SCIENCE NEWS OF THE WEEK

DNA on X Chromosome Cloned and Identified

The most exciting advances in recombinant DNA technology have come during the past three years as molecular biologists, with their enzyme splicing of desired genetic material, insertion of the material into plasmids and insertion of the plasmids into bacteria for gene and gene product production, have harvested human genes and human gene products of great potential value to clinical medicine. These products include insulin, growth hormone, interferon, urokinase and beta-endorphin. Now another coup along these lines is reported in the August CELL by Stanley F. Wolf, Cristina E. Mareni and Barbara R. Migeon of Johns Hopkins University School of Medicine in Baltimore: DNA sequences from a mammalian X chromosome—the human X chromosome—have been cloned and identified for the first time.

Wolf and his co-workers took DNA from human cells containing three or more X chromosomes so they would have enriched X chromosomal material with which to work. They used restriction enzymes to splice the DNA at specific points and inserted the DNA fragments into bacterial plasmids (rings of bacterial DNA). They inserted the plasmids into bacteria, and the bacteria produced clones (copies) of the plasmids. The researchers then hybridized (crossed) the plasmids to DNA from mouse-human hybrid cells containing the X chromosome as the sole human chromosome and to DNA from mouse-human hybrid cells lacking the human X chromosome. Those DNA sequences on the plasmids that crossed with DNA in the former group of cells but not in the latter were deduced to be DNA sequences found on the human X chromosome. The researchers then tested these DNA sequences further to determine which were specific to the human X chromosome and which also shared certain similarities with other human chromosomes.

Although the DNA fragments cloned and identified so far represent probably less than one percent of all the genetic material on the human X chromosome, still more fragments can now be obtained with the same techniques to help scientists determine which genes are located where on the human X chromosome. Now that X chromosome DNA fragments can be cloned and identified, scientists may eventually be able to identify defective genes on the X chromosome that are responsible for hemophilia, muscular dystrophy, the Lesch-Nyhan syndrome (characterized by mental retardation, spasticity and other symptoms) and some 150 other human hereditary diseases and perhaps even find markers linked to the defective genes. Such markers might then be used to identify women carrying the defective genes before they pass on those genes, and very possibly the associated genetic disease, to their offspring. The cloning and identification of DNA sequences from the human X chromosome also may help investigators figure out why one of the two X chromosomes present in every cell in a woman's body does not express its genetic material from fetal life on. In some cells, the inactive chromosome is the X received from the mother; in other cells, it is the paternal X. □

Low cost process detoxifies PCBs

A chemical means to break down persistent and toxic halogenated pollutants, such as PCB's (polychlorinated biphenyls), PBB's (polybrominated biphenyls), DDT and certain other organic pesticides and herbicides, was announced last week by the Goodyear Tire and Rubber Co. Already tested on up to 2,000-gallon batches of oil-based heat-transfer fluids, the process can reduce PCB contamination levels from 200 parts per million to less than 10 ppm in a room-temperature reaction that takes only about five minutes, according to Dane Parker, a developer of the Goodyear technique.

Pending approval by the Environmental Protection Agency (which Goodyear has not sought since it has no plans to commercialize it), this process could be used in the disposal of some of the roughly one billion gallons of mineral-oil-based transformer fluids that are contaminated with low-level (50 to 500 parts per million) concentrations of PCB's. Development of the process is particularly timely because since July 1 of this year, EPA regulations demand that any substance contaminated with more than 50 ppm of a mono- or polychlorinated biphenyl be disposed of commercially in agency-approved incinerators or landfills—depending on the degree of contamination.

To date, only EPA-approved landfills exist for commercial PCB disposal. A limited number of facilities, however, are conducting EPA-approved noncommercial disposal of low-level contaminated substances in high-efficiency boilers owned by generators of those wastes. No incinerators to handle wastes contaminated with high levels of PCB's have won EPA approval yet, but at least two firms in Texas are currently testing experimental systems.

The Goodyear process relies on the interaction of a reagent with the contaminated oil-based fluid. That reagent, sodium naphthalide, is produced by the interaction of a tetrahydrofuran solution of naphthalene with room-temperature solidified sodium droplets. All ingredients are available commercially; in fact, costs of the chemicals involved average only $0.02 per pound of recovered heat-transfer fluid, according to Parker and W.L. Cox in the Aug. 21 PLANT ENGINEERING. The heat-transfer fluid itself costs about $1 per pound new and would be sacrificed during incineration or landfill disposal.

Though Goodyear is the first to reveal its chemical detoxification process, other firms are experimenting with competing techniques. Details of those programs are guarded confidentially, however, because the developers plan commercial introduction of their schemes. Goodyear is patenting its process but offering it free to potential users. □

No nitrite ban: Data reevaluated

Immediate governmental threats to the nitrite in hot dogs, bacon and other cured foods evaporated last week under the heat of a reevaluation of the data that launched the controversial possibility of a nitrite ban two years ago (SN: 8/19/78, p. 119). A group of independent pathologists under contract to the Food and Drug Administration examined 50,000 tissue slides from the 2,000 rats in the original lifetime feeding study conducted by Paul M. Newberne at the Massachusetts Institute of Technology. They conclude, "... insufficient evidence exists to support the conclusion that sodium nitrite *per se* fed to rats causes cancer." In a joint statement, the FDA and the U.S. Department of Agriculture say there is currently no basis for any action to remove nitrite from foods.

The major difference in the analyses of the MIT data was that the independent pathologists found a much lower incidence of cancers of the lymph system than Newberne had reported. They also judged that because animals were obtained at different times and housed in different rooms, some of the comparisons were invalid. Finally, the pathologists suggest that nitrosamines, related chemicals that have been found to cause cancer in laboratory animals, probably were formed in some of the food given to the rats.

When the Departments of Agriculture and of Health, Education and Welfare proposed in 1978 that nitrites be phased out and then banned as a preservative, turmoil