

# BRACHYSPIRA

– is it spiralling out of control?

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**I**t was back in the 1970s that *Treponema* (now *Brachyspira*) *hyodysenteriae* was shown to be the cause of swine dysentery. Nowadays, we are finding *Brachyspira* in many different animals, including humans and particularly in poultry and wild birds – even in Snowy Sheathbills, as far afield as Antarctica.

*Brachyspira* species were probably always there, but it is only during the past decade or so that we have been able to culture them and identify them biochemically, as well as classify them into different species with more advanced genetic sequencing techniques.

## PATHOGENICITY

So what is the significance of *Brachyspira*? With swine dysentery and *B. hyodysenteriae* it was quite clear, as there was often haemorrhagic diarrhoea and mucus indicative of severe damage to the colon, which led to weight loss in the pig, a negative feed conversion efficiency (FCE) and even, if untreated, death.

The organism was haemolytic on culture, indicating its potential pathogenicity. Then, in the 1980s, the other weakly-haemolytic *spirochaetes* started to appear, one of which was considered non-pathogenic – now called *Brachyspira innocens* and another, *B. pilosicoli*, which caused colitis but did not induce the same level of disease in growing pigs as *B. hyodysenteriae* but only a mucoid diarrhoea, slowing of growth, reduction in FCE and usually no mortality.

Others have now been identified, such as *B. intermedia* and *B. murdochii*, which can be associated with a very mild colitis.



*Brachyspira suanatina* has recently been found to be potentially pathogenic in pigs but although it colonised mallard ducks, did not appear to cause diarrhoea or disease in them. This organism is also strongly haemolytic on culture, but is a separate species from *B. hyodysenteriae*.

In poultry, particularly laying and breeding flocks with diarrhoea or high levels of brown caecal droppings, *spirochaetes* have been identified. In the 1980s and early 1990s in the UK and the Netherlands, they were identified as weakly-haemolytic *spirochaetes* on culture but have since been identified as *B. intermedia*. In the UK report, it affected replacement pullets placed onto contaminated litter, and this caused slower development, delayed onset of lay and an increased mortality of 10%.

In the Netherlands, it depressed egg production in broiler breeders by 7.5% and increased the number of small eggs by a further 3%. In the US, scientists found *B. alvinipulli* responsible for increases in diarrhoea, typhlitis, pasty vents and dirty eggshells but it had no effect on egg production or mortality.

Much work has been done investigat-

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**Table 1: Comparison of *Brachyspira* species – hosts and pathogenicity**

Species	Pig	Chicken	Other
<i>B. hyodysenteriae</i>	Moderate–severe	Mild	Rheas – severe
<i>B. pilosicoli</i>	Mild–moderate	Mild	Turkeys – mild Dogs, man – mild
<i>B. intermedia</i>	None–mild	Mild–moderate	ND
<i>B. innocens</i>	None–mild	None – caged Mild–moderate – free range (mixed infections)	ND
<i>B. suanatina</i>	Moderate	ND	Mallards – none
<i>B. murdochii</i>	None–mild	None–mild	ND
<i>B. alvinipulli</i>	ND	Mild	Geese – moderate
<i>B. aalborgi</i>	ND	ND	Man – moderate– severe, associated with immuno-compromised patients, tumours and mixed infections

ing the prevalence of *Brachyspira* spp in UK flocks and in 2004 we identified *B. pilosicoli* on a multi-age caged farm. This appeared to depress egg production by 6% and increased mortality by 8%. This led to further investigation of the prevalence of *Brachyspira* spp in poultry, particularly in free-range flocks, which reported a high incidence of caecal droppings and poor egg production.

#### DIAGNOSTICS

Diagnosis still has a number of problems. Culture and growth of the organisms is slow and specialised. Differentiation of the species by biochemical means also doubles the time to achieve identification and it is frequently takes two weeks for a diagnosis. Recently there have been suspicions that by culturing, there may be some selection for the faster growing *Brachyspira* spp masking that there may be more mixed infections.

The more rapid test was using polymer chain reaction (PCR) techniques, which can take just a couple of days for a result. The most advanced system was only available at SAC Edinburgh and looked only for the major pig isolates *B. hyodysenteriae*, *B. pilosicoli* and *B. innocens*. This system could not differentiate between *B. innocens* and *B. intermedia* and did not recognise the other species. From a poultry perspective, this made it difficult to say absolutely whether potentially pathogenic isolates were present eg *B. intermedia*.

Further work is ongoing and it is hoped that species specific PCR tests will be available for diagnostic samples from chickens.

#### SURVEYS

In an early UK survey, we found that 90% of free-range flocks with depressed egg production were infected with *B. innocens* and a further 70% had pathogenic iso-

lates such as *B. intermedia* and *B. pilosicoli* ie mixed infections. It must always be remembered that *Brachyspira* is only a part of a differential diagnosis as we also found 30% of flocks had high worm burdens and another 20% had recent infectious bronchitis challenges.

Generally, in several surveys around the world, 70% of layer flocks were infected with *Brachyspira* spp and about 30% had potentially pathogenic strains. This affected both caged and barn birds and about 40% of broiler-breeder flocks in an Australian survey. A recent US survey showed that 86% of flocks, aged >40 weeks were positive to potentially pathogenic *Brachyspira* spp. This may well have some effect on performance in older flocks.

In a major UK survey of 220 flocks in 2008, using cultural techniques, we found that free-range and organic flocks were approximately 90% infected with *Brachyspira* and the majority of flocks were positive as early as 22 weeks of age. In contrast, caged flocks were 76% but barns were 100%. Caged birds became positive later at about 36 weeks of age. Replacement pullet flocks prior to placement were all negative, confirming the findings of other investigators and demonstrating that vertical transmission is not a factor.

#### EFFECT ON PERFORMANCE

Free-range flocks generally had a significantly lower egg production than caged flocks but *B. innocens* appeared to be pathogenic in free-range but not in caged birds. *Brachyspira intermedia* were also shown to be pathogenic in caged flocks.

#### TRANSMISSION

This begs the question why free-range flocks appear to be so heavily challenged by *Brachyspira*? Effectively, there is little biosecurity in free-range flocks as they are

open to the air. Wild birds can have easy access; flies are common and can be mechanical carriers of the organism. Rodents, especially rats, can be heavily infected with the bacteria and can transmit them.

The range itself, I suspect, acts as a reservoir between flocks and it is very difficult to control the level of contamination. In caged flocks, the problem is commonly associated with fly problems and occasionally rodents.

It is always surprising to me how quickly a fly problem can develop on a farm but the fly larvae love to grow in faecal waste, so integrated fly control programmes using larvicides such as cyromazine (Neporex) and adulticides such as spinosad (Spy) are essential.

#### CONTROL

So far, control has been successfully based on the use of antibiotics such as tiamulin (Novartis Animal Health's Denagard). The use of organic acids in the water, pre- and probiotics have also been advocated with mixed results.

In some farms autogenous vaccines have been used but there are difficulties in selecting the right strain as in several cases we have isolated two to three different *Brachyspira* species on farms with multi-age flocks.

In the UK, it will be interesting to see how *Brachyspira* infections develop in the future. In the new enriched colony housing with belt cleaning systems, it is expected that the level of disease will fall but as free-range farms increase, as we approach 2012, we might find a steady increase in *Brachyspira* infections. Hopefully, they will not spiral out of control.

**“Free-range and organic flocks were approximately 90% infected with *Brachyspira*”**