



Biosecurity and Animal Health Guidelines

For Semen Stations and Quarantine Stations

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INTRODUCTION

Large resources – both in terms of finance and manpower – are invested by various agencies in the country in producing high genetic merit (HGM) bulls with the objective of gaining genetic improvement in the bovine progenies. Artificial Insemination (AI) employing frozen semen produced by HGM bulls is the main tool to achieving this.

There are many infectious diseases that are transmitted through semen. These include Bovine Brucellosis (BB), Bovine tuberculosis (bTB), Infectious Bovine Rhinotracheitis (IBR), Bovine Genital Campylobacteriosis (BGC), Trichomonosis, Foot and mouth disease (FMD), Bluetongue (BT) and Bovine Viral Diarrhea (BVD). Since most of these diseases are not fatal and do not show characteristic symptoms in adult males, it is possible that an apparently healthy looking bull might shed infectious agents in their semen. Some of the animals infected with these diseases may become carriers where they continue to harbour the pathogen without exhibiting any sign of the disease. The volume of semen doses originating from a single bull highlights the risk of disease transmission of diseases through semen of an infected bull. Since infectious agents survive very well in liquid nitrogen-where semen is typically stored, it also provides a platform for long term storage of these pathogens. Similarly, the semen of High Genetic Merit (HGM) bulls is usually distributed in a wide area - at times in different states or countries. Use of semen collected from an infected bull in an otherwise disease free area is likely to be the source of semen borne disease. Thus, semen collected from an infected bull could potentially spread diseases over a very wide area over for a long period of time.

The Department of Animal Husbandry, Dairying and Fisheries (DADF) of the Government of India developed 'Minimum Standards' for production of frozen semen (MSP) in 2005 which was revised in 2012. For evaluating the compliance of the MSP by the semen stations in the country a 'Central Monitoring Unit' (CMU) was constituted by the DADF which carries out the task of evaluation of semen stations. On the basis of the evaluation, the semen stations are graded as A, B, C or D. Those semen stations that do not meet the pre-requisites are not graded.

The new MSP that is being proposed mentions the standards and the scoring pattern for Animal Health and Biosecurity.

The Biosecurity and Animal Health Guidelines provide support and guidance required for the Semen Stations to achieve the minimum standards mentioned in the MSP.

This document contains the following chapters:

- Biosecurity guidelines for semen processing laboratories
- Biosecurity guidelines for Frozen Semen Stations
- Biosecurity guidelines for Quarantine stations

BIOSECURITY GUIDELINES FOR FROZEN SEMEN STATIONS (FSS)



Biosecurity guidelines are intended to provide appropriate information that would help the FSS in achieving the Minimum Standards and also in developing their own Standard Operating Procedures (SOPs). These guidelines relate to zoning within the FSS, movement of personnel, vehicle cleaning, disinfection, disposal, feed and water biosecurity etc.



General features of the semen station

Topography

- a. Land not low lying.
- b. Soil type favourable for cultivation of fodder.
- c. Proper drainage available.
- d. Adequate water table.

Cordoning of the entire SS & its facilities

- a. Solid concrete wall – 5 ft or higher - Barbed wire topping preferred.
- b. SOP for maintenance of the cordon are in place.

Basic building infrastructure

Animal housing

- a. Animal sheds
- b. Bull exerciser
- c. Sick animal shed (An isolated corner in the high-biosecure zone itself)
- d. Isolation shed (At least 50 m away from bull sheds in the medium/low bio-secure area)
- e. Dispensary (for animals housed in the high bio-secure area only)

Semen collection and processing

- a. Semen collection area.
- b. Artificial vagina cleaning and preparation area.
- c. Semen evaluation and processing.
- d. Semen pre-storage and storage.
- e. Quality control lab

General

- a. Administrative block
- b. Canteen
- c. Rest rooms for personnel (both in core biosecure area & general area)
- d. Change and shower rooms
- e. Quality control laboratory
- f. Central store
- g. Workshop
- h. Tyre dip at entrance

- i. Feed and fodder godowns
- j. Waste disposal rooms
- k. Biogas plant

Additional building infrastructure

- a. Silage pits
- b. Feed mixing area
- c. Weigh bridge
- d. Residence
- e. Guest house

Physically demarcating core SS from other areas

- a. Solid concrete wall – 6 ft or higher.
- b. Barbed wire topping – not less than 2 ft.

Core biosecure area of the SS

- a. Animal sheds.
- b. Sick animal shed.
- c. Semen collection and processing.
- d. Semen pre-storage and storage.
- e. Rest rooms for personnel.
- f. Change rooms.

Distance from habitation

While starting a new semen station, it would be worthwhile to consider the distance from habitation for better biosecurity:

- a. Ideal – 5 Km or more
- b. Fair- 2-4 Km
- c. Minimum – not less than 2 Km

Biosecurity Officer (BSO) in the SS

A biosecurity officer who is a veterinarian should be exclusively available in the SS. He will be responsible for implementation of the biosecurity protocols in the SS.

Entry into the SS

Visitor regulation

One of the major sources of pathogens gaining entry into the farm, other than newly introduced animals, is through people.

Low risk visitors

Those who have no contact with livestock present very little risk of carrying diseases. Precautions for them include:

- a. Provide boots and coveralls (disposable preferred).
- b. Do not allow them to enter animal sheds or feeding areas.
- c. Do not allow them to bring food along.
- d. Ask them to sanitise their hands on entry and before leaving.
- e. SOP to be followed for visitor regulation.

Moderate risk visitors

People who routinely visit farms but have little or no contact with animals – salesmen, delivery men, mechanics etc. In addition to precautions for low risk visitors mentioned above, the following also are to be observed:

- a. Equipment should be cleaned and disinfected between uses if there is any contact with feed, animals, soil or manure.

High risk visitors

They include vets, livestock haulers, livestock owners, labour or other personnel who have close contact with animals and their bodily discharges and also personnel who have visited any animal or human diagnostic facility. In addition to precautions for low & moderate visitors, people in this group should also observe the following:

- a. Equipment that has direct animal contact (dehorers, tagging machines, restraint ropes, hoof trimmers, calipers etc) should be cleaned and disinfected before and after use.
- b. Should remain away from core biosecure area for a minimum of 3 days if they have visited an FMD infected farm/village.
- c. Disposable gloves and other disposable or clothing that can be disinfected should be worn whenever there is direct contact with animal tissues or equipment.

- d. Food packets should be placed in a bag provided at the entry point.
- e. Food should be consumed only at designated areas in the farm and left-over should be disposed as per protocol.
- f. Foot dips are to be installed at the entry and exit of each animal shed.
- g. Hands and forearms should be washed with antibacterial soap and sanitized before leaving the farm.
- h. Farm employees who have livestock at home should report to work in clothes that have not been exposed to their animals. The outer wear and boots provided to them should be cleaned and disinfected after work and left at the farm.

Vehicle regulation

Another major source of pathogens gaining entry into the farm, other than newly introduced animals and people is through vehicles.

Visitor vehicle regulation

1. All vehicles visiting the farm should be parked outside the biosecurity perimeter of the SS.
2. Only essential vehicles may enter the SS.

Regulation of vehicles entering the SS

1. It is preferable to keep the chaff cutter outside the SS area. The chopped fodder is mechanically dropped in the trailer through conveyers.
2. Separate tractor should be used with in the SS premises and fodder area.
3. Vehicles should be clean and free of visible manure on tires and wheel wells. Livestock trucks and trailers should be cleaned and disinfected prior to arriving at the SS.
4. Vehicles should pass through tyre dips of minimum 5.5 m length, 3.5 m width and a depth of 6-9 inches at the centre.
5. Service vehicles (tractor, trailer etc) are to be thoroughly cleaned and disinfected on a regular basis.

6. Manure vehicles are to be cleaned and disinfected daily.
7. SOP for cleaning & disinfection of vehicles are to be followed.

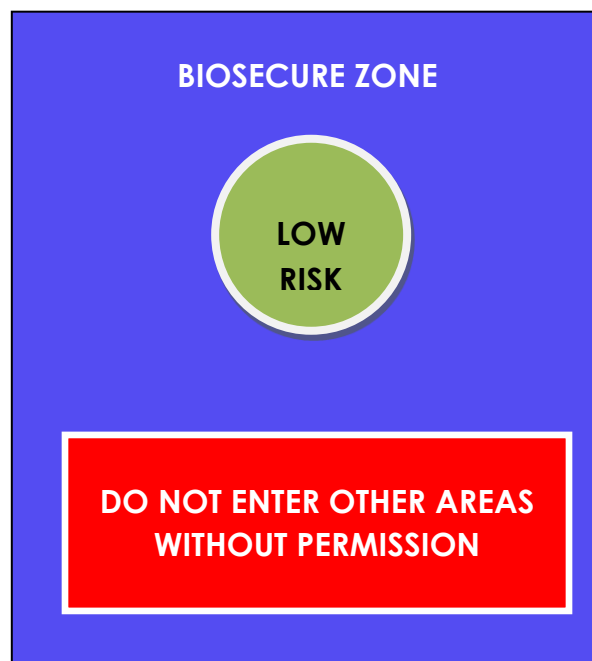
Biosecurity Zones in SS

The biosecurity zone should be segregated into low, medium and high risk areas with different protocols for access and exit.

Low Biosecurity Zone

Visitors lounge, office building, canteen, security outpost, stores, residential area, workshop, recreational & other socializing facilities etc.

- a) An example of signage for this area is shown below:

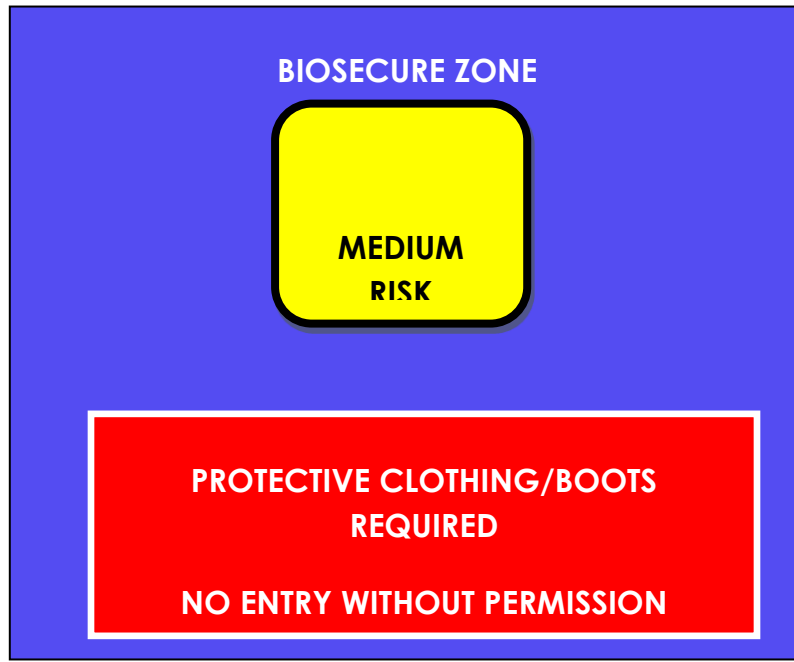


- b) These areas should be outside and physically demarcated from the high biosecurity zone.
- c) Entry by permission only.
- d) Other zones cannot be accessed from here.

Medium Biosecurity Zone

Feed mixing area, silage pits, isolation shed, fodder plots etc.

a) An example of signage for this area is shown below :



b) These areas are outside and physically demarcated from the high biosecurity zone.

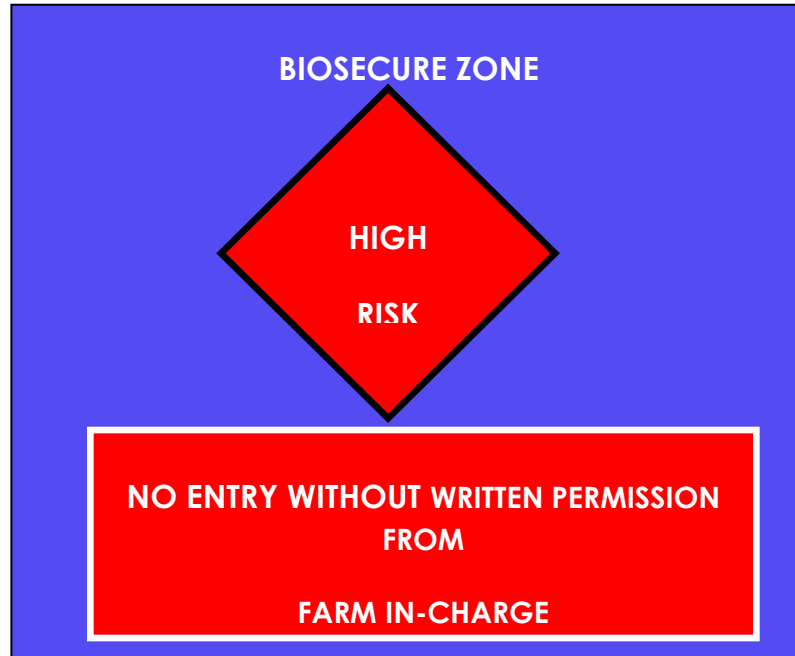
c) Protective boots required to enter this zone.

d) No entry would be allowed without permission of unit head.

High Biosecurity Zone

All animal sheds, semen collection, processing & storage facilities etc.

a) An example of signage for this area is shown below :



- b) Protective clothing (coverall, caps) and proper hand sanitation required to enter these areas.
- c) Change of protective clothing required if entering from medium risk zone.
- d) No entry other than designated personnel unless absolutely necessary, with the permission of the farm in-charge.
- e) SOP for entry & exit of personnel / visitors into each zone (high, medium & low) to be followed.

Disease testing and management protocols in rearing and semen stations

1. The disease testing and management should be strictly as per the MSP of the DADF.
2. Additional numbers of tests are not mandatory but would greatly reduce the chances of disease entering the farm.

Vaccination and sero-sampling protocols

Vaccination is one of the most important animal health interventions to reduce the chances of infection both in the semen station and also in the ring vaccination zone around the semen station.

Vaccinations and sero-sampling in semen station

A general guideline for the vaccinations to be carried out in the semen station is given in the table below:

S.No	Disease	Schedule	Remarks
1	Foot and Mouth Disease (FMD)	6 monthly- preferably during March/April and August/September	Booster after 1 month after initial dose.
2	Haemorrhagic Septicaemia (HS)	Annually during March /April	In endemic areas only
3	Black Quarter (BQ)	Annually during March /April	
4	Anthrax	Annual	In endemic areas only
5	Theileriosis	Once in three years.	Only for cross bred and exotic animals

6	Sero-monitoring for FMD	0 day and 30 day post vaccination	All animals in the semen station to be covered
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1. SOP on vaccination procedure followed.
2. SOP followed for collection, labeling and dispatch of serum samples to laboratories.

Vaccinations in the ring vaccination zone (10 Km) around the semen station

1. The radius of 10 Km around the semen station should be considered as the ring vaccination zone.
2. A minimum coverage of 80% of all cattle and buffalo should be ensured by the State AHD.
3. The Animal Health Officer should be the convener of the monitoring and coordination committees to be formed to implement the vaccination programme.
4. All the vaccinated animals in the ring vaccination zone should be ear-tagged.
5. The following vaccination schedule may be followed:

S.No	Disease	Schedule	Remarks
1	Foot and Mouth Disease (FMD)	6 monthly- preferably during March/April and August/September	
2	Haemorrhagic Septicaemia (HS)	Annually during March /April	In endemic areas only
3	Black Quarter (BQ)	Annually during March	

		/April	
4	Anthrax	Annual	In endemic areas only
5	Brucellosis	Female cattle and buffalo between 4-8 months of age	
6	Theileriosis	Once in three years	Only for crossbred and exotic cattle
7	Sero-monitoring for FMD	0 day and 30 day post vaccination	Random sampling to be done. Please see the details on sero-sampling below.

Sero-sampling in the ring vaccination zone (10 Km) around the semen station

1. With reference to FMD, if a sampling framework is being followed by the State AHD at the district level, no separate sero-monitoring is required.
2. Data on sero-monitoring may be sourced from the AHD for the last 2-3 rounds of vaccination (i.e before the commencement of project), pertaining to the ring vaccination villages if available, or for the respective district in which the semen station is situated. Subsequent sero-monitoring reports may be also maintained with the semen station.
3. Sera-samples have to be collected at 0 day (on the day of vaccination) and on the 30th day post vaccination (+1week max).

4. While recording the sample details, it must be ensured that the date of vaccination and the date of collection are correctly recorded along with the sample.
5. The project personnel may ensure the correct time of sera-sampling in the ring vaccination villages in coordination with the State AHD if it has been included in the sampling frame.
6. If the semen station wishes to carry out sero-sampling on its own in the ring vaccination villages around 10 Km radius of the semen station, random sampling can be carried out based on the following formula:

$$n = z^2 \times p \times q / e^2$$

Where n = sample size z=1.96, p = percentage of population that is protected (may be obtained from previous sero-monitoring reports of the State AHD or assumed if unknown) q=1-p and e= % of error.

Eg. If the percentage of protected population after FMD vaccination is estimated at 80% at 95% confidence level, then the sample size for sero-sampling would be : $n = (1.96)^2 \times 0.8 \times 0.2 / (.05)^2 = 245$ samples.

7. Once the sample size is decided, villages in the ring vaccination area are randomly selected and equal number of samples (say 5, 10 , 20 etc) are distributed to each of the randomly selected village ensuring proper spread (preferably from four corners and centre of the village) while collection. The same process holds true for other vaccinations also.

Anaplasma/Leptospira control

Refer biosecurity guidelines for QS

Ectoparasite control

- a) An ectoparasite control plan is in place
- b) SOP for topical application of acaricides is followed.
- c) SOP for parenteral administration of acaricides is followed.

Worm Control

- a. A worm control plan is in place.
- b. SOP for oral administration of anthelmintic is followed.

Cleaning

Cleaning of animal sheds

The types of sheds (at decreasing levels of purported disease risks) are:

1. Isolation shed
2. Sick animal shed
3. Bull shed
4. Collection area
5. Feed storage area

Daily removal of dung from the sheds is an essential procedure that needs to be carried out in all sheds. However, thorough cleaning and disinfection of sheds maybe carried out on a regular basis as per a pre-fixed schedule (daily, twice a week, weekly etc). The sick animal and isolation sheds should be thoroughly cleaned and disinfected each time an animal moves out. Cleaning and disinfection of a shed may be carried out as under:

1. Remove organic matter, manure and soiled bedding.
2. Use high- temperature pressure washer for all wood, metal or concrete surfaces like railings, feed mangers, feed silos, water troughs, pipes, foot baths etc.
3. In absence of pressure washer, scrub all hard surfaces with detergent and rinse.
4. Pay particular attention to corners, cracks, seams and porous surfaces – wood and concrete can retain infective material.
5. Start high and work low for ceilings/walls.
6. Clean light fixtures, ceilings, fans, lights and disinfect using moistened cloth.
7. Allow surfaces to dry before disinfection.
8. Appropriate disinfectant at correct concentration is to be applied on walls and floors.

9. Disinfectant should be applied at a rate of 400 ml/m²
10. Disinfectant spray should be applied using a low pressure garden type sprayer (around 200 psi).
11. Appropriate contact time should be allowed based on the disinfectant used.
12. Water sources may also require being disinfected/decontaminated.
13. Restock/reuse only after disinfection.
14. The open area may be given a liberal sprinkling of lime. If the open area is filled with sand, the top 10-12 inches may be replenished at least once in six months.

Cleaning of farm equipment

1. Trivice, buckets, pans, spades, pitch forks, scrapers, wheel barrows, hand wash basins, mortar pans etc. are to be scraped/scrubbed completely clean at the end of the day. Boots, restraining ropes etc. are to be cleaned and disinfected with appropriate disinfectant at the end of the day's work.
2. Tagging machines, dehorers (other than electric), hoof trimmers to be cleaned and disinfected with appropriate disinfectant after use on each animal.
3. SOP for cleaning each equipment followed.

Cleaning of farm vehicles

1. Farm vehicles carrying manure are to be scraped / scrubbed thoroughly on a regular basis.
2. Vehicle tyres and undercarriages that have direct contact with animals' discharges should be cleaned thoroughly and disinfected with appropriate disinfectant at the end of the day's operations.
3. Other farm vehicles are to be cleaned and disinfected on a regular basis (monthly/weekly/fortnightly) based on the exposure risk.
4. SOP for cleaning each type of farm vehicle followed.

Cleaning of other equipment/aprons/structures

1. Stethoscopes, i/v pumps (areas touched during patient care) – clean and disinfect with an appropriate disinfectant between uses.
2. Multi dose syringes/vaccinators and other surgical equipment – clean and sterilize by placing in sterilizer after the day's operations. It is advisable to use disposable single dose syringes and needles.
3. Telephones, computer mouse, doorknobs, keyboards, light switches, cabinet doors and handles – Clean and disinfect with an appropriate disinfectant once in a week or whenever visibly soiled.
4. Apron, coveralls, towels – Should be carried to laundry after the day's work and disinfected with appropriate disinfectant.
5. Tyre dips and foot dips/sponge should be cleaned daily and disinfectant changed at the start of each day or as and when excessively soiled.
6. SOP followed for cleaning each type of item.

Cleaning of animals

1. Wash and scrub the animals to remove any dirt or dung on the body before collection, special attention to be given to thorax and lower abdomen.
2. Practice foot bathing on a regular basis.
3. Carry out hoof trimming on a regular basis twice a year.
4. Tuft of hairs at the preputial orifice should be cut to about 2 cm, but not lesser.
5. Animals should be brushed regularly.
6. The veterinarian or in- charge should make sure that the animal is not carrying any excessive litter or particles of feed on its body or its hooves when entering the collection area.

Disinfection

1. Equipment used for semen collection, glassware, bacteriological media etc. are to be sterilized by autoclaving/hot air oven.
2. SOP should be followed for disinfection/sterilization of each equipment.
3. A list of various common disinfectants and their usage details are provided in the Appendix section.

Feed & Water Biosecurity

Feed biosecurity

1. SOP followed for harvesting, handling, and storage of all crops.
2. SOP are in place to reduce chances of introducing diseases when fodder is procured from other sources (contract farming)
3. Feed bunks and storage areas are inaccessible to rodents, birds, dogs, cats, and other wildlife.
4. Materials in silos, bunks, and bins checked regularly and disposed of if spoiled /moldy.
5. Upright silos are emptied before cleaning.
6. Bags of feed or feed ingredients are stored off the floor, e.g. on pallets.
7. Opened feed bags are placed in or emptied into barrels with tight lids.
8. Areas in and around storage areas are cleaned between batches of feed.
9. Inventory is rotated to limit the amount of pathogens in stored feeds.
10. Covers are always kept on barrels and bins.
11. Ensure that water is not getting into storage areas.
12. Moisture problems are addressed periodically.
13. Appropriate storage environment for feed is ensured.
14. Feeding areas are protected from animal carcasses and manure.
15. Optimal feed management practices are followed.
16. Ensure smooth feeding mangers to minimize the surface area that could be colonized by pathogens.
17. Feed refusals are disposed of if not eaten within 24 hours.
18. SOP followed for storage, distribution and disposal of feed and fodder.

Water biosecurity

1. All water sources are protected from animal carcasses and manure.
2. A regular cleaning schedule of water troughs and tanks is followed.
3. Water tanks etc. are disinfected at least twice a year.
4. SOP followed for cleaning and disinfection of water sources

Disposal

Disposal of carcass

Animals that die in under quarantine or due to Anthrax should not be composted. No postmortem should be done on animals that die due to Anthrax.

If death due to highly infectious disease:

1. Clean and disinfect the area after carcass is removed.
2. Wear protective clothing when handling dead stock and thoroughly disinfect or dispose clothing before handling live animals.
3. Properly dispose contaminated bedding, manure or feed.
4. Properly clean and disinfect the vehicle used for transportation of the carcass.

Burial

1. Bury the carcass 6 feet deep and more than 300 feet away from water body, watercourse, well or spring. The site should be well drained.
2. Lay a 24 inch bed of absorbent organic material if possible (wood chips).
3. Cover carcass with dry high-carbon material, old silage, straw etc.
4. Generously sprinkle lime powder before and after laying the carcass, this hastens decomposition.
5. Ensure that the base is wide enough to allow a 2 foot clearance around the carcass.

6. Special methods of incineration or composting may also be used following laid down procedures.

Disposal of clinical /laboratory waste /other wastes

Wastes generated during treatment of an animal or from the laboratory should be considered as potential sources of contamination. Further, meal left-overs of farm personnel need also to be disposed properly to avoid attracting birds and other pests etc. Proper classification of the wastes is to be carried out for management of its collection and disposal.

Wastes may be classified and disposed as follows :

SN	Waste type	Disposal
1	Clinical wastes (tissue, blood, body fluids, aborted material etc.)	Plasma pyrolysis/ Incineration /deep burial
2	Laboratory wastes (cultures, serum, discarded semen, etc.)	Autoclaving/plasma pyrolysis
3	Waste Sharps (needles, syringes, scalpels, blades, glass etc)	Disinfection and mutilation/ shredding
4	Discarded Medicine	Deep burial/ incineration/ plasma pyrolysis
5	Solid waste (Items contaminated with blood and body fluids including cotton, beddings etc. & egg shells, egg white)	Incineration/deep burial/plasma pyrolysis
6	Solid waste (iv sets, tubing, catheters etc.)	Disinfection and mutilation/ shredding/plasma pyrolysis
7	Liquid waste (waste from laboratory and washing, cleaning, housekeeping and disinfecting activities)	Disinfection and discharge into drains
8	Food left-overs & other wastes	Deep burial

2. SOP of collection procedures for the various types of wastes may be prepared and a log book to be maintained
3. **Plasma pyrolysis:** Plasma pyrolysis provides solutions for complete pyrolysis of typical clinical waste and other disposables made of polyethylene, polymethyl methacrylate, rubber, glass etc. The system provides high

temperatures combined with high UV radiation flux which destroys pathogens completely.

4. **Guidelines for incinerators :**

a. Combustion efficiency (CE) shall be at least 99%

$$CE = \left(\frac{\%CO_2}{\%CO_2 + \%CO} \right) \times 100$$

b. The temperature of primary chamber shall be 800±50°C.

c. The secondary chamber gas residence time shall be at least 1 second at 1050±50°C, with minimum 3% oxygen in stack gas.

d. Emission standards (mg/Nm³ at 12% CO₂ correction): Particulate matter, Nitrogen & HCl-150 each; Minimum stack height shall be 30 meters above ground; and volatile organic compounds in ash shall not exceed 0.01%.

e. Waste to be incinerated shall not be chemically treated with any chlorinated disinfectants.

f. Only low sulphur fuels shall be used as fuel.

5. **Guidelines for waste autoclaving of laboratory waste :**

a. A temperature of not less than 121°C and pressure of 15 psi for not less than 60 mts; or 135°C and 31 psi for not less than 45 mts; or 149°C and 52 psi for not less than 30 mts.

b. If for any reason the time temperature or pressure is not reached, the entire load must be autoclaved again meeting proper conditions.

c. Validation test: The autoclave should completely and consistently validated using approved biological indicator (*B. stearothermophilus* spores @ 1x10⁴ spores/ml) at maximum design capacity.

d. Penetration test using thermocouple for temperature mapping.

e. Under no circumstances will an autoclave have a residence time of less than 30 mts, regardless of the temperature and pressure, a temperature less than 121°C and pressure less than 15 psi.

f. Routine test: A chemical indicator (strip/tape) can be used to verify temperature. Place the same at different locations to ensure inner content has been adequately autoclaved.

If the autoclave is used for sterilization of fabrics, the same shall be validated by Bowie-Dick test.

Bowie-Dick test: It is known that the presence of a significant amount of residual air in the sterilizer chamber of vacuum sterilizer may prevent through steam penetration into the load contents especially in the fabric cycle of sterilization. To monitor the performance of the vacuum assisted steam sterilization Bowie-Dick test is widely used. Bowie-Dick test pack kit is commercially available which contains indicator sheet specially designed for this test which can be used as per manufacturer's instruction.

Bowie-Dick test needs to be carried out daily in an empty sterilizer before the first run with load. The test pack is to be kept on the bottom shelf over the drain and the sterilizer is to be run for 3.5 minutes at 132o-134oC or as per manufacturer's recommendations.

A uniform change in colour to dark brown/black indicates rapid steam penetration and adequate air removal hence passing the test.

An unsatisfactory test result indicates non-uniform colour development.

g. Liquid waste :

The effluent generated should conform to following limits :

(i) pH-6.5-9

(ii) Suspended solids-100mg/L

(iii) Oil and grease-10mg/L(iv) Biological Oxygen Demand (BOD)-30mg/L

(v) Chemical Oxygen Demand (COD)-250 mg/L

(vi) Bio-assay test- 90% survival of fish after 96 hours in 100% effluent.

6. **Guidelines for deep burial :**

a. The pit or trench should about 2 meters deep.

b. It should be only half filled with waste, then covered with lime within 50 cm of surface before filling the rest of the pit.

- c. On each occasion when wastes are added to the pit, a liberal sprinkling of lime may be made and a layer of 10 cm soil added to cover the wastes
- d. Animals should not have any access to the burial sites, covers of galvanized iron/wire meshes may be used
- e. The pits should be distant at least 300 feet away from any water body, watercourse, well or spring.

Disposal of farm effluents

1. Farm should have an adequate effluent collection and disposal system.
2. Land used for manure disposal should be at least 100 m away from residential and recreational areas.
3. The disposal area should at least 100m away from animal housing areas.
4. Remove manure frequently from sheds.
5. Manure is composted or used for bio gas generation since it greatly reduces its pathogen load.
6. No manure handling equipment is used to handle feed.
7. High pressure washers or adequate scrubbing done for equipment and vehicle that deals with manure after each operation.
8. Manure application in the fodder fields is limited to time periods well before harvest.

Disease Specific Biosecurity

It is important to have an understanding of the common pathogens and their routes of entry. The table below will help the FSS to assess the risk of disease and carry out necessary measures to reduce the threat of the potential infection source.

Pathogens and route of entry		
Transmission method	Potential exposure sites	Diseases
Air	<ul style="list-style-type: none"> Newly purchased animals. Pastures which adjoin those of other herds. 	IBR , <i>Mannheimia (Pasteurella) haemolytica</i> , FMD
Blood	<ul style="list-style-type: none"> Needles Surgical equipment 	Bovine Leukosis Virus Anaplasmosis
Ingestion	<ul style="list-style-type: none"> New born calves that remain with mature cows. Equipment of personnel tracking manure into feed bunks, feed storage, or silage storage. Exposure to contaminated soil 	Johne's Disease Anthrax BQ Brucellosis
Animal to animal	<ul style="list-style-type: none"> New animals Infected animals Needles Surgical equipment Hoof trimming equipment Calf trailers Fomites 	Mycoplasma, BVD,IBR, FMD, HS, Leptospirosis, Trichomonosis, Campylobacteriosis Brucellosis, Tuberculosis Salmonellosis, <i>E. coli</i> Rotavirus, Coronavirus Neospora sp.
Contact with other animals and ectoparasite	<ul style="list-style-type: none"> Domestic animals in farms Wildlife/ birds entering farm or feed storage Biting ectoparasite 	Neospora (dogs, fox), Brucellosis (deer), Salmonellosis (birds, rodents), <i>E. Coli</i> (many), Cryptosporidium, Anaplasmosis (flies), Bluetongue(flies), Theileria, Babesia (ticks), Trypanosome (flies)

Wildlife and pests biosecurity

Birds

- Birds can spread salmonellosis and avian Tuberculosis (which cross-reacts with bovine tuberculosis tests.)
- They also carry the organisms that cause enteric bacterial diseases, fungal diseases, Q fever and also tapeworms and other parasites.
- They can also eat a good portion of the grain fed to livestock

In order to reduce risk of infection from birds in the biosecure area :

1. Clean out water troughs and feed mangers daily.
2. Keep livestock away from areas where birds congregate.
3. Keep stored feed well covered.
4. Install screening to prevent birds from accessing barns.
5. Discourage migrating flocks from stopping at the farm.
6. Install visual detractors, bird netting and reflectors at strategic locations.
7. Avoid planting trees in the high biosecure area. Trees may be limited to the periphery of the semen station boundary as a wind breaker.

Deer and wild ungulates

1. Deer could carry diseases like TB and JD.
2. Winds socks may be used on the fence posts to deter deer from coming close to the fence.

Rodents (Rats and Mice)

Some guidelines on rodent control are given below for effective implementation of a rodent control programme.

- The indicators of rodent infestation are :
 - Gnawing, climbing sounds and squeaks.

- Droppings (bean size in case of rats and rice size in case of mice) along walls, behind objects and near feed bags.
- Fresh diggings around foundations.
- Dust free runs along walls and behind storage material.
- A colony of 100 rats can consume over 1 ton of feed in a year.
- They potentially spread bacteria like Salmonella, *E. coli* and Leptospira by contaminating feed with their droppings/urine. A rat produces 25,000 droppings per year and a mouse, 17,000.
- Under ideal situations, a pair of rats and their offspring can produce 20 million young in 3 years. Mice reproduce even faster.
- They could potentially damage wires causing fire hazards or machinery failure.

To reduce risks of infection from rodents, the following may be done:

1. Rats usually do not move more than 45 meters from its nest and mice 9 meters. Reducing possibility of nesting sites in this range of the feed stores by proper paving, clearing of vegetation etc., could reduce the population.
2. Minimum width required for entry for rats is 12 mm and mice is 6 mm. Identify their entry points into the feed storage areas and block them off.
3. Rats can jump as high as 91 cm and leap a distance of 122 cm horizontally (around 30 cm for mice either ways). Stack cattle feed off the floor and from side walls at least above these distances. Since they can climb rough surfaces, the elevation should be smooth. Electrical wires /ropes also provide channels to reach the feed source.
4. Locate traps close to walls, behind objects, in dark corners or where droppings are seen. While setting traps next to wall, set it at right angles to the wall with trigger/trap and bait closest to the wall.
5. Rats are apprehensive about new objects, therefore leaving a trap for about 5 days is necessary to ensure acceptance. On the contrary, mice quickly accept new objects

6. Glue boards are very effective against mice. However they do not work well if there is too much dust.
7. For moderate infestations, 50-100 traps/baits may be required. The trapping/baiting programme should be short and decisive to prevent trap shyness.
8. Odour from humans or previously caught rodents do not cause trap shyness.
9. There are two types of rodenticides; (i) acute poisons and (ii) anti-coagulants. Rodents may develop bait shyness after being made sick but not killed by the rodenticide. The shyness usually develops to the bait carrier rather than the rodenticide. Change the bait carrier if bait shyness develops. For rats, pre-bait with baits without poison for about 1 week before adding the rodenticide.
10. Traps / baits should be placed 7-10 meter apart for rats and 1-2 meter apart for mice.
11. Remove all uneaten baits and properly dispose them after the poisoning programme.
12. Dead rodents must be disposed of appropriately, do not touch with bare hands.
13. Regularly inspect buildings and feed storage areas for evidence of rodents such as droppings and nests.

Monkeys

- Have a potential of spreading many diseases like FMD given their wandering nature and close contact with farm animals.
- They would perhaps qualify as good agents for mechanical transfer of pathogens.

To minimize chances of monkeys entering the high-biosecure zone :

- Visual detractors and reflectors may be installed at strategic locations on the boundary wall.
- Commercially available monkey spikes may be installed on the boundary wall of the high bio-secure zone.

Dogs and Cats

Dogs (cats to a lesser extent) play a role in transmitting pathogens to farm animals. It would be beneficial to keep these animals out of the high bio-secure area.

Mosquitoes and other biting flies

Mosquitoes are more of an annoyance in farms and may affect the performance of the animals. It also may be a health hazard to the personnel working in the farm. For controlling mosquitoes, the following may be practiced:

1. Prevent stagnation of water.
2. Clean out troughs and gutters regularly.
3. If there is a pond in the premises, stock it with fish that eat mosquito larvae.

Other biting flies transmit diseases like Surra in animals, to minimize biting flies, the following may be practiced:

1. Smoking/fogging the sheds during the evening hours.
2. Apply natural repellants like neem oil etc, on the animal on regular basis.

Emergency responses to various diseases

In the event of a contagious or infectious disease occurrence, the containment of the same would directly depend on the efficacy of the emergency responses that have been devised for each disease. This would thereby help in avoiding huge economic losses. The emergency responses to be adopted for important diseases are mentioned in the Appendix section.

Animal Welfare

Animal welfare is defined as state in which an animal's individual needs are met for nutrition, shelter, health and the ability to express its natural behaviour, and in which it is free from undue pain and suffering. Animal welfare is fast becoming an important aspect of animal husbandry. Aspects of animal welfare need to be given a fair consideration while rearing, handling, moving, transportation and euthanasia of animals.

Recording of activities and Reporting

All the activities related to biosecurity need to be documented in an appropriate manner so as to have a rich database that would be of help during times of crisis and also for informed decision making. To this end, an information system should be put in place in the semen stations. However, till such time that is done, recording of activities and preparation of monthly reports may be done on prescribed formats.

Recording of routine activities

The routine activities of the semen station that have a direct impact from the biosecurity point of view need to be recorded for later reference in case of any disease emergencies. These activities could include log books for visitor, vehicle, animal treatment, animal isolation, cleaning and disinfection, disposal, environmental microbial load testing, semen discard, animal removal and entry etc. The formats for recording some of such activities are mentioned in the Appendix section.

Monthly reports

Monthly reports would essentially be a consolidation of the daily routine of biosecurity activities which would reflect the implementation of activities in an orderly manner. The consolidated monthly report would be in the format as mentioned in the Appendix Section.

Standard Operating Procedures (SOP)

SOP provide direction, improve communication, reduce training time and improve work consistency at all levels across the farm. For a biosecurity plan to be effectively implemented, SOP in following areas need to be prepared and implemented :

1. Maintenance of cordon
2. Visitor/personnel regulation
3. Personal hygiene
4. Movement between sheds
5. Preparation of bull
6. Sanitation practices during semen collection
7. Sanitation practices in semen processing procedures
8. Preparation of semen collection and processing equipment, buffer, extender etc.
9. Harvesting, handling, and storage of crops.
10. Storage, distribution and disposal of feed and fodder
11. Procurement of fodder from outside sources
12. Sanitation practices in semen laboratory
13. Sanitation practices in Semen quality control lab
14. Cleaning and disinfection/sterilization of laboratory equipment
15. Cleaning and disinfection/sterilization of semen collection equipment
16. Cleaning and disinfection of farm equipment and vehicles
17. Cleaning and disinfection of bull shed
18. Cleaning and disinfection of water sources
19. Parenteral administration of drugs
20. Administration of vaccines
21. Administration of dewormer
22. Application of acaricides
23. Collection, labeling and dispatch of samples to laboratories
24. Collection of lab and clinical waste
25. Maintenance of feed machinery and store



Guidelines on Good laboratory Practices (GLP) for the semen processing laboratories are intended to provide the required information in order to produce frozen semen of appropriate quality and to reduce the chances of contamination occurring in the frozen semen straws.



General features of the Laboratory

Basic building design

- a. The laboratory shall be located in the high biosecurity zone of the semen station.
- b. The floor and dadoing on the wall shall be from material that can be easily cleaned and disinfected.
- c. The laboratory shall be segregated into clean and other areas.

Clean areas

Definition of clean area: Clean areas are those sections of the laboratory which are involved in receipt of semen from semen collection yard, processing filling and quarantine of semen.

1. Trained personnel shall be deployed for clean areas.
2. Avoid crisscrossing of movement of material and personnel clean, dirty and other areas.
3. Movement of material from clean areas or into other areas shall be only through dynamic pass-boxes. Semen from collection yard shall be sent through dynamic pass box into an area with a anteroom adjacent to semen processing area.
4. The outer surface of the liquid nitrogen containers entering the clean areas should be disinfected before allowing entry.
5. The materials entering the mini storage area shall be in a sealed condition, the outer surface of which is disinfected with appropriate disinfectant before allowing entry.
6. No unwanted furniture, equipment or material should be kept in the clean areas.
7. Appropriate number of germicidal UV lights may be placed in the clean area, laminar airflow unit, apron and clean footwear cabinets.
8. The germicidal UV lights (40 watts) should be placed at a distance of not more than 8 feet from the surfaces to be disinfected.

9. An UV light exposure time of not less than 30 minutes should be provided for effective disinfection of surfaces.

10. The following rooms shall be designated as clean areas :

- a. Clean area of change room (inner portion of the change room consisting of the apron, mask, head cover and clean footwear cabinets and hand sanitizer).
- b. Media preparation room
- c. AV preparation and storage area
- d. Semen processing and evaluation room
- e. Semen filling area
- f. Mini storage area

Other areas

- 1. Trained personnel should be deployed for other areas.
- 2. The following rooms may be designated as other areas :
 - a. Artificial Vagina/other equipment washing area
 - b. Office, conference room, rest rooms etc.
 - c. Wash rooms
 - d. Soiled area of change room (outer area of the change room consisting of other footwear rack, wash basin etc.)
 - e. Semen pre-freezing & freezing room
 - f. Semen quarantine
 - g. Semen storage
 - h. Central store
 - i. Collection yard
 - j. Quality control lab (may be in clean area also)

Entry into the clean area of the laboratory

- a. Entry to clean areas shall be only through change rooms.
- b. Only personnel working in the clean areas should be permitted to enter.
- c. Personnel entering in the clean area will leave their street shoes at a designated place in the change room. After removal of shoes hands shall be sanitized with 70% isopropyl alcohol (IPA). Personnel shall wear a clean apron, mask and head cover.
- d. Personnel should change the footwear kept exclusively for use in the clean areas.
- e. Hands should be washed and sanitized before entering the clean area.
- f. Protective clothing and footwear worn in other areas of the semen station or other areas should not be used in the clean areas of the laboratory.
- g. No food items should be allowed.
- h. Eating, chewing pan, smoking etc, should be prohibited in the laboratory premises (both clean and other).

Cleaning & Disinfection

Collection yard

1. The collection yard should be cleaned and disinfected after the end of each day's operation.
2. SOP should be followed for sanitary practices during semen collection.
3. SOP should be followed for cleaning of the collection yard.

Equipment/aprons/structures

1. Equipment used for semen collection, glassware, bacteriological media etc. should be sterilized by autoclaving/hot air oven, the details of which are as under :

S.no	Item	Method	Mode
1	a. Artificial Vagina & rubber cones b. Buffer c. Plastic tips d. Filter papers e. Bull Apron	Autoclaving	5 psi pressure for 20 mts
2	Thermo-resistant rubber wares	Autoclaving	3-4 psi pressure for 10 mts
3	Bacteriological media & distilled water	Autoclaving	15 psi pressure for 15 mts
4	Glassware	Hot air oven	160°C for 60 mts or 180°C for 30 mts.

2. The rubber tubing and cones used for semen filling shall be discarded and should not be re-used.
3. Telephones, computer mouse, doorknobs, keyboards, light switches, cabinet doors and handles, footwear for clean areas etc. shall be cleaned and disinfected with an appropriate disinfectant once in a week.
4. Apron, towels etc. shall be carried to laundry after the day's work and disinfected with appropriate disinfectant.
5. All the equipment shall be routinely cleaned and disinfected with appropriate disinfectant(s).
6. All equipment shall be kept covered when not in use.
7. Sink drains shall be routinely cleaned and disinfected. The sink shall remain dry after completion of work.
8. Immediately after use, all glassware, rubber ware, plastic tips and other re-usable items used for semen processing and filling shall be immersed in a neutral detergent till dispatched to cleaning area.
9. SOP shall be followed for cleaning and disinfection of each type of item.

Clean areas/other areas of semen processing/quality control laboratory

1. All work surfaces in clean /other areas should be cleaned and disinfected at the end of the day's work.
2. All equipment used routinely should be cleaned thoroughly after the day's operations.
3. Clean areas of the laboratories should be disinfected by fumigation/fogging on a weekly basis.
4. Other areas of the laboratory should also be cleaned & disinfected on a regular basis.
5. SOP for semen processing and QC labs should be followed.
6. SOP for cleaning and disinfection of each type of equipment should be followed.

Disinfection

An appropriate disinfectant should be used for disinfection ensuring proper contact time.

There should be a rotation of the use of disinfectants. Identify three disinfectants and change disinfectants at every four month's interval.

A list of various disinfectants and their usage details are provided in the Appendix section.

SOP for using each type of disinfectant should be in place.

Evaluation of efficacy of cleaning and disinfection

A process may be developed by each semen station to assess the efficacy of implementation of the biosecurity protocols being followed in the laboratory. A periodic evaluation of these parameters would help eliminate contamination in the frozen semen.

BIOSECURITY GUIDELINES FOR QS (QUARANTINE STATIONS)



Biosecurity guidelines are intended to provide appropriate information that would help the QS in achieving the Minimum Standards and also in developing their own Standard Operating Procedures (SOP). The guidelines advocate a more stringent approach on biosecurity for QS for the very reason that most of the diseases gain entry into the FSS through newly inducted animals. These guidelines relate to zoning within the QS, movement of personnel, vehicle cleaning, disinfection, disposal, feed and water biosecurity etc. Repetitions have been avoided in case the same topic has been covered under the guidelines for semen stations. Certain semen stations may also have pre-quarantine stations where very young calves procured from the field are maintained up to around 3 months of age. The same guidelines for quarantine stations would apply to pre-quarantine stations also.



GENERAL FEATURES OF THE QUARANTINE STATION

Topography

Refer biosecurity guidelines for FSS

Cordoning of the entire QS & its facilities.

Refer biosecurity guidelines for FSS

Basic building infrastructure

Animal housing

- a. Quarantine sheds- Individual pens with separate water troughs and feed mangers for each pen ideal. If grouping done, then facilities to rear a maximum of 5 animals per group.
- b. Sick animal shed- Away from quarantine sheds.
- c. Isolation shed- Minimum of 100 m away from quarantine sheds

General

- a. Rest rooms for personnel
- b. Change room
- c. Feed & fodder store

The core quarantine area would consist of:

- a. Quarantine sheds
- b. Sick animal shed
- c. Rest room
- d. Change room
- e. Feed & fodder store

Other areas (in the outer cordon) may consist of :

- a. Fodder plots
- b. Isolation shed

Entry into the QS

Personnel/visitor regulation

One of the major sources of pathogens gaining entry into the farm, other than newly introduced animals, is through people.

The following precautions need to be taken for personnel/visitor regulation :

- a. Personnel should be employed exclusively for QS. They would not work outside the core quarantine area.
- b. No visitors would be generally allowed to enter the quarantine station.
- c. Entry of visitors may be allowed only by sanction of the unit head.
- d. Provide boots and coveralls to personnel and visitors.
- e. Any equipment should be cleaned and disinfected between uses if there is any contact with feed, animals, soil or manure.
- f. Equipment that has direct animal contact (dehorner, tagging machines, restraint ropes, hoof clippers, calipers etc) should be cleaned and disinfected before and after use.
- g. Personnel should remain away from core biosecure area for a minimum of 3 days if they have visited another farm/village.
- h. Food should be consumed only at designated areas in the QS and left-overs should be disposed as per protocol.
- i. Foot dips are to be installed at the entry and exit of each quarantine shed.
- j. Hands and forearms should be washed with antibacterial soap and sanitized on entry into the farm and before leaving the farm.

- k. Owning of livestock by those employed in QS should be discouraged. If they do own livestock, they should report to work in clothes that have not been exposed to their animals.
- l. The outer wear and boots provided to them should be cleaned and disinfected after work and left at the farm.

Vehicle regulation in QS

Another major source of pathogens gaining entry into the farm, other than newly introduced animals and people is through vehicles.

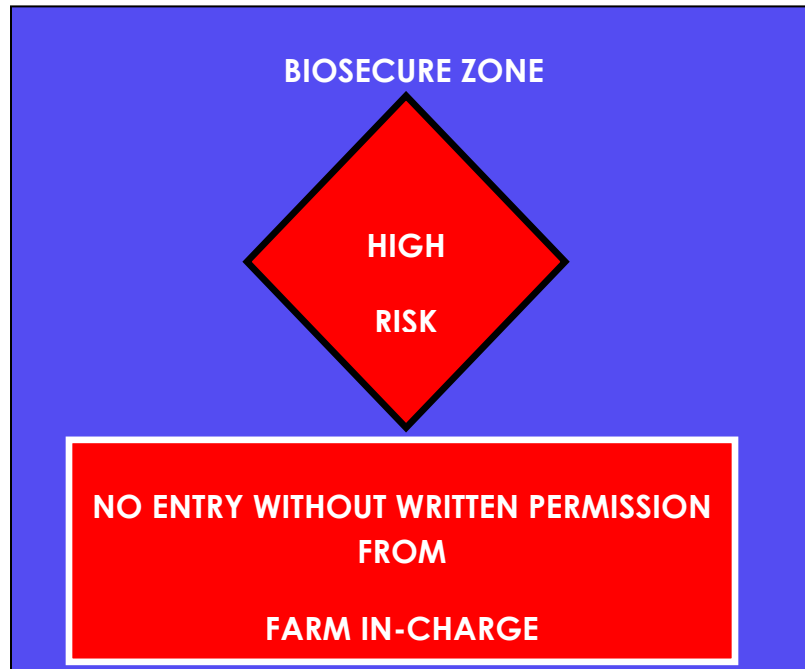
The following precautions need to be taken for vehicle regulation :

- a. No vehicles are generally allowed entry into the QS.
- b. Entry may be allowed only if sanctioned by the unit head.
- c. There should be facilities for unloading feed, fodder or animals at the periphery of the QS without entry into it.
- d. Vehicles entering the QS should be clean and free of visible manure on tires and wheel wells.
- e. Vehicles should pass through tyre dips of minimum 5.5 m length, 3.5 m width and maximum depth of 6-9 inches at the centre.
- f. SOP for cleaning & disinfection of vehicles to be followed.

Biosecurity Zone in QS

The QS with its core zone and outer zone should be marked as high biosecurity zone.

The signage for this area would be as under:



- a) Protective clothing (coverall, caps) and proper hand sanitation required to enter the inner zone.
- b) No entry other than designated personnel unless absolutely necessary, with the permission of the unit in-charge.

Disease testing protocols at village, pre-quarantine and quarantine

1. Calves below 3 months are to be maintained in a pre-quarantine in isolation units till they attain at least 3 months of age.
2. They can be shifted to pre-quarantine even before tests are done on the dam or test results of the dam are pending.
3. In the event of dam turning positive to any test, the calf is culled from pre-quarantine.
4. All disease testing in pre-quarantine are done during the last month in pre-quarantine (at 2½-3 months of age).
5. The disease testing and management of calves between 2 months and maturity maintained in quarantine should be strictly as per the MSP.
6. Calves in pre-quarantine are shifted to quarantine only if they are negative to diseases mentioned in the MSP.
7. Additional numbers of tests are not mandatory but would greatly increase the chances of disease detection in the QS.
8. Two rounds of testing are to be done during the quarantine.
9. The calves are shifted to rearing station if negative for diseases mentioned in the MSP. The shifting is to be done within a month of carrying out the tests.
10. In case of extension of quarantine of a group due to a positive animal, it is better to rear the remaining animals in isolation to avoid risk of culling the entire group.

Vaccination and sero-sampling protocols in QS

Refer biosecurity guidelines for FSS for vaccination and sero-sampling procedures in the QS and ring vaccination zone.

General health guidelines

General health guidelines would help in procuring relatively healthy animals which reduce the chances of mortality in the pre-quarantine and quarantine stations.

Some general health guidelines are provided below:

No	Practice	Field	Pre-Q	Qua	Remarks
1	Dipping (not merely swabbing) of navel with Tr.Iodine	To be done immediately after birth and followed 12-24 hrs later. Farmers may be provided with Tr.iodine (minimum 7%) beforehand.	-	-	Greatly reduces chances of serious infections like sepsis/navel/joint ill.
2	Colostrum feeding	Farmer to be educated on the time of feeding and quantity to be fed.	-	-	Greatly reduces the chances of the animal succumbing to infections.
3	Checking the health of the animal	Check the animal for signs of joint ill/navel ill/ diarrhoea, general health etc			Avoid procuring animals that are unthrifty or unhealthy and showing signs of joint ill/navel ill to the Pre-Q or Qua.
4	Transportation to Pre-Q	Proper bedding to be provided. Tie a cloth	Tie a cloth band around		Tying a cloth band around the waste reduces the

		band around the waste tightly supporting the umbilicus.	umbilicus in cases of herniation.		occurrence or increases cure rate of umbilical hernia post transportation or while in Pre-Q.
5	Weight monitoring	-	Daily/weekly weight monitoring		Minimum weight gain of 500 g per day for CB and 400g per day for Indigenous breeds and Buffaloes.
6	Temperature Monitoring	-	Twice daily		Immediate intervention in case of variation.
7	Body condition monitoring	-	Hydration levels to be checked by skin test on a daily basis especially during scouring.		Appropriate measures to be taken to rehydrate (i/v and oral) and to correct acidosis and hypoglycaemia.
8	Cleaning and disinfection of pens	-	Twice weekly and before and after animals are quartered		Twice weekly and before and after animals are quartered
9	Testing of calf starter/feed/milk replacer		Testing for nutrient content / aflatoxins/coliforms.		Every fresh batch procured may be tested before usage.

Anaplasma/Leptospira/Theileria/Protozoan control

Animals in pre-quarantine/quarantine are prone to various infections and infestations that may be detrimental. Some infections like Anaplasmosis may also develop into a carrier stage which may flare up or remain a source of infection in adulthood. The guidelines provided below may be of use in areas where these diseases are endemic. SOP is to be followed while parenteral /oral administration of the drugs mentioned.

S.No	Disease	Eligible calves	Prophylaxis		Quarantine	Remarks
			Field	Pre-Q		
1	Theileriosis	All age groups	Single dose of Buparvaquone @ 2.5 mg/Kg BW I/M not exceeding a week before lifting	Single dose of Buparvaquone @ 2.5 mg/Kg BW I/M not exceeding a week before shifting to Qua.	Vaccination above 2 months of age.	Only to be done in exotic and crossbred animals to provide protection before vaccination can be carried out.
2	Anaplasmosis	All age groups	Single dose of long acting oxytetracycline -@20 mg/Kg BW I/M not exceeding a week before lifting.	Single dose of long acting oxytetracycline-@20 mg/Kg BW I/M not exceeding a week after the previous dose given in field.	Two doses of long acting oxytetracycline-@20 mg/Kg BW I/M at an interval of 1 week, during last 15 days of Qua.	Four doses of Oxy (LA) at 3 day interval @ 20 mg/Kg BW I/M have greater chances of eliminating carrier stage in anaplasmosis. OR Imidocarb dipropionate @ 5mg/Kg I/M in two doses at 14 day interval may eliminate anaplasmosis infection.
3	Leptospirosis	All age groups				

4	Trypanosomiasis	All age groups	Single dose of Isometamidium Chloride (1-2mg/Kg BW) I/M or Quinapyramine (5 mg/Kg BW) I/M not exceeding a week before lifting.	Single dose of Isometamidium Chloride (1-2mg/Kg BW) or Quinapyramine (5 mg/Kg BW) not exceeding a week before shifting to quarantine.	Single dose of Isometamidium Chloride (1-2mg/Kg BW) I/M or Quinapyramine (5 mg/Kg BW) I/M during last 15 days of Qua.	In high prevalent areas, a prophylactic dosage may also be given at the onset of monsoon.
5	Coccidiosis	Up to 1 year	-	Amprolium @ 5mg/Kg BW/day orally for 21 days from the date of arrival.	Amprolium @ 5mg/Kg BW/day orally for 21 days from the date of arrival.	Need to be done only if coccidiosis is a problem.

Ectoparasite control

Ticks and other biting insects may be sources of infection like anaplasmosis, theileriosis and babesiosis which may gain entry through animals coming from quarantine into the semen station. Certain guidelines for ectoparasitic control are given below. While administering the drugs, SOP for topical application or parenteral administration is to be followed.

Type of acaricide	Field	Pre-Quarantine	Quarantine	Eligible animals
Injectable endo-ecto parasiticide Or;	One dose 1-2 weeks before lifting	One dose not exceeding one week before shifting to quarantine	(a) One dose 7-14 days of quarantine (keeping an interval of 2-3 weeks from the previous treatment) (b) One dose at last 15 days of quarantine	All age groups
Topical acaricide	One application not exceeding 2	One application not exceeding 2	(a) One application immediately on arrival at quarantine	All age groups

	days before lifting	days before shifting to quarantine	(b) One application at last 15 days of quarantine	
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Worm Control

Worms also may gain entry into the semen station through introduction of new animals after quarantine. It is important that these animals remain free of worm load before they enter the semen station. The guideline given below may be adopted for worm control while following the SOP for administration of dewormers.

Type of anthelmintic	Pre-Quarantine	Quarantine	Eligible animals
Oral Or;	(a) One dose of a broad spectrum anthelmintic immediately on arrival at pre-quarantine. (b) One dose of an oral broad spectrum anthelmintic 3-4 weeks after first dose but not exceeding 6 weeks. (c) An oral broad spectrum anthelmintic not exceeding one week before shifting to quarantine.	(a) A broad spectrum anthelmintic immediately on arrival at quarantine(0 day) (b) A broad spectrum anthelmintic between 20-30 days of quarantine (c) A broad spectrum anthelmintic not exceeding one week before shifting from quarantine or 2-3 weeks before any vaccination.	All age groups
Injectable ecto-endo parasiticide (EEP)	Injectable EEP 1-2 weeks after arrival at pre-quarantine (keeping an interval of 2-3 weeks between two	Injectable EEP at 7-14 days of quarantine (keeping an interval of 2-3 weeks from the previous treatment) (b) Injectable EEP during	All age groups – May be synchronized with tick control protocol.

	treatments	last 15 days of quarantine.	
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Period of Quarantine

The period of quarantine may vary with the sources from which the animal has been procured:

Animals from unknown sources

When animals above 2 months of age are procured from herds of unknown disease status they are to be quarantined for a minimum period of 60 days or sufficient time to allow two tests for Brucella, TB and JD with a minimum of 30 days interval between testing (minimum of 42 days for TB & JD).

Animals from known sources

When animals above 2 months of age are procured from herds of known disease status, they are to be quarantined for a minimum period of 30 days or sufficient time to allow one test for Brucella, TB and JD with a minimum of 30 days interval between testing (minimum of 42 days for TB & JD).

Animals from reliable sources

When animals are moved from quarantine stations of the same agency to another establishment of the same agency (eg. rearing station) they may be quarantined for a minimum period of 30 days where one test for Brucella, TB and JD shall be performed.

Cleaning

Cleaning of animal sheds

1. *Refer biosecurity guidelines for FSS.*
2. Practice all in – all-out strategy in a shed.

Cleaning of farm equipment

Refer biosecurity guidelines for FSS.

Cleaning of farm vehicles

Refer biosecurity guidelines for FSS.

Cleaning of other equipment/aprons/structures

Refer biosecurity guidelines for FSS.

Cleaning of animals

1. Wash and scrub the animals on a regular basis to remove any dirt or dung on the body.
2. Practice foot bathing on a regular basis.
3. Carry out hoof trimming on a regular basis twice a year.
4. Animals should be brushed regularly.

Disinfection

Refer biosecurity guidelines for FSS.

Feed & Water Biosecurity

Refer biosecurity guidelines for FSS.

Disposal

Refer biosecurity guidelines for FSS.

Disease specific biosecurity

Refer biosecurity guidelines for FSS.

Wildlife & pests biosecurity

Refer biosecurity guidelines for FSS.

Emergency responses to other diseases

Refer biosecurity guidelines for FSS.

Animal Welfare

Animal welfare is defined as state in which an animal's individual needs are met for nutrition, shelter, health and the ability to express its natural behaviour, and in which it is free from undue pain and suffering. Animal welfare is gaining importance as international organizations advocate its implementation as a routine practice in animal husbandry. Aspects of animal welfare need to be given a fair consideration while rearing, handling, moving, transportation and euthanasia of animals.

Movement of animals

The points that need be remembered while moving the animals in QS are :

1. Painful procedures (including whipping, tail twisting, pressure on eyes, ears or external genitalia), or the use of goads or other aids which cause pain and suffering (including large sticks, sticks with sharp ends, lengths of metal piping, fencing wire or heavy leather belts), should not be used to move animals.
2. Useful goads include panels, flags, plastic paddles, flappers (a length of cane with a short strap of leather or canvas attached), plastic bags and rattles; they should be used in a manner sufficient to encourage and direct movement of the animals without causing undue stress.

Transportation of animals

QS may also require transportation of animals from various parts of the country and PT project areas. For these animals to be transported with the minimum possible stress, the following aspects need to be kept in mind:

1. The amount of time animals spend on a journey should be kept to the minimum.
2. Constant loud noises and sudden noises, which may cause panic, should be avoided.
3. Ensure that adequate facilities and number of animal handlers are present during loading & unloading.
4. Ensure veterinary assistance is provided during the journey.
5. Provide food & water within 5 hours before loading if journey is beyond 24 hours.

6. Provide animals with water and feed when required, adequate space (including lying down), ventilation and protection from adverse weather conditions during transport.
7. Ensure proper rest times and minimal delay during stops.
8. Maintain a journey log maintaining rest periods, feeding and watering times etc.
9. Wash and disinfect the vehicle after unloading.
10. Suitable bedding should be added to vehicle floors to assist absorption of urine and faeces, to minimise slipping by animals and protect them (especially young animals) from hard flooring surfaces.
11. Mixing of animals from different sources in a single consignment should be avoided from the disease control point of view.
12. Contact at resting points between animals from different sources should be avoided.
13. There should be an emergency management plan that identifies the important adverse events that may be encountered during the journey, the procedures for managing each event and the action to be taken in an emergency.
14. Young or small animals should be separated from older or larger animals.
15. Animals with horns should not be mixed with those lacking horns unless judged to be compatible.
16. Animals are to be loaded quietly and without unnecessary noise, harassment or force.
17. To minimise slipping and soiling, and maintain a healthy environment, urine and faeces should be removed from floors when necessary and disposed of in such a way as to prevent the transmission of disease.

Euthanasia of animals

In exceptional circumstances, it may be necessary to euthanize the animal due to some incurable condition eg. Downer etc. In such cases, while devising a euthanasia plan, it is essential that the method chosen be consistently reliable to ensure that the animal is humanely and quickly killed. The same should be carried out under the supervision of a veterinarian.

Recording of activities & Reporting

All the activities related to biosecurity need to be documented correctly so as to have a rich database that would be of help during times of crisis and also for informed decision making. To this end, Information Network for Animal Productivity and Health (INAPH) would be put in place in the quarantine stations. However, till such time that is done, recording of activities and preparation of monthly reports would be done on prescribed formats.

Recording of routine activities

The routine activities of the semen station that have a direct impact from the biosecurity point of view need to be recorded for later reference in case of any disease emergencies. *Refer biosecurity guidelines for FSS for further details.*

Monthly reports

Monthly reports would essentially be a consolidation of the daily routine of biosecurity activities which would reflect the implementation discipline. The consolidated monthly report would be in the format given in the Appendix.

Sources and further reading

1. *The University of Vermont (uvm.edu)*
2. *www.dpcc.delhigovt.nic.in*
3. *vbs.psu.edu/extension*
4. *fao.org*
5. *www.defra.gov.uk*
6. *www.lbl.gov*
7. *ohionline.esu.edu*
8. *www.oie.int*
9. *engormix.com*
10. *www.cfsph.iastate.edu*
11. *http://dae.nic.in/?q=node/305*

Appendix A: Various methods for disinfection

Name	Concentration /Contact time	Advantages	Disadvantages	Suggested application
Red heat flame (Blow torch, burning)	Very little	<ul style="list-style-type: none"> • Rapid destruction of all types of organisms by oxidation to ashes 	<ul style="list-style-type: none"> • Initial contact with flame may produce a viable aerosol • Possibility of accidental fire • Less effective than moist heat 	<ul style="list-style-type: none"> • Floor disinfection is case of threats. • Routine floor disinfection in high risk areas like isolation and sick animal sheds.
UV light	Not more than 8 feet from the surface where disinfection is required./ Min. 30 minutes contact time	<ul style="list-style-type: none"> • No residual effect • Effective against most viruses, cysts, bacteria and spores. • No handling involved 	<ul style="list-style-type: none"> • Low dosage may not inactivate some microbes. • Maintenance of tubes required • Turbidity and total suspended solids in waste water can render it ineffective 	<ul style="list-style-type: none"> • Routine room and surface disinfection in semen processing laboratories.

Phenols	500-3000 ppm (0.5-3%)/10-30 minutes	<ul style="list-style-type: none"> • Very good activity against gram +ve and -ve bacteria, some virus and fungi • Effective against Mycobacteria (TB,JD) • Good activity in hard water and in presence of some organic material • Leaves an active residue • Biodegradable 	<ul style="list-style-type: none"> • Limited activity against rotaviruses & FMD virus • No action against bacterial spores • Not to be used in dairies- phenolic odour quickly taints milk • Concentrations above 2% are highly toxic to all animals, especially cats. 	<ul style="list-style-type: none"> • Ideal for use in foot baths, farm premises & farm equipment disinfection
Quaternary Ammonium Compounds (QAC)	0.1-0.2%/10-30 minutes	<ul style="list-style-type: none"> • Highly effective against gram +ve • Good efficacy against gram -ve, fungi & enveloped viruses • Colourless & odourless • Not affected by hard water • Non-irritating & non-toxic • Have some residual effect 	<ul style="list-style-type: none"> • Non effective against non-enveloped or mycobacteria • Lose activity at pH less than 3.5 • Easily inactivated by organic matter, detergents & hard water 	<ul style="list-style-type: none"> • Ordinary floor cleaning, furniture, walls.

Chlorine compounds	500-1000 ppm (0.5-1%)/10-30 minutes	<ul style="list-style-type: none"> • Relatively inexpensive • Broad spectrum- Bacteria & Fungi • Rapid sporicidal activity around 2500 ppm • Relatively quick kill • Kills hardy viruses 	<ul style="list-style-type: none"> • Toxic, corrosive to skin and metals • Inactivated by organic matter • Hypochlorite should never be mixed with acids or ammonia. 	<ul style="list-style-type: none"> • Instrument disinfection • Emergency spill clean up • Waste liquid disinfection • Surface decontamination • Disinfection of clothing
Hydrogen peroxide	3-30% solution; above 6% solution may be sporicidal /10-60 minutes	<ul style="list-style-type: none"> • Broad spectrum • No residues • Low toxicity • Rapid action 	<ul style="list-style-type: none"> • Corrosive to some metals (especially iron) • Limited action against mycobacteria 	<ul style="list-style-type: none"> • Lab surface decontamination • Lab instrument and equipment decontamination
Per acetic acid	0.03 % solution/ 5-120 minutes	<ul style="list-style-type: none"> • Broad spectrum • Sporicidal and can tolerate organic load • Rapid action • Non-toxic decomposition products 	<ul style="list-style-type: none"> • Pungent odor • Corrosive to some metals 	<ul style="list-style-type: none"> • Lab Instruments and equipment decontamination
Hydrogen peroxide/per acetic blend	10 minutes	<ul style="list-style-type: none"> • Broad spectrum and sporicidal 		<ul style="list-style-type: none"> • Lab surface/ instrument and equipment decontamination

Peroxygen compounds (peracid solutions and monosulfate compounds)	As specified by manufacturer.	<ul style="list-style-type: none"> • Wide spectrum of activity • Fast action • Sporicidal • Effective in presence of organic matter • Effective over wide pH range • Relatively non-toxic 	<ul style="list-style-type: none"> • Concentrated solutions relatively unstable • Working solutions must be replaced every 2-3 days • Corrosive to metals if left in contact for prolonged periods • Relatively high cost 	<ul style="list-style-type: none"> • General disinfectant for personnel and equipment • Fogging agent • Footbaths
Alcohol	Ethanol: 60-80% / Isopropanol:70-90% / Immediate to 10 minutes	<ul style="list-style-type: none"> • Rapid action • No residue • Low toxicity • Non-corrosive • Broad spectrum 	<ul style="list-style-type: none"> • Rapid evaporation limits contact time • Inflammable • Not very effective in presence of organic matter • Not sporicidal and not effective against certain viruses 	<ul style="list-style-type: none"> • Skin disinfectant • Lab surface decontamination • Lab equipment decontamination
Aldehydes	Gluteraldehyde-2% solution/15 minutes	<ul style="list-style-type: none"> • Broad spectrum • Sporicidal • Non-corrosive to metals, rubber, plastic & cement • More efficacious in presence of organic matter, soaps & hard water. 	<ul style="list-style-type: none"> • Highly irritating • Toxic to humans & animals • Potential carcinogen • Personal protective equipment (gloves/eye protection) should be worn while handling 	<ul style="list-style-type: none"> • Disinfection of lab equipment • Surface disinfection

<p>Aldehyde (Formaldehyde)</p>	<ul style="list-style-type: none"> • 35 ml formalin + 17.5 gm potassium permanganate per cubic meter • 12 ml of 37% formaldehyde solution in 100 ml water per cubic meter using humidifier • Contact time- 10-30 minutes 	<ul style="list-style-type: none"> • Broad spectrum of activity against all living forms • Penetrates through the smallest gaps 	<ul style="list-style-type: none"> • Toxic to humans & animals • Potential carcinogen. • No residual effect. • Effective only in tightly confined areas • Personal protective equipment (gloves/eye protection) should be worn while handling 	<ul style="list-style-type: none"> • Laboratory room decontamination
<p>Vaporized Hydrogen peroxide (VHP)</p>	<ul style="list-style-type: none"> • VHP produced by vaporization 35% of liquid Hydrogen peroxide • Various models are available based on area to be decontaminated 	<ul style="list-style-type: none"> • Broad spectrum of activity against a wide range of microorganisms • Powerful oxidizing capacity • No toxic residue-end product is water & oxygen 	<ul style="list-style-type: none"> • Effective only in tightly confined areas • Can be affected by presence of both organic and inorganic materials • Expensive equipment required • Relative humidity of the room has to be within 30-40% for proper decontamination 	<ul style="list-style-type: none"> • Laboratory room decontamination

Acetic acid (vinegar)	4-5% (vinegar)	<ul style="list-style-type: none"> • Readily kills FMD virus 	<ul style="list-style-type: none"> • Not effective against mycobacteria • Poor activity in organic material 	<ul style="list-style-type: none"> • Farm premises decontamination during FMD outbreaks
Sodium Carbonate (Soda ash, washing soda)	4%	<ul style="list-style-type: none"> • Readily kills FMD virus 	<ul style="list-style-type: none"> • Not very effective against other organisms • Mildly caustic 	<ul style="list-style-type: none"> • Farm premises decontamination during FMD outbreaks • Cheap
Sodium Hydroxide	2%	<ul style="list-style-type: none"> • Broad spectrum of activity 	<ul style="list-style-type: none"> • Highly caustic • Most effective when hot/boiling water is used 	<ul style="list-style-type: none"> • Farm premises decontamination for all infectious diseases

Appendix B: List of Emergency responses to various diseases (for FMD refer DSS)

SN	Disease	Action Trigger	Emergency measures	Semen
1	Leptospirosis	<ul style="list-style-type: none"> • Depression, fever, anaemia, rapid breathing, red/dark urine. • Tests positive in affected animals 	<ul style="list-style-type: none"> • Immediate isolation of animal to avoid urine contamination of water source to other animals. • Treat affected animal • Examine all animals • Prophylactic treatment to all animals. 	<ul style="list-style-type: none"> • Do not collect semen during the course of treatment. • Rest infected bull till full recovery.
2	Black Quarter	<ul style="list-style-type: none"> • Sudden lameness, high fever, stiff gait, crepitating swelling on hips / shoulder 	<ul style="list-style-type: none"> • Immediate isolation & treatment. • Through cleaning & disinfection with sporicidal disinfectant of the pen that housed the infected animal. 	-Do-
3	Haemorrhagic septicemia (HS)	<ul style="list-style-type: none"> • High fever, oedematous swelling of throat, dewlap & brisket, cough. 	<ul style="list-style-type: none"> • Immediate isolation & treatment. • Identify & minimize factors causing stress wherever possible, especially during transportation. 	-Do-
4	Anaplasmosis	<ul style="list-style-type: none"> • Depression, fever, rapid breathing, anaemia 	<ul style="list-style-type: none"> • Immediate isolation of animal • Treat affected animal • Examine all animals • Prophylactic treatment to all animals. • Complete ectoparasite treatment to avoid transfer by insects. • Sanitize all equipment and instruments that may transfer blood between cattle. (needles etc) 	-Do-
5	Anthrax	<ul style="list-style-type: none"> • Fever, difficult breathing, 	<ul style="list-style-type: none"> • Immediate isolation. • Aggressive antibiotic therapy may not be effective most of the time. 	<ul style="list-style-type: none"> • Do not collect semen.

SN	Disease	Action Trigger	Emergency measures	Semen
		<p>uncoordinated convulsions and death.</p> <ul style="list-style-type: none"> • Bloody discharges from the natural body openings. • Short course of disease, usually leads to death. 	<ul style="list-style-type: none"> • Thorough cleaning & disinfection with sporicidal disinfectant of the pen that housed the infected animal. • Never open the carcass in case such symptoms are seen. • Apply extra lime while disposing the animal by burial. • Avoid improper burning methods. 	

Appendix C: Details to maintained in the visitor log book

SN	Date	Visitor Name & Address	Purpose	Time of entry	Time of exit	Whether boots/boot cover & coveralls provided	Whether visiting farm or office	Remarks

Appendix D: Details to be maintained in the vehicle log book

SN	Date	Vehicle No. & Type	Purpose	Time of entry	Time of exit	Whether tyre/carrriage excessively soiled (yes/no)	Cleaning before entry (if soiled) done. (yes/no)	Remarks

Appendix E: Details to be maintained in the animal treatment log book

SN	Date	Animal No	Shed no	Rectal Temp with recording time	Any other noticeable symptom	Treatment given if any	Name of person who attended	Disease suspected/ diagnosed	Remarks

Appendix F: Details to be maintained in the animal isolation log book

SN	Date	Animal No	Shed no where housed	Symptoms noticed	Disease suspected and date	Date of shifting to isolation (with shed #)	Treatment given if any	Date of return to bull shed if cured	Remarks

Appendix G: Details to be maintained in animal shed cleaning and disinfection log book

SN	Date	Shed no	Cleaned by	Checked by	Type of shed (General/Isolation /quarantine/sick etc)	Disinfectant used	No. of animals housed presently	Next cleaning due date	Remarks

Note : The next due date of cleaning and disinfection of the shed may be written/pasted on the outer wall of the shed.

Appendix H: Details to maintained in cleaning and disinfection of structures other than animal shed

SN	Date	Type of structure (feed storage, equipment, water tank , public road etc)	Cleaned by	Checked by	Disinfectant used	Next cleaning due date	Remarks

Note : The next due date of cleaning and disinfection of the shed may be written/pasted on the structure.

Appendix J: Environmental microbial load testing log book

SN	Date	Type of test (SPC/physical verification etc)	Sample tested	Sample location	Minimum acceptabl e value	Test value	Next test due date	Remarks

Appendix K: Details to be maintained for the semen doses discarded

SN	Ear tag No. of positive animal	Positive for which disease	Test done on (date)	Sample collected on (date)	No. of FS doses in stock since last test	No. of FS doses discarded	Date of FS discard	Remarks

Appendix L: Consolidated monthly report of semen station

1 GENERAL DETAILS OF THE FARM DURING THE MONTH _____							
Total bulls under collection	Total bulls under rest	Young bulls in rearing station	Adults in quarantine	Calves in quarantine	Animals in isolation	Remarks	
2 VEHICLE ENTRY DETAILS DURING THE MONTH							
No. of non-farm vehicles that entered the farm					No. of visibly soiled vehicles cleaned before entry	No. of visibly soiled vehicles cleaned & disinfected before entry	Remarks
General	Fodder	LN2	Feed	Other (Specify)			
3 VISITOR ENTRY DETAILS DURING THE MONTH							
No. of visitors of various categories visiting the farm							
General	Skilled	Trainees	Official	Foreign	Other (Specify)	No. of visitors who had access to the animal sheds	Remarks

4		NO.OF VACCINATIONS / DEWORMING /DETICKING DONE DURING THE MONTH							
	FMD	HS	BQ	Theileriosis	Anthrax	Brucellosis	De-ticking	De-worming	Remarks
FSS vaccination numbers									
Next due date									
Ring vaccination numbers(10 Km)									
Next due date									
5		NO.OF CLEANING/DISINFECTIONS DONE DURING THE MONTH							
Bull shed	Rearing shed	Quarantine shed	Sick animal shed	Isolation shed	Public Road	Other (Specify)		Remarks	
6		DISEASE EMERGENCY DURING THE MONTH							

Disease name	Date of occurrence	Number affected	Number dead	Type of sample collected	Date of sample collection	Date of dispatch & name of lab	Type of test & result	Control measures taken	Remarks

7	DISEASE TESTING DURING THE MONTH								
Disease name	Total animal / samples tested	Total animal / samples positive	Type of test	Date of sample collection	Date of sample dispatch	Date result received	Name of testing laboratory	Remarks	
TB									
JD									
Brucella									
Campylobacter									
Trichomonas									

IBR								
BVD Ag ELISA								
BVD Ab ELISA								
For FMD antibody titer assessment								
Other(specify)								

8	Details of positive animal removal				
Animal ear tag	Disease for which positive	Date testing result received	Date animal removed	Delay in removal of animal	Remarks
9	Details of semen discard				
Animal ear tag and semen batch number	Disease for which positive	Date testing result received	Date animal removed	Delay in removal of animal	Remarks
10	Any other relevant information				

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Appendix M: Consolidated monthly report of quarantine station

1 GENERAL DETAILS OF THE QUARANTINE STATION DURING THE MONTH _____							
Total animals under quarantine	No. of cattle under quarantine (provide breed wise break-up)	No. of buffalo under quarantine (provide breed wise break-up)	Address from where procured		Quarantine start date	Expected date of completion of quarantine	Remarks
2 VEHICLE ENTRY DETAILS DURING THE MONTH							
No. of non-farm vehicles that entered the farm					No. of visibly soiled vehicles cleaned before entry	No. of visibly soiled vehicles cleaned & disinfected before entry	Remarks
General	Fodder	Feed	Other (Specify)				
3 VISITOR ENTRY DETAILS DURING THE MONTH							
No. of visitors of various categories visiting the farm							
General	Skilled	Trainees	Official	Foreign	Other (Specify)	No. of visitors who had access to the animal sheds	Remarks

4		NO.OF VACCINATIONS / DEWORMING /DETICKING DONE DURING THE MONTH							
	FMD	HS	BQ	Theileriosis	Anthrax	Brucellosis	De-ticking	De-worming	Remarks
QS vaccination numbers									
Next due date									
Ring vaccination numbers									
Next due date									
5		NO.OF CLEANING/DISINFECTIONS DONE DURING THE MONTH :							
Quarantine shed	Fodder store	Feed store	Sick animal shed	Isolation shed	Public Road	Other (Specify)		Remarks	
6		DISEASE EMERGENCY DURING THE MONTH							

Disease name	Date of occurrence	Number affected	Number dead	Type of sample collected	Date of sample collection	Date of dispatch & name of lab	Type of test & result	Control measures taken	Remarks

7 DISEASE TESTING DURING THE MONTH

Disease name	Total animal / samples tested	Total animal / samples positive	Type of test	Date of sample collection	Date of sample dispatch	Date result received	Name of testing laboratory	Remarks
TB								
JD								
Brucella								
Campylobacter								
Trichomonas								
IBR								
BVD Ag ELISA								
BVD Ab ELISA								

For FMD antibody titer assessment								
Other(specify)								
8	Details of positive animals removed							
Animal ear tag	Disease for which positive	Date testing result received	Date animal removed	Delay in removal of animal	Remarks			
9	Details of extended quarantine							
Total number of animals under extended quarantine	Total number of cattle	Total number of buffalo	Date of start of extended quarantine	Expected date of completion of extended quarantine	Remarks			
10	Any other relevant information							