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ERADICATING MOSQUITOES FOR A SAFER AND HEALTHIER COMMUNITY

Ending Mosquito-Borne Threats for a Healthier Future

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PROBLEM STATEMENT

The number of people dying due to malaria is increasing, gradually reducing the population of many countries in Africa and Asia. We have decided to develop a solution to help save lives.

OBJECTIVE

To implement a clean and effective method to reduce fatalities caused by malaria.

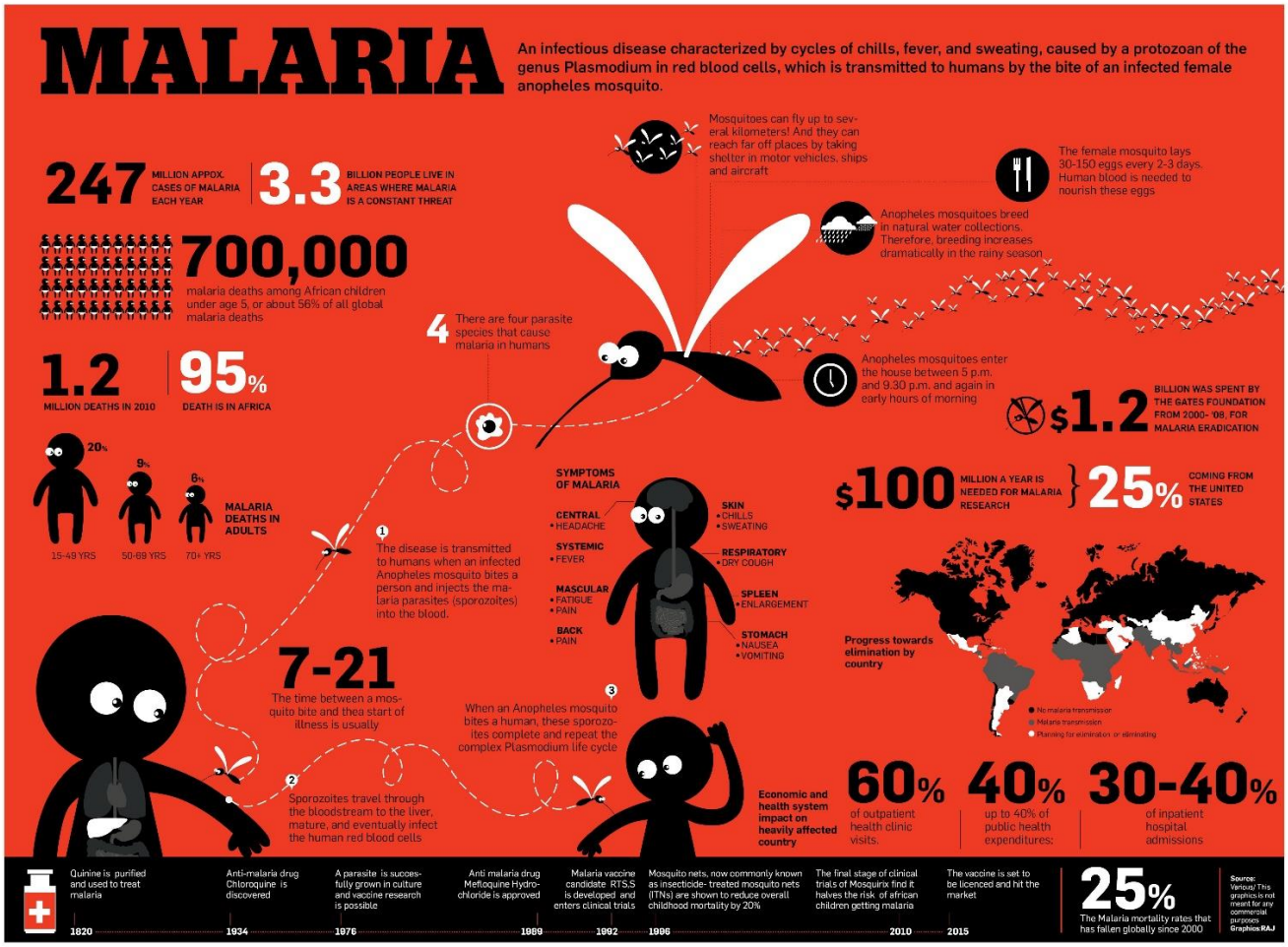
LITERATURE REVIEW / BACKGROUND

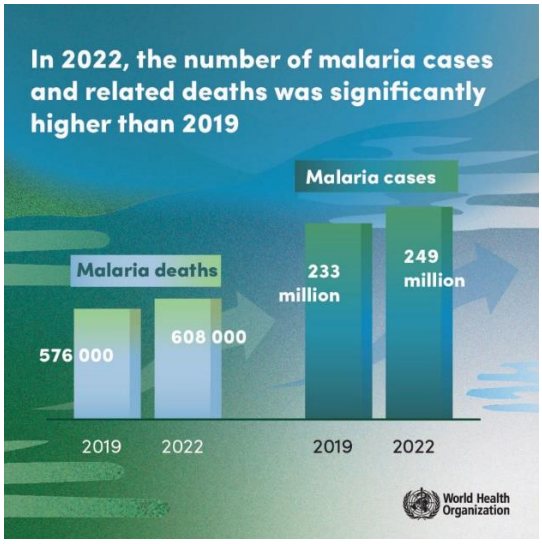
Malaria is one of the deadliest diseases in recorded history and continues to be a major health concern in many countries. It remains one of the leading causes of death worldwide, with approximately 200 to 300 million new cases occurring globally each year and about 1.5 million deaths, over two-thirds of which occur in Africa. The loss of lives due to malaria has a significant social and economic impact on affected countries.

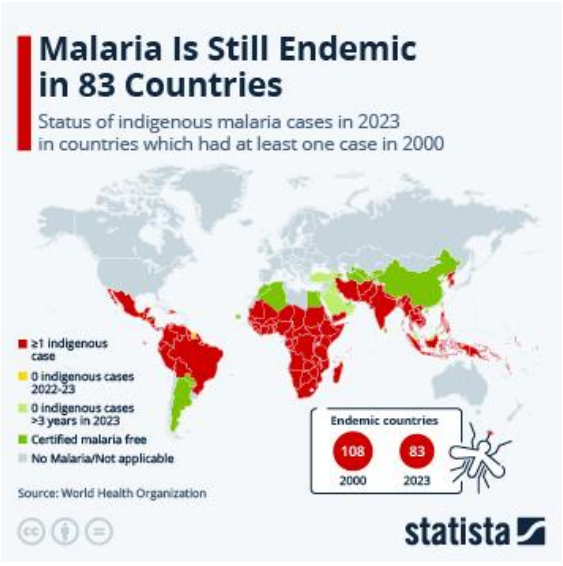
Malaria is most prevalent in sub-Saharan Africa, Asia, and Latin America, primarily due to favorable conditions such as high temperatures and humidity. The disease is caused by a protozoan parasite called Plasmodium, which is transmitted by female Anopheles mosquitoes. When an infected mosquito bites a human, the malaria parasite is transmitted through its salivary glands.

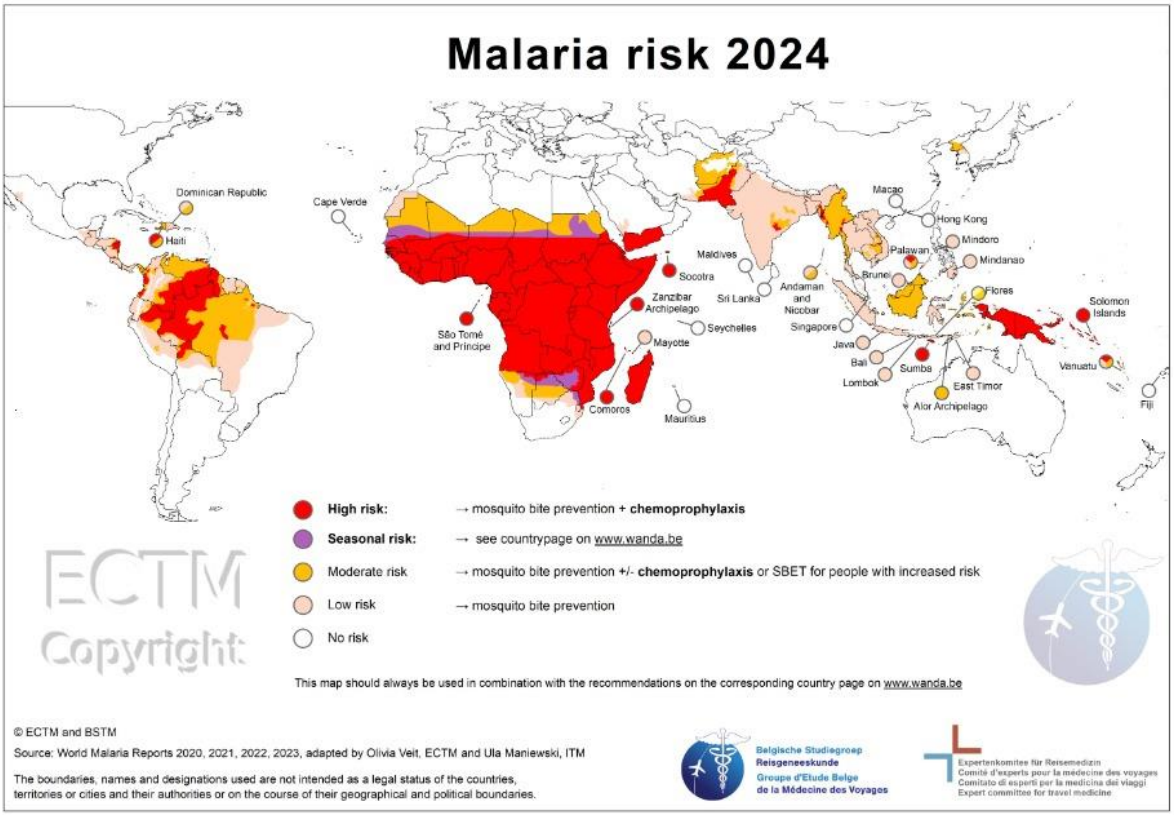
Once inside the human body, the Plasmodium parasite travels through the bloodstream and enters liver cells, where it multiplies. Eventually, the parasite re-enters the bloodstream and infects red blood cells, causing them to rupture. This cycle leads to the rapid spread of the parasite within the body, resulting in severe symptoms and, in many cases, death.

STATISTICS OF MALARIA









PICTURES OF PEOPLE SUFFERING FROM MALARIA

Agartala, June 23: A three-member central experts team on Monday visited malaria affected areas of Tripura where at least 45 people have died due to the disease and thousands have fallen ill, officials said.

20 dead over 400 ill in tripura malaria outbreak

Agartala: At least 20 people have died and over 400 fallen ill due to the outbreak of malaria in northern Tripura, a minister said here Friday.

INTRODUCTION TO THE MOSQUITO ERADICATION MODEL

Mosquito-borne diseases, particularly malaria, pose a severe threat to global health, affecting millions each year. Our model aims to tackle this issue using an innovative yet simple approach: attracting mosquitoes and eliminating them using a combination of **UV light and an electric setup**. The key principle of this system is to **lure mosquitoes using a 365nm UV LED light**, which mimics natural light sources that many mosquito species are drawn to. Additionally, a specially formulated attractant pastes, designed to simulate human sweat, breath, and body odor, releases **carbon dioxide (CO_2), lactic acid, and other volatile compounds**, further enhancing the mosquito attraction.

Once the mosquitoes are drawn toward the **UV light and attractant paste**, they land on a strategically placed **electrified grid or plate**. The **high-voltage electric setup** delivers a **controlled discharge**, instantly eliminating the mosquitoes upon contact. This ensures an **efficient, chemical-free, and environmentally friendly solution** without relying on harmful insecticides. The model is designed to be **cost-effective, sustainable, and adaptable** for use in malaria-prone regions. By combining scientific knowledge of **mosquito behaviour, UV light attraction, and electrical engineering**, this approach provides a promising step toward **reducing malaria transmission and improving community health**.

MOSQUITO-ATTRACTING PASTE FORMULA

Ingredients & Their Purpose

Ingredient	Quantity	Purpose
Cornstarch	2 tablespoons	Thickening agent
Gelatine	1 tablespoon	Better stability
Corn syrup	2 tablespoons	Energy source to mimic nectar
Sugar (Brown/White)	1 tablespoon	Fermentable sugar for CO_2 release
Glycerine	1 tablespoon	Keeps paste moist
Water (Distilled)	1/4 cup	Solvent
Honey (Raw)	1 tablespoon	Contains amino acids & natural volatiles
Yeast (Active Dry)	1 teaspoon	Produces natural CO_2 & attracts mosquitoes
Blood Meal / Casein	1 tablespoon	Strong protein source (mimics blood)
Baking Soda	1 teaspoon	Slow CO_2 release
Citric Acid / Vinegar	1 teaspoon	Reacts with baking soda for CO_2
Powdered Carbon Dioxide	1 teaspoon	Additional CO_2 source
Lactic Acid	10 drops	Mimics human sweat
Octenol (if available)	5 drops	Strong attractant from human breath/sweat
Hexanal (Aldehyde)	5 drops	Mimics human body odour
Ethanol	1 tablespoon	Enhances volatility & attraction

Preparation Method

1. Mix Base Ingredients:
    - In a saucepan, combine cornstarch, gelatine, corn syrup, sugar, glycerine, and distilled water.
    - Heat over low to medium heat, stirring constantly until thickened.
    - Remove from heat and let it cool slightly.
2. Enhance with Attractants:
    - Stir in honey, yeast, blood meal/casein, baking soda, citric acid/vinegar, and powdered carbon dioxide.
    - Mix well to ensure all ingredients are combined.
3. Add Volatile Compounds:
    - Once the mixture is warm (not hot), add lactic acid, octenol, hexanal, and ethanol.
    - Stir gently to preserve volatile properties.
4. Let It Ferment (Optional for Stronger Attraction):
    - Leave the mixture covered at room temperature for 4-6 hours to allow yeast activity.
    - This increases CO_2 and enhances the scent profile.
5. Application:
    - Spread the paste thinly onto a plate or trap area near the mosquito extermination setup.
    - Ensure some ventilation for CO_2 and odours to spread effectively.

Notes for Best Results

- Use fresh yeast for maximum CO_2 output.
- Replace the paste every 2-3 days to maintain effectiveness.
- Keep away from direct wind exposure to prevent quick drying.
- Place near mosquito resting areas for best attraction.

HIGH-VOLTAGE MOSQUITO ERADICATION CIRCUIT

Components Used

- **12V Li-ion Battery 2000mAh** – Powers the entire circuit.
- **TP4056 Charger Module** – Safely charges the Li-ion battery.
- **MT3608 DC-DC Boost Converter** – Steps up voltage to drive the high-voltage generator.
- **Flyback Transformer (3kV-10kV)** – Generates high voltage for the mosquito-zapping grid.
- **1N4007 High Voltage Diode** – Rectifies high-voltage AC to DC.
- **10nF, 3kV Capacitor** – Stores and stabilizes charge for the electrified grid.
- **1MΩ, 2W Resistor** – Limits current to prevent excessive discharge.
- **Electrified Mesh Grid** – Kills mosquitoes instantly on contact.
- **365nm UV LED Module** – Attracts mosquitoes effectively.
- **Current Limiting Resistor (330Ω)** – Ensures safe operation of UV LED.
- **12V 150mA Solar Panel and Module** – Safely charges the Li-ion battery.
- **12V 1A charger –** Charges the battery.

Working of the Circuit

1 Power & Charging:

- The 12V Li-ion battery powers the circuit.
- A TP4056 module ensures safe charging via solar panel or adapter.

2 Voltage Boost & High-Voltage Generation:

- The MT3608 boost converter increases voltage for the flyback transformer.
- The flyback transformer steps up the voltage to 3kV-10kV, needed for mosquito elimination.
- A diode (1N4007) rectifies the voltage, and a capacitor (10nF, 3kV) smooths the output.

3 Mosquito Attraction & Elimination:

- The 365nm UV LED attracts mosquitoes.
- The electrified mesh grid kills mosquitoes instantly when they land on it.
- The solar panel keeps the system running sustainably.

Notes

- The 12V Li ion battery of capacity 2000mAh is fully charged in 2.35 hrs using a 12V 1A charger using electricity
- The 12V Li ion battery of capacity 2000mAh is fully charged in 15 hours when a 12V 150mA Solar panel is used
- 6 hours is the lasting period

CIRCUIT DIAGRAM

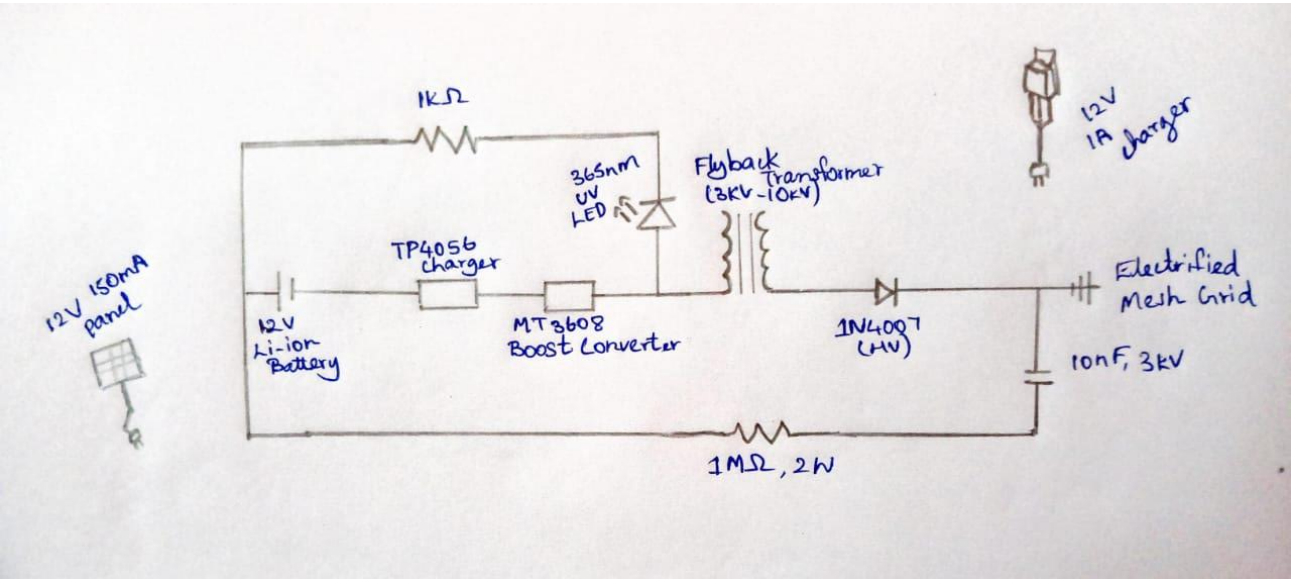
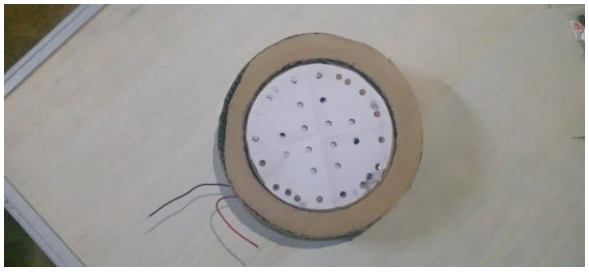
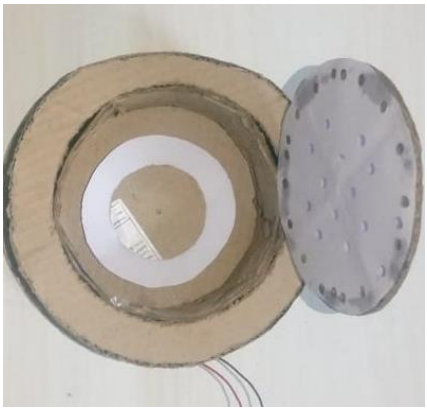
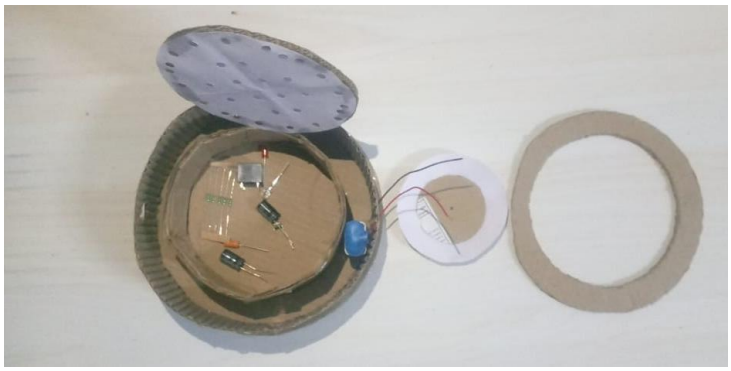


IMAGE OF MOCK-UP / PROOF-OF-CONCEPT PROTOTYPE







ACTUAL PROTOTYPE

Going to resemble a lotus flower!

ADVANTAGES OF THE SOLUTION

1. Advantages of the Mosquito-Attracting Paste

Highly Effective Attraction – The paste mimics human sweat and breath, making it a powerful lure for mosquitoes.

CO_2 Release for Better Efficiency – The paste naturally emits **carbon dioxide**,

which is a primary attractant for mosquitoes.

Long-Lasting & Low Maintenance – Can be **replaced every 2-3 days**, ensuring continuous operation without frequent intervention.

Non-Toxic & Safe for Humans – Made from natural ingredients, eliminating the need for harmful chemicals.

2. Advantages of the High-Voltage Circuit

Instant Mosquito Elimination – The electrified grid provides a **fast and effective** way to kill mosquitoes on contact.

UV Light for Increased Attraction – The **365nm UV LED** significantly enhances mosquito capture efficiency, especially at night.

Low Power Consumption – Operates efficiently on a **12V Li-ion battery**, making it sustainable for long-term use.

Solar Charging for Sustainability – The integrated **solar panel** ensures that the system remains functional without reliance on external power sources.

Chemical-Free & Eco-Friendly – Unlike insecticides, this system does not release toxins into the environment, making it safe for **humans, pets, and beneficial insects**.

Cost-Effective & Accessible – The system uses **affordable components**, making it suitable for use in low-income malaria-prone regions.

Public Health & Economic Benefits – Reducing mosquito populations lowers the risk of malaria, improving community health and **increasing economic productivity** by preventing disease-related disruptions.

POINTS TO NOTE

Key Considerations for Effective Implementation

Community Awareness & Education

- Empowering communities with knowledge about mosquito prevention and the benefits of this system.
- Promoting widespread awareness and correct usage through community campaigns.

- Encouraging active participation in paste replacement and system upkeep for long-term effectiveness.

Proper Implementation & Maintenance

- Strategically placing the system in high mosquito-density areas for maximum impact.
- Keeping the electrified grid clean to ensure continuous efficiency.
- Optimizing solar panel positioning for effective power generation.
- Refreshing the attractant paste every 2-3 days to maintain strong mosquito attraction.

Enhancing Efficiency & Adoption

- Maximizing solar charging with larger panels or additional power backups.
- Improving paste longevity by using moisture-retaining ingredients like glycerine.
- Ensuring electrical safety with proper insulation and protective casing.
- Strengthening community trust and adoption by collaborating with health organizations.

CONCLUSION

Malaria continues to be a significant global health challenge, particularly in Africa and Asia. Through our project, we aim to develop an innovative and sustainable solution to reduce mosquito populations and ultimately prevent the spread of malaria. By implementing this solution, we hope to contribute to a healthier and safer community.

With further optimizations and wider adoption, this model has the potential to significantly reduce mosquito populations and protect communities from mosquito-borne diseases worldwide.