Sneaky *Salmonella*

Rob Fairley, from Gribbles Veterinary Laboratories Christchurch, educates us on the hows and whys of salmonellosis outbreaks.

WHENEVER THERE IS an outbreak of salmonellosis on a dairy, beef or sheep farm, we often get asked where the *Salmonella* came from. The standard answer is that carrier animals within the herd or flock were the likely source.

Of course at some point in time a particular *Salmonella* serotype needs to gain entry to a herd or flock. For example, *Salmonella* Brandenburg has progressively spread throughout the South Island and it seems likely that, with the widespread movement of animals in New Zealand, it has been transported there by carrier animals and lives in several herds and flocks in the North Island – even though the disease has occurred there much less commonly. It's likely that *Salmonella* is present in nearly every dairy herd in the country (Fossler et al., 2004).

If *Salmonella* is present in carrier animals in a herd, why is clinical disease not more common? What factors determine whether disease occurs? It's not just the presence of an organism that causes disease; it's the presence of an organism and other factors. For epidemiologists this is standard stuff to do with the interaction of the agent, the host and the environment.

Farmers often think that an outbreak of *Salmonella* comes from an external source rather than the affected herd or flock itself and any other factors on the farm that might predispose to infection (ducks are a favourite target!).

However, an outbreak is more about factors or stressors in relation to the stock that allow the bacteria residing in the herd or flock to proliferate and cause disease. Having said that, farmers are well aware of the spread of *Salmonella* Brandenburg throughout the South Island in particular, and are quite right to ask how the bacteria came to be present on their farms.

The notion of *Salmonella* living quietly in animals in a herd or flock is no different from the situation for many other bacteria that live in animals and that under the right circumstances may subsequently cause disease. Think *Mycoplasma bovis* for a start; many owners of farms with infected stock had no idea of its presence. Organisms like *Histophilus somni* and *Mannheimia haemolytica* are normal residents of cattle's upper respiratory tracts, yet when provided with the right opportunity may proliferate and cause disease.

The factors that lead to salmonellosis may not be obvious when looking at an individual farm. For example, there have been many outbreaks of *Salmonella* Typhimurium infection in North Island cows in the past, but a veterinarian investigating a single farm would struggle to work out why. One epidemiological study found that outbreaks were highly associated with the use of a magnesium supplement (not contaminated with *Salmonella*) (Stevenson et al., 2016).

If the use of that supplement was the precipitating factor, it presumably altered the physiological conditions in the gastrointestinal tract, allowing *Salmonella* to proliferate. In this situation farmers were applying what they thought were good management practices. This example shows that it's not simply stress from poor management or inclement weather that leads to disease outbreaks.

But stress can be important. Experimental work has shown that even when horses were given very high doses of *Salmonella*, the disease failed to appear (Smith et al., 1979). However, when food was withheld for 24–48 hours in another group, even small doses of *Salmonella* resulted in illness. This study illustrates that it's not just the presence of an organism that causes disease; it's the combination of the presence of an organism and other factors.

If animals are a prime source of new serotypes in a herd, what about in a country? There are various means by which a new serotype could come into New Zealand, but live animals are a risk and one serotype we would do well to keep out is *Salmonella* Dublin. This organism is present in Australia, so if imports of live cattle were to occur (resume) from Australia they would be a potential source of this serotype.

Salmonellosis outbreaks can't be attributed to a single factor. It's important to consider animals, people and the environment. VS

REFERENCES:

Fossler CP, Wells SJ, Kaneene JB, Ruegg PL, Warnick LD, Bender JB, Godden S, Halbert L, Campbell AM, Zwald AG. Prevalence of *Salmonella* spp on conventional and organic dairy farms. *Journal of the American Veterinary Medicine Association* 225, 567–573. 2004

Smith B, Reina-Guerra M, Hardy AJ, Habasha F. Equine salmonellosis: experimental production of four syndromes. *American Journal of Veterinary Research* 40(8), 1072–7. 1979

Stevenson MA, Morgan PL, Sanhueza J, Oakley GE, Bateman RS, McFadden A, MacPherson N, Owen KL, Burton L, Walsh S, et al. A case-control study to identify risk factors for acute salmonellosis in New Zealand dairy herds, 2011–2012. *Epidemiology & Infection* 144, 2154–64, 2016

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