Clinical communication: A helicobacter abortion outbreak in two-tooth ewes in Southland

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Abstract

Case history: this report outlines factors involved in 50 abortions in two-tooth ewes on a sheep farming operation.

Clinical findings: Campylobacter fetus, Toxoplasma gondii, Salmonella and fungi could not be identified as a cause of abortion in this report. This led to investigation of a little known cause of abortion through stomach content laboratory testing and further PCR testing.

Clinical relevance: ‘Helicobacter rappini’ is not diagnosed commonly in abortion outbreaks and is not commonly investigated in New Zealand, even when other common causes of abortion have been ruled out. This could be an important cause of abortion that is easily preventable and warrants investigation into the epidemiology of infection.

Keywords: Helicobacter rappini, abortion, sheep, outbreak

Introduction

‘Helicobacter rappini’, previously classified as ‘Flexispira rappini’, is a gram-negative, microaerophilic, flagellated, fusiform-shaped organism closely related to members of the genus Helicobacter. After identification and isolation in culture from aborted lambs (Kirkbride et al. 1985), Kirkbride et al. (1986) confirmed H. rappini as a causative agent of ovine abortions (fulfilling Koch’s postulates) by inoculating a pure culture into sheep.

In 2009, H. rappini was identified in Southland after gross liver lesions identical to that of Campylobacter abortions were found in aborted fetuses, but no Campylobacter could be isolated. Liver histopathology and stomach content laboratory testing of five post-mortem examinations of lambs identified faintly staining gram-negative bacteria consistent with Helicobacter. Molecular techniques were used after culture could not isolate H. rappini, and Helicobacter bacteria were detected in all samples tested (Bingham 2010, Rawdon et al. 2012). The significance of this finding is unknown as limited information is available on the epidemiology and abortifacient potential of Helicobacter spp. More sampling and testing needs to be undertaken to further our knowledge of this bacteria.
Case presentation

Initial investigation

History

On the 24 July 2014, a sheep and beef farm in Southland had seen an increased incidence of late-term abortions in their two-tooth ewes. In the previous two weeks, seven abortions had occurred in a group of 200 twin and triplet bearing two-tooth ewes. All other groups of mixed-age and two-tooth ewes were not showing signs of abortion and were otherwise normal. Planned start of lambing was 30 August 2014.

In late-June, all ewes on-farm had been pregnancy scanned with a lambing percentage of 210%, had been crutched, and were turned-out onto swedes. While on swedes, the group of two-tooth’s aborting were fed moldy, poor-quality baleage, which had been removed once abortions began. All ewes were supplemented with silage, but only multiple-bearing ewes were supplemented with swedes. Ewes were born on the property, but rams were from a local ram breeder, which had been used for a number of years with no issues. No vaccinations had been administered for *Salmonella, Campylobacter* or *Toxoplasma* as abortion prevention. Iodine supplementation had not been used for any sheep on the property.

On 30 July 2014, a further five two-tooth ewes from the same group had aborted. It was recommended to take the ewes off swedes and to graze on grass only. Diagnostic tests and culture results were returned on the same day.

Post-mortem and diagnostic findings

Post-mortem examination was performed on two aborted fetuses; grossly enlarged thyroid glands were the only significant findings; a thyroid: body weight ratio of 1.2 and 1.1 was found, which is considered to be clinical thyroid deficiency (Everett-Hincks and Dodds 2007). Stomach and thoracic fluids were aspirated for diagnostic testing; an abortion panel was undertaken and culture of stomach contents *Salmonella, Listeria, Campylobacter* and fungi resulted in no identification of a causal organism; thoracic fluid toxoplasma antibody titre was also negative.

Differential diagnoses for abortion, with or without systemic illness, were campylobacteriosis, helicobacteriosis, fungal abortion, aflatoxicosis, listeriosis, toxoplasmosis, yersiniosis and salmonellosis.

Follow-up investigation

History

On 19 August 2014, it was reported that abortions had continued in the affected mob of two-tooth ewes; approximately 50 ewes of the group of 200 had aborted. They were grazing on good pasture, were in good condition and the ewes were not showing any other signs of illness.

Post-mortem and diagnostic findings

Stomach contents and heart blood from one aborted fetus was sent for *Campylobacter* culture and toxoplasma antibody titre, respectively. A second entire fetus was sent for necropsy at the lab and no significant histopathological lesions were present; stomach contents were
submitted for aerobic and anaerobic culture, with no growth of *Salmonella* and ‘light growth of *Campylobacter* species after five days, but unable to identify the species’. The light growth was sent for typing, but died in the process and was considered a likely contaminant.

Due to the large number of ewes that had aborted and lack of positive diagnostic results, the laboratory pathologists considered this a candidate for *Helicobacter* species PCR; and so stomach contents and liver tissue were frozen for testing.

### Outcome

At the time of writing this report, Ministry for Primary Industries were performing the laboratory testing to definitively diagnose the abortifacient agent and results are not available at this time. *Helicobacter* is still considered the most likely differential diagnosis and will be subject to this discussion.

### Discussion

Recent findings indicate *H. rappini* is likely an emerging and significant cause of abortion in New Zealand, with reported cases of 9–20% of ewes aborting on a single farm; not only affecting first pregnancy ewes (Gill 2010, Rawdon et al. 2012) as described by the author, but also mixed-age ewes. Annually, one percent of abortions from 1986–1996 were reported by the Animal Health Laboratory Network (Orr 1997) to be caused by a *Fusobacterium*-like organism, now classified in the genus *Helicobacter*. This is consistent with findings from international studies, indicating *H. rappini* as the cause of abortion in 0.6% of infectious cases of abortion outbreaks (Kirkbride 1993). This highlights that it is a significant and important cause of abortion; could it become more important with increasing vaccination usage for the common causes of abortion by increasing the relative incidence of *Helicobacter*-caused abortion? Knowledge of the epidemiological factors in sporadic cases and abortion outbreaks is needed to better identify prevalence of infection, incidence of abortion, risk factors and preventative measures.

The initial discovery of *Helicobacter pylori* in the stomach of humans has led to a large increase in the number of species found in the *Helicobacter* genus. *H. pylori* and *H. rappini* are found within sheep, and a number of *Helicobacter* species are found within other veterinary species (Harbour and Sutton 2008). This has significance as shepherds have been found to have a higher prevalence of *H. pylori* infection, when compared to the general population, indicating a possible route of infection to humans (Dore et al. 1999a), or less likely humans to sheep.

Without more accurate dates for individual ewes aborting, it is difficult to create an accurate epidemic curve from this case. From the information available, it appears a propagated epidemic may have occurred (rather than point source, such as would occur with toxic abortion, e.g. after feeding mouldy hay); 12 abortions occurred in a period of three weeks, from identification of the first aborting ewe to receiving the initial lab results (10–30 July 2014); a further 35–40 abortions followed in the next three week period (31 July–20 August), at a consistent rate throughout. This would indicate that a primary event could have led to the initial abortions occurring, followed by a larger abortion storm with propagation of the infectious agent; what set-off this initial event is unknown at this time, but could have environmental influence (e.g. adverse weather conditions, under-nutrition,
mouldy feed, etc.). Unfortunately the pathogenesis of Helicobacter abortion is not well understood, but pathological findings have been described.

Bingham (2010) and Gill (2010) described pathological features from an earlier case of Helicobacter abortions: coagulative necrosis of fetal livers with silver (Warthin-Starry stain) curved rods along hepatocyte sinusoidal margins, with no stain response to Gram and Giemsa stains; gram-negative bacilli in fresh stomach contents; mild placentitis and meningitis; moderate numbers of Helicobacter-type bacteria within bile canaliculi; and, ovine enzootic abortion and Q fever were ruled out. It has also been reported that gross liver lesions occur in a higher proportion of aborted fetuses than with Campylobacter abortion. No identifiable pathological features were evident in the present case. Two aborted lambs were used for diagnostic evaluation in this case, consistent with recommendations by Gill and Clark (2000). With upwards of 50 aborted fetuses, necropsy (on farm or sent to the laboratory) of at least 10 fresh fetuses and placentae would have allowed for more confidence in the results of laboratory testing.

Further investigation into Helicobacter-caused outbreaks is warranted as unreported abortion epidemics likely have occurred on many more farms. These outbreaks may be preventable and identification of epidemiological factors involved would allow for management strategies for at-risk farms. Abortion outbreaks have a devastating effect on individual farms through loss of high value stock and this incidence of abortion on a single farm warrants further veterinary investigation and intervention.

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