

Mark Powell¹, John Johnson², Eric Ebel², Emilio Esteban², Sara Lupton³, David Smith³, Eric Scholljegerdes⁴, Shanna Ivey⁴. Development of a PFOS Plasma Depletion Model in Dairy Cattle. Society for Risk Analysis 2020 Annual Meeting.

¹ USDA Office of Risk Assessment and Cost Benefit Analysis

² USDA Food Safety and Inspection Service

³ USDA Agricultural Research Service

⁴ New Mexico State University

Abstract

To better understand its depletion dynamics in cattle, perfluorooctanesulfonic acid (PFOS) was quantified in plasma from blood samples collected every 2 weeks (0 - 153 days) from 8 animals (3 lactating, 5 young) after removal from exposure to PFOS at a contaminated dairy operation. A PFOS plasma depletion model was developed based on 92 PFOS plasma concentrations of the 8 animals. To account for the lack of independence of repeated measures within cows over time, longitudinal data analysis was performed using generalized estimating equations (GEE). Four depletion model forms were considered: log-linear, log-quadratic, log-cubic, and second-order. Based on regression diagnostics and fit criteria, the log-cubic model was selected. Therefore, this study suggests that PFOS plasma depletion dynamics in dairy cattle are complex. In addition, the limited data provided no evidence that the depletion rate differs between lactating and young dairy cows. Independent of the data used to estimate the depletion model, paired PFOS plasma concentration data for 19 animals were collected on-farm and at necropsy after 14 days removed from exposure. An out-of-sample prediction under the depletion model was accurate for the 14-day withdrawal period. Potential applications of this model include development of risk management strategies to permit the recovery of unadulterated beef from PFOS exposed cattle.