

# Causes of bovine and ovine abortions diagnosed using PCR at Gribbles Veterinary laboratories 2016–2018

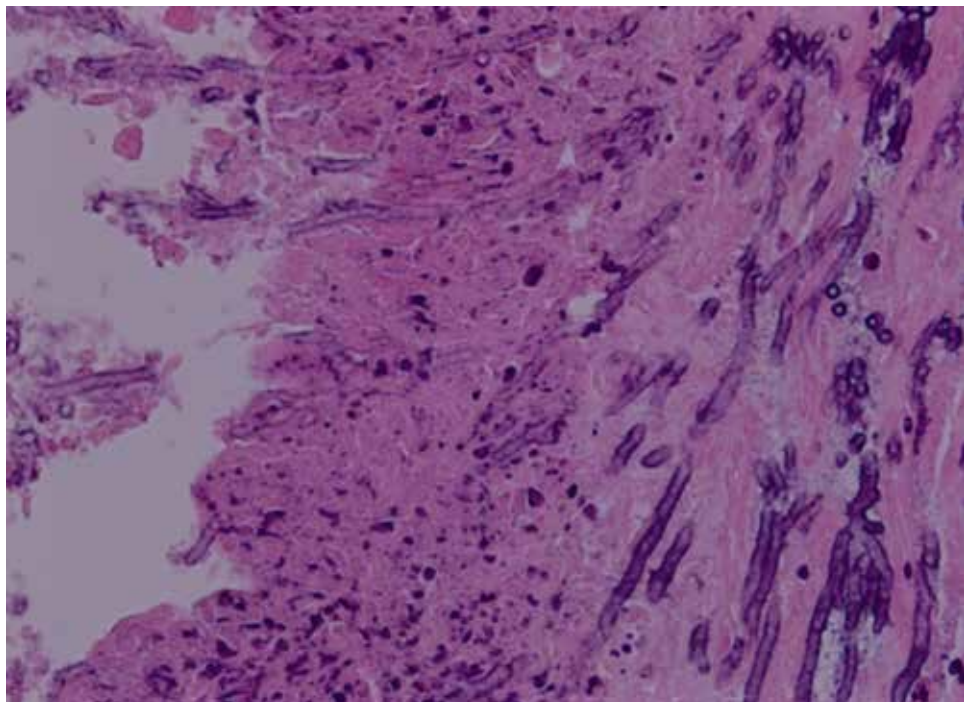
**Cathy Harvey**, Anatomic Pathology Specialist, Gribbles Veterinary, Auckland, discusses the options for PCR testing, the expanded number of organisms tested for, and the prevalence of pathogens identified in infectious causes of abortion in cattle and sheep in New Zealand.

**THE DIAGNOSTIC RATE** for causes of abortion, based on examination of samples submitted to veterinary laboratories throughout the world, varies from five percent to 90%, depending on the species and geographic location. The proportion of abortions that are caused by infection is not known (with the exception of equine cases). However, approximately 90% of abortions in which the cause is determined are found to be as a result of infectious agents (Schlafer and Foster, 2016). Likewise, ruling out infectious agents in abortion cases (ie, negative results) is equally important for herd or flock management.

Preferred samples for laboratory abortion investigations include fresh and formalin-fixed fetal tissues and placenta, fresh fetal fluids and dam serum. It is best to collect a wide range of samples, as those not needed initially can be put on hold to be tested later if required. Fixed tissues include: placenta, brain,

heart, lung, skeletal muscle, liver and kidney. Eyelid with conjunctiva can be useful for lesions seen in *Ureaplasma* and fungal infections. Fresh tissues include: stomach contents, thoracic fluid, heart blood, lung, liver, kidney and placenta (Gribbles Veterinary, 2015). Fetal stomach contents represent a subsample of the amniotic fluid, fetal fluid and fetal plasma (Hill and Tisdall, 2016) and therefore contain infectious agents from the fetus and placenta that can cause abortion. Often, especially for ovine abortions, this may be the only sample required for the most sensitive and specific diagnosis of a pathogenic organism (Gill, 2019).

Polymerase chain reaction (PCR) testing on aborted fetal stomach contents, thoracic fluids and heart blood is now an important part of an investigation of abortion in cattle and sheep in New Zealand (Hill and Tisdall, 2016; Hill et al, 2016), either alone, or in combination with bacterial and fungal culture, serology and histopathology. PCR panels that include multiple



**FIGURE 1:** *Aspergillus fumigatus* fungal hyphae in placenta of bovine abortion H&E stain.

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**TABLE 1:**  
**PCR results from bovine abortion cases 2016–2018**

Pathogen	2016 % detected	2017 % detected	2018 % detected
<i>Neospora caninum</i>	2.1	7.0	8.1
<i>Aspergillus fumigatus</i>	2.1	1.0	6.5
<i>Ureaplasma diversum</i>	1.0	1.0	5.6
<i>Listeria monocytogenes</i>	0.0	0.0	0.8
BVD pestivirus	6.2	4.0	0.0
Leptospirosis	1.0	2.0	0.0
<i>Mortierella wolfii</i>	0.0	1.0	0.0
<i>Bacillus licheniformis</i>	0.0	0.0	0.0
<i>Listeria ivanovii</i>	0.0	0.0	0.0

% detected = number of cases with organism detected/total number of cases x 100

**TABLE 2:**  
**PCR results from ovine abortion cases 2016–2018**

Pathogen	2016 % detected	2017 % detected	2018 % detected
<i>Toxoplasma gondii</i>	16.4	24.6	20.8
<i>Helicobacter</i> spp.	10.9	6.2	4.2
<i>Campylobacter fetus fetus</i>	12.7	7.7	2.1
Hairy shaker disease pestivirus	5.5	4.6	4.2
<i>Chlamydia pecorum</i>	0.0	0.0	2.1
Leptospirosis	0.0	0.0	0.0
<i>Listeria ivanovii</i>	0.0	0.0	0.0
<i>Listeria monocytogenes</i>	0.0	0.0	0.0

% detected = number of cases with organism detected/total number of cases x 100

Note: Salmonella Brandenburg is a significant cause of abortion in New Zealand, but is usually tested by culture, so is not included in the PCR testing results.

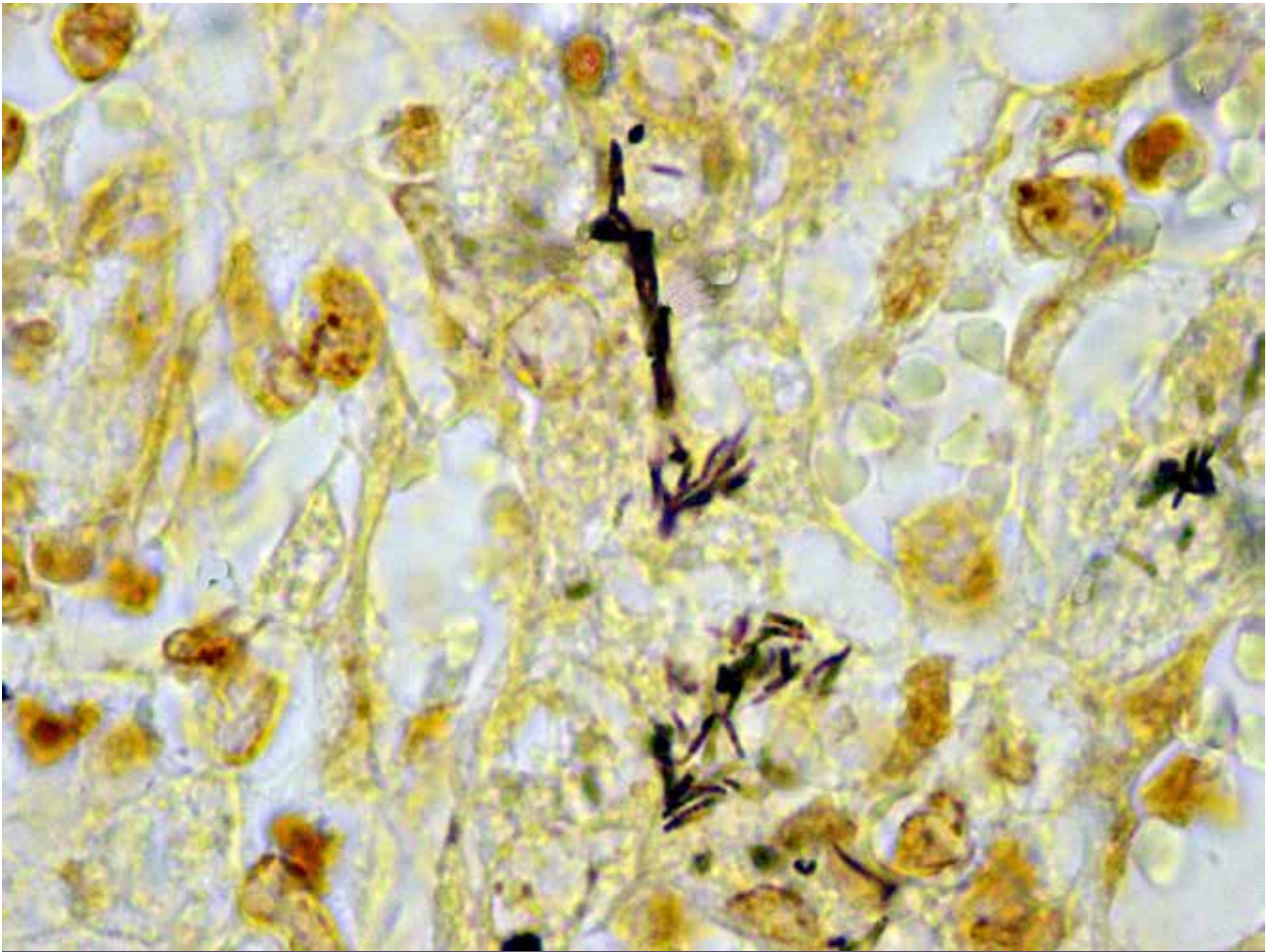
organisms are often a faster and cheaper option for diagnosis, are more sensitive and specific than other tests (serology, histopathology, culture) and can be tailored for species and the stage of gestation that the abortion occurs.

**PCR RESULTS**

A retrospective analysis was performed on PCR testing results for bovine and ovine submissions to Gribbles Veterinary laboratories nationwide in 2016, 2017 and 2018, with a clinical history code for abortion (Tables 1 and 2). PCR test numbers increased each year, and each case often had multiple individual animals tested for individual or multiple pathogens including bovine viral diarrhoea (BVD) virus, hairy shaker virus (border disease), *Neospora caninum*, *Toxoplasma gondii*, *Aspergillus fumigatus* (Figure 1), *Mortierella wolfii*, *Chlamydia pecorum*, *Bacillus licheniformis*, *Campylobacter fetus subsp fetus*, *Helicobacter* spp. (Figure 2), *Leptospira* spp., *Listeria ivanovii*, *Listeria monocytogenes* and *Ureaplasma diversum*. A significant bacterial cause of abortion in the South Island, Salmonella Brandenburg, is usually tested by culture, so is not included in the PCR testing results. In 2018, six bovine submissions were also tested for *Mycoplasma bovis*, which was not detected in the fetal stomach contents or milk from the dams submitted.

For bovine cases, *Neospora caninum*, *Aspergillus fumigatus* and *Ureaplasma diversum* infections predominated, with *Listeria monocytogenes*, BVD virus, *Leptospira* spp. and *Mortierella wolfii* infections also occurring. The fungal infections were often associated with the feeding of mouldy silage/haylage.

For ovine cases, *Toxoplasma gondii*, *Helicobacter* spp., *Campylobacter fetus subsp. fetus* and hairy shaker virus (border disease) predominate, and there were two cases of *Chlamydia pecorum*. *Chlamydia abortus* (the cause of enzootic ovine abortion) has never been diagnosed in New Zealand, but *Chlamydia* (previously *Chlamydophila*)



**FIGURE 2:** *Helicobacter* spp. bacteria in liver of ovine abortion Warthin Starry stain.

*pecorum* has been isolated in New Zealand (Mackereth and Stanislawek, 2002). It is a faecal organism, and has been associated worldwide with sporadic abortions in sheep, goats and cattle (Schlafer and Foster, 2016).

### SUMMARY

This article discussed the options for PCR testing, the expanded number of organisms tested for and the prevalence of pathogens identified in 2016, 2017 and 2018, as well as reiterating the samples required for diagnosis of the cause of abortions in cattle and sheep in New Zealand. PCR testing on aborted fetal stomach contents, thoracic fluids and heart blood is now an important part of an

investigation of abortion in cattle and sheep in New Zealand. PCR panels that include multiple organisms are often a faster and cheaper option for diagnosis, are more sensitive and specific, and can be tailored for species and the stage of gestation at which the abortion occurs. <sup>vs</sup>

### REFERENCES:

- Gill J.** Personal communication. 18 March, 2019
- Gribbles Veterinary.** *Abortion Investigation – Recommended Samples. Tissues to Submit for a General Abortion Workup.* <https://bit.ly/2WfwMhZ> (accessed 20 March 2019), Gribbles Veterinary, New Zealand, 2015
- Hill F, Tisdall D.** Investigating cattle abortions: New PCR options for diagnosis. *VetScript*, 20–2, March 2016
- Hill F, Vastra B, Tisdall D, Gill J.** Investigating

sheep abortions: New PCR options for diagnosis. *Proceedings of the Society of Sheep and Beef Cattle Veterinarians of the NZVA Conference*, Pp 125–30, 2016

**Mackereth GF, Stanislawek W.** First isolation of *Chlamydophila pecorum* in New Zealand. *Surveillance* 29(3), 17–8, 2002

**Schlafer D, Foster R.** Female genital system. In: Maxie GM (ed). *Jubb, Kennedy and Palmer's Pathology of Domestic Animals*. 6th Edtn, vol 3. Pp 399–417. Elsevier, Missouri, USA, 2016

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