

**Title:** Antimicrobial Residues and Antimicrobial Resistance as Affected by Swine Manure Pit Storage Additives – **NPB #17-045**

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### Scientific Abstract

Current swine industry practice is to house animals in confinement facilities which capture and store feces and urine as slurry in pits below the production area. Additives and disinfectants may be introduced into the manure pits. This study was conducted to measure the effects of additives and disinfectants on temporal changes in swine slurry characteristics. Slurry from a commercial swine production facility in southeast Nebraska, USA was collected and transferred to 57 L reactors located within a greenhouse. Selected additives and disinfectants were added to the reactors and physical properties, chemical characteristics, and antibiotic concentrations were monitored for 40 days. Concentrations of dry matter (DM), total nitrogen (TN), phosphorus pentoxide ( $P_2O_5$ ), calcium (Ca), magnesium (Mg), zinc (Zn), iron (Fe), manganese (Mn), and copper (Cu) were significantly greater than the Control in each of the reactors containing additives. The reactors in which the additives MOC-7, More Than Manure®, Sludge Away, and Sulfi-Doxx were introduced had significantly greater values of chemical oxygen demand (COD), total volatile solids (TVS), total suspended solids (TSS), total solids (TS), dry matter (DM), TN,  $P_2O_5$ , Ca, Mg, Zn, Fe, Mn, Cu and chlortetracycline than the other additive treatments. Concentrations of TVS and TSS were significantly lower in the reactors containing Clorox® and Virkon™ than the other disinfectant treatments. The total dissolved solids (TDS) concentration of 26,500 mg L<sup>-1</sup> and pH value of 7.27 obtained for the reactors containing Tek-Trol were significantly greater than measurements obtained for the other treatments. Concentrations of chlortetracycline and tiamulin of 8840 and 28.8 ng g<sup>-1</sup>, respectively, were significantly lower for the treatments containing Tek-Trol. The sodium (Na) concentration of 1070 mg L<sup>-1</sup> measured in the reactors containing Clorox® was significantly greater than values for the other disinfectant treatments. Three out of the six pit additives analyzed were found to significantly increase the

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concentration of all ARGs during simulated storage. The only treatment that exhibited a significant decrease was Sludge Away, a product labeled with purple sulfur bacteria and fulvic and humic acids and claimed to reduce solids and control odors. Two out of the four disinfectants significantly reduced the ARG concentration as compared to the control, Tek-Trol and Pi Quat. Tek-Trol is a phenol disinfectant and Pi Quat is a QAC. The mode of disinfection by both phenol and QAC is cell lysis. A strong correlation was observed between *erm(F)*, *tet(Q)*, and *tet(X)* suggesting they may exist in the same bacterial population or on the same plasmid. The two genes *erm(B)* and *tet(O)* exhibited a strong correlation as well. Taken together, the results from this study indicate that the introduction of selected additives and disinfectants may influence certain physical properties, chemical characteristics, antibiotic and ARG concentrations of swine slurry.