PUBLIC HEALTH

Nerve Gas Antidote

The chemical 2-pyridine aldoxime methiodide, known as PAM, found to counteract effects of nerve gases. Discovered during study of the chemistry of nerve impulse transmission.

➤ THE UNITED STATES has a new and powerful antidote for nerve gases. It is 100% effective in mice. Whether it has been tested on larger animals or man is not known.

Scientists who made the nerve gas antidote, called PAM, hope they are also on the road to conquest of certain diseases, such as disabling and incurable myasthenia gravis. The nerve gas antidote resulted from study of the chemistry of nerve impulse transmission, the basic defect in myasthenia gravis.

The nerve gas antidote is 2-pyridine aldoxime methiodide, shortened to PAM.

Mice given lethal doses of the nerve gas DFP, or diisopropylfluorophosphate, or the chemically related insecticide, paraoxon, were all saved by injections of PAM into the belly. This antidote was injected within one or two minutes after injection of the poisons under the skin.

How fast PAM must be given humans to save them after exposure to a nerve gas or insecticide is not known. Dr. Irwin B. Wilson and his associates at Columbia University have tested the compound only on mice that got the usually fatal doses of the poisons. The doses of poisons were so big some of the mice died within five minutes and the bulk of them within a half hour when not given PAM.

PAM was made by Dr. Sara Ginsburg according to specifications drawn by Dr. Wilson. He was able to draw them because he had studied the molecular forces and chemical changes occurring when a body chemical, cholinesterase, hydrolyzes and breaks down another chemical, acetylcholine.

This chemical, ACh for short, transmits nerve impulses, or messages, across nerve junctions. After the impulse has been transmitted, the ACh must be destroyed so the nerve can be readied for the next impulse. Normally, cholinesterase does this.

Cholinesterase is blocked in this vital nerve function by nerve gases and related compounds.

The nerve gases do this by adding a phosphorus-containing group to cholinesterase. When an acetyl group is transferred to cholinesterase, the acetyl group reacts with water in microseconds. The phosphorus-containing group from the nerve gases takes days to react with water. Hence the difficulty in getting it loose from cholinesterase in time to save nerve gas victims.

Electric eels helped Dr. Wilson draw his specifications for the nerve gas antidote. The electric charges accompanying nerve activity are much larger in eels than in humans. Large specimens of eels can deliver one ampere at 600 to 700 volts, although for only a very short time.

Studying cholinesterase, the nerve chemical, from eels showed the nerve chemical contains a negatively charged electrical center near the site where the phosphorus group from nerve gases attaches itself.

This gave the idea that a chemical with a positively charged center in the right position should have ability to remove the phosphorus group from cholinesterase and thus reverse nerve gas damage.

By exploiting this and other knowledge of cholinesterase, Dr. Wilson arrived at the formula for PAM. When Dr. Ginsburg had made the compound and it was tested on mice, its value in saving the lives of the animals proved "dramatic and certain."

PAM is a crystalline solid which dissolves in water to give a clear yellow solution. It is easily and inexpensively synthesized. The compound itself, in amounts necessary to preserve life, is not toxic.

Associated with Dr. Wilson in the development of PAM was also Dr. Helmut Kewitz, Ford Foundation fellow from Germany. Some of the basic research on cholinesterase had previously been done by another Columbia scientist, Dr. David Nachmansohn.

The Columbia work was supported in part by the U. S. Public Health Service, the Army's Office of the Surgeon General and the Atomic Energy Commission.

Science News Letter, March 24, 1956

TECHNOLOGY

Squeezable Plastic Can Designed for Home Use

➤ HOUSEWIVES will soon be able to buy many household goods in the plastic counterpart of the tin can.

The new can-like container is made of a squeezable polyethylene plastic sleeve with a metal top and bottom crimped onto it.

It is primarily designed for use with liquids and powders. The plastic can also features a new spout that releases the contents at any angle when the body of the container is squeezed.

The container, a development of the Bradley Container Corporation, Maynard, Mass., will be marketed in sizes that range from eight to 32 ounces.

Science News Letter, March 24, 1956

MEASURING PARTICLE SIZE—To measure the size distribution of particles dispersed in air, the cascade impactor shown here was developed by scientists at Battelle Memorial Institute, Columbus, Ohio, for the Army Chemical Corps. Increasing speed and inertia are imparted to particles as aerosols are drawn through a series of funnels with successively smaller openings. When the inertia of the particles overcomes air drag, they impact on the various slides for later detection.