BIOCHEMISTRY

Polio Spread in Cells

Cells tagged with radioactive materials revealed the process inside a cell attacked by poliovirus. The virus is believed to have an early effect on the nucleolus.

➤ SCIENTISTS who attended the Fifth International Congress on Biochemistry in Moscow have a clearer picture of what happens inside a cell attacked by poliovirus.

Dr. Hilton B. Levy of the National Institute of Allergy and Infectious Diseases, Bethesda, Md., reported that new evidence came to light when cells tagged with radioactive materials took X-rays of themselves during the infection process.

Within an hour after infection, Dr. Levy said, the ribonucleic acid (RNA), one of the chemicals involved in genetic transfer of information, begins working overtime in the nucleolus (a nucleus within the nucleus) of the cell. Soon afterward, some of the RNA formed in the nucleolus finds its way into the cytoplasm, the cell substance surrounding the nucleus.

At two hours, the first new polio protein appears in the cytoplasm. At three hours, polio protein appears in the nucleus itself, as a narrow ring around each nucleolus. At this time, the flurry of RNA activity is still going strong, but begins to decline by four hours, and the deoxyribonucleic acid (DNA), the other genetic chemical, also shows a decrease in activity.

By the fifth hour, RNA action in the nucleolus has almost stopped and the new infectious virus, not just its protein components, shows up in the cytoplasm.

On the basis of these data, Dr. Levy has suggested the following working hypothesis: the virus has an early effect on the nucleolus—possibly the virus RNA enters the nucleolus. The nucleolus is stimulated early to produce new ribosomes for specific virus protein manufacture in the cytoplasm. By three to four hours a new protein, possibly a nucleoprotein, is made in the nucleolus, through at least the mediation of the nucleolus, and this substance emerges into the cytoplasm to form new infectious virus. When the nucleolus has done this its RNA and DNA metabolism stop.

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Fatty Substance Found

➤ A NEW TYPE of fatty substance has been discovered. It was found in the digestive gland of the common starfish, but also occurs in mammals.

The substance, a phosphate-free plasmalogen, remained undiscovered until now because it is present in such minute quantities. Beef brain contains three parts of this lipid, guinea pig heart 15 parts, and beef bone marrow 50 parts per 10,000 parts of total fatty substance in each organ.

Discovery of the phosphate-free plasmalogen by Dr. Manfred L. Karnovsky, Dr. John R. Gilbertson and Joseph Eichberg of Harvard University Medical School was reported to the Fifth International Congress on Biochemistry in Moscow. Evidence for the existence of another group of similar substances containing sterols has also been obtained.

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Fights Foreign Protein

➤ NEW FACTS reported at the Fifth International Congress on Biochemistry in Moscow indicate that the reaction of the body to foreign proteins is chiefly the reaction of general rather than specific cells within the body.

The reaction to foreign protein, of which some allergies are examples, is actually a build-up of antibodies to any foreign protein, also known as an antigen.

Dr. F. Haurowitz of Indiana University, Bloomington, working with M. Richter and S. Zimmerman, reported that, contrary to popular belief, antibody production does not stop after the first injection of an antigen. Even after a single injection, antibody production continues in rabbits for more than a year.

The second injection causes immediate formation of antigen-antibody complexes and these complexes act as a strong stimulus for the antibody-forming cells. The antibody content of the blood then increases rapidly.

The findings are in opposition to the theory proposed by the Australian Nobelist, Sir F. Macfarlane Burnet, that the body has built-in cell types and that each type can manufacture antibodies of only one type. When antigen A is injected, those cells that form anti-A will be stimulated to excessive growth and multiplication, the theory states.

This theory does not explain how the body can react against unnatural proteins manufactured by chemists, but not found anywhere as natural substances. Presumably the body would have cells prepared to deal only with naturally occurring substances.

The explanation proposed by the scientists indicates that the antibody-forming type of cell has the ability to form antibodies against any type of antigen, not just one.

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Sulfa Tricks Enzymes

➤ SULFA DRUGS can fight human infections because enzymes are tricked into using them instead of a specific acid.

Dr. Gene M. Brown of Massachusetts Institute of Technology told the Fifth International Congress on Biochemistry in Moscow that a large part of sulfonamide and a small amount of para-aminobenzoic acid means the formation of very little folic acid, and thus little chance of bacterial growth.

In the 20 years during which sulfa drugs have been in use, scientists and physicians have not been able to pinpoint just why they were so effective.

The chemical properties of sulfonamides and para-aminobenzoic acid are so similar that it is possible to fool the enzymes, which are the "mechanics" of bacterial growth, into using them in place of the acid.

Sulfonamides are not toxic to animals, which do not manufacture the vitamin folic acid, but the animals are continually in need of a dietary supply of the acid. Sulfa drugs or compounds fed to an animal do not affect the animal directly, but do prevent the growth of infection-causing bacteria by "inhibiting the enzymatic formation of folic acid by these bacteria."

The biochemist said most bacteria prefer to manufacture their own folic acid and cannot use outside sources at all.

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FILTER FOR REDUCING WASTE

TECHNOLOGY

Vertical Filter Plant For Reducing Waste

➤ A VERTICAL filter system for reducing the amount of industrial waste flushed into a river has been built.

The three-story-high plant has vinyl honeycomb units acting as a filter for the waste water trickling through. More than 6,000 honeycomb "cells" can be stacked one on top of the other, reducing the land area for plants of this type.

Jointly developed by The Mead Corporation, Dayton, Ohio, and Rome Kraft Company, Rome, Ga., the plant will be used to treat pulp and paper waste.

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