

Cryptosporidiosis in Cattle

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Key points

- Cryptosporidiosis is the disease caused by infection with the protozoan parasite *Cryptosporidium*.
- Only one species, *Cryptosporidium parvum*, causes disease in cattle and generally only in neonatal calves.
- Clinical signs can range from mild scouring to calf death depending on the parasite burden, susceptibility and health status of the calves.
- *Cryptosporidium* transmission to young calves can come from many sources including other calves, their dams, animal handlers, other animals and the environment.
- *Cryptosporidium* infection can cause serious problems on some farms and current statistics indicate this parasite is the commonest cause of scour in young calves in the UK.
- The life cycle of the parasite allows it to multiply rapidly in the host leading to the rapid spread of the disease within a susceptible group of animals.
- Infected animals can shed millions of infectious parasites into the environment.
- Accurate diagnosis is crucial and is available through your vet.
- Currently there is no vaccine available and treatment options are limited.
- There are effective management solutions which can significantly reduce the parasite burden on farm and thereby the impact of disease.
- The parasite is opportunistic and is therefore diagnosed in many mixed infections where prevention/treatment of the other pathogens will reduce the impact of cryptosporidiosis.

Introduction

Cryptosporidiosis is the disease caused by the protozoan parasite *Cryptosporidium*. There are currently over 26 species of this parasite which have been identified in many mammals, birds and reptiles, but fortunately not all of them cause disease!

There are 4 species found in cattle but only one of them, *Cryptosporidium parvum*, causes clinical disease and this is usually only in young calves of less than 6 weeks old. Cryptosporidiosis caused by *C. parvum* is zoonotic which means it can be passed to humans where it can cause disease. In the majority of the population, the clinical signs of cryptosporidiosis are generally mild with self limiting diarrhoea, abdominal pain and dehydration. In some circumstances however, such as in the very young, elderly or immuno-compromised individuals, cryptosporidiosis can be more serious or even fatal.

The infective part of the parasite's life cycle, the oocyst or egg, has a very tough outer shell and can survive very happily in a range of environmental conditions particularly if it is mild and humid. They are therefore very well equipped to survive the UK climate, where they can remain viable for over a year in soils, on pasture and in water.

The oocyst stage of the parasite can also survive many commonly used farm disinfectants and water chlorination treatment, making it difficult for farmers, vets and water suppliers to control or inactivate it.

Given these issues, along with the fact that *C. parvum* can cause serious disease outbreaks in susceptible calves, leading to significantly reduced farm incomes in severe cases, Moredun is continuing research into this parasite and currently have work ongoing in immunity, strain pathogenicity and transmission, oocyst prevalence and parasite survival in the farm and catchment environment.

A massive waterborne outbreak of cryptosporidiosis was reported in 1993 at Milwaukee, Wisconsin, USA where an estimated 403,000 people were infected due to faulty filtration of the water from Lake Michigan which supplied the area. Many of these people suffered hospitalisation and serious illness, the average duration of which was 8 weeks. Possible sources of infection were cited as human sewage, slaughterhouses and cattle grazing the banks of the rivers flowing into the lake.

Q1. What are the clinical signs of cryptosporidiosis in calves?

The clinical signs of cryptosporidiosis are generally only seen in very young calves of less than 6 weeks old. It is first seen as a profuse yellow scour and is rapidly followed by signs of dehydration, loss of appetite, fever and abdominal pain. Weight loss or reduced weight gain, depending on the severity of the parasite burden, often occurs and severe cases can result in death.



Figure 1: Calves with cryptosporidiosis showing acute scouring

Q2. What species of *Cryptosporidium* are found in cattle?

It is generally accepted that:

- Of the four species of *Cryptosporidium* found in cattle, only *C. parvum* causes disease and this tends to be seen in neonatal calves only (figure 2)
- *C. bovis* and *C. ryanae* are most commonly found in older calves but do not cause disease
- *C. andersoni* is associated with adult cattle and has been shown to limit production

New research from Moredun has shown that both older calves and adult cattle can shed *C. parvum* and therefore may act as reservoirs of infection for young calves. This has management implications: it is very important not to mix age groups of calves, as the older calves may infect young ones causing clinical cryptosporidiosis. It is also important to manage adult cattle to reduce parasite burden (see Q7).

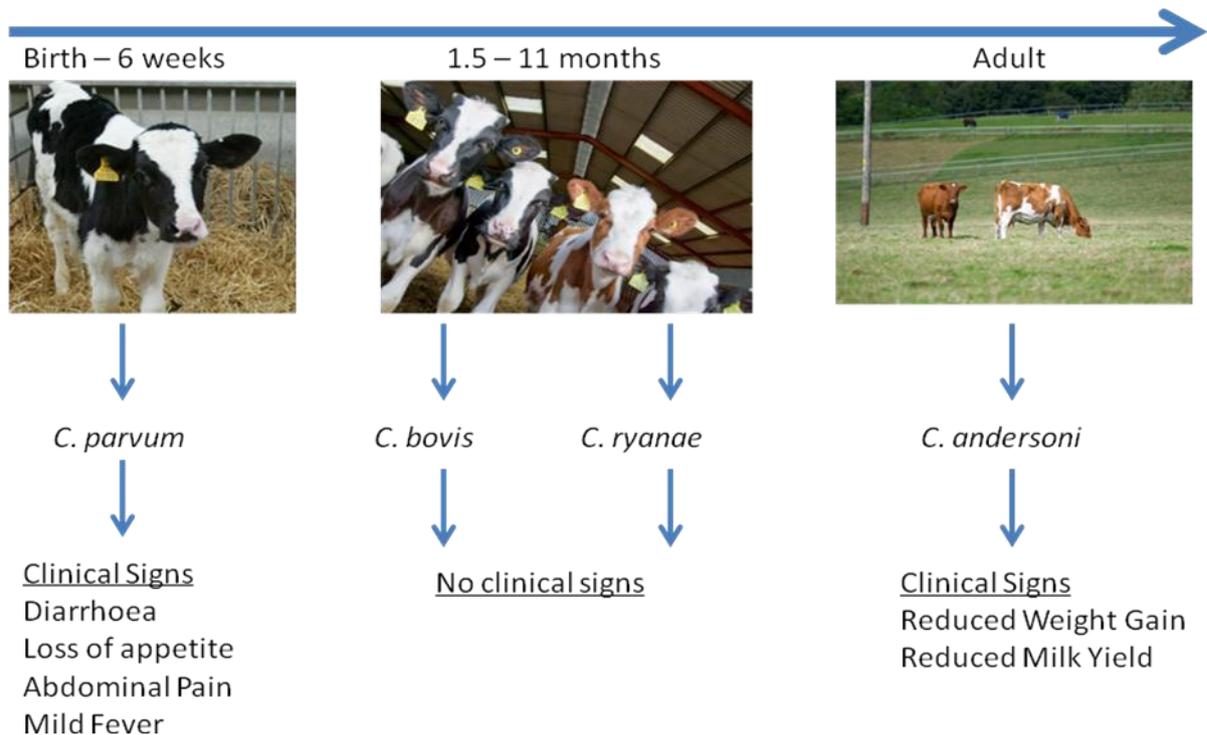


Figure 2: Species of *Cryptosporidium* commonly found in different age groups of cattle

Q3. Where do calves get *Cryptosporidium* from?

From the time of birth, there are many potential sources of infection of *Cryptosporidium* for the calf (figure 3). An understanding of what these are and where they come from will help achieve a reduction in levels of parasite burden on farm.

- The environment is known to be a major source of oocyst infection for calves – including cattle sheds, bedding, pasture, soil and drinking water.
- Other calves, their dams and other animals are also potential reservoirs for the oocysts. Sheep, and in particular lambs, as well as deer have been shown to shed *C. parvum* oocysts.
- Animal handlers, vets and any other people accessing the cattle may also act as sources of infection. Good hygiene procedures using suitable disinfectants for *Cryptosporidium* oocysts (see Q7) should be implemented, such as provision of footbaths and clean clothing.



Figure 3: Potential sources of infection of *Cryptosporidium* to the calf (main routes of transmission)

Q4. Is cryptosporidiosis a practical problem on farms?

Cryptosporidium infection can cause serious problems on some farms due to the biology of the parasite oocysts (the infective stage). Problems include:

Environmentally stable oocysts

- Resistant to commonly used disinfectants
- Resistant to heat (up to 60°C) and cold (down to -20°C)
- Can survive up to 12 months in cool, moist environments

Low infectious dose

- Infection can spread rapidly through farm/groups of calves
- As few as 10 oocysts can cause disease in susceptible calves
- One infected animal can shed 1, 000, 000, 000's (billions) of oocysts – potentially enough to infect 100, 000, 000 other calves!

Current figures of calf scour prevalence in the UK demonstrate that cryptosporidiosis has remained the main cause of enteritis in calves over the past 10 years (Veterinary Investigation Surveillance Report (VIDA, 2012)) and the cause of 38% of the reported neonatal calf scours in 2012 (figure 4). It is therefore considered a serious disease problem to the UK livestock industry.

Neonatal Enteritis - UK 2012

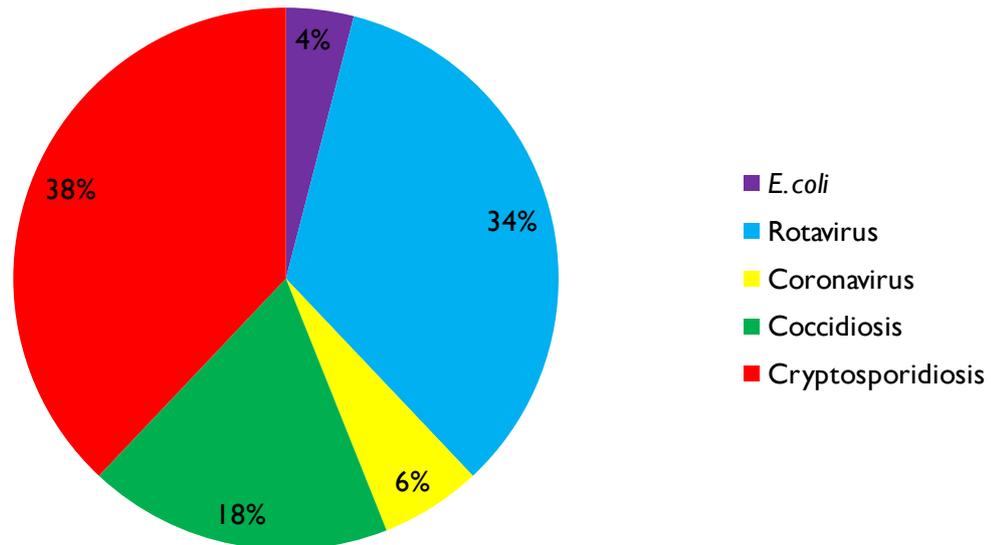


Figure 4: Main causes of scour in neonatal calves in the UK (VIDA, 2012)

Q5. How do ten oocysts turn into billions?

A feature of *Cryptosporidium* is its ability to multiply rapidly in the host leading to a potentially rapid spread of infection through a calf group or farm. The parasite achieves this as each oocyst hatches in the gut releasing 4 sporozoites which individually invade the gut wall, multiply and develop into oocysts, completing the life cycle in 2-7 days. The damage to the gut caused by the invading and multiplying parasites leads to the clinical signs evident in calves infected with *Cryptosporidium*.

In addition, during the infection process the parasite produces some thin-walled oocysts which burst open in the gut causing auto-infection within the host, leading to further multiplication of the parasite (figure 5).

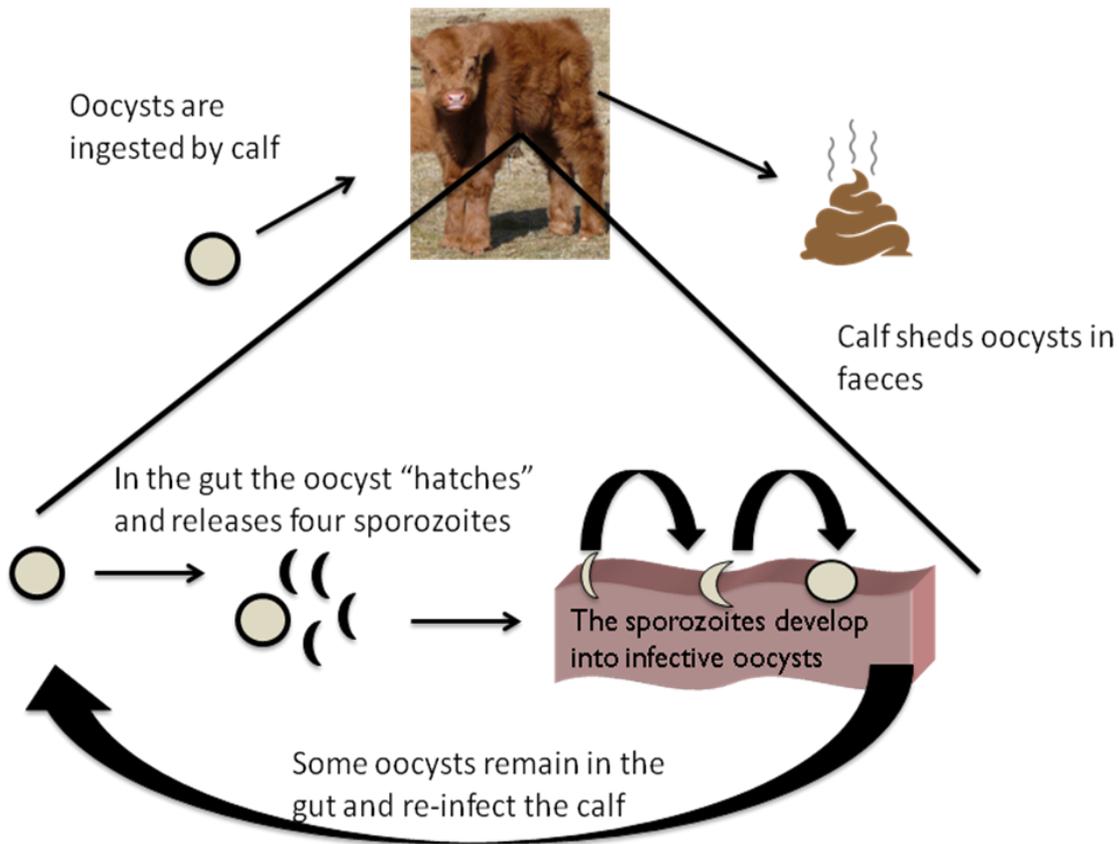


Figure 5: *Cryptosporidium* life cycle showing how the parasite can rapidly increase in number in the host

Q6. How do I know if I have *Cryptosporidium* on my farm?

Highly sensitive and specific diagnostic tests are available to diagnose *Cryptosporidium* infections in cattle faecal samples. If you have a scouring calf, the options are:

1. Confirmation of clinical observation by diagnosis using faecal samples

This may be done at your vet's surgery either by use of a rapid diagnostic kit for the detection of *C. parvum*, *E. coli* K99 and rotavirus, or by microscopy for the detection of *Cryptosporidium* oocysts.

SAC Consultancy (Scotland) and AHVLA (England and Wales) offer calf enteritis screening packages which can include *Cryptosporidium* along with choices of combinations for the main bacterial and viral pathogens of calves (see Q8).

There are also molecular (DNA based) methods available to differentiate between species of *Cryptosporidium* which will inform you if the species present in your calves is pathogenic.

2. Submission of dead neonatal calves to your Animal Health and Veterinary Laboratories Agency centre for post-mortem examination

This involves a pathological examination of gut epithelium during post-mortem examination of a dead calf and subsequent analysis - too late for the calf in question, but diagnosis of the pathogen(s) present will give you valuable information enabling you make informed management, treatment or preventative decisions for the other animals on your farm.

Q7. Cryptosporidium control – what are my options?

There are currently limited treatment options:

There are no vaccines at present to prevent disease and only one licensed product in the UK for the treatment of calves (Halocur®). It is worth noting that this treatment only reduces shedding and does not “cure” the disease; it is toxic if overdosed and cannot be used in dehydrated animals. Also it has to be used for 7 consecutive days from birth which makes it difficult to administer, particularly in large herds. However, many farmers report improvements in disease impact when Halocur® is used.

There are effective solutions to reduce *Cryptosporidium* burden on farm:

Reduce environmental contamination

- Steam cleaning of animal pens/calving areas – to kill oocysts
- Cleaning calving areas frequently – to reduce oocyst build up
- Deep and regular straw bedding – keeps animals clean/away from faeces
- Slurry and manure should be well fermented or composted prior to application on pasture.

Animal management

- The three ‘Q’s’ of colostrum – Quickness, Quality and Quantity
- Rehydration of sick calves with electrolytes
- Keep animals in age groups – do not mix older animals with younger animals
- Quarantine scouring animals until 1 week after scouring stops (see figure 6)
- Feed healthy animals first before handling sick animals

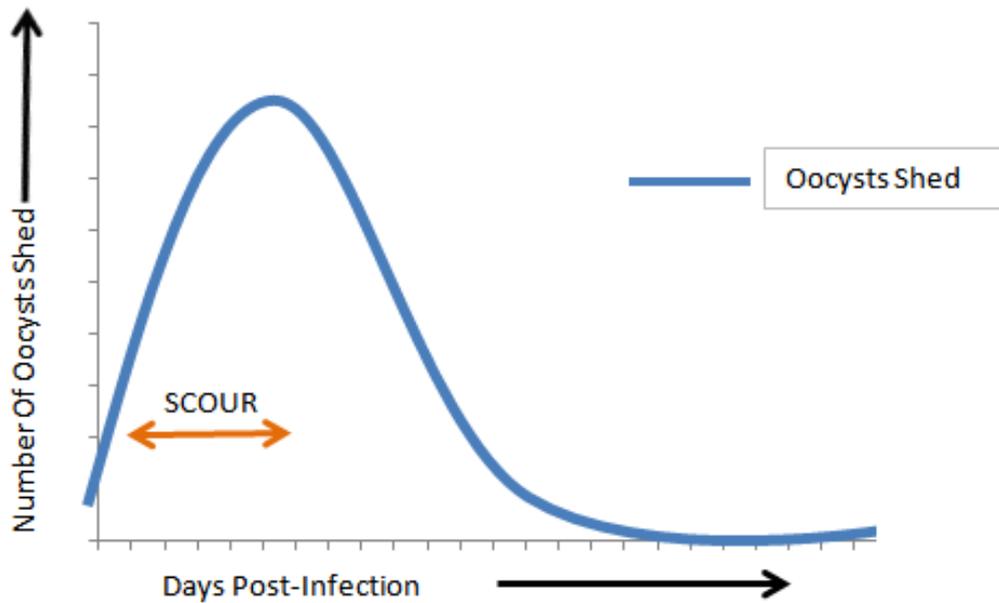


Figure 6: Typical oocyst output from a calf infected with *Cryptosporidium* showing that calves continue to shed parasites when scouring has stopped

Use of effective disinfectants:

Many of the common farm disinfectants such as FAM and Sorgene (if used at the manufacturer’s recommended concentration) are **NOT** effective in killing *Cryptosporidium* oocysts. Some effective disinfectants for *Cryptosporidium* are given below and may be obtained through your vet or farm supplier. It is important to adhere to safety precautions provided with each chemical.

Effective disinfectants:

- **2-3% Keno™Cox** - kills 99% oocysts after 2 hours contact time
- **2-4% Neopredisan** - kills 99% oocysts after 2 hours contact time
- **10% Ox-Virin** - reduced oocyst infectivity after 1 hour contact time
- **3% Hydrogen Peroxide** - reduced oocyst infectivity after 4 minutes

Q8. What else causes scour and how do I control mixed infections in my calves?

The other main pathogens which can cause scour in calves include:

1. Bacteria – particularly *E. Coli* and *Salmonella*
2. Viruses – rotavirus and coronavirus
3. Another protozoan parasite *Eimeria* (coccidia)

Frequently calf scour infections are diagnosed as mixed infections and *Cryptosporidium* is known as an opportunistic pathogen which can increase rapidly in numbers if calves are under stress due to environmental factors or other pathogen invasion.

Preventing or treating the factors or pathogens which can be controlled can significantly reduce the impact of cryptosporidiosis in your herd:

Cryptosporidium mixed infections: the following measures will not prevent cryptosporidiosis but will reduce other infections and thereby lessen clinical severity.

- Vaccination of dams prior to calving with Rotavec™ Corona vaccine can help control rotavirus, coronavirus and *E. Coli* if adequate colostrum uptake is achieved
- Feeding of adult cattle with Deccox® can help reduce diarrhoea caused by *Eimeria*

Accurate diagnosis of disease:

- It is very important to know what you are dealing with and treat accordingly
- Consult your vet who can advise on diagnostic services such as calf enteritis screening

Important calf management factors promoting high calf health and thereby reducing disease impact include:

- Suitable calf housing facilities - well-ventilated and regularly disinfected
- Careful management of calves into similar age groups
- Good nutrition and welfare
- Effective use of animal health plans for your farm in consultation with your vet



Photographs courtesy of: Moredun, Steve Wright, Sarah Thomson, Beth Wells

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