Comparison of the Effects of Two Sulfonamide Containing Antimicrobial Combinations on Growth, Disease Manifestation and Bacterial Colonization in Swine Infected with Bordetella bronchiseptica

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Sulfonamides are commonly added to water or feed to control atrophic rhinitis of swine caused by Bordetella bronchiseptica (Switzer 1963, Farington and Shively 1979). Currently, the only sulfonamides approved in the United States for continuous feed medication to swine are sulfamethazine and sulfathiazole. When comparing these two sulfonamides, one might expect that because of its greater solubility (Stower 1965) and in vitro antimicrobial activity (Florestano and Bahler 1952, Hawking and Lawrence 1950, Williams 1978), sulfathiazole would acheive greater tissue levels in vivo and be more effective than sulfamethazine in controlling bacterial infections. Since these two sulfonamides are usually only used as feed additives in combination with other growth promoting antibiotics (sulfathiazole with chlortetracycline and penicillin, and sulfamethazine with chlortetracycline and penicillin or with tylosin), we compared two commercial products which only differed with respect to the sulfonamide they contained.

Seventy five (75) pigs ages 3 to 4 weeks were each inoculated with a virulent, sulfonamide susceptible strain of B. bronchiseptica prior to receiving penicillin-chlortetracycline-sulfathiazole (PTST), penicillin-chlortetracycline-sulfamethazine (PTSM) or unmedicated, antimicrobial free, feed. The purpose of the study was to compare the efficacies of the two antimicrobial combinations administered continuously in the feed of rapidly growing young swine in controlling B. bronchiseptica infections. Concurrent, naturally occurring, infection with a sulfonamide resistant strain of B. bronchiseptica in this herd enabled us to make additional observations related to the interactions between these microbial organisms and the effects of antimicrobial treatment.

As anticipated, both treatments reduced the extent of infection with the sulfonamide susceptible B. bronchiseptica strain. By two weeks after the start of medication, there was a significant ($P<.01$) reduction in the numbers of sulfonamide-sensitive organisms in treated groups (13% and 8% as compared to 64% in the untreated controls). PTST appeared to be slightly more effective as it completely cleared the infection by 4 weeks post-inoculation/medication as compared to 5 weeks for PTSM treatment. Also, three weeks after withdrawal of the medicated feed, sulfonamide-sensitive organisms reappeared in PTSM treated pigs whereas PTST treated pigs remained free of these organisms. Neither PTST nor PTSM treatments eliminated infection with the sulfonamide resistant bordetella; however, at the end of the medication period the PTST treated group had 13 percent fewer bordetella isolations than the untreated or PTSM treated groups. This suggests that continued medication may have produced more pronounced beneficial effects even in the face of infection with sulfonamide resistant bordetella.

Antimicrobial treatment had a slight effect on turbinate atrophy. Mean turbinate atrophy scores for the PTST, PTSM and untreated groups were 1.86, 1.95 and 2.07 respectively. There was no difference between the PTST and untreated groups with regard to mean daily weight gain and feed efficiency; however, the PTSM treated group had lower values for each of these parameters.

Although existing infection with a sulfonamide resistant bordetella complicated our clinical evaluation of PTST and PTSM treatments in these young feeder pigs, it was apparent by every parameter tested that PTST was as effective as PTSM. In view of the effect of PTSM and PTST treatments on infection with sulfonamide susceptible bordetella, the respective sulfonamide blood levels were measured during the course of antimicrobial treatment. The mean blood levels over the course of treatment were 0.26 and 4.5 ppm for sulfathiazole and sulfamethazine, respectively. Pigs in the unmedicated control group had no detectable levels of sulfathiazole or sulfamethazine during the study. This observation suggests that blood level is not a good indicator of the clinical effectiveness of these sulfonamides in treating infections with B. bronchiseptica.

Selected References: Switzer, W. P.; 1963, Vet. Med. 58:571; Farrington, D. O. and Shively, J. E.; 1979, J. Am. Vet. Med. Assn. 174:597; Stowe, C. M.; The Sulfonamides in Veterinary Pharmacology and Therapeutics, L. M. Jones Ed. Iowa State University Press, Ames; Florestano, H. J. and Bahler, M.E.; 1952 J. Am. Vet. Med. Assn. 121:474; Hawking, F. and Lawrence, J.; The Sulfonamides H. K. Lewis and Co. Ltd., London 1950.