

ZEO Health Pilot Study: RELATIVE BIOAVAILABILITY OF ARSENIC AND LEAD IN TWO PROPRIETARY TEST MATERIALS

University of Missouri, Dept. of Veterinary Pathology; 2015 Sept.

Stan. W. Casteel, DVM, PhD, DABVT

Margaret Dunsmore, BS

A pilot study using a limited number (6) of juvenile swine as test animals was performed to measure the gastrointestinal absorption of arsenic and lead from two proprietary materials (clinoptilolite-zeolite) for ZEO Health Ltd. The relative oral bioavailability of arsenic and lead was assessed by comparing the absorption of arsenic from the test materials (n=2/group) to that of sodium arsenate and lead acetate (n=1 per), respectively. Six swine were used for this fourteen day pilot study, divided into four test groups. Swine were dosed two times per day with test or reference material. A pre-study bleeding (for lead) and urine collection (for arsenic) served as negative control values for the study. Swine were fed two times per day with a nutritionally complete feed at 4% of mean body weight of the swine, adjusted for growth. The feed was analyzed and contained naturally occurring lead at 55.4 ng/g and arsenic at 101ng/g. The feed ended up making a greater contribution to the arsenic excretion than the test materials. The amount of arsenic absorbed by each animal was evaluated by measuring the amount of arsenic excreted in the urine (collected over 48-hour periods beginning on days -2, 7 and 12). The amount of lead absorbed by each animal was evaluated by measuring the amount of lead found in a blood sample drawn from the anterior vena cava on days -1, 3, 6 and 14. Urine (As), blood (Pb) and feed and water (As and Pb) samples were analyzed for lead and arsenic by ICP-mass spectrometry with an estimated method detection limit of 1.8ng/g for lead and 1.8ng/L for arsenic. The two test materials did not generate any increase in blood lead in the test animals over the background. Interestingly, blood lead even decreased to below detection for the test animals, indicating a possible lead chelating effect of the test material. Arsenic levels excreted by the two test material group pigs was at the most double the background level prior to the start of the study, and the amount of feed being consumed was increasing as the pigs grew. There was an increase in the excretion of arsenic in urine, which increased throughout the study. It is presumed that this increase was from the additional feed consumed, and not from the test material, since the arsenic excretion was proportional to the amount in the feed.