life sciences

MICROBIOLOGY

Technique speeds identification of germ

The most rational approach to the treatment of an infectious disease is to identify specifically the offending organism and use drugs appropriate for its destruction. However, the necessary laboratory tests are expensive and time-consuming, often taking days, and as a result physicians frequently skip laboratory identification.

Speaking at the annual meeting of the American Society for Microbiology in Boston, Dr. Brij M. Mitruka of Yale University reported a technique for rapid and sensitive detection of infectious organisms. "If this technique can be perfected," he said, "diagnosis of certain infectious diseases could be made in hours."

Collaborating with Dr. Albert M. Jonas, Dr. Mitruka found that microorganisms that infect animals and man give off characteristic chemical by-products that can be identified by gas chromatography. Once a sufficient number of organism-specific gas chromatographic fingerprints have been studied, the results can be stored in a computer for use in automatic diagnosis, they say.

PATHOLOGY

Models for epilepsy

Lafora's disease is a rare but deadly form of epilepsy that usually appears in adolescence, causing muscle spasms, seizures and, unlike more common forms of epilepsy, death in 5 to 10 years. From studies at autopsy of victims of this disease, scientists have found that their brain tissue contains abnormal levels of sugar molecules, suggesting that a genetic defect (the disease runs in families) leads to a high accumulation of sugar.

Further research in this incurable disease may be possible, says Dr. James M. Holland in the current (March) issue of THE AMERICAN JOURNAL OF PATHOLOGY. The Washington State University scientists reports that two dogs, a bassett hound and a poodle, have been discovered with the disease, thus opening the door to controlled animal experiments. Previously, Lafora's disease was not known in any lower animal species.

GENETICS

Salt in baby diet challenged

If an infant is genetically predisposed to developing hypertension, or high blood pressure as an adult, feeding a salt-containing diet aggravates the problem, according to Dr. Lewis K. Dahl of the Brookhaven National Laboratory in Upton, N.Y. In the April PROCEEDINGS OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE, Dr. Dahl reports on studies with rats.

In man or in rats, there is no sure way to identify early in life those individuals genetically prone to high blood pressure. However, Dr. Dahl observes, "One sure way to spur the development of hypertension is to feed genetically prone individuals a high salt diet. Conversely, "one way to avoid it is to avoid foods with a high salt content." The investigator fed 25 genetically prone rats an exclusive diet of commercial baby foods. All developed hypertension within eight months; 12 died. On the other hand, 15 control rats from the same strain, fed a low salt diet, failed to develop hypertension.

MOLECULAR BIOLOGY

Cell death by exhaustion

Taking a Darwinian approach to the problem of cancer-causing viruses, Dr. Sol Spiegelman of Columbia University reports a new and unique tack in wiping out these infectious agents. Using RNA viruses, he has developed a technique that both rids the virus of its infectious properties and confers on it a useful, selective advantage in blocking the replication of the same type of virus that does have infectious ability.

A typical RNA virus contains a strand of genetic information some 300,000 nucleotides or units long, giving the virus a variety of biological functions. To reproduce themselves, these viruses depend on a specific enzyme, RNA replicase, which Dr. Spiegelman has isolated and purified. In a series of 15 test-tube operations, he combines viral RNA and replicase, each time removing the newly formed RNA strands before their full complement of nucleotides has been duplicated.

By the fifteenth transfer, he has small RNA strands, only 500 nucleotides long, which have shed the genetic information that makes them infectious while retaining the ability to replicate. Indeed, these small organisms replicate faster than their longer infectious counterparts.

When this new harmless viral RNA is placed in a cell with normal RNA strands, Dr. Spiegelman told the annual meeting of the National Academy of Sciences in Washington, D.C., it has a distinct competitive advantage in latching onto the cell's replicase enzymes. In effect, it replicates so rapidly that it uses up all of the available replicase before the infectious viral RNA can duplicate. Outpacing the cell's ability to synthesize the enzyme, it brings about cell death by exhaustion, causing no harm to neighboring normal cells.

ENZYMES

Biological energy systems

Mitochondria, tiny cellular organelles, are referred to as the power plants of cells, though the ways in which they operate are somewhat obscure. Addressing the annual meeting of the National Academy of Sciences, Dr. David E. Green of the University of Wisconsin reported clues to this operation.

Using the electron microscope, Dr. Green, with Dr. John H. Young and a team of collaborators, observed that the mitochondrial membrane is built of toadstool-shaped lipoprotein units that undergo rhythmic pulsations. The structural changes occurring in membrane components, they find, are accompanied by energy transformation. The energy released in the process is used by the mitochondrion to perform work, either the active transport of molecules across the membrane or the production of the energy-storing compound ATP (adenosine triphosphate).

"We have not yet devised a model to describe the details of how this is done," Dr. Green says, "but we feel sure that the pattern already established for studying active transport will point the way to the solution."