



# Infectious diseases of Buffaloes

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Being one of the important bovidae of the tropical countries the domestic buffaloes suffer from almost all the infectious diseases encountered in the domestic cattle of the region. However, information about incidence of almost all bacterial, viral and other microbiological diseases have been presented for use in need.

## VIRAL DISEASES

### *Foot and mouth disease*

Foot and mouth disease (FMD) or aphthous fever is a contagious acute viral disease characterized by fever and formation of vesicles in the mouth and on feet. FMD is caused by an aphthovirus (family picornaviridae), which occurs in seven major serotypes A, O, C, SAT 1, SAT 2, SAT 3 and Asia 1. Of these, the predominant ones in India are, the serotypes O, A, Asia 1 and C. The disease is prevalent worldwide except Australia, New Zealand, Papua New Guinea and a number of European countries. The buffaloes of all age group are equally affected but it is more severe in calves. It is commonly noticed in buffaloes in Socialist Republic of Vietnam (Sharma *et al.*, 1985), The morbidity rate is up to 100%

*Clinical findings:-* In adult buffaloes, the clinical findings are mild in the majority of cases and they recover rapidly. Lesions occur mainly in the mouth and foot lesions are rare and mild in nature. Foot lesions in buffaloes have a scaly appearance initially which become vesicular later on. Small vesicle formation is noticed on buccal mucosa, dental pad and tongue while sometimes these may be observed in interdigital space also.

*Diagnosis:-* Serological methods which can be used for diagnosis include CFT, ELISA, plaque reduction assay, virus neutralization, radial immunodiffusion and the virus infection associated antigen test. ELISA has been found to be more sensitive for demonstration of antibody levels than microserum-neutralization test.

*Treatment and control:-* Treatment is directed to the use of mild disinfectants and protective emollients on the lesions, administration of antibiotics to prevent secondary bacterial infection and the use of NSAIDS like flunixin meglumine to reduce inflammation. Vaccination should be done regularly with multivalent vaccines against the serotypes prevalent in that area.

Vaccination twice in a year is recommended. The results of vaccination with virus of cattle origin are however, not as satisfactory as in cattle. Presently tetravalent oil adjuvant binary ethyleneimine inactivated vaccine is available which can be given @ 3 ml im or sc in buffaloes. This vaccine is to be repeated after 44-48 weeks and can be used in endemic areas as well as in containing the spread of disease during outbreak. In calves it is given at 1 month, 4 months and 1 year of age and than repeated after every 44-48 weeks.

### *Ephemeral fever*

The disease is also referred as three days sickness and characterized by hyperpyrexia, lameness and muscular stiffness. The ephemeral fever virus, which has four serovars and belongs to the family rhabdovirus causes it. The disease has been reported from many countries of the world and is endemic in Gujarat state of India (Patel *et al.*, 1993). It primarily affects the adult buffaloes and calves below 6 months of age are not affected by it.

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**Clinical findings :** - The virus after entry, localizes in the mesodermal tissue in the muscles and joints and affected animals reveal sudden rise in body temperature (41° C), anorexia and reduction in milk yield. Shivering, stiffness and clonic muscular movements are also noticed. Lameness becomes very prominent and typical posture of laminitis may be observed. Sometimes abortions in pregnant buffaloes may also occur. There is increase in heart and respiration rates with presence of nasal and ocular discharge.

**Diagnosis:** - The cases can be easily diagnosed by clinical findings and can be confirmed by blood analysis, which reveals leukocytosis, neutrophilia, lymphopenia and increased fibrinogen. The disease can also be confirmed by agar gel precipitation, complement fixation, ELISA and fluorescent antibody tests

**Treatment and control:** - Usually the clinical findings disappear in 3 days so usually supportive treatment is recommended for affected animals. These are given the drugs to relieve the temperature and muscular stiffness. So paracetamol and phenyl butazone are given by parental route. To prevent secondary bacterial complications, broad-spectrum antibiotics like streptomycin or tetracyclines should be used.

### Rinderpest

Rinderpest also known as cattle plague is an acute highly contagious viral disease of ruminants. Rinderpest virus, which is a RNA agent, is a morbilli virus belonging to family paramyxoviridae causes the disease. The disease has been eradicated in most parts of the world with the exception of certain African and Asian countries including India. A national eradication program has been actively implemented in India and certain zones have already been declared as Rinderpest free.

**Clinical findings:** There is sudden onset with high fever, anorexia, rough hair coat and depression. Mucosal lesions appear 2-3 days after the onset of fever. Diarrhoea, often haemorrhagic, sets in after the fever subsides. These animals become prostrate 7-8 days after the onset of these clinical findings with temperature becoming subnormal a few hours prior to death. Abortions in the pregnant animals have also been noticed.

**Diagnosis:** - Serological techniques that can be used include, AGID (serum must be taken 3-5 days after the onset of fever for accuracy), CIEP, CFT, FAT, ELISA,

immunoperoxidase, serum neutralization and the use of specific cDNA probes. **Treatment and control:** - Disease can be controlled easily as virus can not survive outside the host for longer period and various strains of virus have immunological identity. It is effected by good quarantine measures and the culling and slaughter of all infected and in contact animals.

### Rabies

Rabies also known as lyssa, is a highly fatal viral infection caused by rhabdovirus (genus lyssa virus). It is a truly neurotropic virus and causes lesion only in the nervous tissue. It occurs in most countries of the world. The source of infection is always an infected animal and the spread is invariably through a bite.

**Clinical findings:** - The affected animals either show paralytic or furious form. There is drooling of saliva, eructation, grinding of teeth, continuous tail movements, anorexia, stiffness of hind limbs paralysis and recumbency. The recumbent animals die in 2-3 days in paralytic form. However in furious form, the animals become alert but tense and hypersensitive. They show sexual excitement, apparent inability to swallow, violent ramming of head on fixed objects and loud bellowing. Such clinical findings persist for 36-48 hr and then animal collapses and die.

**Diagnosis:** - Impression smears prepared from brain can be tested by FAT for confirmation. CFT or ELISA can also confirm it. Animal inoculation test using mice is also of greater importance. The disease must be differentiated from other diseases showing nervous clinical findings like sub acute lead poisoning, polioencephalomalacia, listeriosis, lactation tetany and deficiency of vitamin A.

**Treatment and control:** - Immediately after exposure the wound should be irrigated with soap solution and water. Control is effected by the destruction of wild fauna in around animal holdings and the vaccination of all domestic cats and dogs being maintained at the premises. Live and inactivated vaccines both of chick embryo origin and tissue culture origin are available and can be used.

### Malignant catarrhal fever

It is a highly fatal acute disease of buffaloes characterized by gastroenteritis, lymph node enlargement and encephalitis. There are two forms of





the disease, one of which is caused by Alcelaphine herpesvirus-1 (AHV-1) which is a herpes virus and transmitted from blue wildebeest. The other form is associated with the domestic sheep and is caused by ovine herpes virus-2 (OHV-2). The disease has been reported from most of the countries where buffaloes are reared. The morbidity may vary from 20 to 50% in susceptible herds and most of the cases are seen in late winter or spring months.

**Clinical findings:** - In head and eye form, the course of disease is comparatively longer and buffaloes are suddenly infected and reveal high fever (41-42°C), anorexia, rapid pulse rate, reduction in milk yield, profuse purulent nasal discharge and severe dyspnoea. Discrete local areas of necrosis are seen on the hard palate, gums and gingivae due to which mouth is painful and animal moves jaw carefully. The skin of muzzle is extensively involved and there is excess salivation.

**Diagnosis:** - The disease can be confirmed by polymerase chain reaction test. It should be differentiated from mucosal disease, rinderpest, infectious bovine rhinotracheitis, and viral encephalitis or haemorrhagic septicemia.

**Treatment and control:** - Though there is no specific treatment, but use of non-steroid anti-inflammatory drugs may be given to relieve from discomfort. Supportive treatment given in the form of broad-spectrum antibiotics and fluid therapy are also of some value. For the control of disease, buffaloes should be isolated from sheep flock.

### BUFFALO POX

It is a mild viral disease of buffaloes and is characterized by the presence of typical pox lesions on the teats and udder. The disease is caused by buffalo pox virus of the genus orthopox of the family poxviridae. Morbidity up to 70% has been reported but mortality rates are comparatively low.

**Clinical findings:** - The affected buffaloes suffer from fever (40°C), anorexia, dullness, depression and congestion of conjunctivae. These animals show typical pox lesions mainly involving teats, udder and medial aspect of thighs, there is development of mastitis due to secondary bacterial infection in teat.

**Diagnosis:** - The cases can be detected by the clinical findings and can be confirmed by isolation of the virus

from the lesions present on the teats or udder. It can also be confirmed by precipitation, complement fixation and neutralization.

**Treatment and control:** - As it is a viral infection, so there is no specific treatment. However to check the secondary bacterial contamination, antibiotic therapy with broad spectrum antibiotic must be initiated as early as possible. Care must also be taken to prevent the occurrence of mastitis in affected animals. Presently no suitable vaccine is available against the disease so adopting strict hygienic measures can only control it.

### BACTERIAL DISEASES

#### Black Quarter

Black quarter or emphysematous gangrene or black leg, is caused by *Clostridium chauvoei*, a gram positive, spore forming, rod. The disease has a worldwide distribution and is enzootic in certain areas particularly those frequently affected with floods. In India, the disease is milder than that in cattle (Dhanda, 1977). The disease is a soil borne infection and spreads mainly through intestinal mucosa after the ingestion of contaminated feed. True black leg develops when the spores, which are lodged in normal tissues, are caused to proliferate by mechanisms such as trauma and anoxia.

**Clinical findings:** - There is marked swelling in the muscles of shoulder, hip, chest, back or flank region. The swelling that is hot and painful to touch initially, becomes very extensive, cold and painless later on. On palpation of swollen area, crepitating sounds can be listened. The affected area later on, turns black and dry and froth mixed foul smelling fluid is released by puncturing it. There is high fever (41°C), depression, anorexia, and ruminal stasis with increased heart and pulse rates. In terminal stage, diaphragm, tongue and heart muscles are also involved and the animal dies within 12-36 h after appearance of clinical findings.

**Diagnosis:** - In typical cases of black quarter, a definitive diagnosis can be made on the clinical signs and the necropsy findings. Isolation of the causal agents and serological tests are also helpful in the confirmation of the disease. The disease must be differentiated from anthrax, lightning strike, lactation tetany, bacillary haemoglobinuria, haemorrhagic septicemia and acute lead poisoning.





**Treatment and control:** - The severe cases must be treated immediately with BQ antiserum and high doses of antibiotics. The antiserum can be given @ 200-400 ml iv and repeated after 24 h. Penicillin @ 1000 units/kg b wt is highly effective. Treatment should commence with crystalline penicillin iv followed by long acting preparations, some of which must be injected into the affected tissue Ciprofloxacin and norfloxacin are also effective. Treatment with antibiotics must be continued for 5-7 days. Vaccination of calves at 3 weeks of age is recommended when the incidence of disease is very high.

### **Anthrax**

Anthrax or splenic fever may be peracute or acute characterized by sudden death with the exudation of dark coloured blood from the natural orifices. Anthrax is caused by *Bacillus anthracis*, a gram positive spore which are extremely resistant to damage and can survive for 15-20 years in soil. Hence anthrax infected carcasses are never opened. The disease is of zoonotic importance as human beings suffer from "Wool sorter's disease". In recent past it has been used as weapon by the terrorist. It has a worldwide distribution. Buffaloes are considered to be more susceptible than cattle.

**Clinical findings:** - In buffaloes, the disease is manifested in peracute or acute forms. The infected animals die suddenly within two hours without showing any clinical findings, but escape of blood from nostrils, anus and mouth occurs. Before death, fever, muscle tremors, dyspnoea and congestion of the mucosa may be observed with collapse following terminal convulsions. In acute form, the animals survive for 3-4 days as the course of disease is of about 48 h. Body temperatures of 42°C, depression and deep and rapid respiration are seen. Pregnant animals abort, and milch animals show reduction in milk yield and milk is usually blood tinged. There may be diarrhoea, dysentery, and edema of the tongue, throat, sternum and perineum.. Respiration and heart rates are elevated while ruminal movements are absent. The visible mucous membranes are congested with haemorrhagic spots on them.

**Diagnosis:** - Peripheral blood or edema fluid smears will reveal the organism, in positive cases. For ascoli test, a small piece of the muzzle or ear should be collected for preparing antigen for conducting the precipitation test. The disease should be differentiated from peracute black quarter, lead poisoning, acute leptospirosis and bacillary haemoglobinuria.

**Treatment and control:** - Anti-anthrax serum @ 100-150 ml iv can be given to valuable animals in conjunction with antibiotics. Streptomycin @8-10 g/day in two doses im has been found to be much effective. Oxytetracycline @ 5 mg/kg b wt per day parentally is also more effective. It is desirable to prolong the treatment up to a minimum of 5 days to prevent relapse of the disease.

### **Haemorrhagic Septicemia\_(Pasteurellosis)**

Haemorrhagic septicemia also known as shipping fever or locally in India as galghontu and ghurrha. *Pasteurella multocida* type 2B is mainly responsible to cause the disease in buffaloes. The causal organism is a small gram negative, bipolar, coccobacillus. The disease had worldwide prevalence in buffaloes except in Australia, Oceania and Japan. The tonsillar region of the nasopharynx has been identified to be the main portal of entry of the organism whether through inhalation and ingestion. In favorable surroundings the organism can survive in the environment for a week or so. Carriers include cattle and buffaloes while reservoir hosts include pigs, sheep, goat and horses.

**Clinical findings:** - The disease is characterized by sudden rise in temperature up to 42°C, profuse salivation, severe depression, sub mucosal petichae and death in about 24 h. In the common throat form, there is a hot painful swelling of the throat, brisket or perineum and severe dyspnoea may occur. The animals die as a result of respiratory distress.

**Diagnosis:** - It is made based on clinical findings, demonstration of the causal organism in smears of blood / edema fluid made immediately after death, since the organism disappears from dead animals fast. Biochemical studies of blood taken in the febrile stage show increased bilirubin, and other bile salts, decreased cholesterol level and changes in serum protein, all of which are indicative of hepatic insufficiency. It is necessary to differentiate the disease from anthrax, leptospirosis and black quarter.

**Treatment and control:** - Sulphadimidine is highly effective and earlier used to be the drug of choice and given at the dose rate of 0.5-1.0 gm/kg b wt sc for 3-4 days. Combination of trimethoprim and sulphamethoxazole is highly effective when used @ 3-5 ml/ 50 kg b wt im for 4-5 days. Oil adjuvant vaccines





are favored for systematic vaccination programs because they afford protection for over 6 months and may be up to a year. Srivastava (2000) recorded higher efficacy of vaccine prepared from *P. multocida* cells grown in chemically defined media.

### TUBERCULOSIS

Tuberculosis is known as a chronic infection, which is characterized by the progressive development of tubercles in various organs of the body. The causative organism in buffaloes is *Mycobacterium bovis*. The disease occurs worldwide and is of major importance in dairy cattle. The infected animals serve as the main source of infection to other animals since the organisms are excreted in the sputum, faeces, milk, urine, vaginal and uterine discharges and open peripheral lymph nodes. The organisms enter via inhalation or ingestion but inhalation is the common route of spread

**Clinical findings:** - General malaise is the first observable sign in affected buffaloes. In the pulmonary form, low grade fever, inappetance, chronic dry husky coughing, progressive weakness and dryness of skin are observed. In later stages pleurisy and dyspnoea are also noticed. In the intestinal form, there is persistent diarrhea. The affected mammary glands are painlessly enlarged and the supramammary lymph node may also be enlarged. The milk becomes watery and large numbers of organisms are present in it.

**Diagnosis:** - The cases can be detected on the basis of clinical findings and post-mortem lesions. In live animals delayed hypersensitivity reactions like the single intradermal test (SID), short thermal test, Stormont test and the comparative test with tuberculin of various origins, are used for diagnosis. The indirect hemagglutination test is reported to be a very sensitive test to detect early and advances cases of tuberculosis, in which the tuberculin test failed.

**Treatment and control:** - Animals may be treated with a combination of 2.5 gm streptomycin im, 1.5 gm rifampin and 2.0 gm isoniazid given orally daily for 4-6 months has been reported highly effective. Effective eradication of the disease is based on removal of infected animals, prevention of spread of infection and avoidance of further introduction of disease.

### Brucellosis

The disease also known as contagious abortion or Bang's disease and is caused by *Brucella abortus* that are

small gram-negative, non-motile, non-sporulating coccobacillus organisms. The disease is prevalent in buffaloes throughout the world and in India, its prevalence is high. It has also been reported in buffaloes in Vietnam (Sharma *et al.*, 1982 a) and Sri Lanka (Silva *et al.*, 2000). The organism can also penetrate intact skin or mucous membranes. Congenital infection can also occur but is seen in calves. The disease is of zoonotic importance as dairy workers, veterinarians or butchers may pick up infection and suffer from undulant fever.

**Clinical findings:** - Highly susceptible pregnant animals suffer from abortions after 6 months, retained placenta and catarrhal metritis. After one or two abortions the animal may give birth to full term calves. In herds there is usually a 'storm' of abortions. In bulls there is epididymitis and orchitis involving one or both scrotal sacs. The testicles are enlarged and reveal painful swellings. In mild cases, sinovitis and painful swelling of affected joints are noticed.

**Diagnosis:** - The cases can be diagnosed by history of abortions in late pregnancy and can be confirmed by isolation of the organisms from uterine discharges of an infected animal or the stomach contents and heart blood of the aborted foetus. Ziehl Neelsen staining is specific for confirmation of the organisms. Serological tests include the rose Bengal test for herd testing and the standard tube agglutination test, spot agglutination test, ELISA, and CFT in individual cases.

**Treatment and control:** - Sulpha drugs, penicillin or streptomycin alone are of little value. Chloramphenicol or combination of long acting oxytetracycline and streptomycin are useful in its treatment. Calfhood vaccination with *Br. Abortus* strain 19 vaccine, between 4-8 months is carried out when the incidence is 5-20%. The only other vaccine with some currency is Strain 45/20 in adjuvant. Greatest care must be taken in handling and disposal of aborted foetus, foetal membranes and uterine discharges etc. as it may serve as source of infection to other animals and human beings.

### JOHNE'S DISEASE

It is also known as paratuberculosis and is caused by *Mycobacterium paratuberculosis*, which are acid fast and moderately resistant. The disease has been reported from many countries in buffaloes all over the world. Economic losses mainly occur due to ill health, poor growth and





reduced productivity and working efficiency. Though young animals are more susceptible, the clinical findings are seen mainly by 3-6 years of age since organisms grow very slowly.

**Clinical findings:** - In affected buffaloes reduced working efficiency and productivity, submandibular edema and progressive weight loss are noticed in spite of normal appetite. There is chronic diarrhoea and faeces resemble pea soup like but without any odour. The disease runs a protracted course and terminates in death.

**Diagnosis:** - Demonstration of the organisms by microscopic examination of the faeces or of the rectal mucosa also helps in its detection. A CFT having a sensitivity of 90% and specificity of 70% and an AGID that has 96% sensitivity and 94% specificity are the most widely used modes of diagnosis of this disease

**Treatment and control:** - Streptomycin has the maximum activity against the organism. A combination of dihydro streptomycin, rifampin and isoniazid has been found effective when used for three months. Eradication of infected animals and carriers and segregation and proper feces disposal can help to control the disease. A vaccine of live bacilli suspended in lanolin can be employed in calves less than one month of age.

### LEPTOSPIROSIS

It is a disease of zoonotic importance and is characterized by interstitial nephritis, hemolytic anaemia and abortions. The pathogenic leptospire is classified into one species *Leptospira interrogans*. The disease is prevalent worldwide. In Bulgaria, its incidence has been reported as 10% (Khalacheva and Sherkov, 1981) while in Vietnam, it has been found to cause abortions (Sharma *et al.*, 1982 b). The organism gains entry through mucosal and cutaneous abrasions, from contaminated pasture and water by infected urine, aborted fetuses, and infected uterine discharges. Buffaloes suffer from acute, sub acute or chronic form of disease. In acute form, fever, anorexia, acute haemolytic anaemia, haemoglobinuria, jaundice, petechial haemorrhages on mucosae, dyspnoea, abortions and blood in milk are noticed. In sub acute form, moderate fever, anorexia, dyspnoea and haemoglobinuria are observed. Abortions occur after 3-4 months of infection.

**Diagnosis:** - Acute and convalescent sera taken 7-10 days apart should be submitted from each clinically affected animal or from those with a history of abortion. Of all the laboratory tests the examination of urine samples for the organism probably offers the most profitable opportunity of demonstrating the presence of infection. Of the serological tests, the microscopic agglutination test (MAT), is the most commonly used one. Other tests include ELISA and FAT.

**Treatment and control:** - The treatment should be initiated before liver or kidney damage. Streptomycin @12-15 mg/kg b wt twice daily for 3 days is effective when given as soon as the signs appear. Elimination of infection in carriers can be effected by a single dose of streptomycin @ 25 mg/kg b wt. Animals which are severely affected with hemolytic anemia can be given blood transfusion @ 5-10 lit/450 kg b wt).

Vaccination with formalin inactivated bacterin with either aluminum hydroxide or Freund's complete adjuvant can be used. A live vaccine prepared from avirulent *L. interrogans* serovars *pomona* gives good immunity and is quite safe.

### LISTERIOSIS

It is an infectious disease of some zoonotic importance and is caused by *Listeria monocytogenes* that has 13 serovars. Virulent strains can be identified by their ability to multiply in macrophages and monocytes and their ability to produce a hemolysin, listeriolysin 'O'. The disease has a worldwide incidence. The animals of all age group may be affected but adult buffaloes are more susceptible than young ones and buffaloes are less resistant than cattle.

**Clinical findings:** - Among buffaloes, it produces two types of manifestations- listerial encephalitis or listerial abortions. The course of listerial encephalitis in adults is 1-2 weeks while in calves, deaths occur in 3-4 days. The affected buffaloes develop cranial nerve dysfunction and press their head onto fixed objects and there is unilateral facial paralysis. Mostly sporadic abortions occur due to the disease in buffaloes during the late third of pregnancy. Retention of afterbirths is commonly noticed and in such cases temperature rises up to 40.5° C. In the calves, septicemic listeriosis may occur in which case, emaciation, depression, fever and diarrhoea are





noticed. In 3-7 days old calf, corneal opacity, nystagmus and dyspnoea have been observed.

**Diagnosis:** - Examination of CSF for presence of inflammatory cells and increased protein content are also helpful in the diagnosis. ELISA test developed for its diagnosis has also been found satisfactory (Miettinen *et al.*, 1990).

**Treatment and control:** - Though the organism are resistant to many drugs, but these are sensitive to chlortetracycline when given @ 10 mg/kg b wt iv for 5 days. Penicillin when used @ 44000 units/kg b wt for 10-14 days has also been proved effective. Avoiding stress especially in endemic areas effects control. The feeding of excess /spoilt silage must be avoided in these areas. Killed vaccines can be used to control the disease.

### TAIL NECROSIS

The drying of tail due to gangrenous necrosis is quite common in buffaloes. This condition is caused by *Corynebacterium bovis*. It begins with a swelling and inflammation at the tip of the tail, which gradually extends to the entire tail if not checked by amputation. The primary lesion becomes necrosed and a part of the tail sloughs off. The whole of the tail may also be lost as it is a chronic disease. Treatment usually consists of amputation of the affected part. Gangrenous syndrome involving tail, ear tips and extremities has been reported to be caused by mycotoxins.

### VIBRIOSIS

The disease vibriosis in buffaloes may be wide spread as it has been recorded in India. It is caused by *Campylobacter fetus* (*Vibrio fetus*). Infection is spread by the use of infected bulls for artificial insemination / natural service. The disease causes abortion between the 4-6 months of gestation. Isolating the organism from the uterine exudates and stomach contents of aborted fetus can make diagnosis. A mucous agglutination test has been developed and is used as a reliable diagnostic tool. Adoption of good hygienic measures and screening of bulls can help to control the disease.

### CALF DIARRHOEA

It is commonly seen in newly born calves and is recognized as one of the major causes of neonatal fatality. The bacteria usually found associated with this condition include strains of *E. coli*, *S. typhimurium*, *S.*

*dublin*, *S. newport*, *S. bovis morbificans*, *S. weltevreden*, etc. Multiple infections due to enteropathogenic viruses and bacteria are more common than a single infection in a calf or a group of calves. Sharma *et al.* (1982 c) found *E. coli* as a major cause of diarrhoea in calves. Maximum deaths were seen in third week of age and in summer months while there was no sex difference. In surti buffalo calves overall mortality was observed as 33.97% up to the age of one-year.

**Clinical findings:** - The affected calves suffer from profuse diarrhoea, sometimes with dysentery, straining during defaecation, cyanotic mucous membranes, depression, weakness, and inco-ordination of gait and severe dehydration and lymphopenia, neutrophilia and hyperproteinemia.

**Diagnosis:** - Rotavirus induced calf diarrhoea can be detected by dot immunobinding assay Blood examination may also help in its diagnosis.

**Treatment and control:** - The management of calf diarrhoea is based on alteration of diet, replacement of lost fluid and electrolytes, use of antibiotics and use of intestinal protactants. Effective control can be achieved by reduction of the exposure of the neonate to infectious agents, providing adequate colostrum and increased non-specific resistance, and increasing specific resistance by vaccination of the dam or the neonate.

### MASTITIS

It is referred as the inflammation of mammary gland resulting in physical, chemical or bacteriological changes in the milk of lactating animals. In buffaloes, large number of infectious agents causes the disease. The bacteria commonly associated with mastitis are different species of Streptococcus including *Str. agalactiae*, *Str. dysgalactiae*, *Str. faecalis*, and *Str. uberis*. Some of the fungi have also been isolated from mastitic milk of buffaloes. The main sources of infection are the infected udder and the environment, with infection taking place through milkers' hands, contaminated litter or milking machines. The neutrophil counts in buffalo milk is high due to which a large number of cells are available for phagocytosis and destruction of the invading pathogens.

**Clinical findings:** - In acute inflammatory reaction, significant alterations in milk quality occur as it contains large number of clots or flakes and there is change in its colour which may be even blood mixed sometimes.





Udder reveals hot and painful diffuse swelling. In sub clinical form, apparent clinical findings are not seen and there is increase in leukocyte count in the milk. In coliform mastitis, the buffaloes reveal sudden onset of pyrexia, muscular tremors of head and upper hind legs, rumen atony and diffuse local swelling of the udder with straw-coloured watery non-odourous flaky secretion

**Diagnosis:** - Periodical examination of udder, strip cup testing, use of indirect tests like whiteside and California mastitis tests give an indication of the presence of disease. Measurement of electric conductivity by a conductivity meter or analysis of lactose content, N-acetyl-beta-D-glucosaminidase and lactate dehydrogenase in milk is reliable tests for detecting the disease.

**Treatment and control:** -. For treatment of bacterial mastitis, large number of antibiotics are available. It should be selected on the basis of its activity against infective agent, diffusibility in mammary gland and cost. Though the treatment with antibiotics is recommended after sensitivity testing, but in emergency cases broad-spectrum antibiotics like cephalosporins or penicillin G with other drugs may be infused. The cases of coliform mastitis can be successfully treated with parenteral injection of norfloxacin, frequent stripping of affected quarter and oral administration of sodium salicylate and potassium nitrate.

## CONTAGIOUS BOVINE PLEUROPNEUMONIA

It is a highly contagious and septicemic disease characterized by high rise of body temperature and respiratory grunts. The disease is caused by *Mycoplasma mycoides* var. *mycoides* (small colony type) which are pleomorphic, gram negative and highly fragile organisms. The disease is a serious problem in large areas of Eastern Europe, Asia and Africa. Buffaloes of all age group are equally susceptible but once infected, they become immune for subsequent infections. Carrier animals also serve to perpetuate infection.

**Clinical findings:** - Incubation period varies from 3-6 weeks and occasionally up to 6 months. There is a sudden rise of temperature, up to 40° C, anorexia, absence of ruminal movement, dullness, depression and a fall in milk yield. Coughing is observed first on exercise and then even at rest. There is pain in chest region due to which the animal stands with elbows abducted, back arched, and head extended. The respiration becomes

shallow and accompanied by grunting which is pronounced during expiration. Edema of the dewlap and throat is also seen.

**Diagnosis:** - Isolation of organisms from serous fluid in thoracic cavity and identification of the organism can confirm this. Complement fixation and serum agglutination tests are highly useful in its diagnosis.

**Treatment and control:** - Treatment is undertaken only in endemic area. Sulphadimidine and organic arsenicals have been used extensively and appear to reduce the mortality rate. Good hygiene and sanitation practices and removal of sources of infection effect control. Vaccination by a live attenuated vaccine administered at the tip of the tail can be given to calves after the age of 2 months.

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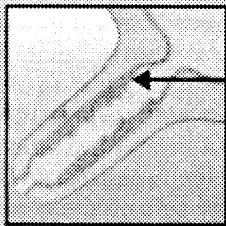


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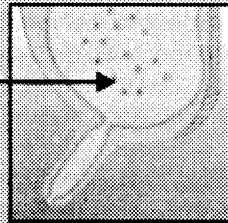
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**Controls Mastitis by potentiating Udder Immunity**



**Strengthens  
keratin layer,  
the first  
line of  
body defense**

**Augments  
resident cell  
population,  
the second  
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- Treats Sub-clinical mastitis\* of variable etiology
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