life sciences

ARTIFICIAL CELLS

Making a lysosome

Lysosomes, among the simplest parts in living cells, are small, saclike structures containing enzymes. Operating normally, these parts, or organelles, play a role in phagocytosis, the process by which invading organisms are engulfed and destroyed. If, however, lysosomes are split open in the body they release their enzymes, which then destroy other cells, causing inflammatory disease.

Drs. Gerald Weissmann and Grazia Sessa of the New York University School of Medicine have successfully synthesized lysosomes for the first time. They announced their achievement at the Third Annual Symposium of the Internal Inflammation Club last week at Brook Lodge, Mich., sponsored by the Upjohn Company.

The artificial lysosome, which Dr. Weissmann says will enable scientists to conduct controlled experiments on the organelles' normal and aberrant behavior, is built of lipids formed in thin layers. Lysozyme, the destructive enzyme in lysosomes, is held in the interspaces between those layers.

PAGET'S DISEASE

Combination therapy

Injections of calcitonin, a thyroid hormone, and oral doses of inorganic orthophosphates appear to be useful in treatment of Paget's disease. The disease is a severely disabling bone disorder that afflicts two percent of individuals over 40 years of age in the United States and Western Europe. The agents lead to increased calcium retention in these patients.

At the Brook Lodge symposium, Dr. Ralph S. Goldsmith and Claude D. Arnaud Jr. of the Mayo Clinic in Rochester, Minn., said that experience with patients shows that this combination therapy is proving more effective than previously employed modes of treatment. Because Paget's disease has many of the characteristics of inflammatory disease, physicians have attempted to treat it with anti-inflammatory drugs including cortisone, though success is transitory and accompanying side effects are serious.

MOLECULAR BIOLOGY

Garbling the genetic code

A single mistake in the sequence of bases in a DNA or RNA molecule can be as devastating to the functioning of that gene as an error in amino acid sequence can be to a protein. Two biochemists from the University of California at Berkeley report discovering a chemical transformation that produces a garbling of information within genetic material.

Drs. Heinz L. Fraenkel-Conrat and Bea Singer, a husband and wife team, discussed their finding at a symposium on Biological Effects of Polynucleotides in New York. In laboratory experiments, they exposed nucleic acid molecules to nitrosoguanidine, a potent methylating agent. The chemical attaches a methyl group of carbon and hydrogen atoms to cytosine, one of the four bases of a viral gene, in this case an RNA molecule.

In normal RNA, cytosine pairs only with guanine, another base, and never with the adenine or uracil bases. But the addition of a methyl group to cytosine disrupts its usual selectivity, enabling it to pair erroneously with any base molecule in the RNA strand. As a result, the proper exchange of genetic information is blocked, leading to aberrations that may be involved in the induction of tumor cells.

PARKINSONISM

Yellow light for L-dopa

L-dopa, a drug that shows great promise in treating some individuals with Parkinson's disease, has been cleared for marketing by the Food and Drug Administration. In announcing the agency's approval of L-dopa (levo-dihydroxyphenylalanine), FDA commissioner Charles Edwards said it may be "one of the major drug discoveries of recent years."

At the same time, however, Dr. Edwards took the unusual step of warning physicians to use the drug with caution. Built into the FDA's clearance is a requirement that Eaton Laboratories and Hoffmann-La Roche, the two companies that make L-dopa, continue to conduct clinical studies of patients who use it.

Although this is the first time FDA has directed continuing studies of an approved drug, Dr. John Jennings of the agency's Bureau of Drugs says that in principle it is no different from the agency's continuing evaluation of oral contraceptives.

Current experience with L-dopa indicates that two of every three Parkinson's patients are partially or totally relieved by the drug, but side effects occur in a majority of users, ranging from nausea to intestinal bleeding and heart disturbances. Dr. Edwards contends that additional information is needed to justify the use of L-dopa in patients in the very early stages of the disease and that more needs to be known about its effects on persons who may take it for 10 or 15 years.

BIOCHEMISTRY

Synthesizing sugar polymers

Oligosaccharides are biological compounds built of relatively short chains of sugar molecules. They exist as parts of many important biological molecules, including glycoproteins and, probably, antigens on the surface of cells.

Progress in techniques for synthesizing these sugar compounds was reported at the Toronto meeting of the American Chemical Society by Drs. Laurens Anderson and Paul J. Pfaffli, and graduate student Susan Hixon, of the University of Wisconsin. "To date," Dr. Anderson observes, "carbohydrate polymer synthesis has largely been limited to disaccharides—two sugar units per molecule."

Synthesis of oligosaccharides, which must be put together one sugar molecule at a time, has been hampered by inadequate knowledge of chemical techniques for blocking certain reactions between molecules while allowing others to proceed appropriately at each stage in the synthetic process. Having established some of the necessary chemistry, Dr. Anderson predicts that it will soon be possible to synthesize oligosaccharides and that the techniques may be applicable to synthesis of new antibiotics having structural similarities.