

What Are Key Considerations for an Approach to Human Health Intake Assessment for PFAS?

Amanda Lee (Amanda.Lee@aecom.com) and Michael Archer
(AECOM Australia Pty Ltd, Melbourne, Australia)

Background/Objectives. Per and poly fluoroalkyl substances (PFAS), particularly perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS), are now known to be widely spread all over the world as a contaminant. Due to their unique chemical structure and potential to bioaccumulate the risk assessment intake calculation approach traditionally used for other persistent organic pollutants requires modification.

Approach/Activities. A review of the traditional risk assessment intake calculations used for other persistent organic pollutants was undertaken to determine how applicable they were for PFAS compounds, particularly PFOS, PFOA and PFHxS. The review considered available physical and chemical property information as well as estimation of steady state blood serum calculations and transfer into human breast milk, animal milk, fruit and vegetables, eggs and animal meat.

Results/Lessons Learned. The review identified that the risk assessment intake equations traditionally used for other persistent organic pollutants cannot be readily applied to PFAS because they rely on chemical and physical parameters which have not been established for PFAS, or are unable to be established. In addition due to rapid absorption of PFAS within blood serum, intake calculations which include consideration of transfer into fat are not relevant. The review resulted in modifications to the following risk assessment intake estimation specific to PFAS:

- Human breast milk calculation with concentrations in breast milk determined from steady state serum concentration combined with a blood serum to breast milk ratio from published literature.
- Egg ingestion with modifications to include a transfer factor from published literature relating PFAS concentrations in eggs to dietary intake by chickens.
- Livestock meat calculations with concentrations in meat determined from steady state livestock blood serum based on empirical tissue to serum ratios.
- Fruit and vegetable calculations with theoretical soil to plant tissue or water to plant tissue uptake factors based on studies relevant to the edible portion of the plant.
- Livestock milk calculations with concentrations in milk determined from steady state livestock blood serum combined with empirical blood to milk ratios.

These modifications to the intake assessment equations enable a more representative estimate of PFAS intake to be established compared with the risk assessment intake equations traditionally used for other persistent organic pollutants. The reliance on empirical data from published literature emphasises the need for continued international investment in high quality scientific research into these aspects of the environmental chemistry of PFAS. Risk assessment work for these compounds needs to acknowledge the reliance on this ongoing research and that assessments may need to be revisited as new data become available.