RESEARCH ABSTRACT

PORK SAFETY

Title: Use of sodium chlorate to eliminate gram-negative pathogens in live hogs: Dose titration study to determine safe tissue residues, **NPB #05-043**

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Abstract

An experimental chlorate-based product (ECP) has been developed which selectively kills or eliminates *Salmonella* species and *E. coli* O157:H7 in the gastrointestinal tracts of live swine. Several studies by Robin Anderson of USDA ARS Food and Feed Safety Research Laboratory in College Station, TX have clearly demonstrated the efficacy of ECP at eliminating these pathogens from grower and finisher hogs. Prior to the successful commercial use of ECP as a feed or water additive, the identity and magnitude of chlorate-based residues remaining in edible tissues of treated swine must be determined. Such data will be useful in the safety assessment of ECP as a possible pre-harvest food safety tool.

In this study three sets of two pigs, each consisting of a barrow and a gilt, were orally dosed with a total of 20, 40, or 60 mg of sodium [^{36}Cl]chlorate per kg body weight via the drinking water. Urine and feces were collected throughout the 30-h study. Twenty-four h after the last exposure to [^{36}Cl]chlorate, each pig was harvested and both edible and inedible tissues were collected. Urine and tissue samples were analyzed for total radioactive residues and for chlorate metabolites. Greater than 80% of the radioactivity was eliminated in the urine regardless of dose, indicating that most of the ECP was absorbed from the gastrointestinal tract. Fecal elimination of radioactivity averaged 1.1% of the dosed radiochlorine across all doses. Parent chlorate always represented greater than 97.4% of the urinary radiochlorine with the remaining radiochlorine being excreted as chloride ion (the form of chlorine found in table salt). Chlorate represented 39 to 77% (7 to 110 ppm on a concentration basis) of fecal radioactivity, depending upon the dose. These results indicate that ECP delivered via the drinking water is delivered to the lower gastrointestinal tract in an inefficient manner. ECP concentrations in edible tissues ranged from 0.01 to 0.49 ppm, with residues in liver and skeletal muscle generally being lower than those in kidney and adipose tissue. In edible tissues, chlorate concentrations fell well below provisional safe tissue concentrations estimated by the US FDA Center for Veterinary Medicine. Chlorate residues were concentrated in thyroid tissues (7.7 to 25.4 ppm) relative to edible tissues, however. No evidence for the presence of chlorite was observed in excreta or in tissues and the only chlorate metabolite present was chloride, a naturally occurring nutrient. Results of this study suggest that further development of chlorate as a pre-harvest food safety tool in swine merits serious consideration.