Detoxifying PCB's: A promising start

Drexel University chemist Louis L. Pytlewski has developed what may be the first chemical breakdown, or detoxification, of polychlorinated biphenyls (PCB's). It's an important accomplishment because like the pesticide DDT, PCB's are insoluble in water, are thermally stable up to 862°C and resist biological and chemical breakdown. As a result, once they enter the biosphere — and 750 million pounds produced between 1930 and 1971 are thought to have been discharged into the environment — PCB's tend to accumulate in the body fat of animals, including humans.

Initially engaged in developing new methods to detect PCB's in the environment, Pytlewski says he first became concerned with PCB's when he realized that even if one can identify and isolate them, "how do you get rid of them?" Attacking the problem required abandoning the preconceived notion that PCB's were too stable ever to break down. And while on sabbatical doing research at the Franklin Institute in Philadelphia last year, Pytlewski happened on a scheme that uses polyethylene glycol 400 to transfer the chemical reactivity of metallic sodium to PCB's.

"We were lucky, really," he says. By spreading out the "extreme chemical reactivity" of sodium, he was able to pull out tightly bound chlorine and replace it with hydroxyl groups. Chlorine bound with sodium to form salt. What remained was a water-soluble and relatively harmless polyhydroxylated biphenyl, he explains, similar to a class of antioxidants (including BHT) used in packaging materials as a food preservative.

Pytlewski, an analytical chemist with more than 10 years' experience in chemical detoxification, says that his finding, while still preliminary, may have great potential. Since the chemical can be rendered water soluble, ways might be found to flush it out of the body. At present, Pytlewski's process only works on pure PCB's or PCB's mixed with oil.

Associated with decreased fertility in higher mammals (SN: 7/8/79, p. 28) and with numerous neurological and epidermal disorders in humans, PCB's were banned from production and most uses in the United States last May by the Environmental Protection Agency.

Although PCB's can be destroyed by costly incineration (SN: 6/17/78, p. 392), most are merely relegated to landfill burial where they do not degrade. Chemical detoxification could prove preferable to both, Pytlewski says. Unlike incineration, it does not add to the dangerous buildup of carbon dioxide in the atmosphere. And even though it may prove about as costly as burning, Pytlewski hopes that chemically transforming PCB's will also yield a salable byproduct.

Now working under an EPA grant back at Drexel, Pytlewski has turned his attention to identifying the fundamental chemical processes at work in his detoxification process. With luck, he says, in five years or so it may be possible to design and build a pilot-scale detoxification reactor. □

Most potent brain peptide yet

During the past several years, the brain chemistry field has become one of the most explosive arenas of biomedical research. It has revealed that the mammalian brain contains various small proteins (peptides) that exert an astounding variety of psychological and behavioral effects and that offer leads on novel kinds of psychotropic drugs. The peptides are called beta-MSH, beta-endorphin, alpha-endorphin, gamma-endorphin, leucine enkephalin and methionine enkephalin (SN: 11/25/78, p. 374).

Now still another brain peptide has been identified by Avram Goldstein of Stanford University in Palo Alto, Calif., and his colleagues and is reported in the December PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. It possesses extraordinarily potent analgesic powers — 700 times greater than the brain peptide leucine enkephalin, 200 times greater than morphine and 50 times greater than the brain peptide beta-endorphin (before considered the most potent peptide analgesic in the brain). When this new peptide was injected into rat brains, it caused catalepsy, the same kind of bizarre immobility seen with morphine or beta-endorphin, suggesting that it may also regulate behavior in some way. The peptide has been dubbed "dynorphin" (from the Greek word "dynamis," which means "power").

Another interesting feature of dynorphin, Goldstein and his team report, is that one end of its structure incorporates the brain peptide leucine enkephalin. Nonetheless, they still suspect that dynorphin is not only a precursor of this peptide but also a hormone or neurotransmitter in its own right because of its potent analgesic and behavioral effects and because it is present in the pituitary gland, the brain and body's master hormone gland. Yet another unique feature of dynorphin, Goldstein and his team have found, is that it is definitely not derived from beta-lipotropin and 31K, large brain molecules from which beta-MSH, beta-endorphin, alpha-endorphin, gamma endorphin and methionine enkephalin derive (SN: 11/25/78, p. 374; 11/17/79, p. 342). So it is quite probable that dynorphin and leucine enkephalin are formed from some yet-to-be-discovered large brain molecule. □

It wasn't Cas A; it was only roast duck

For centuries optical astronomers have had to contend with light from non-astronomical sources that gets into their telescopes and confuses observations. Radio astronomers encounter some similar problems in their range of the spectrum, and one of these may be that trendy kitchen apparatus, the microwave oven. In the Dec. 6 NATURE B. Anderson, R. Pritchard and B. Rowson of the Nuffield Radio Astronomy Laboratories in Jodrell Bank, England, report that three ovens tested by them show "spurious radiation" that could interfere with frequency bands reserved for radio astronomy.

Since its inception radio astronomy has enjoyed frequency bands assigned by the International Telecommunication Union at which astronomers are supposed to be able to listen to the universe without interference from terrestrial emitters. Anderson, Pritchard and Rowson call the oven emissions "spurious" because they invade the radio-astronomical bands and depart from the waveband for which the ovens are licensed, 2.45 $\pm$ 0.05 gigahertz.

The ovens' main emission does come in the licensed band. Apparently the spurious frequencies come from modulation sidebands to the main emission and possibly also from instabilities in the electron distribution in the magnetron. The seals, which are supposed to keep the radiation inside the ovens, tend to work adequately for the main emission but poorly for the spurious emissions.

The spurious emission can be strong enough to be detected by a radiotelescope kilometers away. Such an oven in the field of view of a radiotelescope could interfere with observations of sources with continuous spectra. Anderson, Pritchard and Rowson suggest therefore that "the regulations need revision so that the use of microwave ovens is not allowed if the amount of the emitted radiation outside the licensed band of 2,450$\pm$50 MHz can cause harmful interference to authorized radio services." □

Ramsey URA president

The Universities Research Association, the corporation set up by a consortium of universities to manage the Fermi National Accelerator Laboratory under contract to the Department of Energy, has announced the election of Norman Ramsey, Higgins professor of physics at Harvard, to be its president. He succeeds Milton G. White of Princeton, who died Oct. 16. Ramsey was also the first president of URA, serving from the organization's beginning in 1965 until White was elected last spring. The laboratory has one of the world's two most energetic proton accelerators. □