



Tropical Diseases Research Centre

Biomedical Sciences Department

Unit of Vector Biology

Evaluation of ISONEM SIN-OUT the anti-mosquito  
and anti-insect paint Report  
For ISONEM Zambia LTD  
Kitwe

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## **Introduction**

Insect repellents are substances of either natural or of synthetic origin with deterrent effects on insect pests such that these organisms tend to avoid coming into contact with that substance due to its irritant property. The irritant effect against insect pests is an important characteristic (WHO, 2006) which modifies the contact period of an insect with a treated substratum. The concerned insect finds it difficult to remain at rest for a longer time and would be forced to leave before it bites the individual. In that way insect repellents help prevent and control the outbreak of insect-borne diseases such as malaria, lyme disease, dengue fever, bubonic plague and West Nile fever. The disease pests include mosquito, flea, fly and the arachnid tick.

Documented insect repellents mostly are designed to be used by individuals through their application onto the skin or garments (Fradin, 1998). Insect repellents come in different brands and names where they are included as active ingredients. The effectiveness of the repellents against the insect pests varies from a few minutes to between 8 and twelve hours. Commonly used insect repellents include the oldest, most effective and best studied N,N-diethyl-3-methylbenzamide (DEET), essential oil of the lemon eucalyptus (*Corymbia citriodora*), and its active compound p-menthane-3,8-diol (PMD), Citronella oil, Permethrin, Neem oil etc.

## **Literature review**

One product, ISONEM<sup>®</sup> SIN-OUT is a special paint of the latest innovations which combines both beauty and protection against insect pests including malaria vectors. This special paint is made in Turkey where it has been used to control mosquitoes. The product is new on the Zambian market and is being ordered by ISONEM Zambia Limited Company of Kitwe. Since the product has not been used in Zambia before, ISONEM Zambia Limited Company brought the product to TDRC for evaluation of the claimed important properties for registration and certification of the product for use in Zambia.

According to the manufacturers ISONEM<sup>®</sup> SIN-OUT is a water-based paint repellent of mosquitoes, flies and all kinds of insects with its special additive pyrethroid ingredients, permethrin and esbiothrin. The Product is elastic, washable, acrylic emulsion paint for exteriors, interiors and ceilings. It doesn't have any harmful effect on human health. The performance of the product continues up to minimum 2 years.

ISONEM<sup>®</sup> SIN-OUT is ready to use and it is recommended to mix homogeneously before using. Surface should be prepared perfectly to obtain the best performances. All application surfaces should be free from dust, oil, loose and any other foreign materials. Application surfaces should be dry or slightly moisturious

Application should be made by roller or brush in two layers. Paint should be stirred before using and also in various times during the application. The product is neither to be mixed with any other paints nor any thinners and should not be applied below 5° C.

## **Rationale**

Malaria still tops the list of deadly diseases in Zambia despite the fact that it is a preventable illness. Concerted efforts are required in order to bring the level of malaria down in our communities. The Ministry of Health has recommended integrated vector control approach in the control of malaria in the country.

Control tools at personal and community level are available in the country and new innovative products are needed. Current insecticide repellents are mainly applied on the skin and on garments. These compounds are effective for only a short period of time and have to be reapplied everyday. They affect individuals differently whereby some individual's skins are irritated and develop undesired skin rashes etc.

ISONEM SIN-OUT anti-mosquito and anti-insects paint offers a unique option to the control of mosquitoes. The product has the potential to change the way insect repellents are used for those people who work late in the night. This offers an option also for many people who's bodies cannot tolerate everyday direct skin application of the mosquito repellents. The paint can remain effective for a longer period compared to the common repellents around.

## **Aim**

Measure the effectiveness of ISONEM SIN-OUT paint as an insect repellent tool for the control of insect vectors of disease.

## **Objectives**

1. To determine the first-take-off time for 50% (FT<sub>50</sub>) and 95% (FT<sub>95</sub>) of the mosquito vectors of malaria exposed to surfaces painted with ISONEM SIN-OUT paint.
2. To compare the ISONEM SIN-OUT paint FT<sub>50</sub> and FT<sub>95</sub> to Permethrin FT<sub>50</sub> and FT<sub>95</sub> on WHO test papers

## **Methodology**

The Tropical Diseases Research Centre's Vector Biology Unit evaluated ISONEM<sup>®</sup> SIN-OUT for its repellence, on four different painted surfaces. The product was evaluated in the laboratory for repellence properties on cement, mud, timber and asbestos which are the commonest wall and ceiling surfaces of many building structures in Zambia. The evaluations on painted surfaces in the laboratory took place from 1<sup>st</sup> December 2010 to 12<sup>th</sup> January 2011.

The World Health Organization Cone Bioassays were used to evaluate the product according to the 2006 WHO guidelines on testing adulticides' irritant or excito-repellent properties. A total of 300 laboratory reared *Anopheles gambiae* mosquitoes were used in the evaluation.

### *Laboratory evaluation*

Four squares of test material measuring 15 cm × 15 cm were made out of cement, mud, wood and asbestos. Using a 4'' paint brush ISONEM<sup>®</sup> SIN-OUT was applied on each dry surface in two layers following the manufacturer's instructions. Both a negative and a positive control were used for every test session. The cone bioassays were started twenty-four hours after application of the paint according to the WHO protocol of 2006. Mosquitoes were individually introduced into the test cone attached to the surface coated with ISONEM SIN-OUT Paint, positive and negative control as shown in figure 1 and observed for a maximum period of 4 minutes.



**Figure 1 Evaluation of ISONEM SIN-OUT paint on different surfaces in the laboratory. The figure shows WHO test cones attached to treated surfaces arranged thus L-R, negative control, cement, mud, particleboard, asbestos and positive control.**

In total ten sessions of evaluations were carried out due to limited number of mosquitoes in the laboratory during the test periods. The first take off time in seconds was used to determine repellence. The experiment was stopped after 4 minutes in cases were the mosquito remained on the painted surface without taking off. In all the experiments the room temperature and humidity were recorded. Data were analyzed at 95% confidence level by Log- dose Probit analysis method of Finny (1951). The time in seconds was used as a test dose in the evaluations. The cumulative percentage frequencies were converted to probits and plotted against the log (base10) of take-off times by regression. A line was fitted to the data and the FT<sub>50</sub> and FT<sub>95</sub> were estimated by finding the probit 5 (50%) and 6.64 (95%) and taking the corresponding Log of FTOT and taking the antilog of the figure.

## RESULTS OF ANALYSES OF ISONEM SIN-OUT PAINT'S MOSQUITO REPELLENCE ON TEST SURFACES

The following graphs show the laboratory results on the performance of ISONEM SIN-OUT Paint on CEMENT, PARTICLEBOARD, ASBESTOS AND MUD. The average temperature at which the evaluations were conducted was 26 °C and the average humidity was 66%.

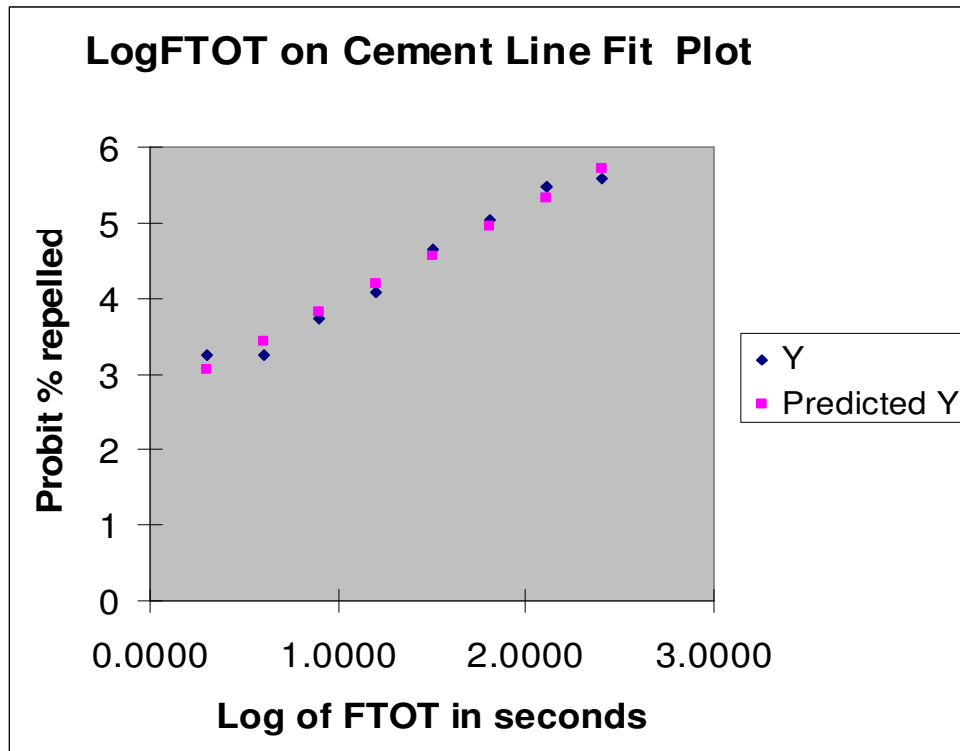


Figure 2 Log probit analysis of ISONEM SIN-OUT Paint on Cement  
FT<sub>50</sub> was **64 seconds** and FT<sub>95</sub> was beyond the test period ( $p = 3.90$ )

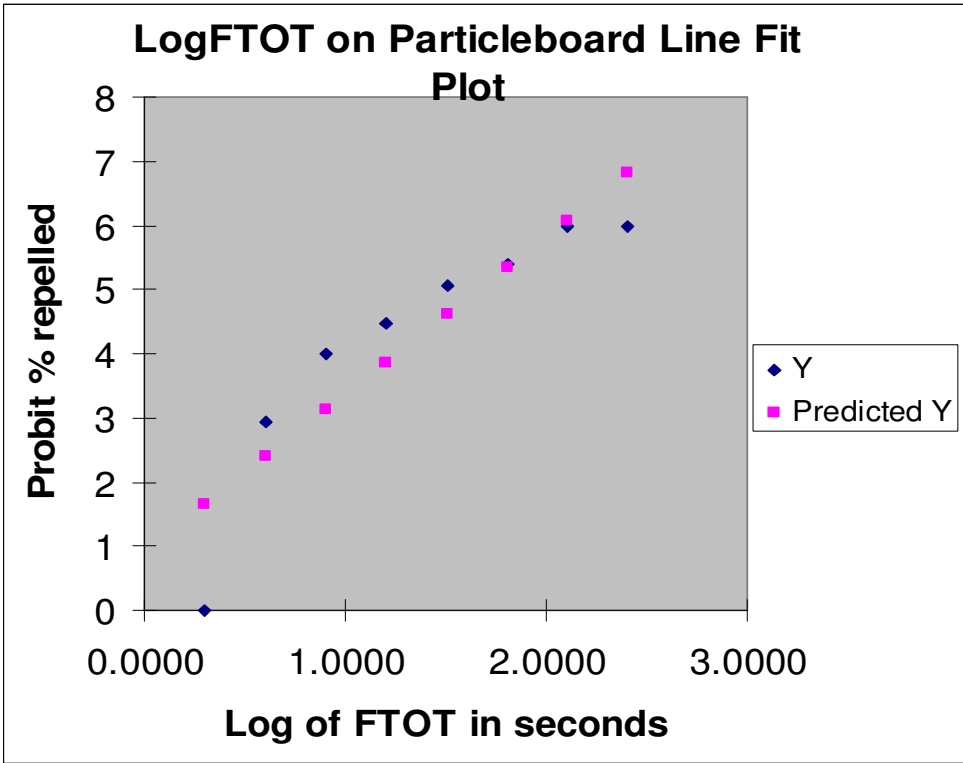


Figure 3 Log probit analysis of ISONEM SIN-OUT Paint on Particleboard  
 $FT_{50}$  was 32 seconds and  $FT_{95}$  was 181 seconds ( $p = 0.002$ )

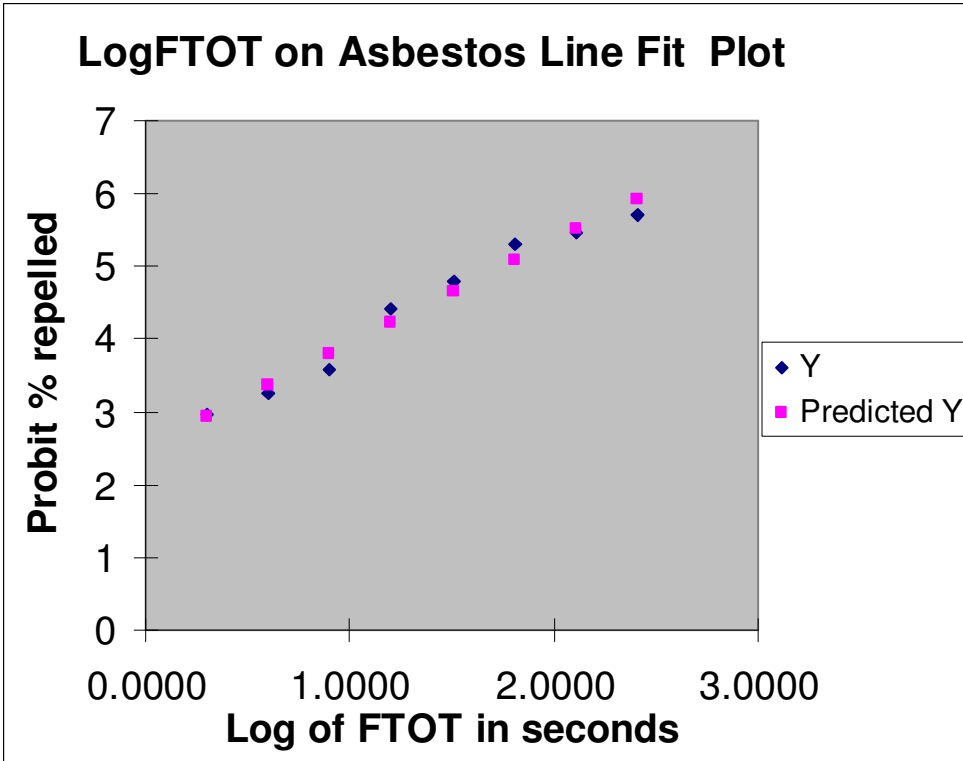


Figure 4 Log probit analysis of ISONEM SIN-OUT Paint on Asbestos  
 $FT_{50}$  was 64 seconds and  $FT_{95}$  was beyond the test period ( $p = 6.98$ )

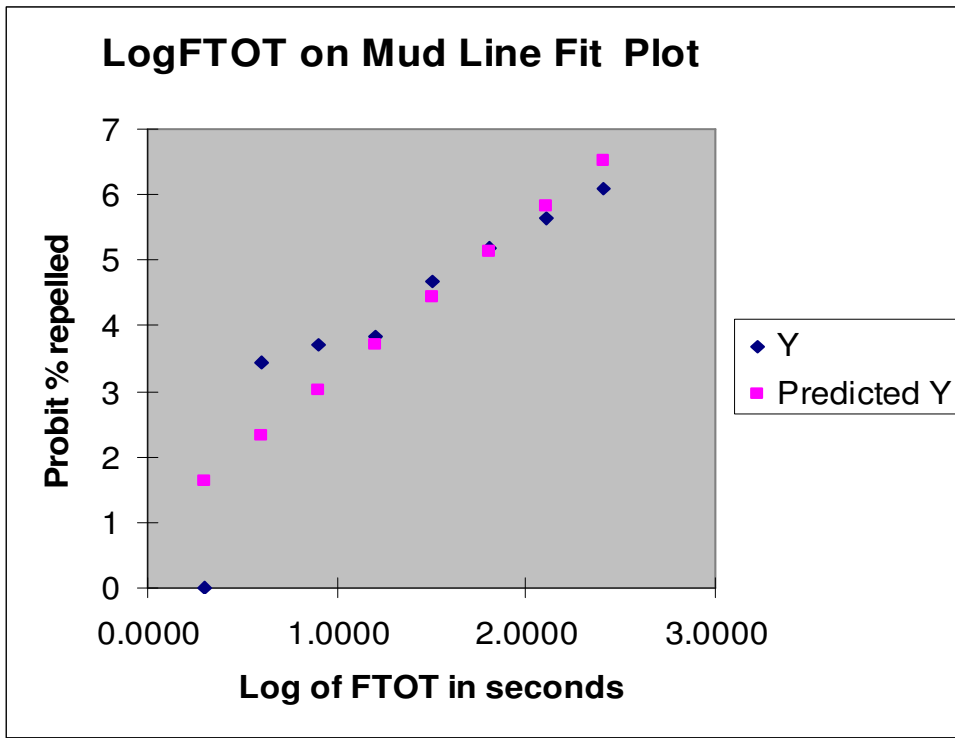


Figure 5. Log probit analysis of ISONEM SIN-OUT Paint on Mud  
 $FT_{50}$  was **45 seconds** and  $FT_{95}$  was beyond the test period ( $p = 0.002$ )

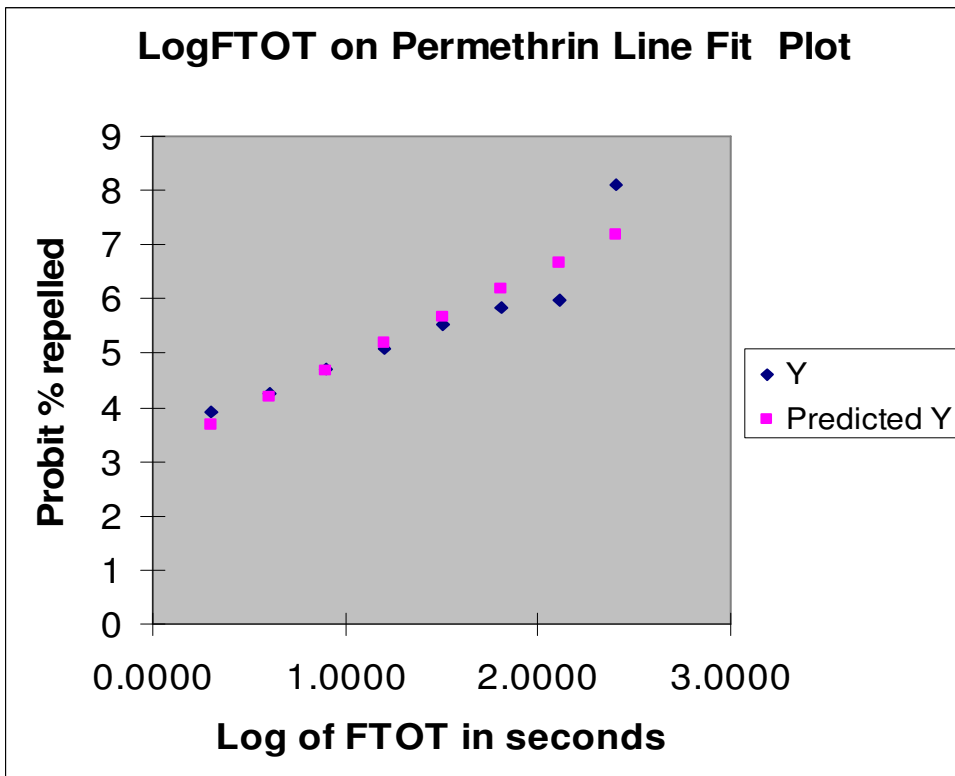


Figure 6. Log probit analysis of ISONEM SIN-OUT Paint on Permethrin  
 $FT_{50}$  was **11 seconds** and  $FT_{95}$  was **181 seconds** ( $p = 0.001$ )

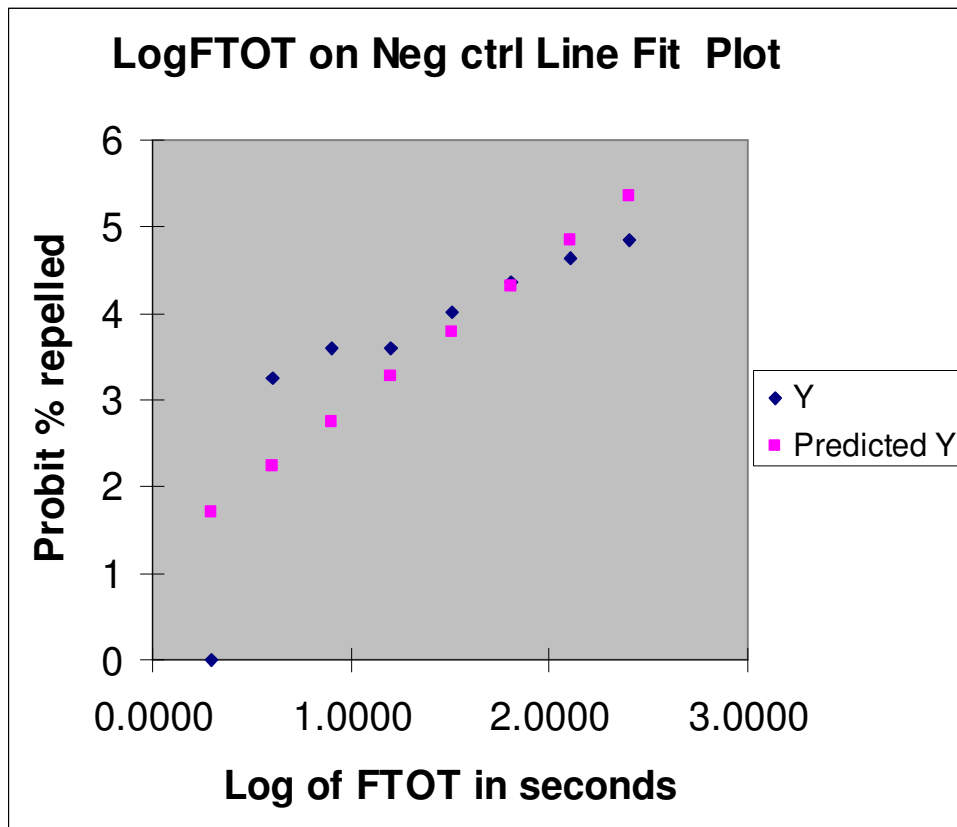


Figure 7 Log probit analysis of ISONEM SIN-OUT Paint on Negative control  
 $FT_{50}$  was **181seconds** and  $FT_{95}$  was beyond the test period. ( $p = 0.011$ )

## Discussion

In comparison with the tests on Permethrin a positive control and the negative control, the results of ISONEM SIN-OUT paint compared well with Permethrin which had the 50% repellence at 11 seconds unlike the negative control with its 50% repulsion at 181 seconds. The take-off times on the negative control were assumed a random behavior of the mosquitoes tested. These results confirm the repellent properties of ISONEM SIN-OUT paint. The findings also show that the paint's effects vary on different surfaces on which the paint is applied. Of the four surfaces on which the tests were carried out, ISONEM SI-OUT paint performed best on Particleboard at 32 seconds for 50% of mosquitoes to be repelled. Mud was next at 45 seconds for 50% to be repelled and for both Cement and Asbestos 50% repellence was at 64 seconds.

The repellence time for 95% of mosquitoes was achieved with the ISONEM SIN-OUT paint only on particleboard within the 4-minute standard test period.

## **Conclusion**

ISONEM SIN-OUT paint is efficacious and can be considered for registration in Zambia. The product has a combination of pyrethroids (permethrin and esbiothrin) as its active ingredients. This insecticide class is permissible for use in the control of malaria vectors in Zambia. The insecticide class is applied in indoor residual spraying (IRS) and on Insecticide-treated nets (ITNs).

ISONEM SIN-OUT paint repellence effect on the mosquitoes will deter those mosquitoes searching for blood meal to remain inside painted rooms. This has the potential to reduce the transmission of disease where malaria transmitting mosquitoes prefer feeding from inside houses/structures.

## **Recommendations**

ISONEM SIN-OUT paint can be applied on plastered walls, the ceiling board, asbestos walls/roofing and even on mud walls. Where this paint is applied on plastered or asbestos walls the effect would be maximized if the ceiling boards and flush doors of these rooms are also coated with ISONEM SIN-OUT paint.

The product can be used in houses, hotels, resting places, children rooms, health institutions, hospitals, laboratories, food and related work places, factories etc.

Regular field and laboratory product evaluations will have to be undertaken on ISONEM SIN-OUT paint to ensure continued product efficacy.

## **Acknowledgements**

The following people are acknowledged for working tirelessly to ensure success of this work.

Dr Victor Mwanakasale  
Ian Mwelwa  
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## **References**

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2. WHO (2006) *Guidelines for testing mosquitoes for indoor residual spraying and treatment of mosquito nets*. World Health Organization Pesticide Evaluation scheme. Geneva, Switzerland.
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