

for the recovery of traces of other volatile liquid compounds. It was shown that the concentration of trichloroethylene in approximately 1 ml. blood samples can be estimated to the nearest microgram at concentrations between 1 and 12 mg./100 ml.

AUTHORS' SUMMARY.

THE TOXIC EFFECTS IN MAN OF THE ANTICHOLINESTERASE INSECTICIDE PARATHION (P-NITRO-PHENYL DIETHYL THIONOPHOSPHATE). D. GROB, W. L. GARLICK, and A. M. HARVEY, Bull. Johns Hopkins Hosp. **87**:106 (Aug.) 1950.

According to Grob and his associates, parathion (o,o-diethyl-O-paranitrophenyl thiophosphate) has been widely used as an insecticide during the past year, and important problems have arisen because of its toxicity in man. This communication describes the toxic effects of parathion in 32 men and 8 women following accidental exposure, and the relation of these effects to the depression of cholinesterase enzymes. Exposure to parathion has resulted in death in 6 men, severe but not fatal symptoms in 2 men and 2 women, and mild to moderate symptoms in 24 men and 6 women. The nature of the exposure is summarized in a table. Symptoms have not yet occurred following the ingestion of fruit or vegetables that had been sprayed with this compound, but this remains a possibility, since fruit harvested from trees that had been sprayed with 0.06 per cent parathion nine days before harvesting contained up to 0.09 mg. per pound of fruit. The length of exposure to this compound prior to the occurrence of symptoms varied from several hours to several weeks, and the degree of harm no doubt depended on the degree of exposure and of absorption.

Manifestations that followed parathion exposure included muscarine-like, nicotine-like, and central nervous system effects, resembling those produced by the other organic phosphate anticholinesterase compounds, di-isopropyl fluorophosphate (DFP) and tetraethyl pyrophosphate (TEPP). Death occurred in coma 18 to 30 hours after the onset of symptoms, and usually after the occurrence of generalized convulsions.

Parathion produced a marked depression of the cholinesterase activity of the plasma and red blood cells in all subjects examined, and a moderate depression of the cholinesterase activity of the tissues (including the brain) in the patients who died. Following cessation of parathion exposure the plasma and red blood cell cholinesterase activities were restored at rates which, after the first three days, were compatible with the regeneration of new enzyme protein by the liver and by the red blood cells.

Most of the effects of parathion and almost all the effects of di-isopropyl fluorophosphate and tetraethyl pyrophosphate appear to be due to the depression of the activity of the cholinesterase enzymes of the tissues. Differences between the clinical effects of these compounds can for the most part be explained by differences in their physical and chemical properties. The elevation of blood pressure and leukocyte count produced by parathion and the postmortem finding of hyperemia and edema of the organs suggest that this compound may have some additional pharmacologic effect.

Because of its high lipid solubility and very slow rate of hydrolysis, the handling of parathion is especially hazardous. Recommendations are made for the safety of personnel exposed to this and other anticholinesterase compounds.

The treatment of symptoms due to the organic phosphate anticholinesterase compounds relies chiefly on atropine. Supplementary measures include the removal of unabsorbed compound, parenteral replacement of fluids, the administration of oxygen and, if necessary, tracheal intubation and artificial respiration.

TOXICOLOGY OF ORGANIC PHOSPHATE INSECTICIDES. H. K. ABRAMS and A. R. LEONARD, California Med. **73**:183 (Aug.) 1950.

The organic phosphate insecticides mentioned by Abrams and Leonard are hexaethyl tetraphosphate, tetraethyl pyrophosphate, also known under the name of vapotone,[®] and parathion which is o,o-diethyl-O-paranitrophenyl thiophosphate. They are being widely used in the control of mites, codling moths and other insects which may be resistant to DDT and the older insecticides. They are applied to fruit orchards and other crops by airplane spraying, mechanical spraying from tractors and hand spraying.