TRITHION POISONING

BY

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(RECEIVED FOR PUBLICATION DECEMBER 7, 1960)

Nineteen cases of poisoning by the organophosphorus insecticide trithion (O,O-diethyl S-p-chlorophenylthiomethyl phosphorodithioate) are reported among workers on a sugar cane estate in Trinidad. There were no fatalities. Whole blood cholinesterase values determined by a portable field kit are given for some cases. The insecticide was applied as a dust under conditions in which absorption through the skin and inhalation were probably unusually severe.

Cases of parathion poisoning have frequently been described in the literature but there has been no report of poisoning by trithion.

Trithion (O,O-diethyl S-p-chlorophenylthiomethyl phosphorodithioate)

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\begin{align*}
\text{C}_2\text{H}_5\text{O} & \rightarrow \text{S} \\
\text{P} & \rightarrow \text{S-CH}_2\text{S} \\
\text{C}_2\text{H}_3\text{O} & \rightarrow \text{Cl}
\end{align*}
\]

is used against the major pest of sugar cane in Trinidad—the frog hopper (Aeneolamia varia saccharina). Trithion is diluted with limestone dust in mixing sheds to a final concentration of 2% and this dust is applied to the roots of the sugar cane. The published acute toxicity data on trithion show some variability, especially on dermal toxicity. Gaines (1960) quotes an oral \(LD_{50}\) of 30 mg./kg. for male rats, and 10 mg./kg. for females; dermal \(LD_{50}\) were 54 mg./kg. for male rats and 27 mg./kg. for females. Kerr and Brogdan (1959) quote a dermal \(LD_{50}\) of 1270 mg./kg. for the rabbit, and Edson (1960) quotes a dermal \(LD_{50}\) of 800 mg/kg. for the rat. The signs of poisoning are those produced by an inhibition of cholinesterase.

Materials

There were 535 workers at risk, of whom 60 were employed in the mixing shed; the rest applied the 2% dust (from "Rotver" dusting guns) to the soil at the base of the sugar cane stalk. The men were predominantly East Indian with about 5% negroes.

The whole blood cholinesterase was determined by the rapid field method (Edson and Fenwick, 1955) using a Lovibond Comparator and portable field kit.* All blood samples were taken and estimated in the clinic and not in the field in order to avoid contamination of reagents by drifting clouds of insecticide dust.

Findings

In 1959, 10 cases of trithion poisoning were observed of which seven were mild and two moderately severe and required treatment with atropine. All the cases involved field workers except the one serious case, the circumstances of which are described in detail as it illustrates one of the difficulties involved in supervision.

Case Report.—An East Indian, aged 25 years, was employed in the mixing-shed. This patient was attacked by some of his colleagues during the lunch break, and held down while trithion dust was forced into his mouth. He presented the following morning with nausea, vomiting, severe abdominal colic, excessive sweating, salivation, pallor, apprehension, restlessness, headache, and ataxia. There were fine fibrillar tremors of the lids and face. He required repeated doses of atropine over 30 hours but made a complete recovery.

No cholinesterase estimations were carried out in that year.

In 1960 the working population was surveyed before exposure. The range of normal cholinesterase (ChE) values of 100 men was from 75-87% on the comparator scale (using a European blood as a control 100%). During this season nine cases of poisoning were observed and the clinical features

*Obtainable from Messrs. Tintometer Ltd.
together with the ChE levels at the time they were first seen are collected in the Table. Cases 1, 2, 3, 4, and 7 were moderately severe and required treatment. They were kept under observation and given atropine, initially 2 mg. (1/30 g.) intramuscularly, then 1 mg. (1/50 g.) subcutaneously and repeatedly according to their clinical condition (Edson, 1955). All cases made a satisfactory response to treatment and there were no fatalities.

Pyridine-2-aldoxime methiodide (P.A.M.) or the methane sulphonate (P₄S) was not given as these drugs were not available in Trinidad at the time.

**Discussion**

The hazards involved in the use of some of the organophosphorus insecticides are well known. In Japan it is estimated that parathion leads to about 1,000 cases of poisoning every year (Hiraki and Namba, 1957). Trithion is not so extensively used as parathion and as far as can be ascertained no cases of poisoning by trithion have been previously described. The cases reported here occurred over a three-month period of root dusting during which some 33,695 cwt. of 2% trithion in limestone dust were applied on an estate of 26,000 acres. The application was carried out during the wet season (July-September) when the temperature averaged 84°F with a relative humidity of 80-90%.

Although those working in the mixing-shed are exposed to a greater concentration of dust, all the cases of trithion poisoning were among the field workers with the exception of the man involved in a fight. The mixing-shed employee works in well ventilated and relatively cool surroundings and is not undergoing arduous physical exertion. Furthermore, the employment of safety precautions can be more easily enforced, at least for most of the time.

The field worker, on the other hand, undergoes strenuous physical exertion as he walks up and down the rows of cane, applying the dust from “Rotver” dusting guns to the roots and raising a dust cloud. The cane is 5 to 6 ft. high acting as an effective shield against any breeze, while strong convection currents tend to maintain the dust cloud. In these intensely hot and humid conditions there is a marked peripheral vasodilation, rapid subcutaneous blood flow, and increased respiratory exchange. These factors facilitate absorption of the insecticide adhering to the skin while the quantity inhaled may be considerable.

The employment of adequate safety precautions in the tropics is a matter of extreme difficulty. Protective equipment is not readily tolerated, and the climatic conditions show their effect also on skin physiology and fatigue. The dusting operations are often of great urgency. The vast majority of the labour force is illiterate and tends either to observe safety instructions with a certain nonchalance, or else to be so impressed by the possible dangers of the work that they will not undertake it at all. The difficulty of ensuring that protective measures are being taken when some of the workers are, of necessity, out of sight of the supervisor as they walk through the cane field during a dusting operation can be appreciated.

Under these conditions an insecticide which can be used safely in temperate climates may carry a hazard in the tropics. The problem is that of supervising all the workers all the time.

Constant vigilance together with the use of the portable field kit makes it possible to detect exposure before serious poisoning develops. It has been found that trithion given in large doses (1-2 g./kg.) will produce ataxia in hens (E. F. Edson, personal

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**Table: Nine cases of trithion poisoning seen in 1960**

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Date</th>
<th>Race</th>
<th>Age (years)</th>
<th>Clinical Picture</th>
<th>ChE per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15.7.60</td>
<td>Negro</td>
<td>18</td>
<td>Anorexia, nausea, vomiting, abdominal colic, pallor, apprehension, restlessness, and headache</td>
<td>37.5</td>
</tr>
<tr>
<td>2</td>
<td>15.7.60</td>
<td>East Indian</td>
<td>28</td>
<td>Anorexia, nausea, vomiting, abdominal colic, excessive sweating, salivation, apprehension, and restlessness</td>
<td>37.5</td>
</tr>
<tr>
<td>3</td>
<td>20.7.60</td>
<td>East Indian</td>
<td>19</td>
<td>Anorexia, nausea, vomiting, abdominal colic, salivation, and restlessness</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>19.7.60</td>
<td>East Indian</td>
<td>22</td>
<td>Anorexia, nausea, vomiting, abdominal colic, excessive sweating, salivation, and bronchoconstriction</td>
<td>37.5</td>
</tr>
<tr>
<td>5</td>
<td>22.7.60</td>
<td>East Indian</td>
<td>38</td>
<td>Anorexia, nausea, vomiting, and headache</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>22.7.60</td>
<td>East Indian</td>
<td>20</td>
<td>Nausea, slight vomiting</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>18.8.60</td>
<td>East Indian</td>
<td>18</td>
<td>Nausea, vomiting, abdominal colic, excessive sweating, salivation, apprehension, restlessness, and headache</td>
<td>25</td>
</tr>
<tr>
<td>8</td>
<td>23.8.60</td>
<td>East Indian</td>
<td>21</td>
<td>Nausea, vomiting, bronchoconstriction, and headache</td>
<td>62.5</td>
</tr>
<tr>
<td>9</td>
<td>23.8.60</td>
<td>East Indian</td>
<td>28</td>
<td>Nausea, slight vomiting</td>
<td>37.5</td>
</tr>
</tbody>
</table>
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communication). It is satisfactory to note that none of these men developed any delayed neurological lesions.

Acknowledgements are due to the Board of Directors of Caroni Limited for their permission to publish this paper, to Mr. P. E. R. Bovell, General Manager, Caroni Limited for his helpful criticism, and to Dr. F. Ayrey, Medical Superintendent, Caroni Limited for his advice and permission to publish details of Case 7.

I should like to express my indebtedness to Dr. E. F. Edson, of the Medical Department of Fisons Pest Control Ltd. for his helpful encouragement and advice in the preparation of this paper.

REFERENCES