

# Disease Facts

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Rotaviruses were first confirmed as causing calf diarrhoea in the mid 1970s, and are probably the most important cause of calf diarrhoea, particularly when mixed infections with cryptosporidia are included.

Rotaviruses are in the family Reoviridae, and are hardy, non-enveloped viruses with double-stranded RNA that is divided into 11 segments. The outer capsid of rotaviruses is composed of the VP4 haemagglutinin and the VP7 glycoprotein. These two antigens are the basis of our current serotyping procedure for rotaviruses, with viruses classified on the basis of their G (VP7) and P (VP4) types. Serologically related rotaviruses have been grouped into seven serogroups (A to G). In most species, including cattle, it is the Group A rotaviruses which are most commonly linked to neonatal diarrhoea.

Rotaviruses are generally species-specific but cross species infection is possible. One of the first experimental studies of rotaviral diarrhoea in humans demonstrated the presence of a filterable agent in diarrhoea (which was shown three decades later to be rotavirus) by showing that filtered faeces from babies with diarrhoea, when given intranasally, caused diarrhoea in calves. However RNA hybridisation assays have shown that while rotaviruses from the same species are very similar,

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**Fig. 1:** Antibody transfer via the colostrum is the key to preventing rotaviral diarrhoea.



**Fig. 2:** Intravenous fluids are an economically effective treatment for rotaviral diarrhoea, but prevention is better.

there tend to be significant differences between viruses from different species. Moreover, serotyping of rotaviruses has shown differences; most human rotaviruses belong to G types 1-4 and P types 4 and 8, whereas the commonest serotypes in cattle are G types 6, 8 and 10 and P types 1, 5 and 11. However, neither of these trends is exclusive, some viruses isolated from humans do appear to be similar to those isolated from animals and vice versa. So it is likely that although the apparently restricted host range of rotaviruses is due to a lower fitness in non-host tissues, this lower fitness can be overcome, resulting in zoonotic spread. However the limited data from the UK suggest that this is unusual. More research is needed.

15 G serotypes have been recognised in bovine rotaviruses, however most diarrhoea is caused by one serotype, G6, with serotype G10 usually a long way second. The VP7 glycoprotein is a key antigen for neutralising antibodies, so the difference in serotype may have implications for vaccination, particularly with monovalent vaccines - which tend to be G6-based. There is some evidence that vaccination with a monovalent vaccine will produce a heterotypic lactogenic response, which will provide the calf with

colostral protection against multiple strains, but this is far from fully established in all reasonable circumstances. In particular, the heterotypic response appears to be dependent on prior exposure, so for less common serotypes such as G10 many heifers and, possibly, cows may not have had previous exposure to G10 virus before vaccination. Consequently, calves from such cows may have a higher risk of disease if they encounter a G10-rotavirus than if they are exposed to a G6 strain. Of the three vaccines available in the UK, two contain one G6-strain, while the third contains a G6 and a G10 strain. So, only one vaccine is not relying on the production of a heterotypic response. However, it is unclear how great a risk the lack of such a response is in the UK, and, with our current understanding, consideration of this risk should play only a small role in the choice of rotavirus vaccine. Factors such as efficacy with one dose are probably more important - is it advantageous to be able to vaccinate all animals just once (as is possible with one of the one strain vaccines) rather than having to ensure that all previously unvaccinated cattle get two doses of vaccine.

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*These multiple choice questions are based on the above text. Answers appear on page 47.*

- 1. Which of these statements is not true:**
  - a. Rotavirus is the commonest cause of calf diarrhoea
  - b. It is commonly found in association with cryptosporidia
  - c. Rotaviruses are DNA viruses with 11 segments
  - d. The outer capsid contains a haemagglutinin and a glycoprotein
  
- 2. Which is the most common disease-causing serogroup of rotaviruses in humans and cattle:**
  - a. H in humans, C in cattle
  - b. A in humans, C in cattle
  - c. C in humans, B in cattle
  - d. A in both
  
- 3. Are bovine rotaviruses zoonotic:**
  - a. Yes, most human outbreaks are due to cattle viruses
  - b. Never
  - c. Usually no, but in some circumstances there may be zoonotic spread.

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