PUBLIC HEALTH

Know These Chemicals

Isopropyl methyl phosphonofluoridate and dimethylamido ethoxyl phosphoryl cyanide are two chemicals whose nicknames will become familiar words if war comes.

➤ IF WAR comes, the average person who has learned such unfamiliar terms as neutron and nuclear fission, thanks to the A- and H-bombs, may be just as much interested in knowing the following.

Isopropyl methyl phosphonofluoridate.

Dimethylamido ethoxyl phosphoryl cyanide.

These are the chemical names for two nerve gases. The isopropyl job has the short name, sarin. The other has been shortnamed or nicknamed tabun.

They were once considered for war use by German military authorities. Almost everything about them except the fact of their existence was a closely guarded secret of our military officials during World War II and for some time after.

Now, Drs. Stephen Krop and A. M. Kunkel, civilian scientists with the Army Chemical Corps, report on work done on these nerve gases in 1947 and 1948. The full names and structural formulas are given in their account, to show how they are related to another well known anticholinesterase chemical, DFP.

DFP, short for di-isopropyl fluorophosphate, has been used medically for some years to treat the eye disease, glaucoma, and the muscle weakness disease, myasthenia gravis.

Like the two nerve gases, DFP stops the action of an important body chemical that is essential to the nerves performing their function. Hence the name, nerve gases. The body chemical is the enzyme, cholinesterase, so nerve gases and DFP are called anticholinesterases.

DFP and sarin are alike in that each has a phosphorus and a fluorine atom. Tabun has the phosphorus, but instead of the fluorine, it has a cyanide group in its molecule. DFP has more oxygen and more hydrogen than either sarin or tabun. And tabun has an extra nitrogen atom besides the one in the cyanide.

The effects of these nerve gases have often been given, although their chemistry, even after secrecy was lifted, has been told chiefly to chemists, pharamacologists and other scientists. Drs. Krop and Kunkel sum them up by saying they "exert profound effects on the respiration, circulation, central nervous system and gastrointestinal tract."

In lay language they have been described as follows:

If a high concentration is breathed for a few seconds, death occurs. Exposure even to traces of their vapors causes marked constriction of the pupils of the eyes. The bronchial tubes become constricted, there is sudden difficulty in breathing, accompanied by coughing, shortness of breath and watery discharge from the nose.

A slightly greater exposure causes painful constriction of the focusing muscles of the eyes. There is pain when the person afflicted tries to focus his eyes and often bright light is painful.

Severe exposure causes irrational behavior, hence the reference to nerve gases as "madness gases." There is also emotional instability, depression, restlessness and tremor in such cases. Milder cases of nerve gas poisoning may show such mental symptoms as giddiness, tension, anxiety, insomnia and excessive dreaming.

The report of the 1947-1948 work on them by Drs. Krop and Kunkel is now reaching scientists through the *Proceedings of the Society for Experimental Biology and Medicine* (July).

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PHYSIOLOGY

Nerve-Gas Resistance

➤ BULL FROGS show "great resistance to and remarkable recovery from" sarin, the most poisonous of three known nerve gas type compounds.

They can survive more than a thousand times the dose that would kill a man, Dr. Charles G. Wilber of the Chemical Corps Medical Laboratories, Army Chemical Center, Md., reports in *Science* (Aug. 20).

Reason for studying the effect of nerve gases on frogs, he explains, is that a big part of our knowledge of fundamental physiology of nervous activity has come from frogs and similar animals.

Even when he gave a dose of sarin big enough to kill a 150-pound man, two out of six of the frogs survived. Comparing the size and weight of a frog to that of a man gives an idea of the frog's resistance.

Doses of drugs or other chemicals usually are sized according to the weight of the animal or person. Children, for example, get smaller doses than grown-ups, and guinea pigs or other laboratory test animals get still smaller doses.

To explain the frog's resistance to sarin, Dr. Wilber points out that two key effects of nerve gas poisoning on man and other mammals are paralysis of breathing and great slowing of blood circulation.

In frogs such effects merely act like an anesthetic, putting the animal to sleep, until the poison has been detoxified.

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"BLAST OFF"—Instead of the deadly ray of science fiction stories, this operator uses rice hulls and ground walnut shells to blast off surface dirt on General Electric J-47 jet engines returned for overhaul.