

chemistry

Gathered at the meeting of the American Chemical Society last week in New York

BIOCHEMISTRY

The initiator of DNA replication

It has been shown in several organisms that some protein other than DNA polymerase needs to be synthesized before replication of DNA can begin. Not much has been known about this unidentified protein except that it acts by directly stimulating replication rather than by relieving something that prevents it.

Now five University of Pennsylvania investigators believe they have isolated the initiator. It is a polypeptide of low molecular weight. This protein fragment exhibits all the properties expected of an initiator of DNA replication, they say. It stimulates the incorporation of DNA precursors in crude or partially purified DNA polymerase and in the nuclei of rat liver cells. Several species of protozoa speed their life cycles when incubated with the new polypeptide. And certain other cells start replicating their DNA considerably earlier when the polypeptide is present.

Dr. Semih Erhan and Samuel Reisher, E. A. Franko, S. A. Kamath and R. J. Rutman report the results.

LIPIDS

Nicotine role in blood fats

It has recently been shown in experimental animals that nicotine speeds atherosclerosis. Now two researchers from the Boston University Medical Center report that this effect is apparently due to an ability of nicotine to stimulate the synthesis of fat within the walls of the major arteries.

Drs. Vladimir D. Stefanovich and Shizuteru Usui found that addition of nicotine markedly stepped up the production of lipids, the compounds that make up fat.

Neutral lipids were increased an average of 40 percent and phospholipids an average of 50 percent. One phospholipid, sphingomyelin, was increased by 137 percent, another by 132 percent and a third by 130 percent.

The studies were performed on human arteries and veins obtained from umbilical cords shortly after the birth of infants.

Human arterial tissue available in earlier studies usually could not be considered normal because of age, disease or postmortem state.

IMMUNOCHEMISTRY

Rapid identification of antigens

An accurate, rapid method for detecting and identifying antibodies and antigens has been developed.

The achievement, by Dr. Alexandre Rothen and Christian Mathot of Rockefeller University, appears to present a way of readier diagnosis of diseases caused by transmissible viruses. It can also be used in the diagnosis of the parasitic diseases trichinosis, leishmaniasis and schistosomiasis.

The immunoelectroadsorption (IEA) technique makes use of a metalized glass slide which is coated with a thin

layer of antigen and put under the influence of a weak electric current. The slide is then immersed in the serum to be tested. By measuring the thickness of the resulting deposit, a scientist can tell whether the serum contains antibodies related to the antigen.

Antigen concentration can be detected in four to five minutes, permitting diagnosis in less than 30 minutes.

GASTROENTEROLOGY

Ulcers and the digestive switch

A team of New York scientists has identified a chemical on-off switch in the stomach which regulates the digestive process. Failure of the self-regulating mechanism allows an ulcer to develop, say Drs. Jesse Berkowitz and Melvin Praissman of Long Island's Meadowbrook Hospital.

The two report that negatively charged glycoprotein molecules lining the stomach play a key role in controlling the secretion of hydrochloric acid.

When food is ingested the glycoprotein lining can absorb glycine, an amino acid in food protein. This passage of glycine causes the secretion of the hormone gastrin, which in turn causes the stomach to secrete hydrochloric acid.

The increased acidity reduces the lining's ability to absorb glycine. Secretion of gastrin is therefore stopped, no more hydrochloric acid is produced and the digestive process stops.

One of the first applications of this new knowledge is expected to be in the advance prediction of what drugs may stimulate peptic ulcers. Patients being treated with cortisone and other anti-inflammatory drugs to relieve arthritis symptoms often develop peptic ulcers. Apparently these drugs reduce the effectiveness of the glycoprotein barrier, leading to an incomplete shutoff of hydrochloric acid.

FOOD CHEMISTRY

Physicochemical method of food synthesis

Astronauts on future space missions lasting two or more years will probably be able to eat food regenerated from their body waste products.

Work described by Dr. Jacob Shapira of the National Aeronautics and Space Administration's Ames Research Center shows promise for a technique of synthesizing carbohydrates from compounds exhaled in normal breathing—carbon dioxide and water.

A prototype device that has been constructed converts carbon dioxide to methane, methane to formaldehyde, and formaldehyde into sugars. The device now in operation produces 750 grams of formose sugar an hour.

Preliminary studies of rats on diets containing the products of these processes are encouraging, but Dr. Shapira points out that exhaustive tests will be necessary to establish their safety and nutritional desirability. He speculates that eventually the process could have some applications in helping relieve world food shortages.

september 20, 1969/vol. 96/science news/237