

Bacteriophages

– no magic bullet

but some potential in combating

Salmonella

by KATE PROCTER

Tests have shown that, though bacteriophages were unable to eliminate *Salmonella* completely, their presence does explain why certain pigs are less susceptible than others

Antibiotics are recognized as one of the most significant discoveries of the 20th century. However, through misuse and over prescription, there has been an emergence of resistant pathogens such as *Salmonella*, which can be difficult to treat if contracted by consumers. Therefore, attempts are being made to phase out antibiotics in animal production and find alternative approaches to control pathogens.

Viruses known as “bacteriophages” are just one example of an alternative to antibiotics which show promise in reducing the prevalence of pathogens on the farm, and which not only enhance animal welfare but also reduce the risk of pathogens passing onto the processing stage. “They will hunt out, infect and replicate within their host, then burst out and infect the next bacteria,” explains Dr. Keith Warriner, who is studying bacteriophages with his team at the University of Guelph.

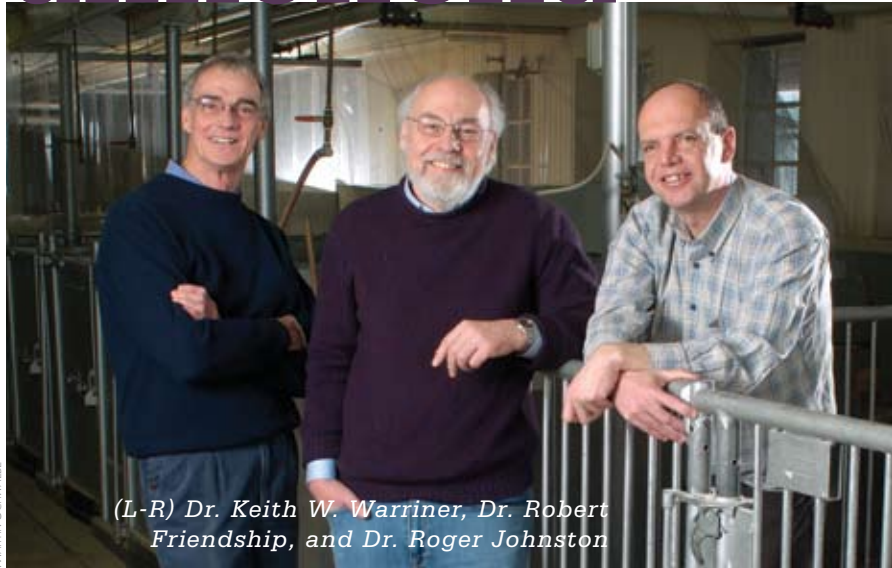
Dr. Robert Friendship of the Department of Population Medicine, University of Guelph, Dr. Roger Johnston of the Public Health Agency of Canada’s Laboratory for Foodborne Zoonoses and Dr. Magdalena Kostrzynska of Agriculture and Agri-Food Canada, worked with Dr. Warriner in the study.

Bacteriophages are not new. Discovered in the early 1920s, they have been studied in many European countries and in eastern Europe, for example, hospitals will administer both antibiotics and bacteriophages to fight bacterial infections.

One of the big advantages bacteriophages have over antibiotics is that they require a specific bacterial host in order to replicate. Antibiotics, which are non-specific, kill all bacteria, both good and bad. This can lead to further complications, such as making patients susceptible to *Clostridium difficile* infection, which is potentially lethal.

The researchers developed a bacteriophage method to control *Salmonella* in pig production with the aim of improving animal health and reducing the extent to which *Salmonella* reaches the slaughter line and, in turn, the consumer.

One of the first steps was finding a combination of bacteriophages that would be the most effective against *Salmonella*.



(L-R) Dr. Keith W. Warriner, Dr. Robert Friendship, and Dr. Roger Johnston

The researchers used four-week old pigs and infected them with *Salmonella* Typhimurium DT104, a significant antibiotic-resistant pathogen. The bacteriophages were administered by two different routes – injected with milk into the mouth and sprayed in the piglets’ environment.

The piglets were sampled over a four-week period. The researchers then compared fecal samples, the gastro-intestinal tract, the lymph nodes and the spleen between the control group and the treated pigs. They did not find much difference between the two groups of pigs with *Salmonella* levels being very low in the treated and control groups.

“We were injecting high levels of *Salmonella*. The pigs should have been sick, but they were only shedding *Salmonella* at low levels,” said Dr. Warriner. The researchers took a closer look at the control group and found indications that bacteriophages were present in the animals before they arrived for the study.

“The evidence suggests that the bacteriophages are naturally present in some herds, which may explain why certain pigs are less susceptible to carrying *Salmonella* than others,” explained Dr. Warriner.

In one respect, the results are encouraging and show the potential of bacteriophage therapy. “However, it was noteworthy that, despite applying high phage levels beyond what would be encountered in nature, they were not able to completely eliminate *Salmonella*. Therefore, bacteriophages cannot be considered a magic bullet but can be used in combination with other interventions, I don’t think there is much data to support the use of probiotics to control *Salmonella* in swine herds.”

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