BIOLOGY

Caution, Byword in Biology

Laboratory safety devices are making it less hazardous for biologists to work with dangerous microbes than it is for pedestrians to cross a busy street.

By JUDITH VIORST

➤ SURVIVAL of the fittest is no longer the motto of the biological scientist. Even the "unfit" biologist survives these days, thanks to safety devices developed to protect him from infectious bacteria and viruses.

The long-standing tradition of the men who worked with deadly microbes was that you had to take your chances. Courage, not caution, was the byword.

Scientists made no serious attempt to keep their laboratories uncontaminated. They injected themselves and their co-workers with living organisms that could, and sometimes did, infect and kill those with low tolerances.

Today, however, special cabinets and suits, ventilated cages and hoods, vaccinations and training programs are contributing to the rising safety record in biological work throughout the country. Number one pioneer in the effort to guard the biologist against the hazards of his job is the U.S. Army Biological Laboratories at Fort Detrick, Frederick, Md.

The prime enemies of Detrick's safety division scientists are aerosols, air-borne infectious organisms that cannot be seen, felt, tasted, touched or heard. These microorganisms, undetectable without elaborate monitoring equipment, enter the body through the respiratory system. Scientists agree that the only completely safe way to avoid their damaging effects is to eliminate them from the air. And this the Biological Laboratories has done—by perfecting a versatile closed laboratory system called the safety cabinet.

Safety Cabinets

The standard safety cabinet is a stainless steel and glass structure about six feet wide and two and one-half feet deep. Work is done on a steel table closed in on all sides, except for an open area at the bottom front. Through this opening the scientist adds or removes materials, and does whatever else is necessary.

Three essential features characterize this safety cabinet. Front glass panes make it possible to observe work while remaining protected from materials that might unexpectedly spurt up. Air is steadily drawn into the cabinet through the opening, keeping air-borne organisms from dispersing into the room. A filtration system purifies all air leaving the cabinet.

The laboratories where infectious organisms are used have the designation "hot" areas. When the work is very "hot," it is confined within an even safer version of the safety cabinet.

This cabinet has no open section. Instead, the lower front is closed off and fitted with long rubber gloves extending into the cabinet. Anything entering or leaving must travel through a pass-through box equipped with an inner and outer door which are never opened at the same time.

Here is how this cabinet works: When a scientist wants to place something inside, he unlocks the outer door, located at the side of the cabinet, puts the material into the pre-sterilized box, then locks the door again. Now he slips his hands into the rubber gloves extending into the cabinet, unlocks the inner door and brings the material inside. No step in this procedure permits the infectious microorganisms to extend beyond their confines.

Decontamination Procedure

Removal of material from the cabinet requires a decontamination procedure. Using the rubber gloves to unlock the inner door, the scientist places the material from the cabinet into the pass-through box, then locks the door again. Steam, ultraviolet or some other sterilizing force is then applied to the material in the box. When decontamination is completed, the outer door is opened and the now "clean" material is removed.

The fully developed safety cabinet is about ten years old, although earlier German versions existed back in the 1930's. Prior to its completion, some biological work was far too hazardous to be risked in an unprotected environment.

Even today, wherever the closed cabinet is not used, certain disease organisms simply must be outlawed from experimental work. At Detrick, however, nothing is outlawed, for the safety cabinet is designed to meet the ultimate dangers.

Other Safety Devices

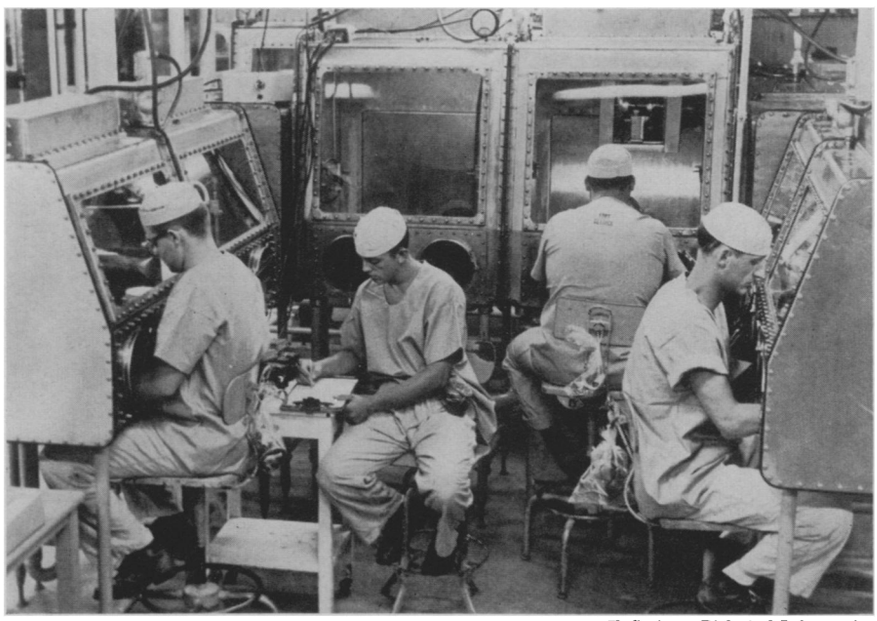
Safety suits reverse the safety cabinet principle. Instead of shutting the laboratory away from the man, this device shuts the man away from the laboratory.

The vinyl-plastic suit looks something like the garment worn by our astronauts. It has its own air supply so that contaminated outside air cannot enter. It is used for work that involves materials so large and so cumbersome that they cannot conveniently be enclosed.

Ventilated hoods and cages are smaller versions of the suits and cabinets. The cages are essential for experiments dealing with scientifically infected animals that cannot be handled without high risk.

Many other safety devices and procedures have been developed or tested at Fort Detrick. Improved centrifuge equipment has eliminated the danger of breaking glass tubes or in other ways allowing microorganisms to escape in the process of shaking and mixing materials. A new design for the old pipette prevents the sucking up of pathogenic materials into the mouth.

A simple little metal clamp set over a



U. S. Army Biological Laboratories

ENCLOSED LABORATORY—Harmful microbes are contained within glass and steel safety cabinets designed to provide maximum protection for biologists.

rubber stopper makes it impossible for the stopper to pop out of a germ-filled bottle accidentally. A variety of sterilizing agents have been explored, including ethylene oxide gas—a cold sterilizer developed for use with delicate heat-sensitive instruments.

At Detrick everyone working in hot areas is vaccinated. There are very few micro-organisms dealt with at the Biological Laboratories for which there are no vaccines, but where such work is done the precautions are redoubled.

Employees dealing with pathogens are trained to report themselves at the slightest sign of physical abnormality. Time taken off for these medical precautions is not deducted from sick leave or annual leave.

Because of its deep concern with protective measures, Detrick probably has the safest laboratory conditions in the world. Some scientists say that there is less hazard at the Biological Laboratories than there is in crossing a busy street. When accidents do occur, they are almost always the result of an individual's failure to follow correct precautionary procedures.

Detrick scientists disseminate their safety findings and recommendations through professional journals, pamphlets, film strips, etc. They also answer innumerable queries from research institutions, public health departments, universities and commercial laboratories. In addition to informing biologists about the various safety devices now available, these educational materials also emphasize the need and value of caution in biological work.

A wild African lion, one slide film points out, belongs in a safety device called a cage. Brave as a lion tamer may be, he cannot afford to take chances with dangerous beasts. Nor can the biologist (who, the film implies, may be easily as brave as the lion tamer) afford to take chances either—with those equally dangerous creatures, infectious bacteria.

• Science News Letter, 83:282 May 4, 1963

MEDICINE

New Disease Weapon

➤ A NEW WEAPON for fighting infectious diseases has been discovered.

Both a group of chemical compounds and an idea, it enables a host animal to adjust to disease-causing bacteria, rather than fighting to overcome the invaders. The bacteria are not killed, yet no disease develops.

The compounds have been christened "pacifarins" by their discoverer, Dr. Howard A. Schneider of Rockefeller Institute, New York.

One of the chemical "silencers" has been isolated from grain, he reported to the American Philosophical Society meeting in Philadelphia.

Pacifarins open the way for a new strategy of disease control. The strategy is expected to apply to humans, although specific tests have not yet been made.

In laboratory tests on mice, the chemicals silenced the bacteria that cause typhoid. When a mouse ate a pacifarin, its system adjusted to the bacteria. Disease did not break out. After a while, the bacteria stopped multiplying, and the mouse and bacteria lived together in peace.

Scientists and laymen focus on the sickness bacteria cause, Dr. Schneider said. But when an animal or human host encounters bacteria, disease very rarely results. For a handful of polio cases in one area, there are a thousand persons who have the virus but do not become ill.

By understanding the reasons a disease is not contracted, scientists will be able to help those who have the disease, he said.

Using pacifarins in a strategy of silent adjustment means abandoning the idea that "man should survive and bacteria be eradicated," Dr. Schneider reported. It changes the basic notion that disease, in itself, is a war.

Past methods of fighting disease have been based on the war assumption. Neither man nor the bacteria has won.

The first pacifarin isolated works with all three varieties of mouse typhoid. Tests will be made with chickens and other animals to see how many types of typhoid the substance can stop.

Dr. Schneider said he did not know whether the pacifarin would have stopped the recent Swedish typhoid epidemic.

The pacifarin already works more generally than many immunological techniques. For every new strain of a disease, immunologists have to develop a new vaccine. The body itself builds up immunities to drugs and treatment.

This could be overcome by using pacifarins, Dr. Schneider indicated.

• Science News Letter, 83:283 May 4, 1963

DENTISTRY

Mouth Cancer Detection Dentist's Responsibility

➤ YOUR DENTIST has the responsibility of detecting mouth cancer. The American Dental Association urges dentists to take a sample smear of any suspected mouth area when a patient comes for routine dental work.

Dr. Clifford Wilk of Chicago told the National Dental Health Conference at Chicago that dentists have adapted the Papanicolaou cervical cancer smear technique with reliable diagnostic results. They take their smears with a metal blade or with a cotton-tipped applicator tongue blade and send the samples to laboratories for analysis.

Dr. Wilk, who is a member of an advisory committee to the Chicago Board of Health, said mouth cancer, although in an easily detectable area for early diagnosis, has received little attention.

• Science News Letter, 83:283 May 4, 1963