BIOLOGY

Clue to Photosynthesis

➤ A SIGNIFICANT STEP toward unraveling the intricate chemistry of photosynthesis may have been taken.

Dr. Andrew A. Benson of Pennsylvania State University told scientists at the annual meeting of the Federation of American Societies for Experimental Biology in Atlantic City that a substance resembling a common household detergent may hold the key to how sulfur is used in photosynthesis.

Photosynthesis is the process by which the green leaves of plants remove carbon dioxide from the air and convert it to growth material and to free oxygen. The entire animal world depends on this process for the continuation of life, for the production of all the food we eat and the oxygen in the air we breathe.

"For almost three years, we refused to believe that a plant could produce this kind of compound," Dr. Benson said. "But experimental evidence mounted and recently pure crystals of the sulfur compound have been isolated from alfalfa and spinach leaf extracts."

Dr. Benson said the compound—a sulfonic acid derivative called a sulfosugar—was found in the portion of the leaf which contains chlorophyll, the material that converts the energy of sunlight into biochemical energy.

Detergent molecules consist of two functional parts: one end that is soluble in water, the other end soluble in oil. The cleansing action lies in the solubility of grease in the oil portion, both of which are carried away by the flow of water. Thus, clean clothes.

Dr. Benson thinks the compound discovered in his laboratory might work the same way. The two ends in combination "are able to dislodge and transport many substances in a liquid medium."

Because photosynthesis involves the reactions of multiple water-soluble and oil-soluble substances, the sulfosugar molecules may act as shuttles, directing other substances to parts of the plant cell where their particular aspect of photosynthesis occurs.

The discovery of this sulfosugar seems to provide much of the answer to how sulfur is used in photosynthesis. For years, the role of this atom puzzled photosynthesis researchers.

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BIOLOGY

Inject Ether, Chloroform

➤ DOCTORS CAN NOW anesthetize their patients by injecting anesthetics such as ether and chloroform, formerly used only as inhalants, scientists attending the Federation of American Societies for Experimental Biology meeting in Atlantic City, N. J., learned.

Dr. John C. Krantz Jr. of the University of Maryland School of Medicine, Baltimore, told colleagues that patients can now be "put under" faster and the cumbersome face masks can be eliminated with this new injectable form of the volatile anesthetics.

The standard, non-volatile, injection anesthetics are acceptable for short-duration surgery, he said, but the old volatile inhalants are more dependable for lengthy operations, and scientists have been searching for an injectable form for years.

The main stumbling block has been the fact that these agents do not dissolve well in the normal salt solution.

Dr. Krantz and his co-workers tried using the anesthetics dissolved in oil and emulsified in a sugar (glucose) solution, and they finally found the right combination.

The anesthetic used was methoxyflurane, a methyl ether, and the emulsifying agent was "lecithin and Pluronic F 68." This particular emulsion is stable for several months, is compatible with the elements of the blood, is easily sterilized, affects blood pressure only slightly, works quickly in small amounts and lets the patient recover rapidly with very few side effects.

The new emulsion has been used successfully on four persons, Dr. Krantz said, and one of them, Dr. Helmut F. Cascorbi, is a member of his own research team.

Both Dr. Krantz and Dr. Cascorbi believe that now that one injectable volatile anesthetic has been prepared, it will be a simple matter to prepare others. Drs. Martin Helrich, Raymond M. Burgison and Martin I. Gold, and Miss Frieda Rudo, concur.

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BIOLOGY

Brain Damage Seen

➤ THE UNSEEN FINGERS of atomic radiation can leave a lasting impression on the brain, scientists from the University of California, Berkeley, reported in Atlantic City, N. J.

As a result of their findings, future space travelers may have still another problem to consider before they can safely encounter the higher radiation levels of interplanetary space. And atomic biologists may begin to revise some older opinions about the vulnerability of the brain, generally regarded as the most radiation-resistant part of the body.

Even a moderate dose of radiation can cause long-lasting changes in brain activity, Drs. Fred Rosenthal and Paola S. Timiras reported at the Federation of American Societies for Experimental Biology.

During a six-month period, the scientists found, irradiated rats showed an increased degree of brain excitability and a lower ability to maintain heightened brain activity. The findings were obtained by using a standard pair of physiological tests to measure the susceptibility of the brain to electroshock convulsions, and by comparing the results from irradiated and non-irradiated animals.

When the California scientists applied the tests for six months after rats had been given a 500-roentgen "shot" of whole-body exposure to X-rays, they found:

1. A consistently lower electroshock seizure threshold, interpreted to mean that brain excitability is increased after irradiation.

2. A shorter period of total maximal seizure, suggesting a decreased ability in irradiated animals for maintaining heightened brain activity.

Cause of the radiation effects on the brain is still unknown, but may be related to hormonal changes or to altered nerve cells.

Whatever the cause, radiation changes in the brain appear to stay with the affected animal long after it has recovered from the more acute results of radiation sickness, such as the disorders of the gastrointestinal tract and of the blood.

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Gauge for Heart

➤ THE PROBLEM of applying an accurate gauge to the heart's blood-pumping capacity has been solved by an ingenious method developed at the University of California, Berkeley.

The method may be applied soon to determine how the gravity-free conditions of outer space will influence heart performance. It is already showing promise in testing treatments used in medical practice.

Details of the new "automatic dye-dilution cardiac output determination" were reported by Drs. Julius T. Hansen, assistant research physiologist, and Nello Pace, professor of physiology, at the Federation of American Societies for Experimental Biology meeting in Atlantic City, N. J.

The main advantage of the new technique is fully automatic operation. Guesswork and the possibility of human error have been removed. Remote-control tests where the subject is free of external stimuli are now possible.

Synchronized with the subject's respiration, the new method also avoids previous errors that were due to the lungs' effect on the heart. And most important in repeated testing, the new method requires no permanent loss of blood.

Like earlier techniques, the new method employs a harmless dye injected into the blood stream and a "densitometer" to measure dye-intensity in the blood by means of a photoelectric cell. A complex control system that achieves full automation has been added by the California scientists.

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