



International Alliance for
Biological Standardization

Avoiding Antimicrobial Resistance: Veterinary Use of Phages for Prevention, Therapy and Control of Bacterial Infections

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Towards bacteriophage control of Campylobacter in the poultry rearing environment

BACKGROUND

Campylobacter species are the most common cause of human bacterial gastroenteritis worldwide. Poultry are a reservoir for the pathogen and poultry meat a major source of foodborne Campylobacter. Birds reared for meat are a target for the application of bacteriophages to control Campylobacter at source. Campylobacter bacteriophages are frequently present in poultry production units and can be recovered from retail poultry meat, and are therefore regularly encountered by birds in production facilities and the consumer without harm.

METHODS

In vivo studies, Ross 308 broiler chickens colonized by *C. jejuni* formed the basis to test the efficacy of phage therapy against Campylobacter. Chickens were colonized at 6 or 20 days of age by oral gavage, and either phage(s) or a placebo administered before colonization as a prophylactic measure or after as active therapy. Campylobacters and phages were recovered from intestinal contents or organs at necropsy to assess colonization levels. The frequency of resistance to bacteriophages post-intervention was assessed using single colonies recovered from primary isolation plates onto which intestinal contents from all phage-treated and control birds had been inoculated. The impact of phage therapy was assessed on the 16S rRNA PCR amplifiable bacterial communities of the gut using DNAs isolated from ileal and cecal contents.

RESULTS

Monophages or phage combinations containing virulent Campylobacter phages significantly reduced Campylobacter counts from the cecal contents of broiler chickens ($p < 0.05$). The reductions observed varied with the phage and the phage titres applied but ranged between 1 and 5 log₁₀ CFU/g. Reductions in the colonization levels were evident throughout the rearing periods but were most effective 2 days post-treatment. Effective phage therapy coincided with evidence for phage replication in vivo to establish stable populations. Bacteriophage predation of *C. jejuni* was not found to affect the resident bacterial microbiota but selectively reduced the abundance of *C. jejuni*.

CONCLUSIONS

Campylobacter bacteriophages can reduce the intestinal carriage of *C. jejuni* in broiler chickens without any collateral effects on the gut microbiota.