New POPs - Candidate Chemicals for Stockholm Convention

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Abstract

Environmental pollution by chemicals, particularly of persistent, bioaccumulative and toxic nature (so-called "Persistent Organic Pollutants" or "POPs"), has been of major concern. After four decades since publication of the famous "Silent Spring" written by Rachel Carson, an international treaty to protect environment and human health from POPs pollution, Stockholm Convention, was adopted and was entered into force in May 2004, in which 12 chemicals, i.e., dioxins, furans, PCB, HCB, DDT, chlordane, heptachlor, aldrin, dieldrin, endrin, mirex and toxaphene, are banned / regulated.

An important aspect of the Convention is the mechanism to add new chemicals to the target POPs list (Article 8). An expert committee, POPs Review Committee (POPRC), was established at the 1st Conference of Parties (COP-1; May 2005) to review the proposal of Parties for listing new chemicals. The reviewing process proceeds;

1) Apply screening criteria and judge whether the criteria is fulfilled or not
2) Evaluate a developed risk profile and judge whether the proposed chemicals have enough risk to be regulated under Stockholm Convention or not
3) Develop a risk management evaluation based on the information provided by the Parties

The result of each step will be reported to the next COP, and if approved, the process will move to the next step.

So far 10 compounds have been proposed as additional chemicals to the Annex A – C of the Convention[1];

1st POPRC (2005)	pentabromodiphenyl ether (PeBDE), hexabromobiphenyl (HxBB), chlordecone, Lindane (γ-HCH), PFOS and derivatives
2nd POPRC (2006)	octabromodiphenyl ethers (OcBDE), pentachlorobenzene (PeCB), short-chained chlorinated paraffin (SCCP), α-HCH, β-HCH

All the chemicals have passed the 1st step and the 1st five passed the 2nd step. This year the 3rd POPRC meeting will be held during 19-23 Nov in Geneva, where 3rd step of the first five, and the 2nd step of the second five chemicals will be done in addition to the 1st step of the new proposal on endosulfan.

The 10(+1) chemicals may be categorized into several groups;

(A) organochlorine pesticides used extensively in the past; α-, β-, γ-HCHs, chlordecone, (+ endosulfan)

(B) brominated fire retardants; PeBDE, OcBDE, HxBB

(C) industrial organochlorine chemicals used for fire retardants and other purposes; SCCP, PeCB

(D) fluorinated surfactants; PFOS

Among them, five (Chlordecone, HxBB and three HCHs) have already been banned or regulated as POPs in the Convention on Long-Range Transboundary Air Pollution (LRTAP) in European Commission[2]. In addition, the remaining five (PeBDE, PFOS, OcBDE, PeCB and SCCP) are being reviewed as candidates for POPs in LRTAP. Another group of chemicals, polycyclic aromatic hydrocarbons (PAH), is a target of LRTAP but not yet included/reviewed in Stockholm Convention. Two more chemicals not included/reviewed in Stockholm Convention, i.e., polychlorinated naphthalenes (PCN) and hexachlorobutadiene (HCBD), are being reviewed now in LRTAP. Endosulfan, the newest proposed candidate to the Stockholm Convention, is now reviewed by Chemicals Review Committee of Rotterdam Convention as an addition to the Annex III[3].

Among the "new POPs", organochlorine pesticides (A) are, in fact, rather 'old' chemicals, used extensively in the past but banned in many countries now. The analytical methods for these chemicals have been established and many reports have been published. Brominated fire retardants (B), especially PeBDE and OcBDE, on the other hand, have been used until recently or even now. PeBDE and OcBDE are complex mixtures of chemicals and are rather difficult to analyze. SCCP is another example of continued production and complex mixtures with difficult analytical procedure. PFOS (D) is in a different category; it is non-volatile and is analyzed by LCMS instead of GCMS. PFOS is again a mixture of different compounds, with many branched isomers and derivatives, and its quantification method needs standardization. Also PFOS is different from other POPs in its unique property to be accumulated in livers, a target organ of its toxicity, and blood, a transport media within the body, rather than in lipids.

PBDE (polybrominated diphenyl ether including PeBDE and OcBDE) as well as PFOS and other fluorinated surfactants have been studied extensively in recent several years. For example, 104 and 54 presentations among 762 presentations in Dioxin 2007 meeting held in Tokyo, Japan, in Sept 2007, dealt with PBDE and fluorinated surfactants, respectively. Reports of their analysis in Asian environment have been increasing, too. In this presentation, brief outlines of usage, chemical and environmental properties, and environmental levels of these candidate POPs chemicals will be summarized with special reference to the two emerging chemicals, brominated fire retardants, especially PBDE, and fluorinated surfactants, especially PFOS..

References:

1) POPs Review Committee activities in Stockholm Convention homepage:
http://www.pops.int/documents/meetings/poprc/poprc.htm
see meeting reports of POPRC for detailed information on the proposed candidate POPs chemicals
2) Convention of Long-range Transboudary Air Pollutants homepage:
http://www.unece.org/env/lrtap/welcome.html
3) Rotterdam Convention homepage:
http://www.pic.int/home.php?type=t&id=5&sid=16