

# TEAM IIT MADRAS iGEM 2013 PRESENTS

# CODE RED

*A COMPREHENSIVE GUIDEBOOK ON THE SAFE HANDLING OF RED MEAT*



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## **How does this booklet help you?#**

This booklet is meant for cattle farmers. It guides the reader through cattle farming from dealing with common diseases (prevalent in India) affecting cattle to proper delivery of final product (meat) to the customer.

# 1. Striking facts#

Cattle diseases cost farmers millions of rupees every year. In addition to death, they cause loss of production and frequently a loss of body condition. Unhealthy animals require more food and take longer time for growth than healthy ones.

Generally, animals are born free of diseases or parasites. But, they usually acquire these maladies either through contact with diseased animals or due to improper sanitation, feeding, care and management.

One should be vigilant against cattle diseases as dairy cattle are affected by a variety of diseases. Knowledge of cattle diseases is necessary from public health point of view also as many diseases can be transmitted to man through milk. Keeping animals healthy by confining purchases to healthy herds, by proper quarantine at the time of bringing in new animals, by employing sound principles of sanitation, management and feeding and by judicious use of appropriate and dependable vaccines are the practical and economical ways to avoid losses from the disease.

By proper management and feeding, the dairy farmer can, to a great extent, prevent disease outbreaks. Good housing assists in maintaining the health of the herd, whereas judicious feeding not only builds up body resistance to disease but also helps in speedy recovery in case there is a disease attack.

## 2. Common Diseases affecting Cattle prevalent in India

### 1. Foot and mouth disease

The foot-and-mouth disease is a highly communicable disease affecting cloven-footed animals. It is characterized by fever, formation of vesicles and blisters in the mouth, udder, teats and on the skin between the toes and above the hoofs. In India, the disease is widespread and assumes a position of importance in livestock industry. The disease spreads by direct contact or indirectly through infected water, manure, hay and pastures. Foot-and-mouth disease occurs in a relatively mild form in India and is seldom fatal. It occurs practically all the year round.

#### Symptoms

- Fever with 104-105°F
- Profuse salivation ropes of stringy saliva hangs from mouth
- Vesicles appear in mouth and in the inter digital space
- Lameness observed
- Cross bred cattle are highly susceptible to it

#### Diagnosis

- Quick spread and the occurrence of lesions in the mouth and feet of affected animals are characteristic symptoms.
- It presents some similarity to rinderpest, from which it can be readily differentiated by the absence of diarrhoea and by the presence of the foot lesions.
- It can be cured by severe antibiotic therapy and topical application of ointments

#### Treatment

- The external application of antiseptics contributes to the healing of the ulcers and wards off attacks by flies.
- A common and inexpensive dressing for the lesions in the feet is a mixture of coal-tar and copper sulphate in the proportion of 5:1.

#### Control and prevention

- Heavy milch animals and exotic breeds of cattle bred for milk should be protected regularly.
- It is advisable to carry out two vaccinations at an interval of six months followed by an annual vaccination programme.

- Isolation and segregation of sick animals. It should be informed immediately to the veterinary doctor
- Disinfection of animal sheds with bleaching powder or phenol
- Attendants and equipments for sick animals should be ideally separate
- The equipments should be thoroughly sanitized
- Proper disposal of left over feed by the animal
- Proper disposal of carcasses
- Control of flies

## 2. Anthrax

### **Synonyms: Splenic fever, fanshi, kalpuli Ban**

It is an acute widespread infectious disease of all warm blooded animals specially cattle, buffalo, sheep, goat. It is communicable to man through these sources. It is soil-borne infection. It usually occurs after major climatic change. The disease is enzootic in India.

Etiology: This disease is caused by bacteria called *Bacillus anthracis*.

### **Transmission:**

- It usually spreads through ingestion of contaminated feed and water.
- Sometimes, it also occurs by inhalation and biting flies.

### **Symptoms:**

- Sudden rise in body temperature (104 – 108°F)
- Loss of appetite i.e. off-feed.
- Severe depression or dullness.
- Suspended rumination
- Increased respiration and heart rate
- Bloat or tympany.
- Dyspnoea - difficult breathing
- Dysentery or diarrhoea,
- Bleeding from natural openings like anus, nostrils, vulva etc.
- Sudden death in peracute cases.

### **Diagnosis:**

- History of sudden change in climate and sudden death,
- Symptom - sudden death & bleeding from natural openings.
- Postmortem findings:

- Oozing of dark: tarry Coloured poorly clotted blood from natural opening
- Enlargement of spleen i.e. Splenomegaly.
- Microscopic examination of blood smears.
- Isolation and identification of organism.

### **Treatment**

The nearest Veterinarian officer or para-veterinarian of the department should be contacted for treatment and prevention

### **Control:**

- General measures: Identification and isolation of affected animals.
- Movement of animals from infected area to clean area should be stopped.
- Deep burial of dead animals.
- Destroy contaminated fodder by burning.
- Thorough disinfection of cattle shed by using 10% caustic Soda or formalin.
- Never conduct postmortem of the animal suspected to be died of Anthrax.

### **Vaccination**

Anthrax spore vaccine @ 1 ml subcut every year before onset of monsoon in areas where anthrax outbreaks are common.

## **3. Brucellosis**

Brucellosis among cattle and buffaloes produces heavy economic losses due to abortions in late pregnancy, infertility and reduction in milk production. The organism responsible for brucellosis or contagious bovine abortion is *Brucella abortus*. Under natural condition, the cattle get infection by ingestion of food and water contaminated with uterine discharge of aborted animals. Aborted foetuses, foetal membranes, vaginal discharges, milk and faeces of infected animals contain the organisms, which contaminate the environment, feed and water.

### **Symptoms**

- The cow throws out a dead foetus prematurely but the placenta does not fallout.
- The cow gets sick and there is blood tinged discharge from the vagina.
- Milk yield drops in a lactating cow and the cow goes down in condition.
- There are signs of pregnancy and signs of calving will be noticeable much earlier than the due date and the calf will be thrown out prematurely. In subsequent pregnancies, the foetus is usually carried to full term but second or third abortion may take place in the same cow.

- In the bull, orchitis and epididymitis occur. One or both the scrotal sacs may be affected with acute, painful swelling.

### **Treatment and control**

Vaccination with *Brucella abortus* strain 19 is helpful in the control of brucellosis in a herd. The vaccine is inoculated in the calves aged 91 -100 days. It stimulates the development of high level of immunity which lasts till fifth pregnancy.

The general practices for the control of brucellosis in cattle are hygienic measures, identification and elimination of infected animals from herds. Hygienic measures include isolation of infected animals, disposal of aborted fetuses, placental and uterine discharges and disinfection of contaminated area.

## **4. Leptospirosis**

Leptospirosis is another bacterial disease spread by the inhalation of organisms in aerosolized urine droplets, or by direct exposure to the organism from the urine of infected animals. The people at highest risk for this disease include dairy farmers, piggery workers and stock transporters, but any person handling livestock or native wildlife is at risk.

### **Symptoms**

- In cattle it is an acute, often fatal, disease characterized by haemorrhage, haemoglobinuria and icterus.
- Non-fatal infections are often characterized by fever, anaemia, abortions, sterility, decreased lactation and mastitis.

### **Diagnosis**

- The principal methods used for the diagnosis of leptospirosis are direct microscopical examination of tissue preparations and body fluids, bacteriological culture, animal inoculation and serological tests.

### **Treatment**

- In cattle treatment with antibiotics may result in considerable diminution of even temporary cessation of urinary excretion of leptospire.

## **5. Black-quarter (Black-leg)**



This disease is widespread amongst cattle in certain parts of India, particularly in Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra. Sporadic cases occur in the northern and eastern states of the country. Young animals in the prime of condition and six months to three years old are affected more than others. Buffaloes usually suffer from a milder form of the disease. Outbreaks generally occur with the onset of rains. True black-quarter is caused by *Clostridium chauvoei*. Death may occur in severe cases in 1 or 2 days

### Symptoms

- The disease usually occurs in an acute form, affected animals dying within 24 to 48 hours of the onset of symptoms.
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- There is high fever with a hot, tense, painful swelling usually in one of the quarters, more often a hind-quarter, although such swelling may also occur in other before death, the swelling becomes cold and painless and crepitates on pressure due to the presence of gas in it.

### Prevention and control

- To prevent the spread of infection and contamination of the soil with spores of the causal organisms, carcasses of animals dead of black-quarter should be either buried deep and covered over with lime or should be cremated.
- Administration of penicillin in repeated doses may be effective if injected before muscle damage has been caused.
- Use of black-quarter vaccine protects animals against the disease for about a year. Animals should be vaccinated with this about three to one month before the onset of rains.

## 6. Rinder pest

Rinderpest is the most destructive of the virus diseases of cloven-footed animals, such as cattle, buffaloes, sheep, goats, pigs and wild ruminants. Its control was a major issue till recently all over the world.

- Organised efforts over half a century have brought about a total eradication of the disease in the Western Hemisphere.
- The disease still persists in the Asian countries.
- The virus is found notable in the saliva, discharge from eyes and nostrils, and in the urine and faeces.
- It is present in the circulating blood during the febrile stage and is later concentrated in different organs, especially in the spleen, lymph nodes and liver.

Outside the animal body, the virus is rapidly destroyed by direct sunlight and disinfectants. Cold preserves the virus.

- The virus is usually spread by contaminated feed and water.
- Rise in temperature upto 104 – 107 0 F. Lacrimation and redness of eye.
- Foul odour from mouth. Discrete necrotic foci develop in the buccal mucosa, inside lip, and on the tongue. Bloody mucoiddiarrhoea is noticed

### **Treatment**

- Symptomatic treatment with penicillin, streptomycin, sulphadimidine and intestinal antiseptics has no action on the virus, but may help in the recovery of less severe cases of rinderpest, as these control secondary complications caused by bacteria.

All people who come into contact with any species of animal should be aware of the risks of transmission of disease from both ill and clinically normal animals to humans. Reminding your medical practitioner, if you are ill, of any contact you have had with animals will prompt them to consider possible zoonoses.

Obtaining an accurate veterinary diagnosis when animals are ill, practicing proper personal hygiene, completing regular intestinal de-worming of pets, and using vaccination when available, will help lessen the chance of contracting these diseases.

### 3. Ideal Slaughtering processes#

#### For cattle

1. Receiving live cattle - cattle sent to slaughterhouse and rested in the Holding Lairage and then sent to the Waiting Lairage on the day before slaughter.
2. Ante-mortem inspection - all cattle are inspected by the Ante-mortem Inspection Unit of the Slaughterhouse (Veterinary) Section. Stunning - cattle is rendered unconscious by a shot from a pneumatic captive bolt into the brain.
3. Shackling and hoisting - the stunned animal is shackled by the left hind leg. It is then hoisted onto the overhead conveyor railing and pushed to the sticking point.
4. Sticking and Bleeding - a cut is made at the neck to sever a group of blood vessels including jugular veins. The animal is bled by passing slowly over the bleeding trough.
5. Removal of the head, legs and tail - the forelegs, the head and the tail are removed from the carcass. The tail and forelegs are put into a plastic bag to prevent contamination to the carcass. Whilst the head is hanged up for inspection.
6. Dehiding - the hide is chained and pulled off at the flank by a hide puller.
7. Open the brisket and evisceration - the brisket is cut by an electric saw. Offal is taken out and dropped onto the large moving viscera table.
8. Carcass splitting - the carcass is split longitudinally by an electric saw along the vertebral column into two halves.
9. Carcass and offal inspection - the carcass and offal are inspected by Health Inspectors. Only meat and offal that are fit for human consumption will pass the inspection and unfit meat / offal / parts will be condemned.
10. Stamping - the inspected carcass and offal which are fit for human consumption will be officially stamped.
11. Rinsing of carcass and offal cleaning - The carcass is then rinsed in rinsing chamber, and offal is cleaned at offal washing room.
12. Quartering - each side of the beef carcass is cut into two quarters between the 5th and 6th ribs by mechanical scissors in the Quartering Area.
13. Meat delivery - beef quarters, offal and other parts of cattle are sent to the Meat Despatch Bank, and then are collected and delivered by meat delivery vehicles to individual retail outlet.

## 4. Spotting the Disease on Cattle

Dairymen should develop a keen eye to spot a sick animal. Common signs of ill health of cattle are given below which should be helpful to dairy fanners in detecting diseases in their herds.

1. The general posture of the animal, its movement, breathing and behaviour will change in case of sickness. Animals standing with head down or showing weariness or a tendency to separate from the herd are warning symptoms.

2. One of the first signs of disease in cows and buffaloes is loss of appetite and stopping rumination. However, one has to make sure that the cause for animal going 'off-feed' is not due to the unsuitable feed, dirty feeding troughs or lack of water.

3. A coarse and dry skin is indicative of disease.

4. Raised hair coat, falling or brittle and lusterless hair is undesirable glow.

5. Muzzle and nostrils of healthy animals. will be moist and free from any discharge. The muzzle will be dry mammals having high temperature.

6. The eye in healthy animals are bright and alert. Sunken eyes with a fixed staring like often accompany the onset of fever. Lacrimation or glued eyes should be specially noted. Trouble in one eye indicates local condition, while discharges from both the eyes indicate a systemic ailment.

7. The dung of healthy cattle should be semi-solid in consistency, rich green in colour and free from gas bubbles and blood clots. Constipation and scouring should be particularly noted.

8. Urine of the animal should be clear and straw coloured. It should not be dark or bloody in colour, nor should it have any abnormal odour.

9. The vulva and tail should not show any evidence of discharge from the genital organs. Pus containing discharges indicate septic condition of the reproduction organs.

10. Milk yield in dairy cows and buffaloes will fall even if they have only a slight chill or heat exhaustion. Blood clots in milk indicate mastitis disease.

11. variation in body temperature can be measured by inserting a clinical thermometer into the rectum of an animal for half a minute. High temperature is usually associated with the increased activity of the body in fighting off the disease. Young animals, frequently show higher temperatures than normal. On chilly days, weak and debilitated animals may have sub-normal body temperature. The normal body temperatures of cattle and buffaloes are 101.5°F and 98.3°F, respectively.

Incidence of coughing, whistling or grunting with pain associated with respiration should be particularly noted.

## **5. Prevention of Cattle Diseases(in general)**

Following steps are to be adopted to prevent the spread and occurrence of cattle diseases.

### **1. Quarantining**

Quarantining refers to a procedure of keeping the animals which are imported to a new area at the point of entry itself, in an, isolated place for a prescribed period of time to keep the animals under observation and to allow time for any latent infection to develop into disease condition.

### **2. Vaccination**

Vaccines have been developed for many of the animal diseases such as black quarter, tetanus, rinderpest, brucellosis and foot and mouth diseases. Against certain diseases, a second booster dose is required after the first vaccination for achieving stronger immunity.

### **3. Diagnosis**

The complete history of the animal has to be extracted from the owner. The feed taken before the onset of disease, the nature of any preliminary treatment done by the owner, behaviour of the animal, etc. have to be enquired. After the history of the animal is collected, a preliminary examination is to be made based on the external manifestation. This will be followed by a systematic examination of the animal. This involves the examination of the different systems of the body, like respiratory, circulatory, etc.

### **4. Isolation**

Isolation means segregation of animals which are known or suspected to be affected with a contagious disease from the apparently healthy ones. Preferably, such segregated animals should be housed in a separate isolation ward situated far away from the normal animal houses.

Attendants working on sick animals and equipment such as buckets, shovels, etc., used for them should not be used for healthy animals. If this is not practicable, the sick animals should be attended to, daily, after the healthy stock. After this the equipment should be thoroughly disinfected before they are used on healthy stock next day. The attendant too should wash his hands and feet in an antiseptic solution and discard tile cloths in which he worked.

### **5. Destroying carriers of the germs**

Common diseases for which carriers have been observed in farm animals are tuberculosis and brucellosis. Carriers of diseases in the herd should be diagnosed and eliminated so that the herd may be completely free from the diseases.

## 6. Disposal of carcasses

Proper disposal of animals died of contagious diseases is of great importance in preventing the spread of the disease. Besides, it is also necessary to prevent human infection. Carcasses of such animals should never be disposed off by depositing them in or near a stream of flowing water, because this will carry infections to the points downstream. An animal died of contagious disease should not be allowed to remain longer in the shed as biting insects, rodents, etc. can reach it and spread the infection. Therefore, it is absolutely essential that all the carcasses of animals died of contagious diseases should be either buried deep into the earth or burnt completely. For burning or burying such carcasses, an isolated place, quite away from human activities or source of drinking water or pasture, should be selected.

## 7. Disinfection

The common disinfecting agents available to the cattle owner are sunlight, heat and chemical disinfectants. Sunlight possesses strong disinfecting properties. Animal houses must be so constructed that sunlight falls in the sheds at least for some time during the day. The effectiveness of antiseptics is greatly reduced in the presence of organic matter. Therefore, it is highly desirable to clean the areas before using a disinfectant.

## 6. Ante-mortem Inspection:

To ensure that only apparently healthy, physiologically normal animals are slaughtered for human consumption and that abnormal animals are separated and dealt with accordingly.

Some of the *major objectives* of ante-mortem inspection are as follows:

- To screen all animals destined to slaughter.
- To ensure that animals are properly rested and that proper clinical information, which will assist in the disease diagnosis and judgment, is obtained.
- To reduce contamination on the killing floor by separating the dirty animals and condemning the diseased animals if required by regulation.
- To ensure that injured animals or those with pain and suffering receive emergency slaughter and that animals are treated humanely.
- To identify reportable animal diseases to prevent killing floor contamination.
- To identify sick animals and those treated with antibiotics, chemotherapeutic agents, insecticides and pesticides.
- To require and ensure the cleaning and disinfection of trucks used to transport livestock.

## 7. Diseases after slaughtering

The **spoilage of meat** occurs, if the meat is untreated, in a matter of hours or days and results in the meat becoming unappetizing, poisonous or infectious. Spoilage is caused by the practically unavoidable infection and subsequent decomposition of meat by bacteria and fungi, which are borne by the animal itself, by the people handling the meat. Meat can be kept edible for a much longer time – though not indefinitely – if proper hygiene is observed during production and processing, and if appropriate food safety, food preservation and food storage procedures are applied.

The organisms spoiling meat may infect the animal either while still alive or may contaminate the meat after its slaughter. There are numerous diseases that humans may contract from endogenously infected meat, such as anthrax, bovine tuberculosis, brucellosis, salmonellosis, listeriosis, trichinosis or taeniasis.

Infected meat, however, should be eliminated through systematic meat inspection in production, and consequently, consumers will more often encounter meat spoiled by bacteria or fungi after the death of the animal. One source of infectious organisms is bacteraemia, the presence of bacteria in the blood of slaughtered animals. The large intestine of animals contains some  $3.3 \times 10^{13}$  viable bacteria, which may infect the flesh after death if the carcass is improperly dressed.

Contamination can also occur at the slaughterhouse through the use of improperly cleaned slaughter or dressing implements, such as powered knives, on which bacteria persist. After slaughter, care must be taken not to infect the meat through contact with any of the various sources of infection in the abattoir, notably the hides and soil adhering to them; water used for washing and cleaning, the dressing implements and the slaughterhouse personnel.

Bacterial genera commonly infecting meat while it is being processed, cut, packaged, transported, sold and handled include *Salmonella* spp., *Shigella* spp., *E. coli*, *B. proteus*, *S. epidermidis* and *Staph. aureus*, *Cl. welchii*, *B. cereus* and faecal streptococci. These bacteria are all commonly carried by humans; infectious bacteria from the soil include *Cl. botulinum*. Among the molds commonly infecting meat are *Penicillium*, *Mucor*, *Cladosporium*, *Alternaria*, *Sporotrichium* and *Thamnidium*.

As these microorganisms colonize a piece of meat, they begin to break it down, leaving behind toxins that can cause enteritis or food poisoning, potentially lethal in the rare case of botulism. The microorganisms do not survive a thorough cooking of the meat, but several of their toxins and microbial spores do. The microbes may also infect the person eating the meat, although against this the microflora of the human gut is normally an effective barrier.



## 8. Cross-contamination of food products

Cross-contamination is the transfer of harmful bacteria from one food to another - this may be directly, or via chopping board, utensils, hands, etc. Cross contamination occurs when handling raw meat, especially poultry meat, because it contains more liquid than other meats. It is important to keep meats and their juices away from already cooked or ready-to-eat foods such as salads.

Uncooked poultry meat is frequently contaminated with *Campylobacter* but rarely with *Salmonella*.

To ensure you don't cross contaminate when handling raw meat:

- **When shopping** - separate raw meat from other foods in your shopping trolley. Place these foods in plastic bags to prevent their juices from dripping onto other foods. The poultry industry now provides whole chickens in leak-proof packs and these should be selected wherever possible
- **In the refrigerator** - place raw meat in containers to prevent their juices dripping onto other foods. Juices will contain harmful bacteria if they are present on the meat
- **Defrosting** - completely defrost meat before cooking so it will cook evenly. Ensure juices do not drip onto other foods
- **In the kitchen** - harmful bacteria can spread throughout the kitchen and get onto chopping boards, utensils, and bench tops. To prevent this:
  - Wash hands with soap and hot water before and after handling raw meat
  - Wash chopping boards, dishes, utensils and benches with hot, soapy water after preparing each food item. Preferably, use one chopping board for fresh produce and a separate one for raw meat
  - It is not necessary to rinse raw meat before cooking. Studies have shown that rinsing can spread bacteria around the kitchen
  - Cook raw meat thoroughly until juices run clear. This is especially important for poultry meat
  - When marinating, boil used marinade before brushing onto cooked meat
  - When serving, never put cooked food back on the same plate or chopping board that previously held raw meat.

## 9. Conclusion:

With the introduction of some of the foreign breeds of cattle and their crosses, which are highly susceptible to diseases, the demand for efficient health cover has increased considerably in order to maintain them in good health and production. For this, control and eradication programme for these cattle diseases has become very important considering the economies of cattle and buffalo industry.

Prevention, control and eradication are the three basic methods used in dealing with any disease in the cattle population.

The slaughtering process should be done with all the necessary measures as mentioned in the booklet ensuring the delivery of high quality products.

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