

WORLD HEALTH  
ORGANIZATIONORGANISATION MONDIALE  
DE LA SANTÉCONFERENCE ON MALARIA  
IN AFRICAWHO/Mal/130 ✓  
Lagos Conf./4  
1 September 1955Lagos, Nigeria  
28 November - 6 December 1955

ORIGINAL: ENGLISH

Provisional Agenda item 3.4

The Chief of the Malaria Section  
has the honour to communicate hereunder the  
following note:

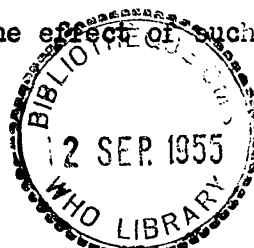
## THE EFFECT OF SMOKE ON INSECTICIDE RESIDUES

by

. R. Elliott  
Entomologist  
Malaria Service, Medical Department  
Nigeria

In village houses in northern Nigeria there is seldom a room set aside as a kitchen as is often done in the south; it is the general practice to cook outside the hut during fine weather, but during the rains and the cold part of the dry season fires may be lit in any hut for cooking and for warmth. The result in the typical grass-roofed mud hut is a thick deposit of soot and tarry material over the roof and walls of the hut. Also present is a variable proportion of fatty material, due to the use of ground-nut oil for frying.

In the area of the Malaria Control Pilot Project in Western Sokoto, this surface deposit is found in at least one hut in three and its effect on the biological efficiency of insecticide residues is therefore a matter of some importance from the viewpoint of establishing malaria control by the use of residual insecticides. The effect of smoke deposits could take place in two ways; firstly, by affecting the suitability of the internal surface of the houses as substrates for insecticidal deposits; secondly, by masking the effect of such deposit after their application.



### Methods

Discs of typical building mud were made, also flat surfaces of dry grass stems (Pennisetum purpureum) of the type used for thatching. For the first trial grass surfaces and mud discs were hung on a wall about five feet from the ground, close to a fire-place where the daily cooking of an African family was carried out. After two weeks' exposure, when a visible deposit of tar and soot had accumulated, the mud and grass surfaces were sprayed with DDT, dieldrin and lindane wettable powders. Precisely similar dosages were given to unsmoked surfaces, and at intervals afterwards the biological activity of the deposits was assayed, using Aedes aegypti females, blood-fed and three to four days old, confined over the surfaces in perspex funnels for exposure periods of five to 20 minutes. Twenty-four-hour mortalities were then recorded.

To ascertain the masking effect of smoke deposited after spraying, similar surfaces were prepared and sprayed with the three insecticides. One set were protected from smoke by wrapping in brown paper; the other left exposed, and both hung up as before. The effects of temperature, which rose to 65°C during cooking were thus roughly equalized. At intervals after exposure the biological activity of the smoked and unsmoked surfaces was compared in the same way as in the first trial. Controls were run on both untreated and smoked surfaces.

### Results

In table 1 are summarized the effects of pre-treatment of mud and grass surfaces with smoke before application of the insecticide. Each result indicates the mean of three replicates.

TABLE 1. EFFECTS OF PRE-TREATMENT WITH SMOKE ON SUBSEQUENT APPLICATIONS OF INSECTICIDE

Biological material: blood-fed Aedes aegypti females 3-5 days old

Type of Surface	Treatment and dosage	Corrected percentage mortality after 20 days (5 minutes contact)	Corrected percentage mortality after 40 days (5 minutes contact)
Mud, smoked	75% DDT w.p. at 98 mg per sq. foot DDT p'p	95%	60%
Mud		85%	55%
Grass, smoked	"	95%	45%
Grass		100%	35%
Mud, smoked	Dieldrin 50% w.p. at 25 mg per sq. foot dieldrin	85%	60%
Mud		80%	50%
Grass, smoked	"	85%	45%
Grass		90%	50%
Mud, smoked	Lindane 50% w.p. at 12 mg per sq. foot lindane	100%	35%
Mud		95%	40%
Grass, smoked	"	90%	45%
Grass		100%	35%

TABLE 2. EFFECTS OF TREATMENT WITH SMOKE ON PREVIOUSLY APPLIED INSECTICIDES

Biological material: blood-fed Aedes aegypti females 4 days old

A. Mud surfaces: 24-hour mortality in Aedes aegypti after 10 minutes contact

Toxicant	Dosage per square foot	Smoke	Corrected mortalities (per cent.)					Mean corrected mortality (per cent.)
			i	ii	iii	iv	v	
DDT	152 mg	2 weeks	40	62	32	31	33	39
"	"	Nil	100	100	92	100	86	95
Dieldrin	24 mg	2 weeks	29	10	0	7	0	9
"	24 mg	Nil	82	75	38	41	31	53
Lindane	20 mg	2 weeks	40	29	6	12	6	19
"	20 mg	Nil	94	60	39	15	43	62

B. On matting surfaces: 24-hour mortality in Aedes aegypti after 5 minutes contact

Toxicant	Dosage per square foot	Smoke	Corrected mortalities (per cent.)			Mean corrected mortality (per cent.)
			i	ii	iii	
DDT	150 mg	2 weeks	73	36	30	46
DDT	150 mg	Nil	100	75	90	88
Dieldrin	24 mg	2 weeks	80	93	75	83
Dieldrin	24 mg	Nil	100	100	98	99
Lindane	15 mg	2 weeks	30	33	24	29
Lindane	15 mg	Nil	100	94	83	93

## Discussion

In the first case, that of the deposition of insecticides onto a surface already covered with smoke and tar, it might be expected that a difference in absorptive capacity between the smoked surface and a plain mud surface would affect the residual toxicity of the insecticidal treatments. In the present trials this effect has not been demonstrated, and it is perhaps safe to conclude that the presence of smoke deposits is no bar to the effectiveness of insecticidal deposits. On the basis of experience this might have been expected. The second case, that of smoke deposited subsequent to spraying, is a very different matter; and a pronounced drop in the toxicity of all three insecticides can be demonstrated over a short period. The consequences of this cannot fail to be serious for the future of malaria control campaigns using imagocidal measures in areas where the domestic arrangements of the protected population include the presence of fires in small unventilated huts. It must be remembered, however, that the wall directly over a fire-place used daily is subjected to a much heavier deposit than the general surface of a hut where a hearth is used only during cold and wet weather. The study of this problem in the field should be taken up as a matter of some urgency.