BIOLOGY

Hormone-Enzyme Control

➤ TWO BIOCHEMISTS hope they have opened the way to understanding one of the least known biological processes—how enzymes and hormones together control metabolism.

Drs. K. Lemone Yielding and Gordon M. Tomkins of the National Institutes of Health, Bethesda, Md., have shown that a compound similar to the female sex hormones broke down the structure of an enzyme called glutamic dehydrogenase—an enzyme that takes part in the build-up and breakdown of proteins.

Reporting their findings at the annual meeting of the Federation of American Societies for Experimental Biology in Atlantic City, N. J., Drs. Yielding and Tomkins said their work was the first example of such interaction.

The way hormones and enzymes interact is one of the least understood aspects of biology. Some kind of interaction must take place between the two substances if the complex chemistry of the body is to be regulated.

Biochemists say that some 10,000 individual reactions occur in the human being, each under the control of its own special enzyme. Scientists also know that the same reactions are also under the control of different hormones — possibly the thyroid hormone, or any of the sex hormones, or a hormone such as insulin.

But they are less sure what hormones are associated with what reactions. There are fewer hormones than there are enzymes, so one hormone must ultimately affect several reactions, thus several enzymes.

Drs. Yielding and Tomkins studied the ways by which one type of hormone might break up the glutamic dehydrogenase molecule, thus keeping its activity down. They said the shape of the hormone might be a crucial factor.

They worked with a molecule similar in structure to most of the female sex hormones, a compound called o-phenanthrene. On mixing this compound with the long, intact molecule of glutamic dehydrogenase, the enzyme was split into four parts, destroying its effectiveness.

They think that the flat structure of o-phenanthrene "enables this compound to interfere with the forces which hold the enzyme molecule together." So if the body suffers from too much glutamic dehydrogenase the hormone would destroy some of it, restoring the chemical balance.

"Further studies of how this enzyme is altered by such compounds may lead to a better understanding of the manner in which hormones control enzymes," they said.

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Insulin-like Substance

➤ THE BODY apparently produces insulin-like substances, even when the pancreas has been removed, two scientists reported at the Federation of American Societies for Experimental Biology meeting in Atlantic City, N. J.

No one knows what the substances are or where they come from, Dr. Richard H. Egdahl and Harold L. Goldberg of the Medical College of Virginia, Richmond, reported.

Experiments show that in dogs from which the pancreas and all other abdominal organs have been removed, something causes artificially-induced high blood sugar levels to decrease and stay at a normal level. Insulin does the same thing in intact animals. But blood tests on these operated animals show that the "something" is not insulin.

These substances with insulin-like activity have kept blood sugars at a normal level for periods up to seven days in operated dogs, but whether they could maintain the pace longer is not known.

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Protection Method Found

➤ SEROTONIN, one of the top four drugs that gives some protection against radiation. appears to work by depriving critical blood-forming tissues of oxygen, a University of Chicago research team reported to the Federation of American Societies for Experimental Biology in Atlantic City.

Dr. John Doull and Dr. B. J. Ticou of the Radiation Laboratory operated by the University of Chicago for the Air Force, reported that when serotonin, also known as 5-HT, is given to white mice before irradiation, the radiation dose which kills half of the mice within 30 days can be raised from 542 roentgens to 880 roentgens.

They suspected that oxygen deprivation was the mode of action for serotonin and tested their assumption by placing mice in boxes containing 25 times as much oxygen as they would normally receive, then gave them serotonin and a large dose of radiation. If the drug actually protects by reducing oxygen, they reasoned, mice in an oxygen-saturated atmosphere would receive more oxygen and less protection.

The excess oxygen cut the protective effect of the serotonin by 60%. The most important changes were in the spleen, where tissue oxygen levels dropped 80% within five minutes after the drug was given.

The scientists also reported that serotonin, a neuro-hormone found naturally in the brain and the intestines, reduces body temperature when given as a drug, but no relationship has been found between this phenomenon and radiation protection.

Serotonin ranks below aminoethyl isothiourea (AET) and mercaptoethylamine (MEA) and above P-amino-propiophenone (PAPP) in ability to protect against radiation. But none of these drugs are good enough, Dr. Doull said. What is needed, he reported, is something that can provide protection when given after radiation.

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