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PhD Program in Environmental Life Sciences

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Seminar room, 1st floor, Q Building, Via Giorgieri n° 5, Trieste

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The human health risk assessment associated to exposure to environmental pollutants: cyanotoxins and PFAs as examples

Among environmental pollutants, those known as 'contaminants of emerging concern' have received an increasing attention, especially when chronic exposure is concerned. This is particularly true for water bodies contaminants, used as drinking water supplies, considering the frequency of exposure for a large part of the population. Beside some 'well known' chemicals which are routinely monitored, the improved analytical methods sensitivity has allowed to detect chemicals that had not previously been detected: among them microcystins (MCs), produced by cyanobacteria naturally present in many water bodies, and per- and polyfluorinated alkyl substances (PFAS), persistent environmental chemicals used in a wide range of industrial applications and commercial products. Dense blooms of cyanobacteria increasingly occurring worldwide, due to eutrophication and climate changes. MCs are among the most studied cyanotoxins; the group consists of more than 200 hepatotoxic variants, with different potency, associated to differences in their kinetic behaviour, acting through inhibition of PPA1 and PP2A triggering a cascade of events leading to hepatotoxicity and tumor promotion. Some variants showed in vitro also a neurotoxic potential. Also in the case of PFAS kinetics play a crucial role, determining their bioaccumulation potential by binding to plasma proteins paralleled by a lack of biotransformation and a very slow urinary excretion with renal resorption. Some epidemiological studies carried out in highly contaminated areas showed a positive association of PFAS with increased total cholesterol and low and high density lipoproteins in blood, suggesting dysfunction in lipid metabolism. Other effects were described but they are still under discussion. Both class of contaminants consist of a group of variants, to which it is possible to be simultaneously exposed, but unfortunately data gaps in knowledge about the toxicity of different MC variants or PFAS family members limit the application of a cumulative risk assessment procedure.

