

Vulnerability of some Ecosystems to PCBs

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During the last decade the development of a wide range of new chemical substances, such as therapeutic agents, chemical substances of industrial use, and agrochemicals, have led to a series of problems at a global level, due to the persistence of these compounds in the atmosphere, with subsequent deterioration of the ecosystem and the attendant risks for human health (Smith & Gancolli, 2002). Persistent Toxic Substances (PTS) belong to a group of chemical substances that share a number of fundamental characteristics: 1) **pronounced resistance to degradation**, be it chemical, physical, or biological; 2) **bioaccumulation**; 3) **toxicity**, and 4) **potential to travel long distances** in the environment and land in areas where they have never been used, for example in the Antarctica (Cleveland et al., 1997), the Arctic regions (AMAP, 2000) and the high-mountain lakes of Europe (Carrera et al., 2001) and South America (Borghini et al. 2005), as defined and explained by the global fractionning theory of POPs (Wania and Mackay, 1993).

Lately, these substances have been subject to intensive studies and are also the subject matter of International Conventions (for example, Stockholm Convention on Persistent Organic Pollutants, Basel Convention on Transboundary Transport of Hazardous Substances) whose objective is to protect human health and the environment from the presence and the effects of these substances. Among the latter we can find the polychloride biphenyls (PCBs), a group of substances heavily used as dielectrical fluids in condensators and electrical transformers, amongst other less relevant uses. At a global scale it has been estimated that the production of PCBs is 1.3 millions of tons (Breivick et al, 2002).

There is evidence that identifies long range transport (LRT) as a source of contamination for pristine areas situated far from production sites and areas where synthetic chemical products are used, including PCBs (Baker and Eisenreich, 1990; Calamari et al., 1991; Simonich and Hites, 1995)

During atmospheric transport it is assumed that contaminants follow a defined

pattern of dilution, i.e. higher concentrations are found in areas closer to the source of emission. Nonetheless, this pattern is not followed by the PCBs -- the physical-chemical properties of these compounds, such as chemical stability, semivolatility, affinity for organic matter, in combination with gradients of temperature, generate a net transference of contaminants from medium and low latitudes to high latitudes, which neutralize the effects of dilution that this high-scale transference should elicit according to traditional criteria.

Recently, the possible existence of contamination convergence zones has been posed. Such geographical areas would have certain natural characteristics (mountain zones, tropical forests) allowing a selective accumulation of PCBs or that can act as a natural trap for such products (Wania, 1999, Macdonald et al., 2002, Grimalt et al., 2001). Altitudinal gradient studies have described phenomena of concentration increments in zones of higher altitudes, e.g. in the high-mountain lakes of Europe, mountains in the East of Canada and more recently in Northern Chile (Grimalt et al., 2004), Meijer and collaborators (2002)) show the importance of the type and use of the soil in the spatial variable of PCB distribution, observing an increase of PCB (same altitude) in places with forests, versus sectors with plains, which can be explained by forests' enhanced capacity of catching the contaminants from the atmosphere. Therefore, cold areas in high altitudes can constitute more vulnerable areas to contamination by PCBs and other POPs.

Since various PCBs have been and are being used in industrial and urban areas, it is clear that the concentrations can be higher in the aforementioned areas. Unfortunately, up to now the information available in Latin America is scant as regards exposure to these contaminants. Hopefully, the incentive that the signing and ratification of the Stockholm Convention will contribute to increased interest in the study of such persistent toxic substances.

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