What have We Learned about Swine Dysentery in Canada?

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■ Introduction

Swine dysentery re-emerged in western Canada in 2009. Since then, our research team at the University of Saskatchewan has worked with the pork producers, veterinarians, diagnosticians and the Canadian Swine Health Board to investigate and develop diagnostic and control strategies. Since 2009, we have investigated samples from 37 farms in western Canada, primarily in Alberta and Saskatchewan. The presence of one or more species of *Brachyspira* have been detected or isolated in 76% of farms. Many of the farms are independent, i.e. unrelated to each other in terms of ownership, management, pig source and geographic location. Some of the farms inter-related, being a part of a larger production system.

Our research and diagnostic work is funded by the University of Saskatchewan and the Canadian Swine Health Board, and is supported by the Prairie Diagnostic Services, Saskatoon. The purpose of this paper is to reflect on the most important things we have learned about swine dysentery since 2009.

■ Discovery of a Novel Species: “*Brachyspira Hampsonii*”.

By convention, swine dysentery is a disease affecting the large intestine (caecum and colon) caused by a bacteria; *Brachyspirahyodysenteriae* (Bhyo). After ingestion, Bhyo colonizes the colon causing mucohaemorrhagic diarrhea within 1-2 weeks. In late 2009, pigs with mucohaemorrhagic colitis unrelated to Bhyo were identified in two Saskatchewan farms. Additional diagnostic testing revealed the presence of a novel species of *Brachyspira*, temporarily named *Brachyspira* sp. 30446 (Harding 2010). In 2011, researchers at the
University of Minnesota also reported the discovery of “novel strongly hemolytic Brachyspira” associated with bloody diarrhea (Primus 2011). Substantial evidence has been compiled by us and other researchers to propose and provisionally name a new species (Gebhart 2012, Chander 2012, Rubin) and demonstrate that it causes disease clinically and pathologically similar to swine dysentery (Rubin, Burrough).

- **Distribution of Brachyspira Spp. in Western Canadian Farms**

To the end of September 2012, we have completed diagnostics on 211 samples from 37 farms in western Canada. A “sample” refers to feces, tissue, or a carcass from farms demonstrating loose, bloody or mucoid diarrhea in nursery and grow-finish stages. Sixty-six percent of samples tested positive for any *Brachyspira* species by PCR, culture or both. In 43% of samples (not farms) *B. Hampsonii* was detected. By contrast, Bhyo and *B. pilosicoli* (Bpilo), the other pathogenic species, were only detected in 14% and 12% of samples respectively. In 12% of samples, more than one *Brachyspira* species was detected.

- **Improved Brachyspira Diagnostic Tests were Developed**

It was clear from the outset of our investigation that the diagnostic tests available in western Canada were insufficient. *Brachyspira* culture was not available, and species-specific PCR assays were incapable of detecting novel *Brachyspira* species. Since 2009, we have developed new PCR tests specific for the novel strains, and with assistance of the Iowa State Veterinary Diagnostic Laboratory, implemented routine *Brachyspira* culture in WCVM’s Molecular Microbiology Research Laboratory. We continue to collaborate with the Prairie Diagnostic Services to deliver a range of microbiologic tests for *Brachyspira* diagnosis including direct examination, culture, genus- and species-specific PCR, and DNA sequencing.

- **Culture is most Sensitive**

Because *Brachyspira* culture is somewhat onerous, the standard method of diagnosing *Brachyspira* in most diagnostic labs has been PCR. Most labs routinely test for Bhyo and Bpilo, the two traditionally pathogenic species. For technical reasons however, *Brachyspira* PCR is not particularly sensitive. In practice, this means that a sample must contain a relatively high number of organisms per gram in order to be detected positive by PCR. As a result, false negative results are common. We have recently completed a study comparing the sensitivity of culture and genus-specific PCR on rectal swabs.
collected from a farm with a history of *B. Hampsonii* associated colitis (Patterson 2012). Our results indicate culture is far superior to genus-specific PCR; however, a limitation of this study was that PCR were performed on rectal swabs from apparently healthy pigs, and not feces or colonic tissue, as is generally submitted for diagnostic cases. When PCR is performed on rectal swabs, the amount of starting material is very low. By contrast, when feces or tissue are submitted as the diagnostic sample, 200 mg are used as the starting material.

In an experimental infection study we completed in the past year, the diagnostic sensitivity *B. Hampsonii* specific PCR was higher, albeit only ~60% compared to culture. In this particular experiment, feces collected from inoculated animals were used. This implies that feces collected from a diarrheic animal can be used to screen for the presence of *Brachyspira* organisms by PCR, but culture is the preferred method of diagnosis particularly when a few individual pigs are sampled. Rectal swabs should not be used for PCR testing. It is essential that that feces or swabs are packaged in air-tight containers, chilled (not frozen), and shipped immediately to the laboratory.

**Best Samples to Submit for Diagnosis**

Our present recommendation is to submit as much as possible. Live, unmedicated scouring pigs or intestinal tissue (ileum and colon) to the diagnostic laboratory. Live pigs are always preferred because samples can be collected and processed immediately after euthanasia. Fresh chilled and formalin fixed intestinal tissue is a reasonable alternative. All the necessary diagnostic tests including pathology and special stains can be completed on these samples, resulting in the highest probability of confirmatory diagnosis. The submission of feces can be useful for farm screening, but is insufficient to confirm a diagnosis of *Brachyspira* colitis or swine dysentery. The submission of rectal swabs alone should be avoided. Tissues and feces, packaged in airtight, leak-proof containers (not latex gloves), should be shipped by overnight courier to the lab. Do not allow the samples to freeze.

**Biosecurity Breaches are Poorly Understood**

Except for farms that have been infected through contaminated pigs (approximately 50% of farms investigated to date), we have been unable to identify specific biosecurity breaches explaining how most farms became infected with *Brachyspira*. Since the disease is transmitted by fecal-oral transmission, it follows that the farms were exposed to contaminated feces or manure. Since many *Brachyspira* species are normal inhabitants of the gut of pigs and other birds and mammals, wildlife is a potential reservoir. To prevent the spread of the disease, we strongly encourage all producers to conduct a
thorough review of their biosecurity procedures including adoption of the National Biosecurity Standards developed by the Canadian Swine Health Board.

- **Most Age Groups can Shed Brachyspira**

With the exception of suckling piglets, all ages of pigs on infected farms can potentially shed *Brachyspira*. Based on a study just completed (8), the prevalence of shedding was highest in grower pigs (21%), followed by finishers, sows and gilts (7-9%) and nursery pigs (3%). In this study, shedding was defined as any *Brachyspira* species grown on agar following 4 days of anaerobic incubation. Diagnosis however, is most difficult on sows and gilts, because few are clinically affected, and adults likely shed lower numbers of organisms in feces. For this reason, determining if a sow farm is the source of infection can be difficult. In addition, feed medications can mask clinical signs and impede diagnostics. Breeding stock farms needing to declare freedom from pathogenic *Brachyspira* species of concern should remove all medications from grow-finish and breeding herd diets, monitor rigorously for diarrhea, and submit live pigs or tissues from affected animals for histopathology and microbiologic testing.

- **Control**

At present, vaccines to aid in the control of swine dysentery are not available in Canada. Feed medications, primarily in grow-finish diets, are the mainstay of control programs. Various products have been used in western Canada with success including tiamulin, tylosin, salinomycin, virginiamycin and lincomycin. Herd eradication is possible for Bhyo, but is extremely intensive. Whether or not eradication is possible for novel pathogenic *Brachyspira* is unknown. While eradication offers the best means of long-term control, it is difficult to justify on individual farms unless the source of infection is known, and biosecurity can be altered to prevent re-infection. Moreover, some farms may be contaminated with a number of different *Brachyspira* species, some of which may not cause severe disease. Clearly defining the objectives of an eradication program (i.e. elimination of diarrhea or eradication of all *Brachyspira*) is essential.

- **References**


Chander Y, Primus A, Oliveira S, Gebhart CJ. Phenotypic and molecular characterization of a novel strongly hemolytic *Brachyspira* species,


