



Contribution of polyfluoroalkyl phosphate esters (PAPs) and other precursor compounds to perfluoroalkyl carboxylates (PFCAs) in humans and the environment

av

Ulrika Eriksson

Akademisk avhandling

Avhandling för filosofie doktorsexamen i kemi,
som kommer att försvaras offentligt
fredag den 4:e november 2016 kl. 10.15,
HSL3, Långhuset, Örebro Universitet, Örebro

Opponent: Professor Jonathan Martin
Stockholms Universitet
Stockholm, Sverige

Örebro universitet
Institutionen för naturvetenskap och teknik
701 82 ÖREBRO

Abstract

Ulrika Eriksson (2016): Contribution of polyfluoroalkyl phosphate esters (PAPs) and other precursor compounds to perfluoroalkyl carboxylates (PFCAs) in humans and the environment. Örebro Studies in Chemistry 18.

Per-and polyfluoroalkyl substances (PFAS) are anthropogenic compounds that have been spread all over the world. The use of fluorotelomer compounds, short-chained homologues, and other PFASs with perfluorinated moieties has emerged recent years. One of these emerging compound classes is polyfluoroalkyl phosphate esters (PAPs), which have the ability to degrade into persistent PFCAs.

The aim of this thesis was to assess the contribution of PAPs and other precursors to the exposure of PFCAs to humans and the environment. The main objective was to analyze a wide range of PFAS in human serum, wild bird eggs, indoor dust, waste water, and sludge.

There was a significant contribution from selected precursors to the total amount of PFASs in the abiotic compartments indoor dust, waste water, and sludge. Levels of PAPs found in house dust exceeded those of PFCAs and perfluorosulfonic acids (PFSAs), revealing PAPs as a world-wide important exposure source.

A net increase was during waste water treatment was observed for several PFASs in Swedish waste water treatment plants. Together with presence of precursor compounds and intermediates in the influent water and the sludge, this suggest that degradation of PFCA precursors contributed to the increase of PFCAs. Detection of precursors in human serum, together with slow declining trends of PFCAs, revealed an ongoing exposure of PFCAs to the general population of Australia. The diPAPs and the FTSAs were also detected in raptor bird eggs from Sweden from both the terrestrial and the freshwater environment. The precursors concentrations and patterns observed reveal that current regulatory measures are insufficient for the purpose of protecting humans and the environment from PFASs exposure.

Keywords: PAPs, precursors, PFCA, exposure, indoor dust, human serum, WWTP, bird eggs

Ulrika Eriksson, School of Science and Technology, Örebro University, SE-701-82 Örebro, Sweden, ulrika.eriksson@oru.se