

BIOCHEMISTRY

New Hormone Era Seen

New light on structure of ACTH molecule gives promise of synthesis and precision use of hormones from the pituitary gland. Study shows activity is retained in molecule fragments.

► A NEW era in hormone treatment may be foreshadowed by the development for the first time of a picture of the complete structure of the ACTH molecule.

Dr. C. H. Li, professor of biochemistry at the University of California, and his colleagues have completed the tortuous five-year job of identifying each of the 39 amino acids, the chemical building blocks, that are linked in a straight chain to form the ACTH molecule.

They also stripped 11 amino acids off the right side of this chain, and the remaining fragment still retains the ACTH biological activity.

The work opens the door to a better understanding and to the possible future synthesis and precision use of the powerful hormones produced by the anterior (front part) pituitary gland. These hormones are the prime movers of reproduction, growth, maturation and general metabolism.

This is the first time the structure of one of these anterior pituitary hormones has been clarified. Last year Dr. Vincent du Vigneaud of Cornell University Medical College, New York, reported the structure and synthesis of oxytocin and vasopressin, hormones of the posterior pituitary.

These hormones have small molecules, however, containing eight amino acids, and they are involved in the muscular contractions of labor and the release of milk in new mothers.

Dr. Li has taken a concrete step toward the duplication, with the larger and wider-ranging anterior hormones, of Dr. du Vigneaud's feat with the posterior hormones.

One of the difficulties of working with the anterior pituitary hormones, such as ACTH, has been the complexity of the effects these secretions have on the body. In the treatment of rheumatism, for example, the use of the hormone is limited by unwanted deleterious side effects.

Now, with a complete knowledge of the structure of the hormone, it may be possible to determine whether different biological effects are located in different portions of the ACTH molecule. If this turns out to be the case, it may be possible to synthesize fragments of the molecule with more specific activities, thus getting rid of unwanted side effects and using a "bull's-eye" rather than "shotgun" technique in hormone treatment.

An indication that biological activity does lie in fragments of the molecule is provided by Dr. Li's successful retention of ACTH activity in a fragment of the molecule.

Dr. Li is the scientist who has been chiefly

responsible for the isolation of five of the six anterior pituitary hormones, including ACTH, the growth, lactogenic, follicle-stimulating and interstitial cell-stimulating secretions.

Much of the latest work has been reported in the scientific literature already. The final report detailing the complete structure of the ACTH molecule will be made on June 29 at the Gordon Conference on Proteins, at the New Hampton School, New Hampton, N. H. Dr. Li's colleagues are Drs. I. I. Geschwind, J. S. Dixon, R. D. Cole, and I. D. Raacke, research biochemists.

Dr. Li reported partial structure of the sheep ACTH molecule, with which he works, last year. The partial structure of ACTH extracted from hogs was reported in November, 1954, by American Cyanamid Company scientists and by Armour & Company scientists in March, 1955. The sheep and hog ACTH molecules are different.

The Berkeley scientists call the larger molecule alpha-corticotropin (molecular weight 4500) and the smaller one, with 28 molecules, beta-corticotropin (molecular weight 3000). They are white powders, almost crystalline. The smaller molecule is slightly larger than a sucrose molecule.

The five-year project cost about a quarter of a million dollars, and was supported primarily by the U. S. Public Health Service, the Eli Lilly Laboratories and the Lasker Foundation.

The preparation of the two hormones is difficult and tedious and not presently adaptable to commercial use. Only about two grams (1/14th of an ounce) of the precious hormone could be extracted from 360,000 sheep glands in years of work. Tests indicate that the hormones are unexcelled in potency and purity.

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TECHNOLOGY

Automatic Device Records Reactor Heat

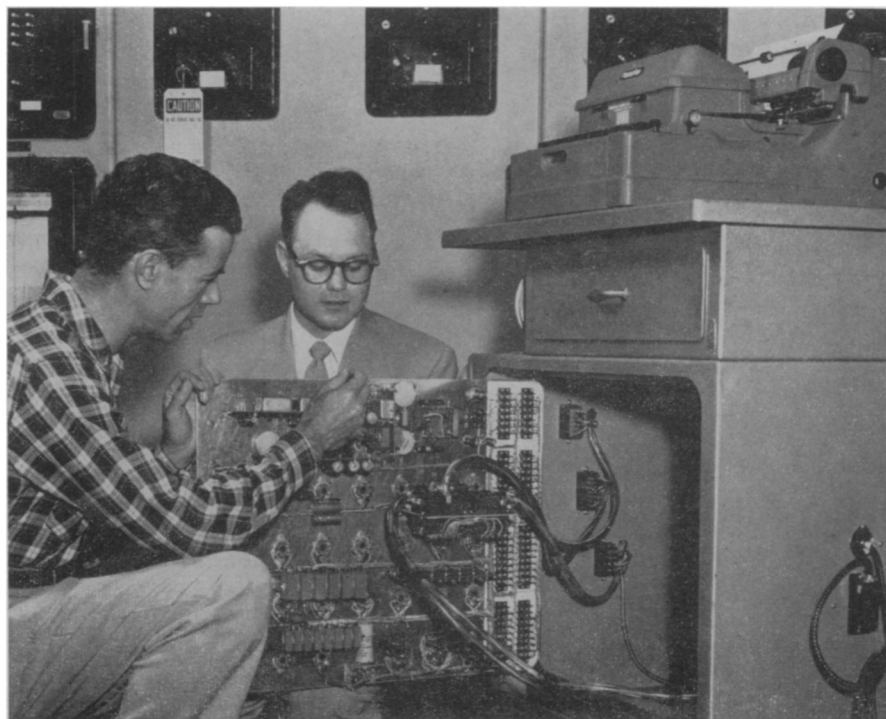
► PLUTONIUM REACTORS now have their temperatures taken by thermometer-typewriters that instantly record temperature without the help of human hands.

The automatic devices instantly tell scientists the temperature of reactors, which become dangerous when too hot, and are inefficient if too cool.

Before automation, manual methods of making temperature charts took so long that information was old by the time it was recorded. Thermometer-typewriters installed in the Hanford plutonium plant, operated by General Electric for the Atomic Energy Commission, compile in minutes information that took hours to assemble manually.

Thermocouple temperatures are converted into electrical impulses. These are then translated into a code that triggers the typewriter keys, recording the temperature.

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TYPES TEMPERATURE—This typewriter at the Hanford Atomic Products Operation records temperatures inside atomic reactors.