Comité d'océanographie chimique

Polychlorinated biphenyls in Marine Air, Deep Sediments and Water of the Mediterranean Sea

D.L. Elder and J.P. Villeneuve
International Laboratory of Marine Radioactivity
Musée Océanographique, Principauté de Monaco

During 1974-1976 we measured the PCB concentrations in numerous samples of sea water, marine air and deep sediments of the Mediterranean Sea in an attempt to assess the present levels of these compounds and to determine their major reservoirs and fluxes. Polychlorinated biphenyls appear to be widely distributed in the Mediterranean basin. The concentrations we found in the Mediterranean are comparable to those reported by others for different oceanic regions.[1,2,3,4,5]

In general we found that the spatial gradients of PCB concentrations in off-shore transects of both water and marine air are small but that near shore concentrations in water tended to be about 1 order of magnitude higher in areas of high industrial run-off than in the open sea. The lowest concentrations in water were found in the Aegean and Ionian Sea while slightly higher concentrations were found in the Algero-Provencal basin and Tyrrhenian Sea.

The PCB concentrations in marine air along north-south transects of the western basin and Tyrrhenian Sea do not vary greatly but there is a detectable decrease in the southerly direction. Temporal concentration gradients seem more evident however (for example we found that air concentration steadily decreased over a 7 month period by a factor of 10) and appear to correlate strongly with variations in temperature.

We found detectable quantities of PCBs in the top 1 cm sections of all sediment cores including one from 4000 meters in the Ionian Sea.

The lowest concentrations in sediments were found in cores taken on the Siculo-Tunisian and Gibraltar sills. These low values are attributed to scouring of the sills by accelerated water movements through these narrow, shallow channels.

References

1. G.R. Harvey and W.G. Steinhauer, Atmospheric transport of polychlorinated biphenyls to the North Atlantic, *Atmospheric Environment* 8 (1974) pp. 287-290.

2. T.F. Bidleman, C.E. Olney, Chlorinated hydrocarbons in the Sargasso Sea, Atmosphere and Surface Water, *Science* 183 (1974) pp. 516-518.

3. E.D. Scura and V.E. McClure, Chlorinated hydrocarbons in Sea Water: analytical method and levels in the Northeastern Pacific *Mar. Chem.* 3 (1975) pp. 337-346.

4. R.N. Dexter and S.F. Pavlou, Chlorinated hydrocarbons in Sediments from southern Greece, *Mar. Poll. Bull.* 4 pp. 188-190.

5. G.R. Harvey and W.G. Steinhauer, Biogeochemistry of PCB and DDT in the North Atlantic. In: *Environmental Biogeochemistry* Vol. 1 (J.O. Nriagu, Ed). Ann Arbor Science Publishers, Ann Arbor, Michigan (1976) pp. 203-221.

DISCUSSION

Questions and comments:

1. What is the explanation for PCB depletion in sediments? (A. BALLESTER, Spain)

- Because the sedimentation rate in the Mediterranean sea is of the order of centimeters/1000 years, the PBCs are expected to be found in the first centimeter of the sediment only, but the sample from Villefranche was collected in shallow water in a zone where run-off is important. This might explain the presence of PCB in the second and third centimeter of the core.

2. What is the mechanism of concentration of PCB in particulate organic matter? (A. BALLESTER, Spain)

- In their study of a pelagic community, Elder and Fowler (1976) found that the PCB concentrations in the fecal pellets of Euphausiids were 3.5 to 21 times higher than those found in the food organisms which formed the feces. Since these pellets sink rapidly and intact, we think this process is important in transporting PCBs from the surface waters to the bottom sediments.

3. What are the main inputs of PCB to the Mediterranean Sea? (M. BRANICA, Yugoslavia).

- For the coastal zones we can believe that run off and industrial and domestic sewages are the major input pathways, while in the open sea atmospheric transport is more important.

4. Is it possible to use distribution of PCB as indicator for exchange of water masses in the Mediterranean? (M. BRANICA, Yugoslavia).

- In some cases yes. For example at the Gibraltar Strait we see a difference in PCB concentration in the inflowing. Atlantic water at the surface and the outflowing Mediterranean water at intermediate depths and at the bottom.