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Letter to Editor Open Access

Emerging Contaminants Such as Perfluorinated Compounds: Toxicity and Oxidative Stress

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Letter to Editor

Perfluoroalkyl and polyfluoroalkyl substances (PFASs) are widely applied in a variety of industrial and consumer products since 1949 and comprise a diverse group of chemicals with significant economic value. Due to their unique properties, mainly given by the strong C-F bond, they have been used in a wide variety of technological and industrial application, such as surfactants in fluoropolymer production, metal plating, aqueous film-forming foams, paper, textile, and household products [1]. PFASs are highly stable and difficult to degrade in the environment [2]. They also have the capability for long-range transport through the atmosphere and water [1]. Their presence in soils raised concerns over their potential ecological risks in terrestrial food chain [2].

Several episodes of pollution took place in the phreatic zone of medium-lower Agno Valley (Vicenza Province), between Lessini Mountains and the contiguous plain in Southern direction until the area of Colli Berici and the Municipality of Vicenza, due to the high density of production sites and industries. Nowadays the total catchment area involves three Provinces (Vicenza, Padova and Verona).

According to the length of the carbon chain, PFAS can be divided into: long chain PFAS (>C8), short-chain PFAS (C4-C7) and ultra-short chain PFAS (C2-C4). Between the whole PFAS, two sub-categories are of environmental interest: perfluoroalkyl sulfonate sub-category that includes also acid salts and precursors (PFOS is the most important) and perfluoroalkyl carboxylate including perfluorooctanoic acid (PFOA) and homologues and their acid salts and precursors. Other perfluoroalkyl chemicals (PFCs) include perfluorobutane sulfonate (PFBS).

Perfluorooctanoic acid (PFOA; C7 fluorocarbon) has a low bioaccumulation potential and is relatively similar among species from different trophic levels. This low bioaccumulation potential may be driven by the short perfluorocarbon chain length and particular functional group [1]. Unlike most other persistent and bioaccumulative organic toxicants, PFOA is water-soluble and does not bind well to soil, allowing for easy transportation through and contamination of human drinking water [3].

PFOA and other PFAS with shorter and ultra-shorter carbon chain are considered emerging contaminants and are included in the national environmental legislations. A high number of studies report high levels of PFAS in the environment, as well as in human samples such as blood, tissues, and breast milk [4]. PFAS are not stored in body fat. Several studies on laboratory animals indicate that PFOA exposure can impact male fertility. Altered polyunsaturated fatty acid compositions, concomitant with excessive oxidative stress, as demonstrated by increased malonaldehyde and decreased glutathione peroxidase, were observed [5-20].

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