Fact or Fiction?

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Nature's New Chemical

Researchers with Canada's Wildlife Service have discovered an unusual brominated and chlorinated chemical, $C_{10}H_6N_2Br_4Cl_2$ (1,1-dimethyltetrabromodichloro-2,2-bipyrrole), in marine aquatics.[1] What's so unusual, you ask? Well, it behaves like PCBs (polychlorinated biphenyls)—some of the most criticized industrial wastes—yet it differs importantly from such wastes in that it originates from something natural in the oceans.

Environment Canada researchers have christened the chemical HDBPs (halogenated dimethyl bipyrroles).[2] Characterization and speculation on how it originates cast doubt on a major premise that substances combining chlorine and organic molecules do not result from biosynthesis (production of a chemical compound by a living organism), and are therefore dangerous. Although nearly 2,400 naturally produced organohalogens have been identified, natural sources are often ignored. Two examples illustrate this observation:

1. A report from the Science Advisory Board to the International Joint Commission on the Great Lakes, which stated, "There is something non-biological about the halogenated organics." [3, 4]
2. Articles in *Science*[5] and elsewhere[6] that contained the quote: "some types of synthetic compounds, including halogenated hydrocarbons such as PCB, are not found in nature."

Well, perhaps not so, as you've already read. Currently, it is not known if HDBPs are dangerous to humans or wildlife, but their existence shows that some pollution laws depend at least partly on unreal distinction.[3] Sound familiar?

Chemicals such as PCBs and DDT have been banned on the basis that they are bioaccumulants.[3] "Bioaccumulation" refers to an increase in the concentration of a chemical in the environment (in water sediment, soil, etc.) that builds up in living organisms because it is metabolized or is eliminated very slowly. Some scientists claim that unnatural (man-made) bioaccumulants cause reproductive problems in mammals, birds, and fish, while others seriously doubt this.[7] Regardless, on the basis that chemicals that combine chlorine and organic molecules are bioaccumulants, politicians in the U.S., Canada, and Mexico have moved steadily toward "zero-discharge" rules concerning them. Implicit in this is the basis that only unnatural chemicals are bioaccumulants.[3] However, HDBPs upset the apple cart because they are a PCB-like bioaccumulant in marine aquatics, and no longer can one assume that just because something is building up, it is man-made. HDBPs have been found in Pacific Ocean and Atlantic Ocean samples, but not in samples from the Great Lakes.[1] Because the Great Lakes is an industrial center inhabited by nearly 40 million people, if a chemical doesn't exist here, it probably isn't industrial. Furthermore, the apparent absence of HDBPs from the five freshwater Great Lakes also suggests that they are not airborne.[3]

Currently, no one knows where HDBPs originate. Wildlife researchers suspect that marine bacteria secrete them as a defense against predators, or they may be a slow macroscopic organism incapable of fighting, such as a sponge or a marine worm.[3] A comparison is natural toxic chemicals, which appear to be present in all plants and serve to protect plants against fungi, insects, and animal predators. Think about this for a moment. If you were a plant and couldn't run from predators or bite back at them, what would you do? If you wanted to survive, you might learn how to develop some toxins to discourage these predators from wanting to eat you. This is the case with a lot of food we eat. Ames[8] suggests that we are ingesting in our diet at least 10,000 times more by weight of natural pesticides than of man-made pesticide residues. These are natural toxic chemicals that have an enormous variety of chemical struc-

ture, and serve to protect the plants against fungi, insects, and animal predators.

Now, a few words about PCBs. There is no conclusive evidence that background PCB levels to which some occupational groups were exposed have resulted in acute effects, increased cancer risk, endocrine disruption, or widespread deterioration in children exposed to PCBs *in utero*. The only health effects that could be attributed to PCBs were skin and eye irritation.[9] However, as Baarschers[10] points out, the general perception is that PCBs are "linked to cancer" or are "cancer-causing chemicals." This has resulted in complex legislation that makes transport of PCBs or clean-up of sites very difficult and expensive.

Dr. Renate Kimbrough initially raised the flag in 1975 with her research that showed force-feeding rats their body weight in PCBs once a day (yes, an amount equal to their body weight each day) will eventually give some of them liver cancer. She's now completed a much larger study. These results, which followed more than 7,000 former GE employees who worked with PCBs between 1946 and 1977, led to the conclusion that there was no cause for concern.[11] This was the fifth such undertaking, which concludes that PCBs pose no cancer risk to humans.[12–14] Government regulators should keep this in mind when they order PCB clean-up and disposal.

Summary

It has been shown that our society generally accepts a risk ten times higher for a natural contaminant than for a man-made contaminant.[15] Will this now apply with PCBs? Will we think differently about them since something that appears to act like them can be found in the oceans? Not a chance! Most of the public won't even hear about this recent finding. However, let someone spill some PCBs or find some in a dump site in your city, and you will hear about it on television or read about it on the front page of your local newspaper.

In fact, Whelan reported in December 2000 in the *Wall Street Journal*[16] that the EPA has proposed that General Electric spend $490 million dredging the Hudson River to remove PCBs, which are embedded in the mud beneath the Hudson and are not generally dispersed in the water. Media coverage as to exactly what the EPA hopes to accomplish with half-a-billion dollars of dredging has been murky. All of this in spite of comments from the National Cancer Institute that even they know of "no evidence" that eating fish from the Hudson River poses a human cancer risk.

Last, here's a hypothetical scenario. What if future research were to show that HDBPs are even more closely related to PCBs than currently known? Who will the EPAs of the world charge with their clean-up from all the oceans? As has already been pointed out, one can't blame industry for this contaminant. Therefore, will we ask Mother Nature to clean up her own problem? Or, maybe folks will look at all the data on PCBs and conclude that they aren't really a problem after all. Dream on. **P&SF**

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