

Antibiotic Residue Survey of Distillers Co-products for Livestock and Poultry in the Upper Midwest

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Abstract

Antibiotics are utilized in ethanol production to control deleterious bacteria from competing with yeast for nutrients during ethanol fermentation. However, there is no published scientific information on whether antibiotic residues are present in distillers grains (DG) co-products from ethanol production, or whether they retain their biological activity. Therefore, the objectives of this study were to quantify concentrations of various antibiotic residues in DG and to determine whether residues were biologically active. Twenty distillers wet grains and 20 distillers dried grains samples were collected quarterly from nine states and 43 ethanol plants in the United States. Samples were analyzed for DM, CP, NDF, crude fat, S, P, pH, and titratable acidity to describe the nutritional characteristics of the samples evaluated. Samples were also analyzed for the presence of erythromycin, penicillin G, tetracycline, tylosin, and virginiamycin M1 using liquid chromatography and mass spectrometry. Additionally, virginiamycin residues were determined using an FDA-approved bioassay method. Samples were extracted and further analyzed for biological activity by exposing the sample extracts to 10^4 to 10^7 CFU/mL concentrations of sentinel bacterial strains *Escherichia coli* ATCC 8739 and *Listeria monocytogenes* ATCC 19115. Extracts that inhibited bacterial growth were considered to have biological activity. Physiochemical characteristics varied among samples, but were consistent with previous findings. Thirteen percent of all samples contained low (≤ 1.12 ppm) antibiotic concentrations. Only one sample extract inhibited growth of *E. coli* at 10^4 CFU/g, but this sample contained no detectable concentrations of antibiotic residues. No extracts inhibited *L. monocytogenes* growth. These data indicate that the likelihood of detectable concentrations of antibiotic residues in DG is low, and if detected, they are found in very low concentrations. The inhibition in only one DG sample by sentinel bacteria suggests that antibiotic residues in DG were inactivated during the production process or are present in sublethal concentrations.

Keywords: antibiotic, antimicrobial, distillers grains, ethanol production



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