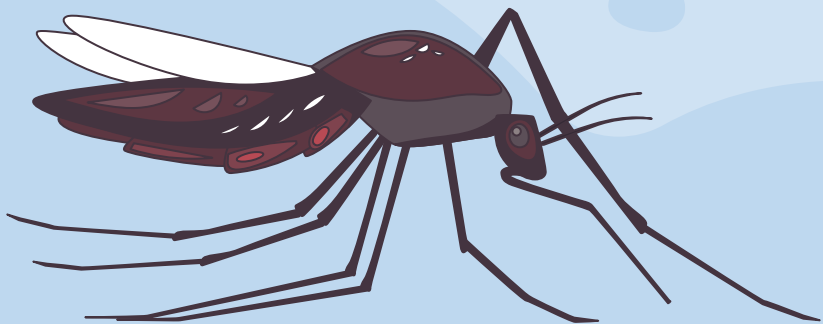




# **Preventing Dengue: Controlling Mosquito Populations Through Recyclable Traps and Education**



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# 01 Background



# Dengue (Break Bone Fever)



## From Monkeys

Dengue was derived from a monkey version of the same virus. This virus jumped to *Homo sapiens* in Africa or Southeast Asia 500 to 1000 years ago.

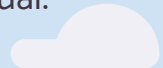
## To Humans

Mosquitoes spread the fever from monkeys to humans causing the first Dengue cases and outbreak. Symptoms include rashes, nausea, body ache, headaches, high fever, and body aches.



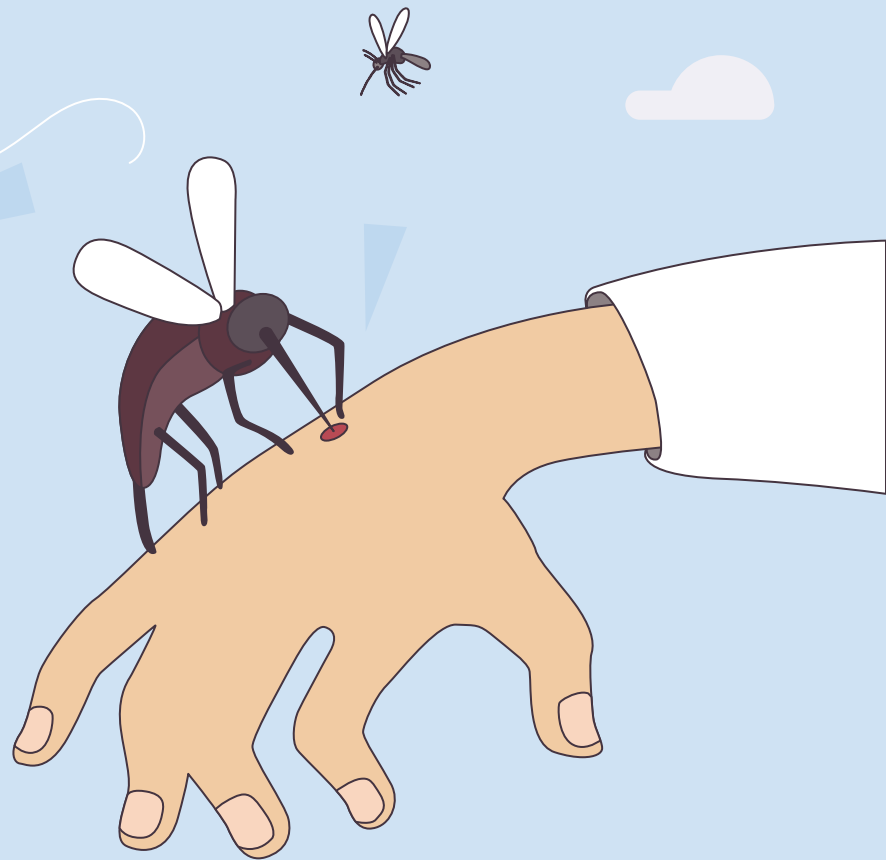
## Through Mosquitoes

*A. aegypti* and *A. albopictus* spread the disease by biting an infected individual and then biting a non infected individual.



# 02

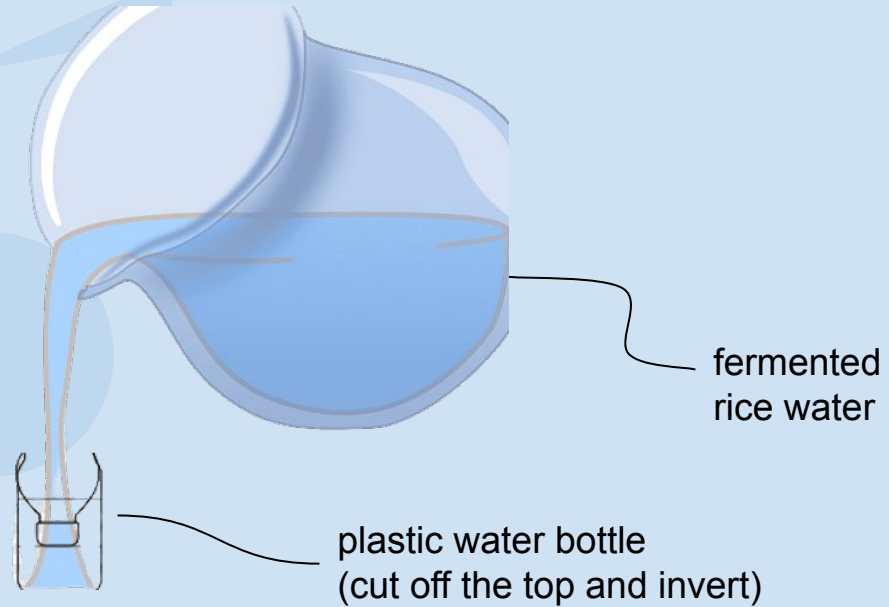
## Our Solution



# Trap Diagram

## Trap Break down / Informational

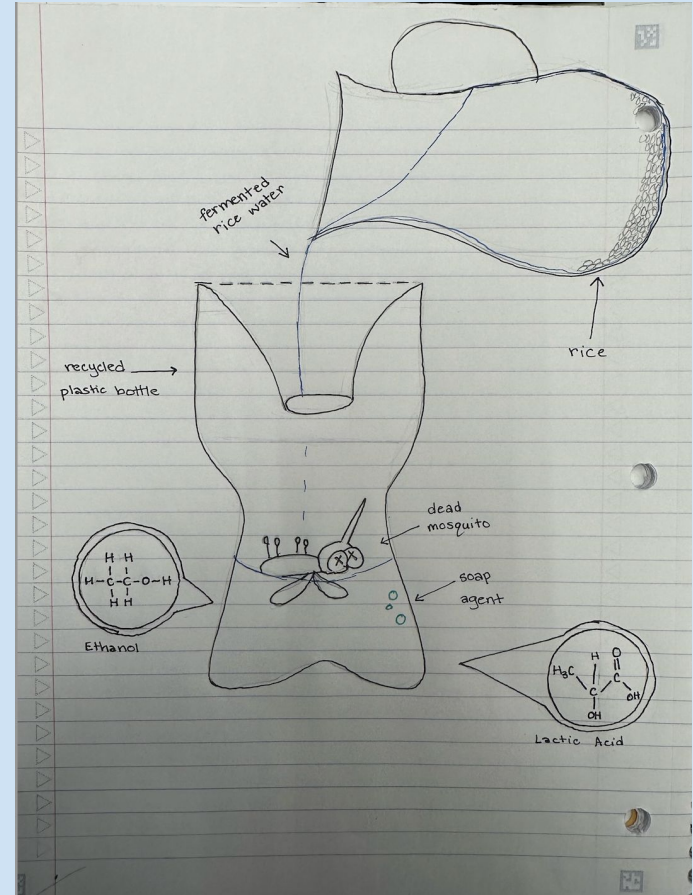
The trap is a very simple design. Using a plastic bottle with the top cut off, fermented rice water which produces a mixture of lactic acid and ethanol is poured in. Mosquitoes attracted to the lactic acid drown in the ethanol. When this trap is placed near light sources or windows mosquitoes are more attracted to the trap than people. This prevents them from “biting” people and spreading dengue.

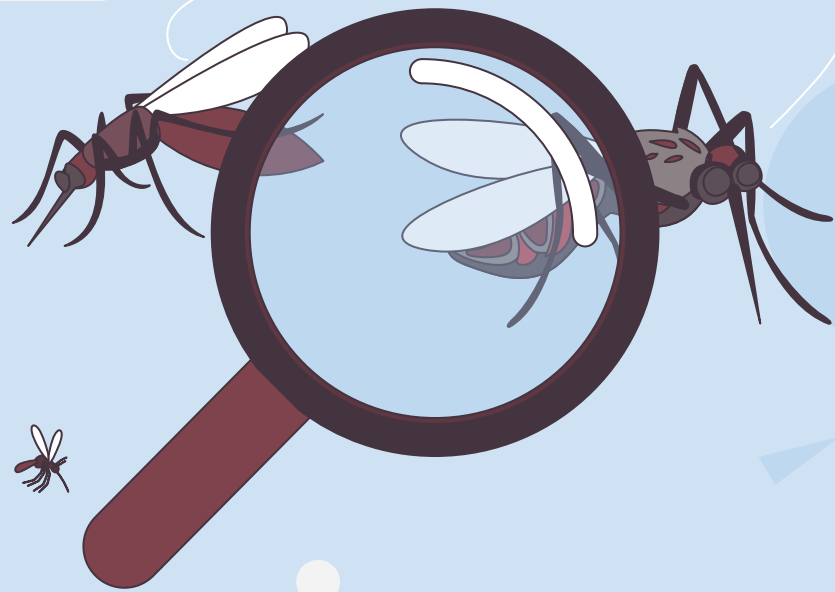


# How the Trap works

## How to make lactic acid and ethanol / our procedure

1. Set aside water from washed rice
2. To make ethanol, place a covering over the bowl to reduce oxygen
3. Wait 12-24 hrs to allow fermentation.
4. To make lactic acid, leave covering off
5. Place in the shade (under a tree, etc) for 2-3 days to allow fermentation to take place.
6. Pour water into container.
7. Put a drop of soap
8. Mix ethanol and lactic acid in plastic container, place near window or light source.





# 03

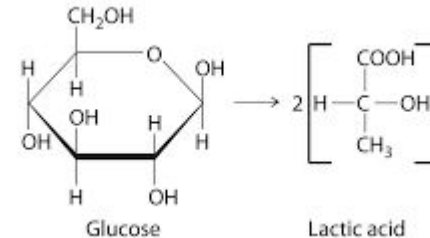
## Attractant



# Why Fermented Rice Water?

Mosquitoes are attracted to lactic acid. This compound is found in sweat and muscle build up as it is indicative of something that the mosquito can feed upon.

Fermented rice water gathers starch from rice and once fermented exudes a mix of ethanol and lactic acid; ethanol being harmful to mosquitos. This fermentation process first creates glucose. Then produces lactic acid after more fermentation. One mole of glucose produces two moles of lactic acid through lactic acid fermentation which occurs when rice water ferments.



# 4 Killing Agents





# The Killing Agent

The fermentation process of rice water results in a mixture of lactic acid and ethanol. While lactic acid acts as the attractant, ethanol is the killing agent. Ethanol is also known as ethyl alcohol or, the alcohol ingredient in various drinks such as beers, wines, and other liquors.

The production of this alcohol, through the fermentation of rice water is utilized as the killing agent in our mosquito traps as ethanol is commonly used to kill various soft-body insects, including, the yellow fever and asian tiger mosquitos.

Additionally, the added drop of soap in the end, ensures the mosquitos are killed, acting as the secondary killing agent.



# 05 Pitfalls



# Potential Limitations

## Education

### Water



A concern that was brought up was accessibility to water and how Southeast Asians who do not have access to water can implement the traps. The prolonged monsoon season can help water collection for the traps. This water can then be boiled to clean and kill bacteria. Utilizing water that was previously used to wash rice ensures that no extra water is necessary for the trap.



Educating the public, especially in areas that are poverty heavy is a limitation. Potential ways to combat this lack of knowledge or education on the topic would be to spread the idea through word of mouth. These smaller, isolated areas tend to have a heightened sense of community making it much easier for new ideas to spread. This is also an aspect where the government or school systems can help educate the public.

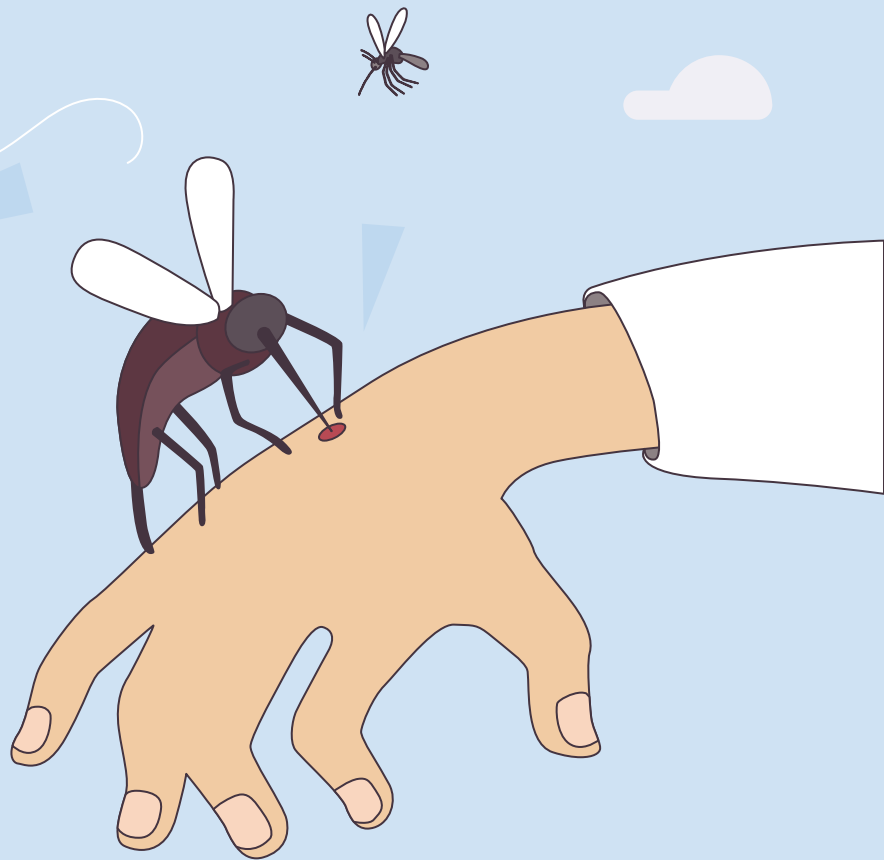
### Accessibility



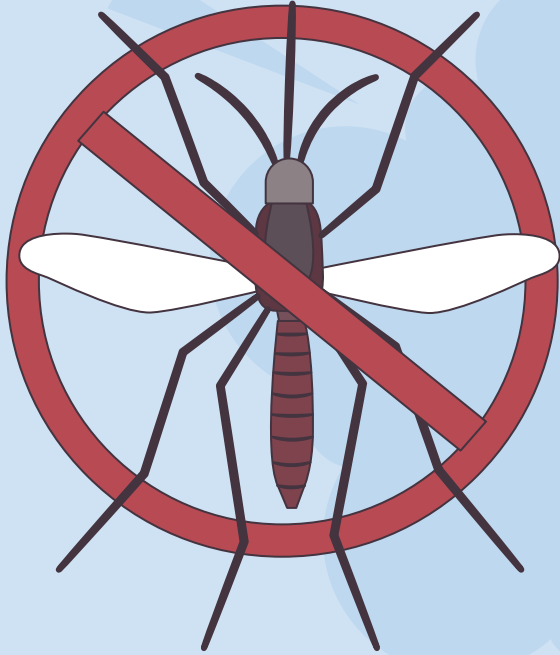
Accessibility of materials would only be a problem for plastic materials and soap that may be necessary for the base of the trap. Since the base of the trap can be interchangeable with any plastic, recyclable base, this is not an issue. The traps are meant to be a combination of pre-existing household items, hence access to the materials is not an issue.

**06**

**Conclusion**



# Final Overview



## Goal

Our goal is to prevent the spread of Dengue from reaching 2.25 billion more people by preventing the growth and reproduction of vectors.

## Trap

The mosquito trap will be eco-friendly and made from plastic materials. The attractant and killing agent will be the fermented rice water which is easily attainable in Southeast Asia.

## Limitations

The prolonged monsoon season and basis of civilization will provide access to water. Educational programs and use of containers will ensure that the base of traps is available.

## Future Implications

With this trap implemented in households across Southeast Asia, mosquito populations could be kept low, preventing the spread of Dengue and other mosquito transmitted virus'.

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**Questions?**  
**Thank you**

