

PORK SAFETY

Title: Use of naturally-occurring bacteriophage to reduce *Salmonella* in swine prior to harvest.
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Abstract

Swine can be a reservoir of *Salmonella* that can be transmitted to human consumers of pork products. Bacteriophage are viruses that prey on bacteria and may be a potential strategy to reduce foodborne pathogenic bacteria in the gastrointestinal tract of food animals. Phages are fairly common in the gastrointestinal microbial ecosystem of mammals, but the incidence is unknown. If phages are to be an intervention strategy, we must understand their role in the microbial ecology of the gut. Therefore the current study was designed to determine the incidence of phage active against *Salmonella* spp. in the feces of commercial finishing swine in the United States. Fecal samples (n=60) were collected from each of six commercial swine finishing operations. Samples were collected from 10 randomly selected pens throughout each operation. Total number of fecal samples collected in this study was n=360. *Salmonella* spp. were found in 6.6% of the fecal samples. *Salmonella* spp. were isolated from only 2 farms and the serotypes represented were Schwarzengrund, Anatum, Ohio and Heidelberg. Bacteriophages were isolated from fecal sample through 2 parallel methods, 1) initial enrichment in *Salmonella* Typhimurium, or 2) initial enrichment in *E. coli* B (a strain very sensitive to phages); followed by direct spot-testing against *Salmonella* Typhimurium. Bacteriophages active against *Salmonella* Typhimurium were isolated from 1.1% (4/360) of the individual fecal samples when initially enriched in *Salmonella* Typhimurium, but *E. coli* B-killing phages were isolated from 43.8% (158/360) of the fecal samples but only 2 of these isolates were capable of killing *Salmonella* Typhimurium. Our results indicate that bacteriophage capable of killing *Salmonella* Typhimurium are fairly widespread across commercial swine production facilities but may be present at relatively low populations. When these pigs artificially infected with *Salmonella* Typhimurium were dosed with these phage isolates (10^9 PFU/pig) at 24 and 48 h prior to sacrifice, cecal populations of *Salmonella* were reduced slightly over 10-fold, and the number of pigs positive for *Salmonella* in the cecum were lower. *Salmonella* populations of the rectum were not changed by phage treatment, nor were the numbers of pigs containing *Salmonella* in the ileocecal lymph nodes. Phage isolates were used as an area spray to kill *Salmonella* on surfaces similar to lairage pens; however because these phage were isolated anaerobically, their efficacy under aerobic conditions was minimal. These results indicate that phage (predator) populations may vary along with *Salmonella* (prey) populations and that phage could potentially be used as a food safety pathogen reduction strategy.

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