

EFFECTIVENESS OF PERMETHRIN - INCORPORATED

"OLYSET NET" BEDNET FOR MALARIA CONTROL IN

AN ENDEMIC AREA OF ESMERALDAS PROVINCE

REPUBLIC OF ECUADOR

JULY 1993 - JUNE 1994

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# EFFECTIVENESS OF PERMETHRIN - INCORPORATED "OLYSET NET" BEDNET FOR MALARIA CONTROL IN AN ENDEMIC AREA OF ESMERALDAS PROVINCE REPUBLIC OF ECUADOR

## INTRODUCTION

In Ecuador malaria continues to be a major public health problem mainly in the hot and humid coastal province of Esmeraldas, Manabí, Guayas, and Los Ríos.

During the last ten years these regions recorded 90 % of all malaria cases in Ecuador .

In Esmeraldas province, a tropical and forested area bordering on Colombia, malaria is still the most important vector - borne disease. The increasing demand of wood and the extensive agriculture exploitation have been attracting a large number of temporary workers. This has created optimal conditions for malaria transmission.

In the last four years malaria cases in Esmeraldas province is as follows :

YEAR	SLIDES	CASES	P. FALCIPARUM	API
1990	68.890	18.986	8.156	56.5
1991	66.271	14.759	5.494	42.8
1992	64.957	11.107	3.813	31.0
1993	70.855	12.429	5.534	34.4

API : Annual Parasite Incidence per 1.000 inhabitants.

The Esmeraldas province continues to have the highest incidence of Plasmodium falciparum ( the most dangerous parasite of malaria) in Ecuador reporting 40 % of the country's total.

## FIRST "OLYSET NET" TRIAL IN LATIN AMERICA

One of the best ways of preventing malaria transmission is to avoid mosquito - man contact. Bednets protect against insect bites and help to

fight malaria and other vector - borne diseases. They can also be easily used by anyone, therefore they encourage community participation. Since July 1993 until June 1994 the Malaria National Program of Ecuador (SNEM) tested the bednet "OLYSET NET" in the field in an area of Esmeraldas province where malaria transmission is very high.

## MATERIAL

A new type of pretreated bednet called "OLYSET NET" was tested . It is a permethrin - incorporated bednet , made of polyethylene resin and the insecticide has two - year residual action. "OLYSET NET" does not have to be retreated after washing . The permethrin persists for several washings. The mesh size is larger in the "OLYSET NET" ( 4 x 4 mm ) than in others traditional nets ( 1.6 mm ).This permits better air flow and therefore more comfort for the person that sleep in tropical conditions. Since "OLYSET NET" is pretreated at manufacture, it is not necessary to treat it in the field as another type of mosquito net needs. "OLYSET NET" was recently developed by Sumitomo Chemical Co. of Japan, which kindly provided the bednets to carry out this study.

## METHOD

The four communities selected in Esmeraldas province (see the enclosed map) had a total population of 1.867 inhabitants. The villages were separated from one another by at least 4 km. To compare the results, different malaria control measures were carried out in each village as follows :

VILLAGE	HOUSES	VILLAGERS	CONTROL MEASURE
MERIVE	93	377	Only "Olyset Net"
CHUMUNDE	52	173	"Olyset Net" and SMT spray
CHONTADURO	120	371	Only DDT spraying
RIO CHUMUNDE	206	946	Control Area

Before beginning the trial a census was performed and sleeping habits were verified. The census was updated every month. At the time of bednets distribution the proper use and care of nets was discussed with villagers. They were asked to use the nets at all times while sleeping and they were told that they could wash "OLYSET NET" any time they wished. Every month all nets were examined for cleanliness and damage and villagers were asked to repair any hole or tears. Unannounced night -time visits were made once a month from 8:00 PM to 11:00 PM to a random selection of houses.

To determine the prevalence of malaria, SNEM performed a study - wide blood survey in which thick blood smears were obtained from at least 70 % of the study participants. Continuous community surveillance was accomplished by "Resident Voluntary Collaborators" (VC) . They were well known in the villages as a source of free malaria diagnosis and treatment. Patients who thought they had malaria could visit the VC at any time to have a blood smear taken. The VC then provided presumptive malaria treatment of a single dose of 10 mg/kg base of chloroquine. The VC were visited weekly by SNEM workers to collect slides, replenish medicines and materials, and leave radical treatment for patients recently diagnosed as having malaria.

## ENTOMOLOGICAL STUDIES

Anopheles were collected during the night (indoor/outdoor captures). Also mosquito susceptibility to Permethrin, DDT, and SMT was tested using WHO impregnated papers with an exposure time of 60 minutes. Mortality was 100 %. Some bioassays were made to evaluate Permethrin residual action. After 8 months of "OLYSET NET" use in Merive, a test showed the insecticide continued to give 100 % mortality to *Anopheles albimanus*. Another test with the malaria vector placed on an "OLYSEY NET" previously washed ( 30 min. exposure) showed the mortality remained at 100 %.

## RESULTS

The trial conducted during the 12 - month period July 1993 - June 1994 is compared with the period July 1992 - June 1993 when no malaria control measure was applied. ( See enclosed graphic )

PERIOD	MALARIA CASES	API	RESULT
<b>MERIVE VILLAGE. Control Measure : Only "OLYSET NET"</b>			
JULY 92 - JUNE 93	146	387	82 % REDUCTION OF MALARIA CASES
JULY 93 - JUNE 94	26	68	
<b>CHUMUNDE. Measure : "OLYSET NET" and SMT spraying</b>			
JULY 92 - JUNE 93	76	439	63 % REDUCTION OF MALARIA CASES
JULY 93 - JUNE 94	28	161	
<b>CHONTADURO VILLAGE. Measure : Only DDT spraying.</b>			
JULY 92 - JUNE 93	134	381	18 % REDUCTION OF MALARIA CASES
JULY 93 - JUNE 94	113	304	

API : Annual Parasite Incidence per 1.000 inhabitants.

**RIO CHUMUNDE. CONTROL AREA ( NO MEASURE)**

<b>JULY 92 - JUNE 93</b>	<b>129</b>	<b>136</b>	<b>NO CHANGE IN</b>
<b>JULY 93 - JUNE 94</b>	<b>128</b>	<b>135</b>	<b>MALARIA CASES</b>

It is important to compare the monthly evolution of API (Annual Parasite Incidence per 1.000 inhabitants) in Merive where the only protection during the trial ( JUL 93 - JUN 94 ) was the bednet "OLYSET NET". On the contrary during the period JUL 92 - JUN 93 no malaria control measure was applied.

**MERIVE. MONTHLY ANNUAL PARASITE INCIDENCE (API)**

( See also enclosed graphic)

PERIOD	MONTH											
	J	A	S	O	N	D	J	F	M	A	M	J
JUL 92/JUN 93	21.2	18.5	15.9	18.5	13.2	10.6	37.1	66.3	66.3	71.6	26.5	21.2
JUL 93/JUN 94	18.5	13.2	7.9	0.0	0.0	0.0	5.3	13.2	7.9	2.6	0.0	0.0

**CONCLUSIONS**

A. Malaria incidence was reduced by 82 % in Merive village, protected only by "OLYSET NET" bednet. In Chumunde, protected by "OLYSET NET" and SMT spraying, the malaria cases decreased by 63 %. In conclusion both villages protected by "OLYSET NET" bednet showed a sharp reduction in malaria transmission.

B. On the contrary in Chontaduro, protected by DDT spraying, the malaria cases reduced in a small amount, probably due to technical

problems. (DDT rejection or aggression). In Rio Chumunde (control area) malaria transmission remained high.

C. The bednet "OLYSET NET" was enthusiastically accepted by all villagers. The reasons were : To avoid mosquito bites, prevent malaria and improve night's sleep. Many villagers found that "OLYSET NET" large dimensions and wide mesh resulted in more comfortable ventilation during hot nights.

D. For rural areas the spraying of residual insecticides has been the recommended measure against malaria vectors for decades, but this method has now encountered several problems. The introduction of insecticide - incorporated bednets at the community level could be a great possibility for malaria control as it was proved in this study.

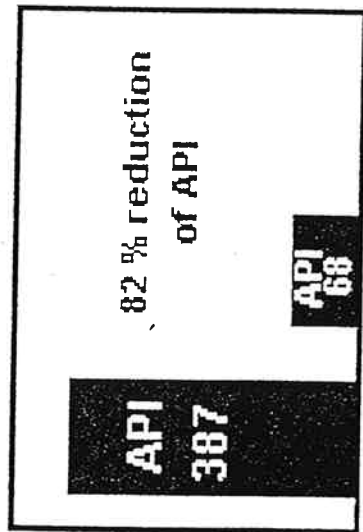
Guayaquil, Ecuador, Aug. 10, 1994.

Dr. Luis Triviño Yépez  
Director of SNEM

# OLYSET NET TEST FOR MALARIA CONTROL IN ECUADOR

## MERIVE

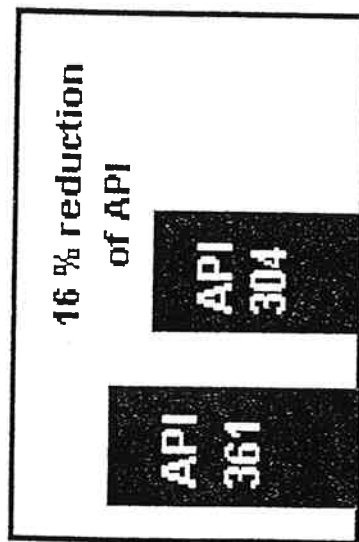
Control Measure : Olyset Net



92-93 93-94

## CHONTADURO

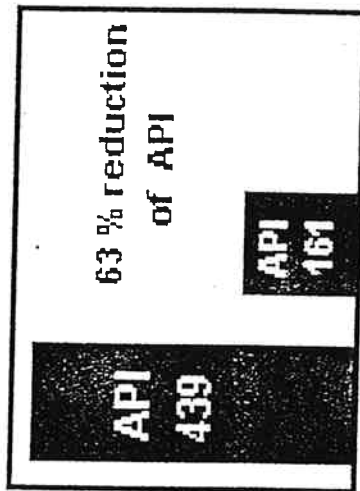
Measure : DDT spraying



92-93 93-94

## CHUMUNDE

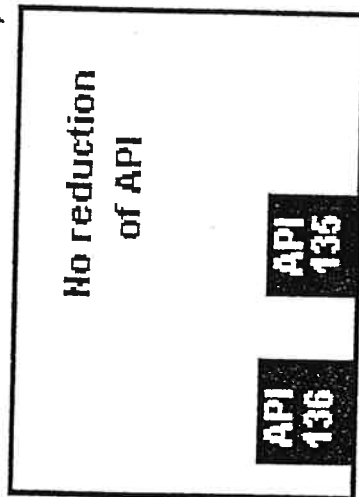
Olyset Net and SMT spray



92-93 93-94

## RIO CHUMUNDE

Control area (No measure)



92-93 93-94

■ Jul 92 - Jun 93 : No malaria control measure was applied.

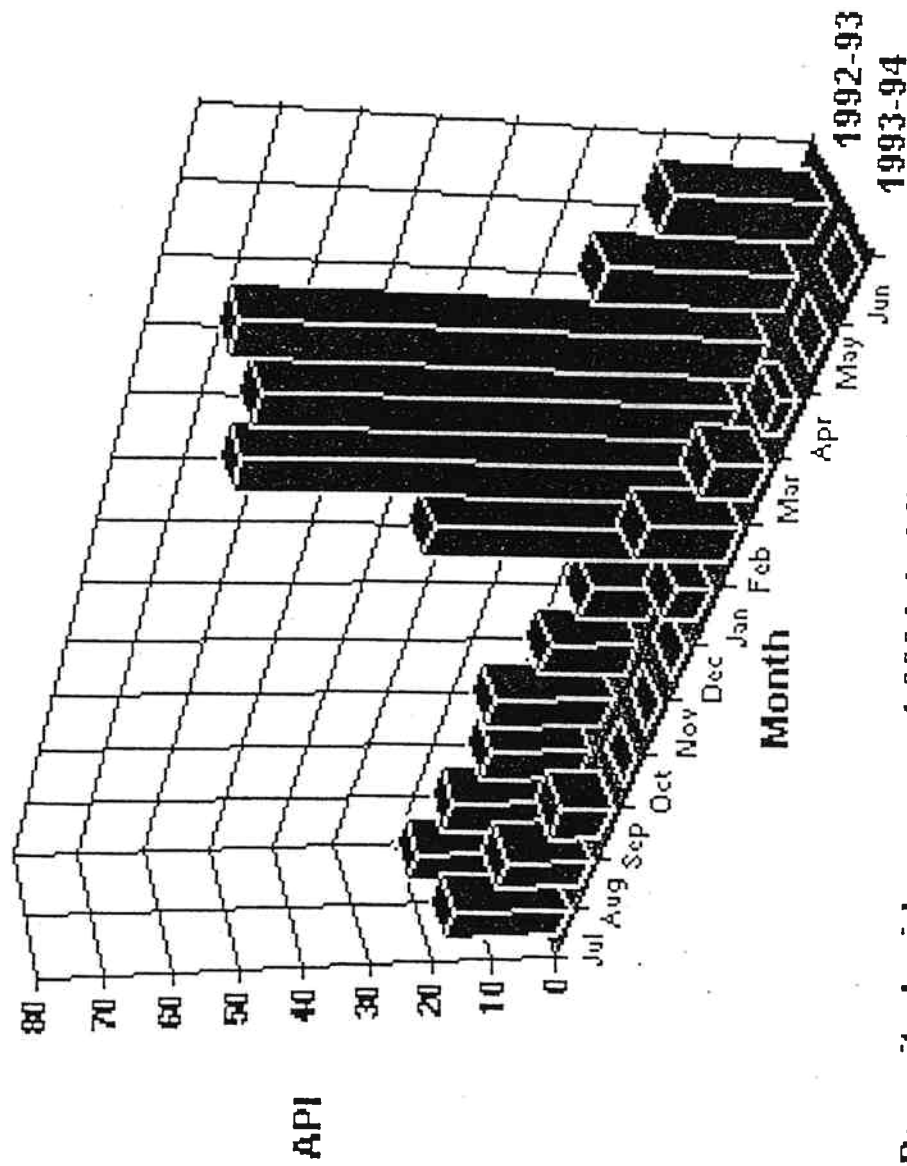
■ Jul 93 - Jun 94 : Study period.

■ API : Annual Parasite Incidence per 1.000 inhabitants



# OLYSET NET TRIAL IN ECUADOR

## Merive village



■ API: Annual Parasite Incidence per 1,000 inhabitants.

■ This figure shows the Annual Parasite Incidence (API) of malaria in MERIVE protected only by the permethrin-incorporated mosquito-net "OLYSET NET" (Jul 93-Jun 94), compared to the unprotected period (Jul 92-Jun 93).