FrontLine®
TECHNICAL INFORMATION FOR TODAY'S FEED PROFESSIONAL

# Intestinal Disorders Caused By Bacteria Part 1

## *BACTERIA*

Bacteria are very small monocellular organisms which are visible under the light microscope. Their size is given in micrometers (1 $\mu$m = 1 micrometer = 1 thousandth of a millimeter).

A cell wall gives the bacteria their characteristic shape. One distinguishes between globular, rod-shaped and spiral species. Some bacteria can propel themselves by ciliary movement. There are encapsulated and non-encapsulated bacteria. Some species have both variants. Encapsulated bacteria are more dangerous than the same species without capsule, because they are better protected against the defense mechanisms of the body (white blood cells, enzymes) and against the environment (heat, cold, disinfectants).

Unlike viruses, bacteria have a metabolism of their own and possess the two nucleic acids DNA and RNA. They can therefore grow and multiply independently. A bacterial cell multiplies by splitting whereby colonies are formed. Some species are capable of forming spores, although the spores do not serve for multiplication (as with fungi), but are a resistant stage of survival in times of unfavorable environment conditions.

*One distinguishes between bacteria that can only exist if the oxygen supply is ensured (aerobic) and those that live without oxygen (anaerobic).*

The degree of acidity of the environment is also important. Thus, lactic acid bacteria can only exist at a low pH, for example in an environment that kills coli bacteria.

### SECONDARY BACTERIAL INFECTIONS

*Intestinal disorders may be caused by non-infectious factors (housing, feeding) or by infectious factors (viruses, bacteria, protozoa).*

An intestinal disorder always involves a change in the intestinal environment. The vital lactic acid forming bacteria in the small intestine (lactoflora) are damaged by this environmental change. Organisms which naturally occur in the large intestine often cause a secondary bacterial infection. However, if these organisms pass into the small intestine, they find favorable conditions for their reproduction there and become pathogenic. Some strains of coli bacteria are of particular importance here.

#### Course and Symptoms

*…….some coli strains are ciliated and are therefore capable of independent movement.*

As a result of the change in the environment and a temporary paralysis of the bowel movements, coli bacteria can ascend to the small intestine. This settlement in the small intestine is easy, since some coli strains are ciliated and are therefore capable of independent movement. Certain coli strains can attach themselves to the intestinal epithelium by means of special mechanisms (fimbrial or pilus antigens). They displace the lactic acid-forming bacteria which are already weakened through the change in the environment. The attachment of the coli bacteria prevents them from being moved on and excreted with the chyme and the intestinal contents.

There is a massive multiplication of pathogens in the changed intestinal environment. Harmful substances like enzymes and enterotoxins are excreted which act directly on the cell membrane of the villi of the small intestine and induce the release of great volumes of fluid into the intestine, causing another attack of diarrhea or aggravate existing diarrhea.

Milk Products
The Milk Replacer Source™
FOR MORE INFORMATION, CALL OR WRITE MILK PRODUCTS, LLC
P.O. Box 150, Chilton, Wisconsin 53014, (920) 849-2348, Fax (920) 849-9014 www.milkproductsinc.com

The epithelial cells of the small intestine themselves are not damaged by the coli bacteria. However, with persistent diarrhea and progressive destruction of the protective layer (lactoflora) of the villi of the small intestine, initially a mucoid and later a bloody intestinal inflammation develops. The feces are malodorous and of grayish white to yellow color. As a result of the great loss of fluid the body tissues become dehydrated, the blood fluid thickens and there is a breakdown of the metabolism with the animal dying very quickly if treatment is not started in time.

The toxins of the coli bacteria, the bacteria themselves and incompletely broken down and therefore incompatible feed components may also pass into the blood stream. The body temperature rises to over 104°F (40°C). The animals become listless and lose their appetite. If the initial intestinal disorder was caused by viruses, the secondary infection with coli bacteria can very quickly lead to blood poisoning. In this case the villi of the mucosa of the small intestine have already been destroyed by viruses, which makes it easier for bacteria and toxins to invade the blood stream. A secondary infection following housing or feeding induced intestinal disorders does not cause blood poisoning until a later stage, since it is merely the protective layer of the intestinal villi and not the epithelial cells themselves that ate damaged by the bacteria. In that case the toxins cannot pass into the blood quite so easily.

The pathogens and their toxins very quickly reach the various organs via the blood stream. Thus they get into the liver, kidneys, lungs, meninges and joints where they settle and multiply. At this stage the prospects of recovery are poor.

If the coli bacteria settle in the meninges, this results in meningitis with the formation of an edema. The fluid formed as a result of the inflammation increases the pressure on the brain. In such cases central nervous disorders like rolling of the eyes, contortion of the head and cramped posture of the body are observed with the animal lying down all the time.

If the bacteria multiply in the joints, an inflammation will develop there. The joints are swollen, hot and tender. The calves are unwilling to rise or cannot get up at all. This clinical profile which may also be caused by salmonellae is called "septicemia of newborn calves".

### Diagnosis

*A coli infection cannot be diagnosed on the basis of outwardly visible symptoms. Even a bacteriological demonstration in the feces is not sufficient, since coli bacteria are also regularly excreted in the feces of healthy animals.*

The demonstration of large numbers of coli bacteria in the small intestine and in the organs of animals that have just died provides an indication of the presence of a coli infection. Since the pathogenic properties of coli strains vary greatly, it is appropriate to determine the coli type precisely.

### Treatment

*If the disease is still confined to the intestine, it is the supportive, alleviating and life preserving measures that are most important.*

Impaired general condition, deep-set eyes, reduced elasticity of the skin raised (above 103°F/39.5°C) or lowered (below 101°F/38.5°C) body temperature and greatly reduced intake of milk, or none at all, are indications of the presence of blood poisoning due to a coli infection. Intensive treatment is then necessary. Because of the wide distribution of resistant coli strains, specific treatment with antibiotics is appropriate only after a sensitivity test has been carried out. Until the result of the sensitivity test is available, the antibiotics neomycin, gentamycin or ampicillin should be used.

A transfusion of dam's blood may also be helpful (collect 500 to 1000 cc in a BLUKO bottle, given intravenously or intraperitoneally).

*A single dose of cortisone or antihistamine weakens the effect of bacterial toxins on the body.*

### Prevention

The prevention of a coli infection in calves starts with appropriate housing and feeding of the dams. General preventive measures against infections of the gastrointestinal tract are particularly important for the prevention of coli infections.

In the newborn animal, antibiotic drugs should be used as a preventive only with great caution. Antibiotics like gentamycin, neomycin, and etc. should not be used, because they are likely to cause severe damage to the intestinal flora.

There is the possibility of vaccinations, but these cannot eliminate the actual cause of the coli infection, although they may help interrupt the infection. On the one hand, barn specific vaccines are used which are prepared in veterinary laboratories from the coli strain isolated from a calf of the stock that has died of the infection. On the other hand, the following industrially produced ready-for-use vaccines are currently available: COLI-BOV, NOBIVAC K99, SCOURGARD 3.