BIOCHEMISTRY

Complex DNA Isolated

The most complex DNA molecules ever discovered, coming from a virus which causes cancer in some rodents, contain double strands of atoms which are joined at the ends.

➤ DNA MOLECULES from a virus that causes cancer in some rodents have been discovered to be the most complex so far isolated. DNA (deoxyribonucleic acid) molecules contain the hereditary blueprints of all living things.

Taken from the polyoma virus, the highly organized chains contain the traditional long, double strands of atoms, intertwined in a helix or spiral form, that are characteristic of DNA molecules.

However, in addition, a team of researchers from the California Institute of Technology in Pasadena have found that each of the two strands is joined at the ends, forming a circle of two continuous strands wrapped around each other in 500 right-handed turns.

They have also discovered that the circle forms an additional superstructure by twisting to the left upon itself five or more times. Thus five or more smaller loops are formed by the twistings of the larger circle.

By enzymatic and chemical studies, combined with ultra centrifuge techniques and electron micrographs, the researchers obtained the detailed picture of the complex molecule, which as a circle is only one fifty-thousandth of an inch in diameter.

"This is the first evidence of a higher organization of an isolated DNA molecule," Dr. Jerome Vinograd, research associate in biology and chemistry at the University, pointed out.

Dr. Vinograd and his associates unlocked the super-twisted configuration by using an enzyme called pancreatic DNAase. They were also able to break the hydrogen bonds linking the two strands in the 500-turn helix with alkaline chemicals or heat.

The key to unlocking the molecule so that it will "unravel," the scientists pointed out, is to break one of the two strands. Only one break, which may be anywhere on either strand, is necessary.

One break in one strand sets up, in effect, a mechanical swivel, Dr. Vinograd said. This reaction, started by DNAase or by a reducing agent such as hydroquinone, allows the super-twist to unwind, uncoiling the five or more left-handed super coils.

Then, if the DNA is heated or treated with alkali, the 500 right-handed helical turns unwind and the strands separate. The heat or the chemical will break the hydrogen bonds binding the two strands together.

Although DNAase and certain reducing agents can cause the DNA molecule to break in a laboratory, it is not known what causes such a break in nature. Presumably an enzyme is responsible.

Collaborating with Dr. Vinograd in the research, which is supported by the U.S. Public Health Service, are Dr. Jacob Lebowitz, research fellow in chemistry; Roger J. Radloff, graduate student in biology; Robert Watson, research assistant in chemistry; and Philip Laipis, undergraduate student in chemistry.

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BIOCHEMISTRY

Memory May Use Proteins

➤ WHAT IS MEMORY? Two biological chemists at the University of California at Los Angeles think it may involve the rapid production of highly specialized proteins in the brain.

Dr. Sidney Roberts and Dr. Claire E. Zomzely of the UCLA Medical School report unique characteristics of protein-synthesizing mechanisms in the brain which support the concept that these processes participate in the coding, storage and utilization of biological information.

Drs. Roberts and Zomzely and their coworkers have found that brain protein-making mechanisms are unusually sensitive to alterations in the internal environment. For example, variations in concentrations of charged atoms of magnesium and potassium appear to result in rapid and significant changes in protein production. Potassium ions are important links in the transmitting of impulses from sense organs.

This sensitivity of protein synthesis may be related to the engraving of memory traces from information received by the brain and, also, to the recalling of this information.

In this scheme, the production of specific "memory" protein is presumably presided over by genetic messengers. These are special forms of ribonucleic acid (RNA), which other investigators have suggested may participate in the coding, storage and retrieval of biological information.

Protein synthesis in the brain is also apparently uniquely sensitive to changes in levels of amino acids, the raw material of proteins. Hence mental retardation associated with inherited disorders of amino acid metabolism such as phenylketonuria may be due to abnormal or faulty protein synthesis in the brain.

In a similar fashion, faulty synthesis of brain protein, resulting from nutritional imbalances during fetal development, may frequently contribute to the development of mental disorders.

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ZOOLOGY

'Instant Ocean' Plus Care Keep Fragile Fish Alive

➤ HERE'S A QUICK formula for artificial saltwater to keep sea creatures alive and healthy.

For 100 gallons of "instant ocean," simply take tap water and add 23 pounds of salt, 6 pounds of magnesium sulfate, 10 ounces of potassium chloride, and various pinches of other chemicals such as strontium chloride, lithium chloride and cobalt sulfate.

By careful handling and management to keep the water in dynamic ocean condition, a successful aquarium hundreds of miles from the ocean is possible, said William E. Kelley, president of the new Aquarium of Niagara Falls, which opened June 12, 1965.

Mr. Kelley described the special filtering and circulating system used in which bacteria are used to absorb the poisonous waste materials produced by the sea creatures and change them to nontoxic chemicals.

"We can now display marine animals so delicate that they have never been shown alive to the public before," he said. With advice from zoologists and technicians the crystal-clear tanks keep the marine animals healthy, in contrast to murky dark tanks often found on exhibit.

Among the sea creatures to be housed in the new two-story circular aquarium will be dolphins, sharks, electric eels, jellyfish, polyps, Alaskan king crabs and basket starfish, which have five arms that open to form a net for catching fish.

Research studies and experiments will also be conducted in this aquarium, which is situated near the famous falls.

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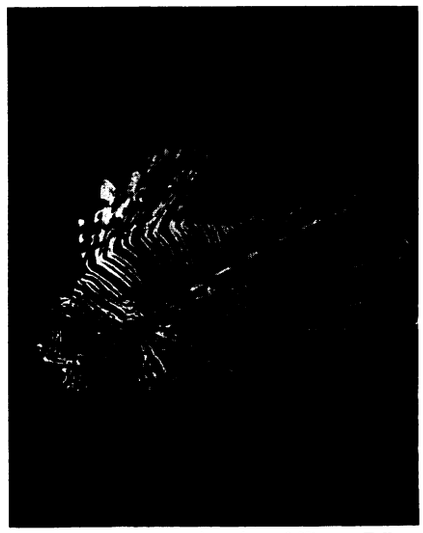

Aquarium of Niagara Falls

LION FISH—This striking fish in its natural habitat is normally found in the West Indies from Brazil to Florida. It is one of many fish being housed in the new Aquarium of Niagara Falls. Its chunky head and mottled coloration give it a very shaggy appearance and it reaches a length of about eight inches.