirements.
- Anthrax carcass can also be disposed by burning (if incinerator is not available). All vessels, instruments should be disinfected with 3% solution of sodium carbonate.

e. Composting

Composting is a natural biological process that transforms organic material in a predominantly aerobic environment into a useful and biological end product. It destroys nearly all pathogenic virus, bacteria, fungi, protozoa and helminth except endospore forming bacteria (*B. anthracis*) and prions (including BSE).

Composting process

- Composting should be at least 100 meter away from water sources and residence and 300 meter away from roads.
- It involves layering/mixing carcass with co-compost material (sawdust, silage etc) with at least 60 cm covering of composting material.
- Material should be removed from the compost pile after the carcass/related material is completely composted with minimum odours.
- Compost piles kill most pathogens in 10-14 days in case of small carcasses, longer in large carcasses.
- Assume land area as 17 square meter for cattle carcass, 3.5 square meter for pig/sheep carcass and 8.7 square meter for 100 chickens. The site should be 120 cm above seasonal high-water level and at least 1 meter above bed rock. The site should not be located on flood plains.
- On the base of litter, the carcass and related material along with bulking agent are added in layers so that the carbon-to-nitrogen ratio is in the range of 15:1 to 35:1 (optimal 23:1).
- Necessary measures should be taken to minimize odour, flies, rodents, bird menace and fire hazard.
- Leachate should be re-circulated in the compost plant for moisture maintenance.
- Turning piles may increase the rate of decomposition. First stage of composting normally completed within about 3 weeks for poultry, 12 weeks for large animals. Second stage composting takes additional 3 weeks for poultry and up to about 8 months for large animals.
- The volume of dead animal(s) in the compost pile must not exceed 25% of the total volume of the compost pile.
- Break eggs prior to composting.
- Finished product can be recycled, stored or added to the land as a soil amendment subject to the fulfillment of standards prescribed by Fertilized Control Orders.
- Clean and disinfect all the equipment and area.
- The operation should be under expert care for proper composting.

f. Rendering

Rendering is a process that uses heat to convert animal carcasses into safe, pathogen-free feed protein, meat and bone meal, fat or tallow and other final products and byproducts. Some facilities can efficiently transport and process one million or more pounds of raw animal per day. Not recommended for anthrax carcass.

Rendering process

- Rendering is done in a dry (yield 20% more) or wet process.
- Carcass should be processed immediately before putrefaction.

- Carcass cooker with operating pressure of 35-40 psi and a capacity of 250 kg is preferred.
- Chlorination should be adopted for the treatment of effluent before discharge.
- Hides should be salted for 14 days before delivery to the tannery.
- Proper pollution control measures as per pollution control norms should be adopted for chimney gases, liquid and solid waste disposal.
- Workers should have proper dress and follow the SOPs in this regard.
- Rendering should be under veterinary supervision under official checks.

Considerations

- Facilities should have established procedures for handling biosecurity, wastewater and byproducts.
- Rendering shall be practiced only on-site by agencies and institutes that have adequate trained manpower in operating the rendering plant.
- The agency or the institute using rendering as a method of infected animal carcass disposal shall maintain proper records of each rendering cycle.
- Rendering should not be used if barbiturates are used for chemical euthanasia.
- Rendering facilities should be regulated to maintain environmental safety
- Carcass transport should be biosecured in leak-proof, clean and disinfected transport trucks.
- Temporary storage may be needed if carcasses cannot be rendered right away
- The rendered product shall not be used as ingredient of animal feed.

g. Natural disposal

Natural disposal means disposing of dead animal(s) in a manner that allows for scavenging.

Natural disposal process

- Dead animal should not be suspected to have had an infectious or contagious disease.
- Animal should not be euthanized with drugs or other chemical substances.
- Total weight of animal disposed at one site should not exceed 1000 kg.

Consideration

This practice should be avoided as it is difficult to monitor the carcass of diseased animal(s) and animal(s) treated with non-steroidal anti-inflammatory drugs (NSAIDs) like diclofenac, carprofen, flunixin, ketoprofen. NSAIDs have potential risk for vultures and may be risky to other animals and birds.

4. Commonly used disposal methods and disinfectants for animal diseases

Sl. No	Name of the disease	Preferred Disposal Method	Preferred Disinfectants for farm structures, equipment, animal houses etc.
1	Anthrax	Burial or Burning Burn. If incineration or cremation is	10% formaldehyde, 4% glutaraldehyde, 3% hydrogen

		<p>not possible, burying the carcass deep (at least 6 feet) is acceptable.</p> <ul style="list-style-type: none"> • Carcass should be decontaminated • Ensure sealing of all body openings (anus, mouth, nose etc.) of carcass with absorbent material to prevent leakage of exudates. • Ensure that the head of carcass is covered with heavy duty plastic bag. • There should be 1 m clay at the base of the pit and also carcass should be covered with minimum 1 m clay 	<p>peroxide, and 1% peracetic acid. <i>Hydrogen peroxide and peracetic acid will not work in the presence blood.</i></p> <ul style="list-style-type: none"> • Soil from areas of anthrax contamination should be removed for incineration or soaked with 5% formaldehyde. • Contaminated materials should be incinerated, and non-disposable items should be soaked with 4% formaldehyde or 2% glutaraldehyde. <p><i>Avoid using lime and other calcium products on carcass or contaminated ground.</i></p>
2	Avian influenza / Newcastle Disease	<p>Burial or Burning</p> <ul style="list-style-type: none"> • Approximately 5 quintals of wood would be required to burn 100 kg of dead birds. • For burial, cover with calcium hydroxide followed by at least 40 cm layer of soil. More layers of lime and soil can be applied to level the pit. A pit of 2x2x2 meters will accommodate around 1800 birds (fowls) and about 450 turkeys. • Prior to the commencement of operations, briefing must be given to all involved on the importance of kit, its use and disposal etc. • PPE must be used by RRTs and all persons having direct and active exposure to infected poultry. • Operations should not be started without the use of PPE and filter (N-95). 	<p>5-6% sodium hypochlorite, 5% calcium hypochlorite, 2-4% glutaraldehyde solution, 250-500 ppm Diocetyl dimethyl ammonium chloride, 4% formalin.</p> <ul style="list-style-type: none"> • Disinfect the walls, floors and ceilings of the sheds in the premises to remove organic material with either or a combination of the following: <ul style="list-style-type: none"> > 3% calcium-hydroxide solution > Sprinkling of bleaching powder and lime on the floors of the sheds > White-washing of concrete areas with lime > Fumigation of closed chambers and sheds with Potassium-permanganate (KMnO4) and formalin > Treating all the equipment with 2% sodium-hypochlorite solution for 48hrs > Cages and other large metal structures may be

		<i>National Action Plan should be referred</i>	<p>decontaminated by heat treatment (flame gun)</p> <ul style="list-style-type: none"> > Feathers spread around the farm or attached to metal net, if any, should be burnt with the flame gun > All units and items which are physically or functionally connected to the establishment (e.g. hatchery, egg store rooms, packaging rooms, egg trolleys and egg product plants etc.) must also be properly disinfected. Vehicles used for transporting live birds, eggs and feed must also be disinfected. > Water-reservoirs must also be emptied, washed and disinfected > Feed tanks (silos) need to be emptied, washed with a hot water-pressure pump and subsequently fumigated > After washing and disinfecting, all units must be fumigated twice with at least two weeks between the fumigations <ul style="list-style-type: none"> • Use 2% solution of NaOH should be used at the entrance on foot mats to clean the shoes gumboots and other items <p><i>National Action Plan should be referred</i></p>
3	FMD / Swine vesicular disease	Burial or Burning	Virkon® (2%), 2-4% Glutaraldehyde, Citric acid, Sodium carbonate, 0.5% sodium hypochlorite solution (5000 ppm available chlorine)
4	Lumpy Skin Disease	Burial or Burning	Ether (20%), Chloroform (20%), formalin (1%), phenol 2% in 15min. sodium hypochlorite 2-3%, iodine compounds (1:33) dilution,

			<p>Virkon® (2%) and quaternary ammonium compounds (0.5%)</p> <ul style="list-style-type: none"> Affected Premises, vehicles plying through the affected animal holdings should be carried out with appropriate chemicals / disinfectants
5	African Swine Fever	<p>Burial or Burning or Rendering</p> <ul style="list-style-type: none"> Carcasses shall not be allowed to move out of the area and shall be disposed in the Infected premises itself. In case of exceptions where the carcass disposal is not possible, the transport of carcasses should be undertaken by agencies under the control of District Veterinary/Administrative authority following strict biosecurity protocols and using leak proof vehicles. Carcasses shall be destroyed under official veterinary supervision ONLY. <p><i>National Action Plan should be referred</i></p>	<p>Appropriate disinfectants for ASF include 2% sodium hydroxide, hypochlorite (0.5% available chlorine for 30 minutes), detergents and phenol substitutes, sodium or calcium hypochlorite (2-3% available chlorine), Ortho-phenylphenol 3% for 30 minutes, formalin 0.3 % for 30 minutes, iodine compounds and Virkon® (2%).</p> <ul style="list-style-type: none"> Disinfection has to be made in three steps – <ul style="list-style-type: none"> a) Pre-disinfection This is to prevent spreading of virus in the room. Clean the surface with a broom, spray the disinfectant keeping a distance of approximately 50 cm, on the surface and let the agent react for 30 minutes b) Cleaning This will eliminate more than 90% of the present virus in the area. Hence, after pre-disinfection, brush the surface with water and soap and let it dry c) Disinfection The remaining virus will be destroyed during the step of disinfection. Spray the disinfectant on the surface

			and let it react during 2 hours <i>National Action Plan should be referred</i>
6	Classical Swine fever	Burial or Burning	B-propiolactone (0.4%). Cresol (5%), sodium hydroxide (2%), formalin (1%), sodium carbonate (4%) anhydrous or 10% crystalline), ionic and non-ionic detergents as well as strong iodophors (1%) in phosphoric acid, Virkon® (2%)
7	Bluetongue disease	Burial or Burning	0.5-1% sodium hypochlorite, 3% sodium hydroxide.
8	Rabies	Burial or Burning	0.5-1% sodium hypochlorite solution, Phenolic compounds and 70% ethanol, Virkon® (2%)
9	Hemorrhagic Septicemia	Burial or Burning	3% hydrogen peroxide, 5% acetic acid, Virkon® (1%)
10	Peste des Petits Ruminants (PPR)	Burial or Burning	70% ethanol, phenol, and 5% sodium hydroxide, Virkon®(2%)
11	Glanders	Burial or Burning <ul style="list-style-type: none"> • A pit of minimum 8 ft. deep is to be made. The area requirement is about 3 sq. yards per carcass • The dead animal is put into the pit with feet upwards. The carcass is covered with quick lime followed by filling of the pit. • Personnel in close contact with the diseased animal should follow high standards of personal hygiene and strict antiseptic measures. <i>National Action Plan should be referred</i>	<i>B. mallei</i> is susceptible to sodium hypochlorite (500 ppm), 70% ethanol, 2% glutaraldehyde, iodine, benzalkonium chloride (1/2000), mercuric chloride in alcohol and potassium permanganate. It is less susceptible to phenolic disinfectants. This organism can be destroyed by heating to 55°C (131°F) for 10 minutes, or exposure to ultraviolet irradiation. In the environment, <i>B. mallei</i> is susceptible to drying and sunlight. <i>National Action Plan should be referred</i>
12	Other common bacterial and viral diseases	Burial or Burning	Quaternary Ammonium Compounds, 5% Sodium hypchlorite, 5% calcium hypochlorite, 5% acetic acid, 5% Sodium hydroxide,

			<p>Sodium carbonate, 2-4% Glutaraldehyde, Formalin, Formaldehyde gas.</p> <p>Some of the commercially available disinfectants such as Virkon® (1%), AlkaSept™ Active, PowerCull™ Extra, CombiSept, Bactrex Plus, Germitol, Germisol, Potassium permanganate (1-2 grams / litre of water) and Lysol (500 ml of Lysol in 9.5 lit of water) can also be used to sanitize the premises depending on type of disease organisms and related factors.</p>
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B. Clean-up and Disinfection of infected premises

Thorough cleaning and disinfection help in decreasing the pathogen level and prevent or break the disease cycle. One unique disinfectant cannot match all the different sources of contamination existing at farm level or at infected sites. The infected premises should be disinfected after the animals and infected materials have been disposed-off. Disinfectants should not be applied to animals directly, unless labeled for such use.

Various categories of disinfectants are as under:

Bactericide - kills or inactivates bacteria.

Virucide - kills or inactivates viruses.

Fungicide - kills or inactivates fungi.

Tuberculocidal - kills Mycobacterium tuberculosis, an acid-fast bacterium which is generally more difficult to kill than most bacteria.

Sporicide - kills all microorganisms including bacterial endospores, a very resistant form of certain microorganisms.

Clean-up and disinfection protocols after disposal of carcass and related material should include as below:

- Removal and safe disposal of manure, feed, and debris by burial or burning, followed by thorough scraping and cleaning of all buildings and equipment, must precede the application of a chemical disinfectant. Bedding straw, manure, etc., should be buried, burnt, or disinfected by mixing with slaked lime. A 3% solution of washing soda (sodium carbonate) or trisodium phosphate dissolved in hot water may facilitate cleaning
- Liquids such as blood urine, etc. should be disinfected with a 30% suspension of chloride of lime. Walls, floors, doors, and tools may be cleansed with a suspension of bleaching powder (1:20). Metal tools or instruments of the abattoir may be disinfected by immersion in boiling water.
- Ensure complete disposal of feed, bedding, faecal material, and slurry etc. The infected premises/area should be disinfected by spraying disinfectants like 2% Sodium Hypochlorite or 4% formalin prior to reduce the virus load. Floors, ceilings, walls of the sheds should be washed to remove organic matter and disinfected using 3% calcium-hydroxide solution/ bleaching powder and apply lime on the floors. Concrete areas must be whitewashed with lime; closed sheds and rooms should be fumigated using Potassium-permanganate (KMnO₄) and formalin.
- All the equipment's, materials, should be treated with 2% sodium-hypochlorite solution for 48 h and other metal structures should be disinfected using flame gun.
- Water-reservoirs must also be emptied, washed, and disinfected farm workers and the visiting officials should wash their hands and feet with soap and disinfectant with approved detergent or rectified spirit.
- Use Quaternary-ammonium salts for the treatment of walls, floors, ceilings, and equipment etc., Cresolic-acid 2.2% solution or Synthetic phenols 2% solution for the treatment of floors, Vircon-, D-125 and Trilocid concentrate for surface decontamination.

- Disinfection of disease infected/suspected premises, vehicles plying through the affected animal holdings should be carried out with appropriate chemicals / disinfectants [Ether (20%), chloroform, formalin (1%), phenol (2% /15 minutes), sodium hypochlorite (2-3%), iodine compounds (1:33 dilution) and quaternary ammonium compounds (0.5%)].
- All traces of the cleaning agent must be rinsed away with clear water before the disinfectant is applied because some may inactivate the disinfectant. Provision must be made to contain and safely dispose of cleaning solutions, rinse water, and disinfectant.
- Disinfectants recommended for general use on surfaces free of organic matter are sodium or calcium hypochlorite (1,200 ppm available chlorine), iodine, phenol, and quaternary ammonium compounds.

General provisions

1. The choice of disinfectants and of procedures for disinfection should be made taking into account the causal agents of infection and the nature of the premises, vehicles and objects which are to be treated.
2. Disinfectants and insecticides should be authorised only after thorough tests have been carried out under field condition. Whereas hypochlorite, which is very often used, may be regarded as a universal disinfectant, its effectiveness is diminished by prolonged storage and it is therefore necessary to check its activity before use, a concentration of 0.5% active chlorine is satisfactory for disinfection.
3. No matter what substances are used, disinfection techniques should comprise the following:
 - i. thorough soaking of bedding and litter as well as faecal matter with the disinfectant;
 - ii. washing and cleaning by careful brushing and scrubbing of the ground, floors and walls;
 - iii. then further washing with the disinfectant;
 - iv. washing and disinfecting the outside of vehicles should be carried out, if possible, with liquids applied under pressure and the washing, disinfecting or destroying of articles used for tying up the animals (ropes, reins, etc.) should not be omitted.

Pathogen-specific disinfection

1. Foot and mouth disease virus is easily destroyed by a high or low pH but the disinfectants used may be caustic or corrosive in concentrated form.
2. Mycobacteria are very resistant to disinfectants and a high concentration is required to destroy the organisms, as well as prolonged action.
3. **Bacillus anthracis (Anthrax)**

a. In situations in which manure, dung or bedding may be contaminated with Bacillus anthracis (B. anthracis) spores, the following are recommended:

i. small volumes by incineration

or

ii. chemothermal treatment by composting as follows:

- mix with one of the following at a rate of 1–1.5 litre/m³:
 - 10% formaldehyde (approximately 30% formalin), or
 - 4% glutaraldehyde (pH 8.0–8.5),

Turn the material after five weeks and leave for a further five weeks.

b. In situations in which liquid manure (slurry) may be contaminated with B. anthracis spores, disinfection with formalin (35% aqueous solution of formaldehyde) with stirring for one hour daily is recommended:

i. for slurry up to 5% dry matter, 50 kg formalin per m³ for 4 days

ii. for slurry >5% and <10% dry matter, 100 kg formalin per m³ for 4 days.

[Note: Formalin is a dangerous chemical and as such the appropriate personal protective equipment should be used and safety training on the handling of this chemical should be provided.]

c. In situations in which surfaces in animal houses, stables, vehicles, etc. may be contaminated with B. anthracis spores, the following three-step approach is recommended:

i. a preliminary disinfection should be carried out using one of the following disinfectants at a rate of 1–1.5 litres/m³ for 2 hours:

- 10% formaldehyde (approximately 30% formalin), or
- 4% glutaraldehyde (pH 8.0–8.5)

ii. all surfaces should be washed and scrubbed using ample hot water and, when cleaned and waste water is free from dirt particles, dried,

iii. a final disinfection step should be carried out using one of the following disinfectants applied at a rate of 0.4 litre/m³ for 2 hours:

- 10% formaldehyde (approximately 30% formalin), repeated after one hour, or
- 4% glutaraldehyde (pH 8.0–8.5), repeated after one hour, or
- 3% hydrogen peroxide, or
- 1% peracetic acid, repeated after one hour, or
- 5–10% sodium hypochloride solution.

[Note: Formaldehyde and glutaraldehyde should not be used at temperatures below 10°C. Hydrogen peroxide and peracetic acid are not suitable in the presence of blood. As with all chemicals the appropriate personal protective equipment should be worn and appropriate safety training should be provided to staff handling dangerous chemicals.]

d. Contaminated rooms which cannot be cleared before cleaning and disinfection can be fumigated to eliminate B. anthracis spores. The following procedure is recommended:

- i. all windows, doors and vents to the outside should be sealed with heavy adhesive tape; and
- ii. for rooms up to 30 m³, 4 litres of water containing 400 ml of concentrated formalin (37% w/v formaldehyde) in an electric kettle (with a timing switch to turn it off) should be boiled away and the room left overnight. Room temperature should be >15°C.

[Note: Formaldehyde fumigation is hazardous and proper respirators should be on hand for operator safety.
