Pharmacokinetics and Safety of Sulfamethoxazole-Trimethoprim After Oral Administration of Single and Multiple Doses to Rhode Island Red Chickens (Gallus gallus domesticus)

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Abstract: Sulfamethoxazole-trimethoprim (SMZ-TMP), a commonly prescribed antibiotic for backyard hens, is neither Food and Drug Administration approved nor prohibited in laying hens in the United States. The aim of this study was to determine whether plasma concentrations above targeted minimum inhibitory concentration breakpoint values for Enterobacteriaceae could be achieved with oral dosing. Five Rhode Island red hens (Gallus gallus domesticus) were administered a single dose of 96 mg/kg SMZ-TMP (80 mg/kg SMZ and 16 mg/kg TMP) IV followed by the same dose orally after a washout period. Following oral dosing, mean SMZ concentrations exceeded the target breakpoint for approximately 12 hours; however, TMP only briefly exceeded the target breakpoint. Bioavailability was 60.5% for SMZ and 82.0% for TMP. Ten naïve birds were allocated into control (n = 4) and treatment (n = 6) groups for a 7-day multi-dose study. Treatment birds received an oral suspension dosed at 16 mg/kg TMP and 80 mg/kg SMZ every 48 hours (on days 1, 3, 5, and 7); TMP tablets were additionally dosed at 25 mg/bird on days 1, 3, 5, and 7, and 50 mg/bird on days 2, 4, and 6. Plasma SMZ-TMP concentrations were measured on a multiple time interval by ultraperformance liquid chromatography–mass spectrometry, and pharmacokinetic analyses were performed using a noncompartmental model. No accumulation for either drug was noted following repeated dosing, and no statistical differences in biochemical values, packed cell volumes, or weight were found between pre- and posttreatment in either the treatment or control groups. Sulfamethoxazole (80 mg/kg q48h PO) and TMP (24.1–28.0 mg/kg q24h PO) maintained therapeutic plasma concentrations at or exceeding the minimum inhibitory concentration breakpoint of Enterobacteriaceae for 72 and 24 hours for TMP and SMZ, respectively, without evidence of adverse effects or drug accumulation. Further studies are needed to refine this dosage regimen and evaluate adverse effects in ill birds.