CHEMISTRY

Aids for Brain Study

May yield some of the secrets of its functioning to "tracer" experiments with the radioactive by-products of atomic research.

➤ THE BRAIN, which is probably the most impervious to study of man's organs, may yield some of the secrets of its functioning to "tracer" experiments with radioactive by-products of atomic research.

Scientists in the University of California Medical School have already conducted experiments with radioactive phosphorus produced in the Berkeley cyclotron. Radioactive sodium and potassium also show promise of being useful tools in the study of the brain.

While the work is just beginning and it is too early to speculate on results the scientists believe the "tracer" studies hold the greatest promise in studying abnormal conditions of the brain, such as epilepsy.

"Tracer" studies are made possible by the radioactivity of various isotopes, or sisters, of common elements.

A radioactive isotope of phosphorus, for example, cannot be distinguished from ordinary phosphorus, except by its radiations. In the human body it acts like ordinary phosphorus. However, the presence of an atom of radio phosphorus anywhere in the body can be detected recording its radiation on delicate instruments.

Thus the metabolism of radio elements in the brain can be determined by the "tracer" method.

The importance of learning more about the functioning of the brain is evident from figures on epilepsy alone. It is estimated that over half a million people have convulsions in the United States alone, a figure approximating the number who have active tuberculosis.

While more has been done in the study and treatment of the disease in the past 10 or 15 years than in all previous history, there is still little understanding of the biochemical basis of the convulsive state. Epilepsy, therefore, remains largely a mystery.

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CHEMISTRY

Molecules Reveal Secrets

Great advances in medicine and biology to come from study of sizes and shapes of molecules. Specific action of drugs explained by configuration.

➤ GREAT ADVANCES in fundamental biology and medicine will come from thorough investigation of the sizes and shapes of molecules of body chemicals and of drugs and germ-killing chemicals, Dr. Linus C. Pauling, director of the Gates and Crellin Laboratories of Chemistry of the California Institute of Technology, declared at a meeting of the American Chemical Society in Rochester.

Antibodies, substances formed in the body to fight invading disease germs, are protein chemicals with very large molecules, Dr. Pauling pointed out. They react with the antigen of a disease germ or with a protein substance like egg white to form a precipitate in the same way that many of the ordinary precipitates the chemist meets in his work are formed. Dr. Pauling gave as an example the precipitate formed by a solution of a silver salt with a solution containing a cyanide ion. The antibody-antigen precipitate, moreover, can be redissolved by addition of an excess of antigen just as the silver cyanide can be by an excess of cyanide ion.

The great specificity of interaction between antibodies and antigens, each antibody reacting only with its corresponding antibody, is like another familiar chemical process, the formation of a crystal of a substance from a solution, Dr. Pauling pointed out.

After the antigen is injected into the body, antibody molecules are formed in such a way that a region of the antibody takes a configuration that mirrors a portion of the surface of the antigen molecule.

"This complementariness in structure leads to a strong attraction between the antibody molecule and the antigen, because it permits this combining region of the antibody molecule to get into close contact with the antigen molecule," Dr. Pauling said. "The closer that the two molecules can get in contact with each other, the stronger the intermolecular force of attraction between them.

"A crystal of a molecular substance is stable because all of the molecules pile themselves into such a configuration that each molecule is surrounded as closely as possible by other molecules; that is, if a molecule were to be removed from the interior of a crystal, the cavity that it would leave would have very nearly the shape of the molecule itself. Other molecules, with different shape and structure, would not fit into this cavity nearly so well, and in consequence other molecules in general would not be incorporated in a growing crystal."

"The specific action of drugs and bactericidal substances," he said, "has a similar explanation. Even the senses of taste and odor are based upon molecular configuration rather than upon ordinary chemical properties—a molecule which has the same shape as a camphor molecule will smell like camphor even though it may be quite unrelated to camphor chemically."

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ENTOMOLOGY

Insects Hide in Woods During Winter Season

➤ WINTER finds the woods quiet and still, deprived of the cheerful humming and buzzing of an active insect world. Safe in a silken sleeping bag or protected by a water-proof varnish, hidden under loose bark or cozy in tunnels chewed in rotting wood, insects pass the freezing days in a state of complete inactivity. As eggs, larvae, pupae or even adults, they await spring with its flowers and warm weather.

A slight swelling on a twig may be the winter quarters of hundreds of insect eggs. The mother lackey moth, for instance, binds her eggs in bracelets around a twig and covers them with a gum that hardens into a protective crust. A shiny coat of glandular shellac the same color as the twig protects the eggs of the Eastern tent caterpillar against weather and other enemies, until the caterpillars are ready to emerge in April.

Some insects pass the winter as larvae, hidden under stones or tunneled deep