TOXICOLOGICAL EVALUATION OF SUMITHION** (OMS-43) ON OPERATORS AND INHABITANTS IN THE MAMASANI AREA, SOUTHERN IRAN, 1972*

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ABSTRACT **The aim of this trial was to determine the toxic effect of OMS-43 or spraymen and inhabitants.**

The spraying operation lasted for 30 successive days, and two teams consisting of 20 spraymen, 2 mixers, 4 foremen and 2 team leaders were engaged in this operation. The operators were under systematic and closed clinical observation and cholinesterase determination (tintometric method) during the operation as well as, in some cases, two months after.

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In spite of the rigid instructions given to the spraymen to follow the necessary precautions, there were 42 cases of clinical symptoms. In some individuals several relapses occurred during the operation. No complaints or cholinesterase depression was observed during the first 2-week exposure.

The majority of cases were mild and short, recovery resulted after washing and rest (2-3 hours), and most cases returned to work on the same day.

The main clinical symptoms were headache, giddiness, nausea and abdominal cramps; some workers felt weakness. Diarrhoea was reported amosg two cases and was treated with Enterovioform (Ciba).

A drop in whole blood CHE was seen among both mixers accompanied by clinical symptoms. One of the mixers left his job when his CHE was depressed to 12.5%. Out of 20 spraymen, 8 showed depression of CHE, in some cases with clinical symptoms. After Atropine was injected and rest prescribed, recovery resulted. Among the 4 foremen (except one) and 2 team leaders, CHE depression was not significant.

Clinical investifation and laboratory tests among 925 inhabitants of 5 villages, carried out 24 hours after insecticide application, showed only 15 cases with light symptoms. No significant change in CHE level was observed.

This study showed that the use of Sumithion under local conditions (sub-tropics, hot dry season) was safe for residents, but its toxic effect on operators should be considered and further toxicological investigations are required under tropical conditions.

INTRODUCTION

Due to the development of resistance of *A. stephensi* to chlorinated hydrocarbon insecticides, Malathion is in use at the present time for malaria control in southern Iran. This program may be faced with serious obstacles in the near future, and therefore there is a vital need for a safe and effective insecticide which could be used as a substitute for Malathion. A large-scale field trial of Sumithion (OMS-43) at stage VI was carried out in the Mamasani area in southern Iran, in August 1972, by the School of Public Health and Institute of Public Health Research in collaboration with MEO of Iran and the Sumitomo Chemical Co., Ltd., Japan.

Objectives:

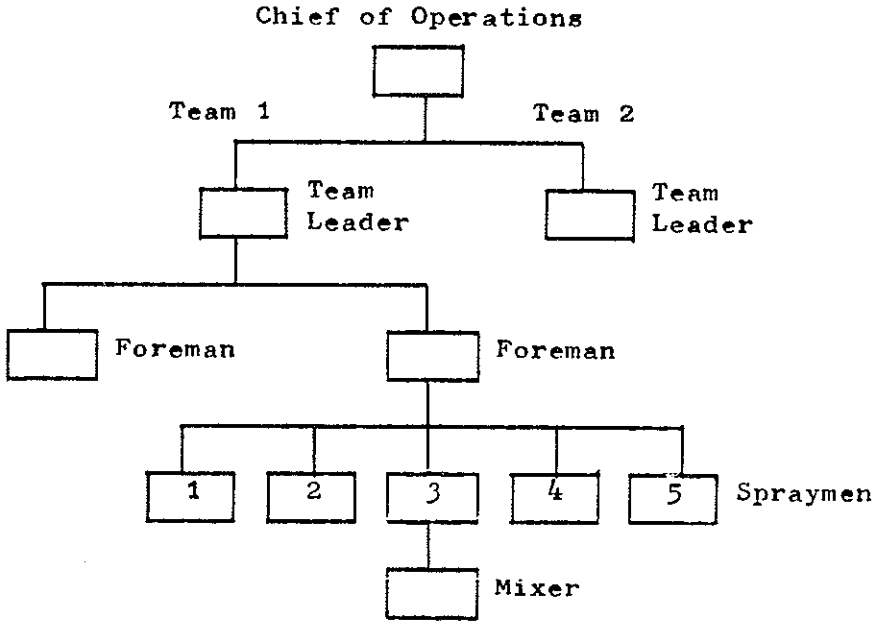
In addition to an entomological evaluation of this insecticide, which was carried out separately, the main objective of this study was to determine:

1. The safety of the material in regard to spraymen and inhabitants under operating conditions; and
2. The toxic effects of the insecticide on domestic animals and poultry.

MATERIALS AND METHODS

Area : A vast plain northwest of Kazeroun, which is almost entirely surrounded by mountains, was selected, and 57 villages with a population of 11,445 were sprayed.

Methods and instructions for spraying : Twenty-eight workers were selected from the local candidates, who were mostly experienced spraymen without exposure to insecticide since one year ago. The workers were divided into two teams, each having a team leader and consisting of two squads of 5 spraymen, one mixer and 2 foremen, according to the following chart :



Necessary instructions regarding safety measures were given to the operators before the commencement of spraying operations and personal protective devices such as hats and overalls were supplied to all. In addition, rubber gloves and cloth masks were given to the mixers.

A sub-station with necessary facilities such as a water supply, showers, soap, etc., was set up in a suitable place in the operational area where, every day in the morning, the workers could put on their overalls and wash themselves at the end of the day's work. Overalls were washed daily and made ready for the

following morning.

The insecticide, Smithion w.w.p. 40% in 40 kg containers, was used as a 5% suspension which was prepared in a large drum of 220 litre capacity and sprayed at 2 gms/m^2 by Hudson x-pert spray pumps fitted with 8002 nozzle tips. The nozzles were changed every 10 days.

Work was carried out from 6:00 a.m. to 1:30 p.m., and there was a break of 30 minutes at 11:00, when the workers had sandwiches and rest.

Spraying was carried on for 30 successive days (during August 1972) and the workers returned to their homes in the afternoon.

The day before spraying started, the villagers were informed of tomorrow's job and were instructed to keep food and feed-stuffs, dairy and agricultural products, as well as pets and poultry, away from the insecticide. It was emphasized that dwellings and rooms should be emptied prior to the spraying and warning was given not to enter or use the rooms for up to one or two hours after spraying.

Observations on the toxic effects on spraymen : A medical examination and cholinesterase determination was carried out for the workers as follows :

All workers were midically checked and blood pressure was determined for two successive days before spraying and repeated occasionally during the spraying period.

Any ailments and/or complications noted during the spraying period were recorded.

Cholinesterase determination was done on whole blood according to Edson by the Lovibond tintometric method through field cholinesterase test kit as follows :

a) 24 hours before spraying was started;
b) Early morning on the first day of work before spraying;
c) At weekly intervals during spraying and up to two months after spraying was over;
d) For workers who had any complaint due to the insecticide;
e) Occasionally before, during and after sprayings and also at resting times.

Table I and II shows cholinesterase changes in the 28 workers during the spraying period.

Toxicological evaluation of the inhabitants was done at random; the following 5 villages with a total population of 925 persons were studied : Tolrizi Alivand, Sangar Sofla, Tolrizi Amaleh, Tol Anjiri and Ghala Kohneh.

Table 1- Cholinesterase change in spraymen

No	Age	Kind of Job	spraying period and afterwards									
			24 hours before spraying	the day before spraying	8 days after exposure	17 days after exposure	26 days after exposure	30 days after exposure	5 days after spraing finished	12 days after spraying finished	20 days after spraying finished	25 days after spraying finished
1	24	spraying	87.5	87.5	87.5	62.5	62.5	50	75	75		87.5
2	20	"	87.5	87.5	87.5	50	62.5	62.5		75		
3	41	"	100	100	100	75	62.5	75	75	75	87.5	
4	42	"	87.5	87.5	87.5	50	62.5	75	75			75
5	22	"	87.5	87.5	100	75	62.5	62.5	75			87.5
6	24	"	87.5	87.5	87.5	62.5	62.5	62.5	75			75
7	33	"	100	100	87.5	87.5	75	75	87.5		75	
8	22	"	100	87.5	100	62.5	62.5	75		75		87.5
9	27	"	87.5	87.5	75	62.5	62.5	62.5	75		87.5	
10	35	"	87.5	87.5	75	87.5	75	87.5	75		75	87.5
11	33	"	87.5	75	87.5	37.5	37.5	37.5		50	50	75
12	35	"	87.5	75	75	62.5	50	50	50		75	75
13	18	"	100	100	100	50	37.5	25	25			
14	28	"	100	100	100	37.5	37.5	50		50	62.5	87.5
15	23	"	100	100	87.5	37.5	25	25	37.5		50	50
16	21	"	87.5	87.5	100	50	50	62.5		62.5	62.5	
17	17	"	87.5	75	75	37.5	37.5	37.5	50		62.5	
18	34	"	100	87.5	100	50	62.5	62.5		62.5	62.5	
19	32	"	87.5	87.5	100	62.5	62.5	37.5		37.5	50	
20	22	"	75	87.5	87.5	75	62.5	75		75	75	
21	24	Mixer	87.5	75	62.5	12.5	12.5	25.	25	25	37.5	37.5

No	Age	Kind of Job	24 hours before spraying	the day before spraying	8 days after exposure	17 days after exposure	26 days after exposure	30 days after exposure	5 days after spraying finished	12 days after spraying finished	20 days after spraying finished	25 days after spraying finished
22	21	Mixer	100	87.5	100	37.5	25	37.5	50	50	62.5	62.5
23	26	Foreman	100	87.5	100	75	75	75		75	75	
24	22	"	100	87.5	100	75	87.5	75	75		75	
25	37	"	75	75	87.5	75	50	62.5		62.5		
26	45	"	100	87.5	100	75	75	75			87.5	
27	31	Team leader	100	-	100	75	62.5	75				
28	27	"	87.5	-	100	75	62.5	75			87.5	

Cholinesterase levels were determined as follows :

a) 24 hours before spraying;

b) 24 hours after spraying;

c) One week after the spraying was finished.

All complications due to effects of the insecticide were questioned and recorded, and information regarding the intoxication and death of cattle and poultry was also collected.

RESULTS

Number of villages sprayed	57
Total no. of families under the program	2,015
Total population covered	11,445
Total dwellings and shelters sprayed	13,340 =96.9%
Unsprayed dwellings and shelters	478
Houses sprayed	1,850 =96.9%
Houses unsprayed	58
Amount of insecticide used	4911.5 kg
Total workers/day	840

Toxicological symptoms :

Clinical investigation and cholinesterase tests on 840 workers/day showed 42 cases of clinical symptoms, most of which were very light and subsided after the worker had a shower and some rest (2-3 hours). Headache, nausea, dizziness and abdominal pain were the usual symptoms. Some of the workers felt weakness. Two cases of diarrhoea were recorded, both of which recovered after the administration of drugs.

Out of 20 spraymen, eight cases of cholinesterase decrease were noted, of which a few had general clinical symptoms and two (mixers) had severe complications. Detailed observations follow later.

The attached diagram shows the changes and variations in cholinesterase in six severe cases, of which No. 21 and 22 were mixers.

All complaints were treated by a complete washing of the body, the administration of Belladona tincture and, in a few cases, by atropine ampoules of $\frac{1}{4}$ mg followed by from several hours up to one or two days of rest.

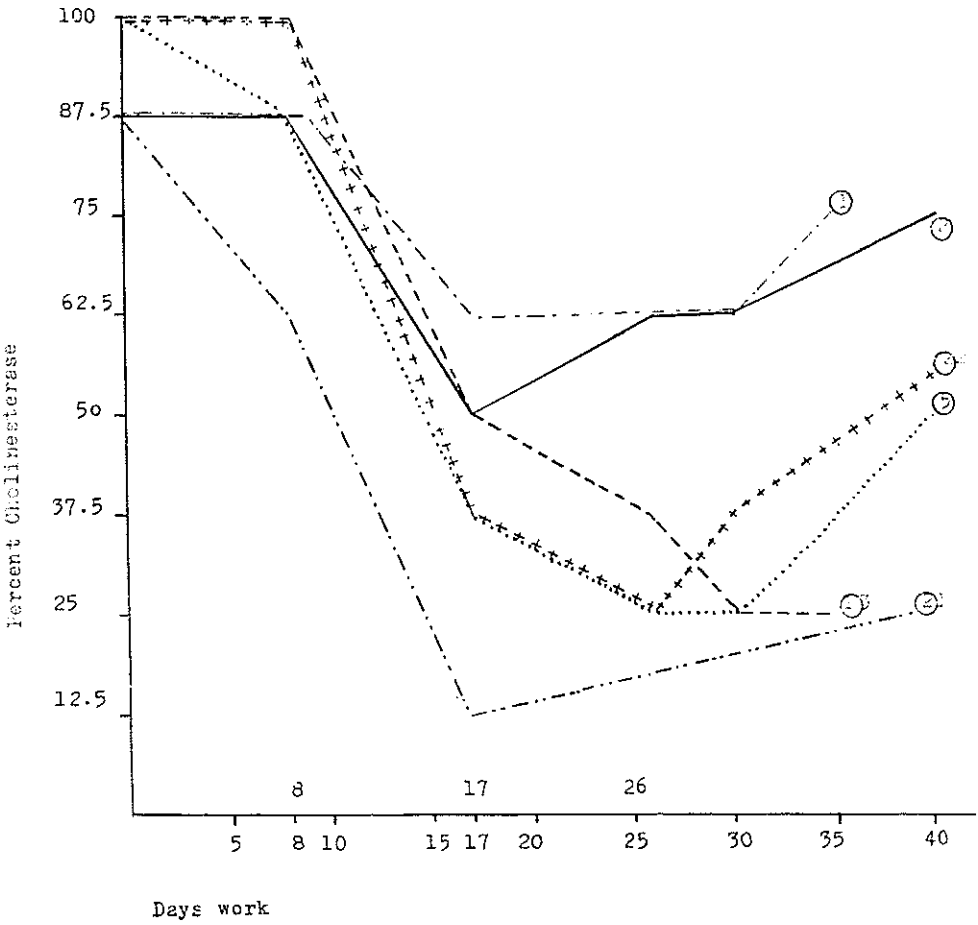
effects on inhabitants and poultry:

Toxicological evaluation of the inhabitants of the 5 previously-mentioned villages, consisting of 925 people in 167 families, revealed only 15 cases of very mild complications, namely dizzines and nausea (12 men and 3 women).

Mostly the complications lasted from six to 26 hours and were due only to the sweeping of the rooms or entering them as

Table 11 cholinesterase changes of spraymen before, during and after spraying

No	Age	Kind of Job	Before spraying averge	19 days after exposure		25 days after exposure		30 days after exposure	
				before spraying (early morning)	after spraying (in afternoon)	early morning before work began	at the end of daily work	early morning before work began	at the end of daily work
1	24	spraymen	87.5	62.5	50	62.5	50	50	37.5
2	20	"	87.5	50	37.5	50	37.5	62.5	37.5
3	41	"	100	75	75	50	50	75	-
4	42	"	87.5	62.5	62.5	50	37.5	75	62.5
5	22	"	87.5	75	62.5	62.5	37.5	62.5	50
6	24	"	87.5	62.5	50	62.5	25	62.5	50
7	33	"	100	87.5	75	75	50	75	50
8	22	"	87.5	62.5	62.5	62.5	37.5	62.5	50
9	27	"	87.5	62.5	62.5	50	50	62.5	50
10	35	"	87.5	87.5	62.5	62.5	37.5	75	50
11	33	"	87.5	37.5	25	37.5	37.5	37.5	25
12	35	"	75	62.5	37.5	37.5	50	50	37.5
13	18	"	100	50	37.5	37.5	37.5	25	37.5
14	28	"	100	50	37.5	37.5	50	50	37.5
15	22	"	100	37.5	37.5	37.5	25	25	25
16	21	"	87.5	50	50	50	37.5	62.5	50
17	17	"	87.5	50	37.5	37.5	25	25	25
18	34	"	87.5	62.5	50	62.5	50	62.5	50
19	32	"	87.5	62.5	37.5	37.5	37.5	25	25
20	22	"	87.5	75	50	62.5	50	75	62.5
21	24	Mixer	87.5	12.5	12.5	12.5	12.5	25	25
22	21	"	87.5	37.5	25	25	25	37.5	25
23	26	Foreman	87.5	75	62.5	50	50	75	50
24	22	"	87.5	75	75	75	50	75	62.5
25	37	"	75	75	37.5	50	50	62.5	37.5
26	45	"	87.5	75	50	62.5	37.5	62.5	50
27	31	team leader	100	75	50	62.5	75	75	62.5
28	37	"	87.5	75	50	62.5	62.5	75	62.5



The changes of whole blood chlinesterase among 4 spray-menand 2 mixers during of spraying period.

soon as spraying was finished.

Cholinesterase tests showed no significant changes and all cases were put under medical care and treatment.

The effect of the insecticide on domestic animals (cattle and poultry) was not noticeable and only a few cases of poultry death were recorded due to the animals being left at the spraying sites.

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