

GAMES FOR HEALTH EUROPE

2026



GAMES FOR HEALTH
EUROPE

DISCLOSURE SLIDE
for presentations at the

GAMES FOR HEALTH EUROPE 2026 CONFERENCE

I herewith confirm that there is not any conflict of interest with the conference organization or any of its sponsors.



A Vector Control Research Alliance



Play. Modify. End?
**Re-engineering mosquitoes and storytelling:
Genes and games – new tools in the fight to save lives**

Games for Health Europe

30-31 March 2026

Louise Marston



A Vector Control Research Alliance



Play. Modify. End?
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Hallo Games For Health!



**CRISANTI
LAB.
IMPERIAL**



A Vector Control Research Alliance



Senior Research Technician, Louise Marston & Mosquitoes

Mosquitoes & Malaria



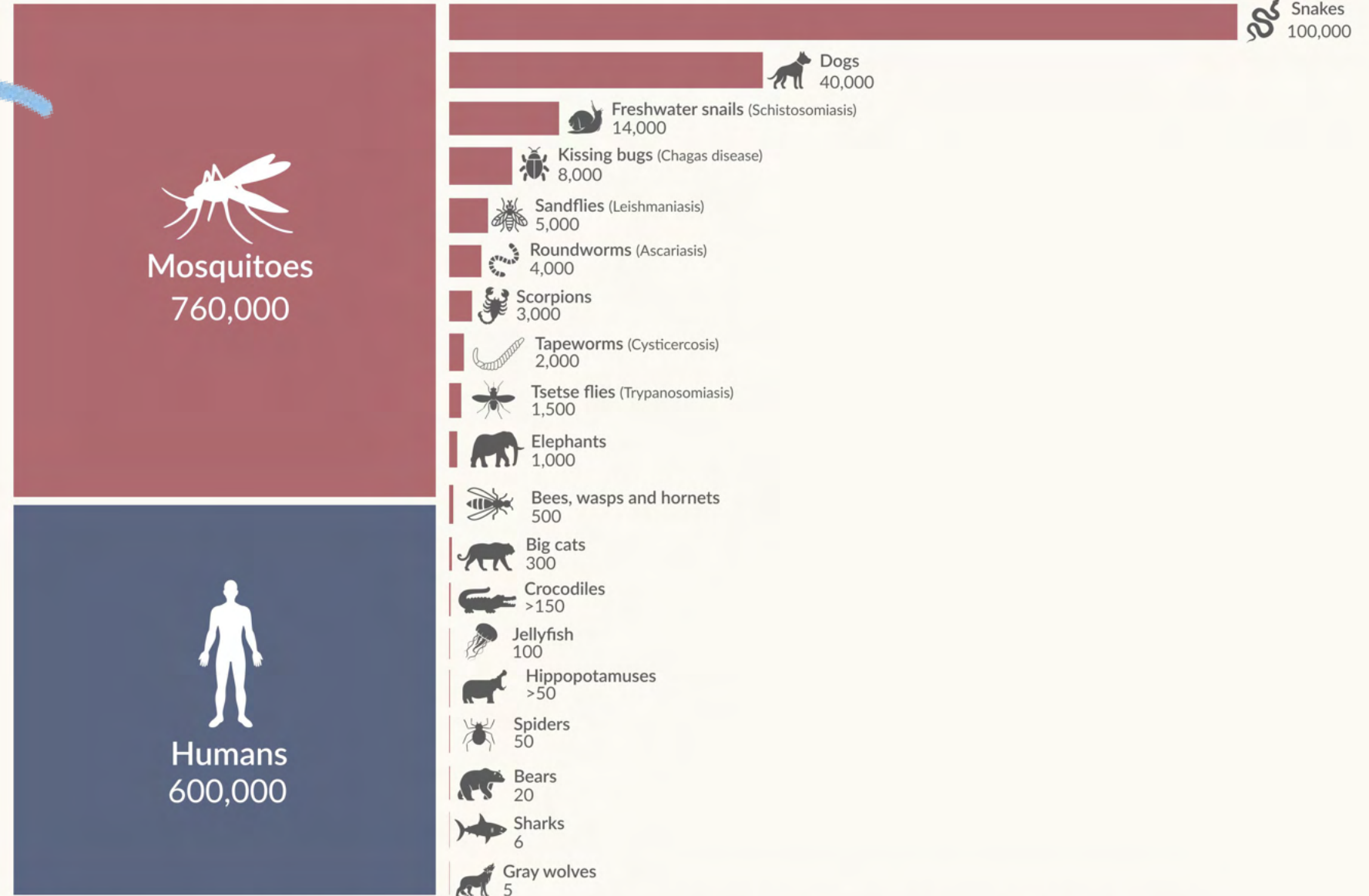
World's deadliest animal?



What are the world's deadliest animals?

Estimates for the number of humans killed by different animals in 2023.

Over 80% of those deaths are because of those that carry malaria



Note: This is not an exhaustive list. Estimates come with significant uncertainty, and are used for relative magnitude comparisons. Figures have been rounded to not overstate accuracy.

Data sources: IHME, GBD (2025); World Health Organization; CrocAttack; ISAF; and others. See our full documentation at https://docs.owid.io/projects/etl/analyses/deadliest_animals/

OurWorldinData.org – Research and data to make progress against the world's largest problems.

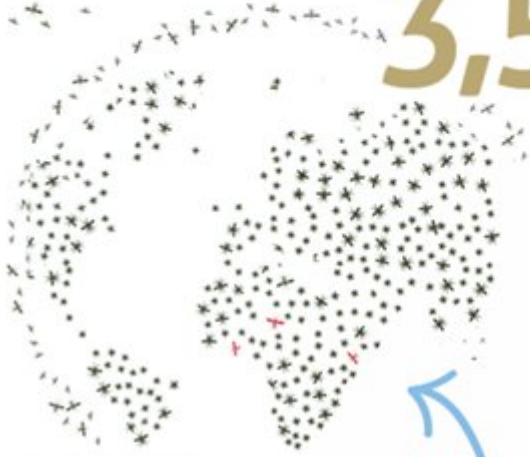
Licensed under CC-BY by the authors Hannah Ritchie and Fiona Spooner.

Which mosquitoes can give you malaria?



Worldwide, there are over

3,570 species of mosquitoes



677 of those species are in **Africa**

Target Malaria's work specifically targets only **4 species:**



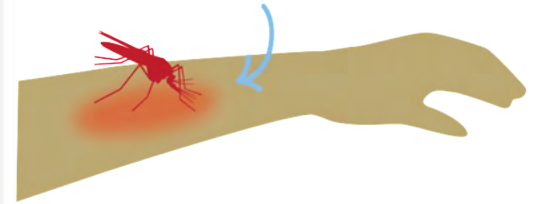
Anopheles gambiae

Anopheles coluzzii

Anopheles arabiensis

Anopheles funestus

These closely related species are **responsible for most** of the **Malaria transmission** in Africa



Source: *Mosquitoes of the World*
Richard C. Wilkerson, Yvonne-Marie Linton,
and Daniel Strickman, January 19, 2021

Anopheles
Vector for Malaria



Aedes
Vector for Dengue

©PIOTR NASKRECKI 2015





Why do they bite?



Larva



Pupa



Anopheles gambiae
Development
Life Cycle

Embryo



Adult
mosquito



Only the
females
bite

Blood meal



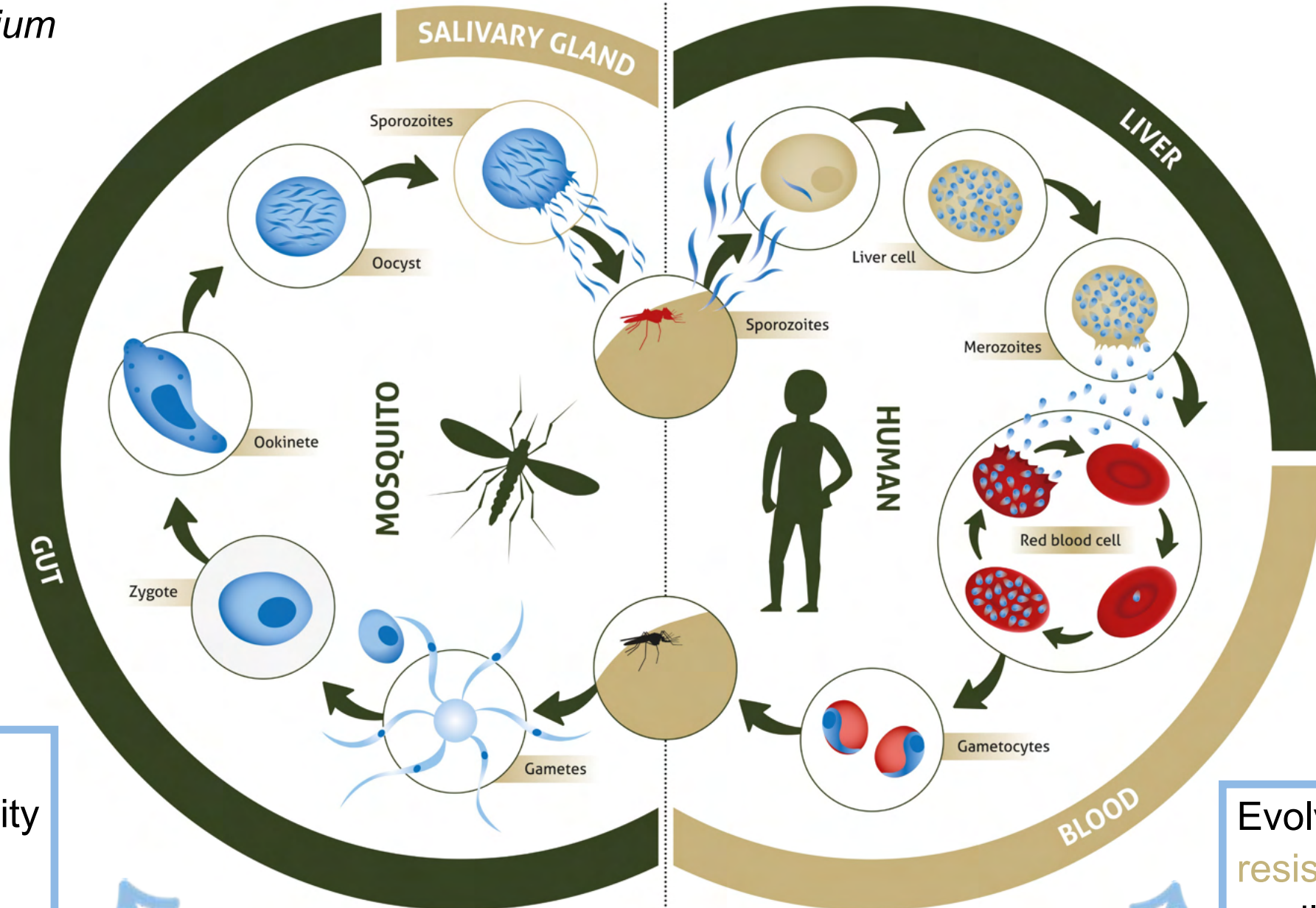
The background of the slide is white and features a decorative pattern of numerous small, grey mosquito silhouettes. These mosquitoes are scattered across the page, with a higher concentration in the top-right and bottom-left corners, and a few more in the center. The silhouettes are simple line drawings showing the mosquito's body, legs, and wings.

What is malaria?

Parasite

Plasmodium

Malaria Transmission Cycle



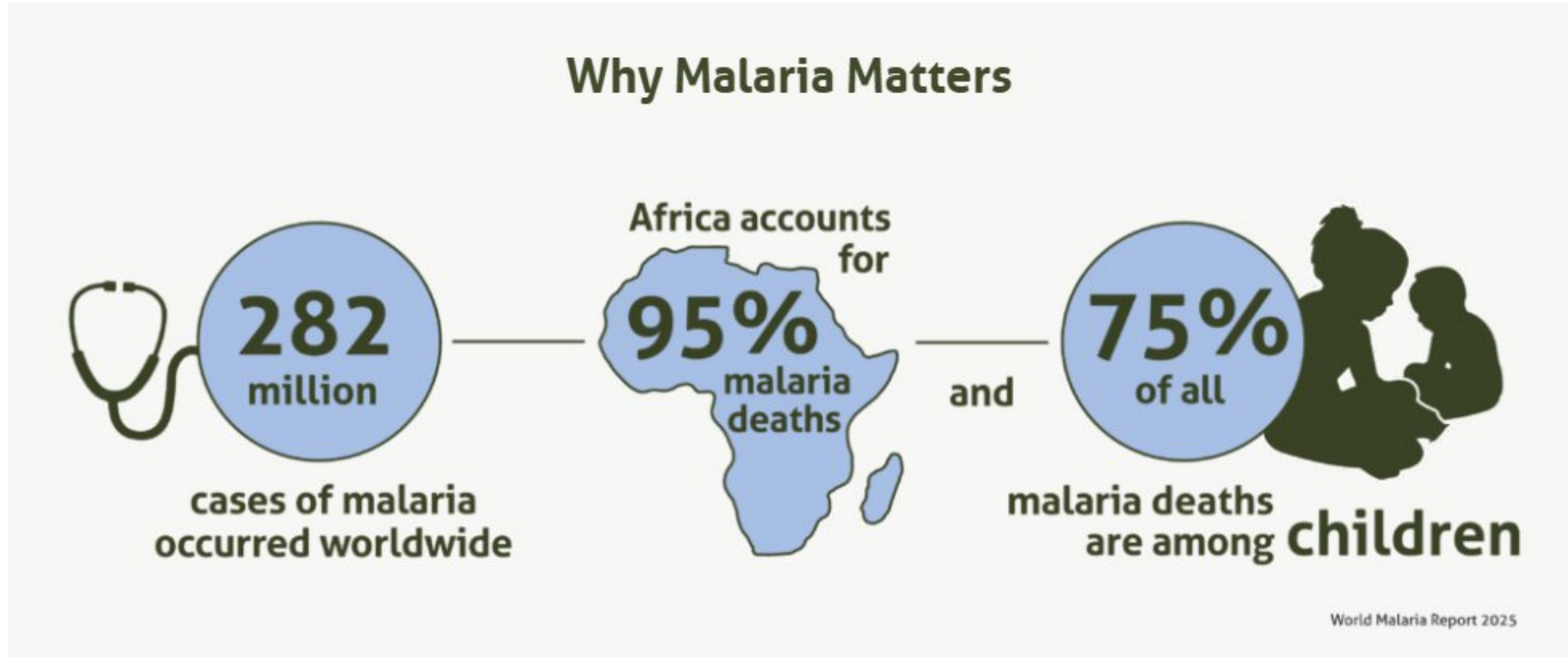
Less opportunity for resistance

Evolves resistance easily

1 mosquito bite... ...billions of parasites

Last year

610,000 deaths worldwide

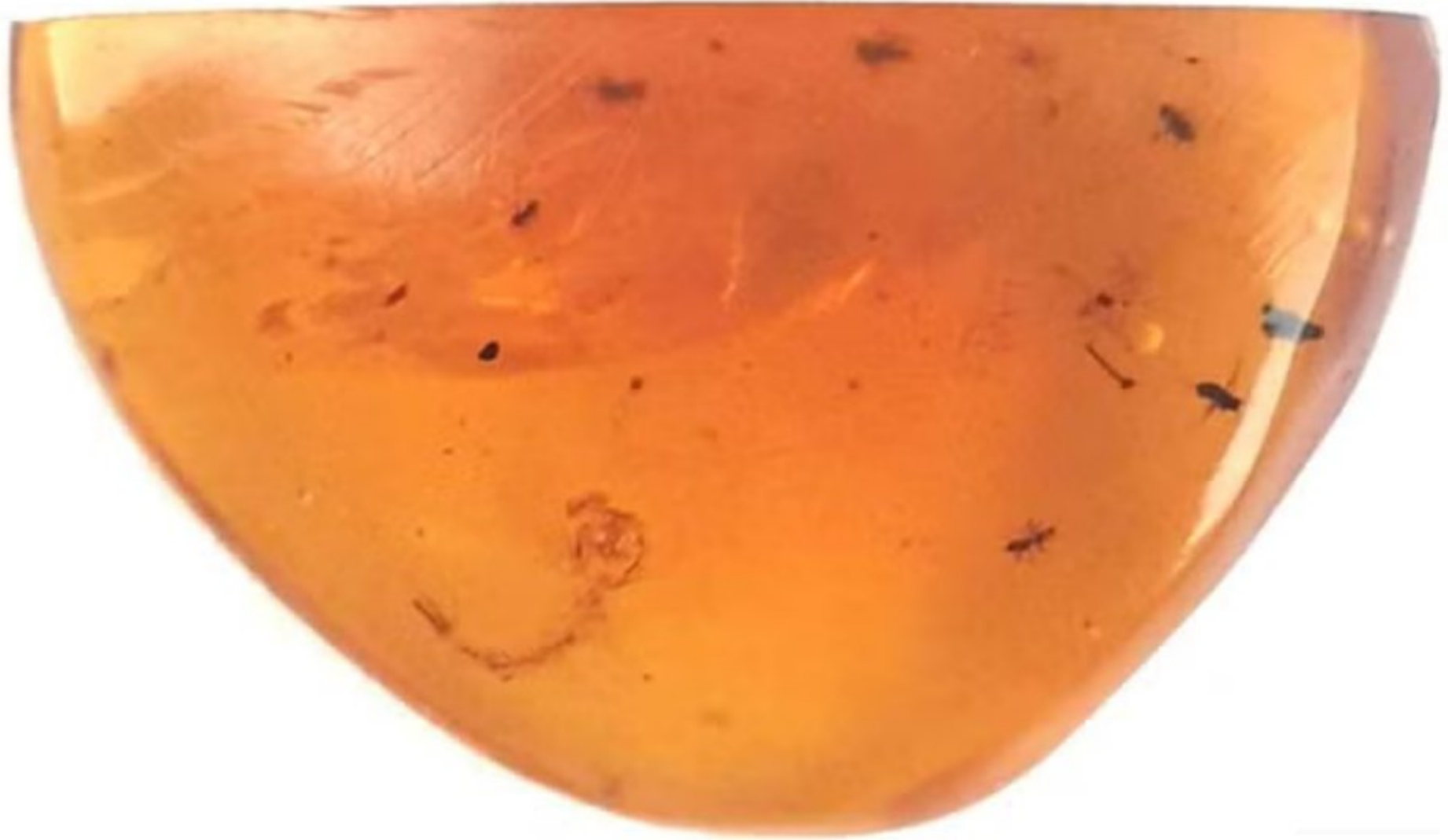


Huge social & economic burden

Half the world's population is at risk



Are we going to win?



Oldest known mosquito larva trapped in amber (*André Amaral, AG Haug*)

Current malaria interventions

► Interventions

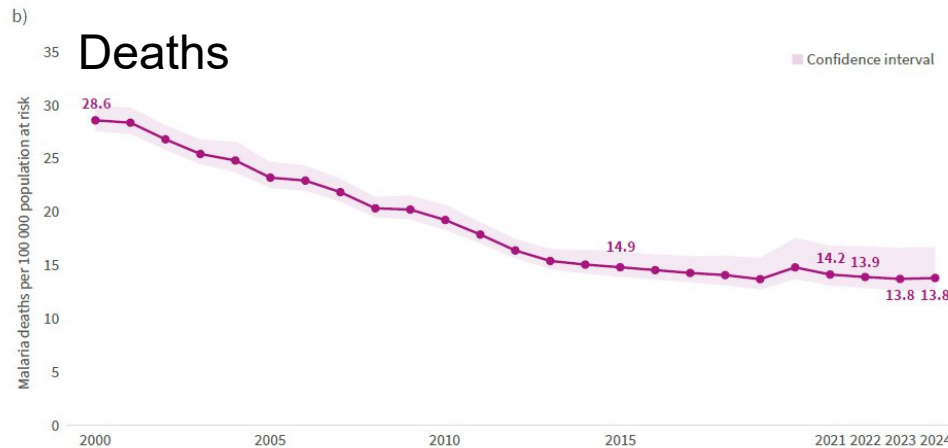
- > Insecticides
- > Bed nets
- > Drugs
- > Vaccines



Vital, but **not enough** to eliminate the disease

► Progress

Fig. 2.3. Global trends in a) malaria case incidence (cases per 1000 population at risk) and b) mortality rate (deaths per 100 000 population at risk), 2000–2024; and c) distribution of malaria cases and d) deaths, by country, 2024 Source: WHO estimates.



WHO: World Health Organization.

2015

Progress is stalling

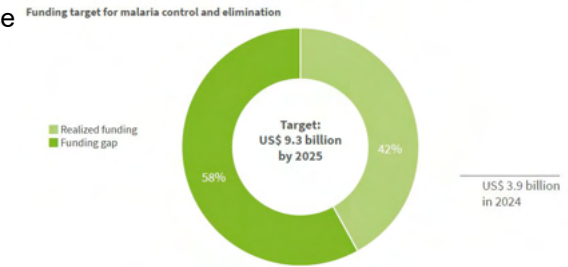
► Challenges

- > Access
- > Insecticide & drug resistance
- > Parasite complexity
- > Invading species
- > Asymptomatic cases
- > Reinfection
- > Relapse
- > Climate

Significant challenges

► Funding gap

Fig. 4.1. GTS funding targets for 2025 and 2030^{a,b} Sources: GTS and 2021 GTS update.



Additional cost-effective & sustainable vector control methods are needed



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Target Malaria



My life cycle

2007

Volunteering - Africa (Malawi, Kenya)

2007

University of Warwick - Biological Sciences BSc

2010

National Health Service –
Tuberculosis
St John Ambulance – First Aider

2013

Medical Research Council -
Genetics

2016

Imperial College London / Target Malaria

A diverse international research team



1. CDC Foundation
2. Imperial College London
3. Liverpool School of Tropical Medicine (LSTM)
4. Polo d'Innovazione di Genomica Genetica e Biologia
5. Uganda Virus Research Institute (UVRI in Uganda)
6. University of Oxford

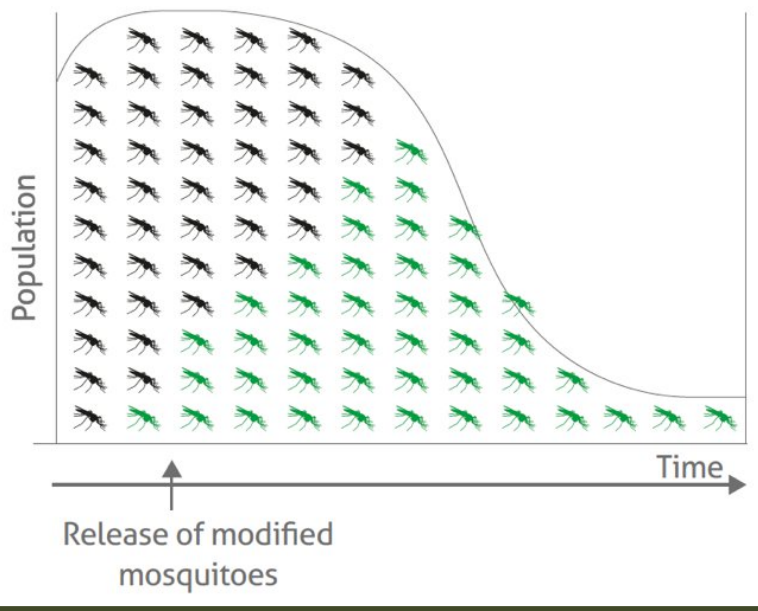


The Science

Genetic vector control strategies

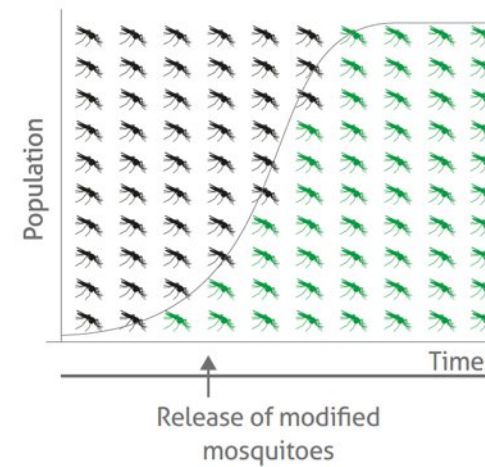
Population suppression

Releasing modified mosquitoes into the population can cause transient or permanent population suppression



Population replacement

Releasing modified mosquitoes into the population can lead to the spread of a gene that blocks malaria transmission

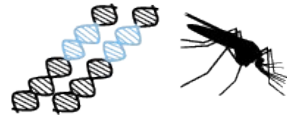


Targeting genes

Everything living has DNA



Genes cause the traits that determine our differences. Individuals have two copies of each gene.



Genetic traits that work for us

Malaria resistance

Inability to find a blood source



Female infertility



Produce only males



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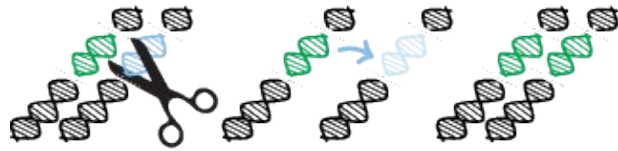
Using nucleases

e.g. CRISPR-Cas9



We used **DNA-cutting** enzymes called **nucleases** to modify mosquito genes in a very precise way.

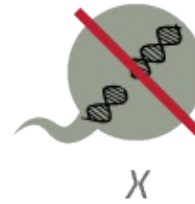
by cutting and pasting from one chromosome to another



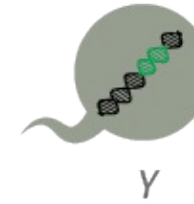
or

by removing a chromosome that determines the sex of the mosquito

Female-forming sperm

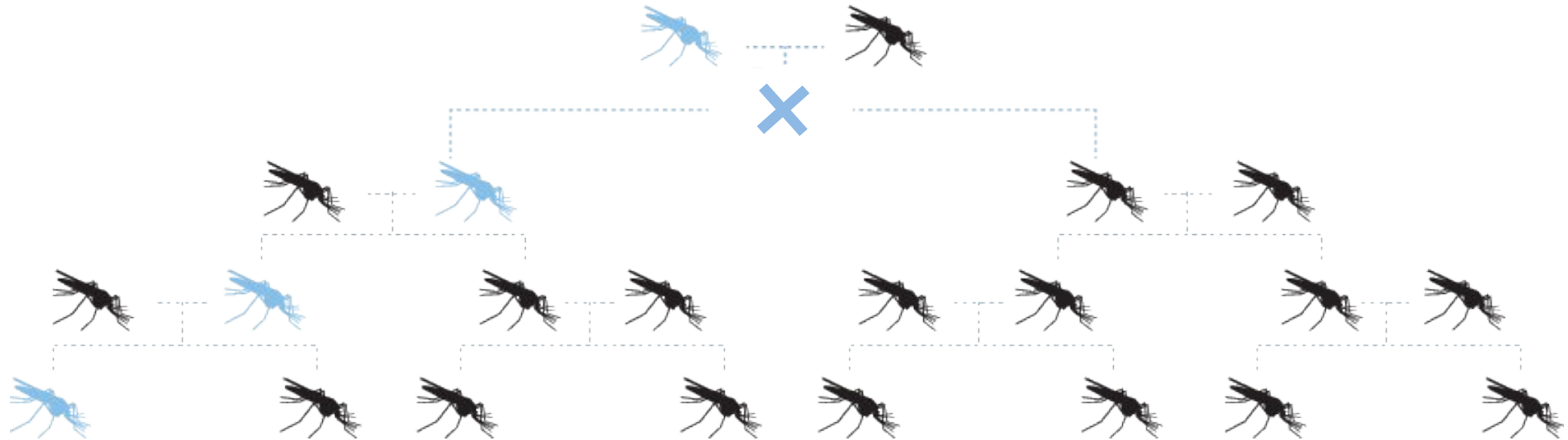


Male-forming sperm



However

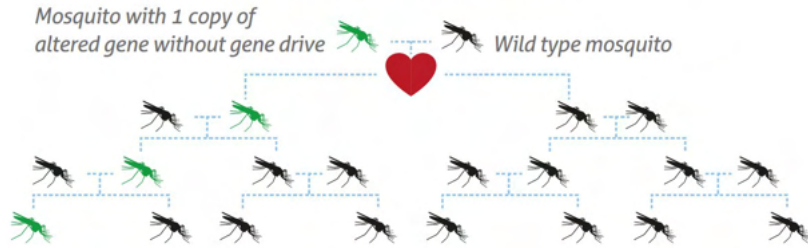
New genes tend to stick around in low numbers



- > Wild-type population still exists, and continues to spread malaria

Gene drive

Mendelian inheritance



50% inheritance

Gene Drive inheritance

Mosquito with 1 copy of altered gene with gene drive

Wild type mosquito

The diagram shows a pair of mosquitoes (one green, one black) with a red heart between them. Dashed lines represent genetic inheritance. In the first generation, 100% of the offspring are green. In the second generation, 100% of the offspring are green. This illustrates that the gene drive converts wild type genes to altered genes, leading to nearly 100% inheritance of the altered gene.

Gene drive converts the wild type gene to the altered gene.
Offspring will almost always inherit the altered gene.

Up to 100% inheritance

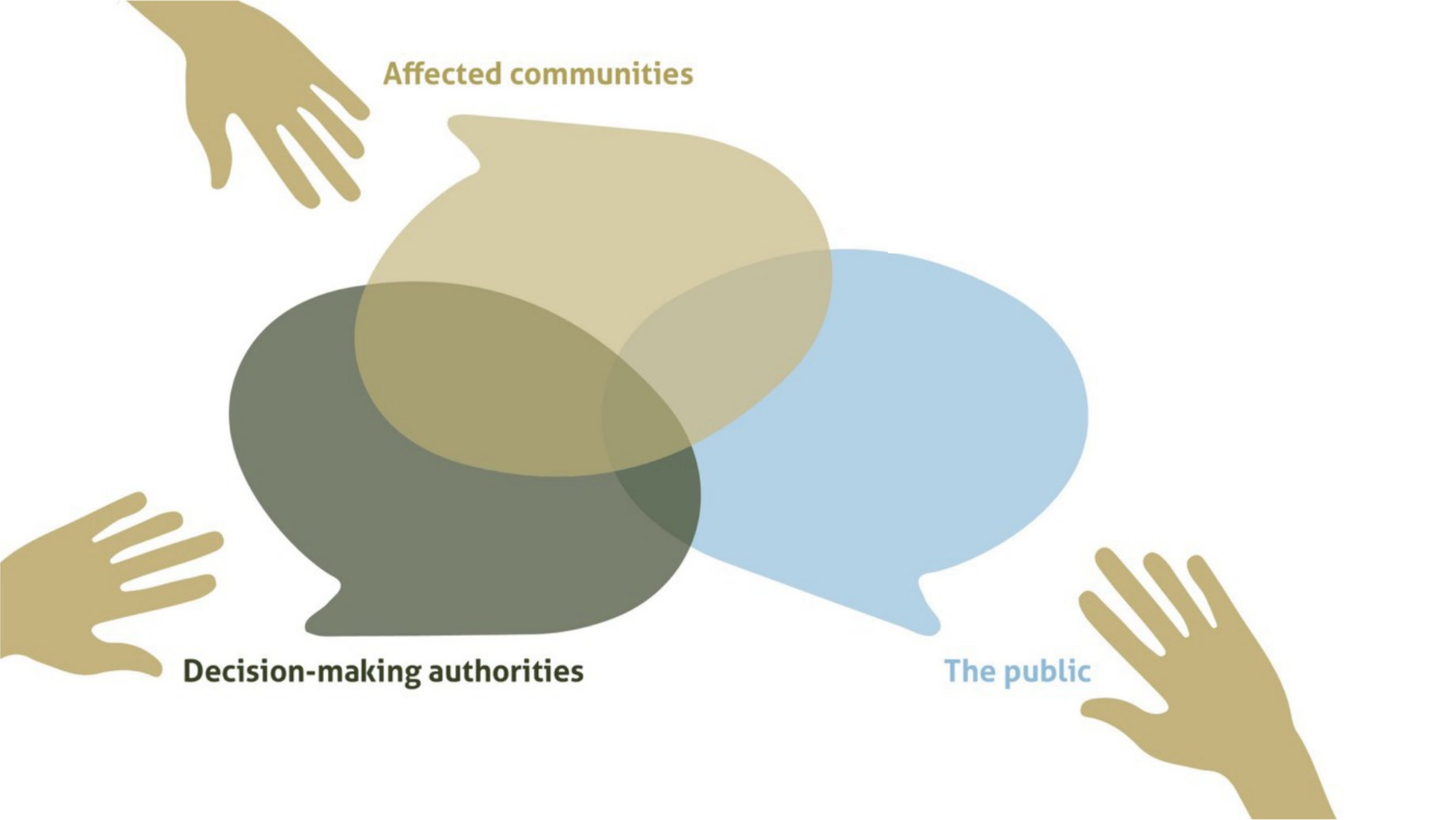
- > Self-sustaining
- > Cost effective

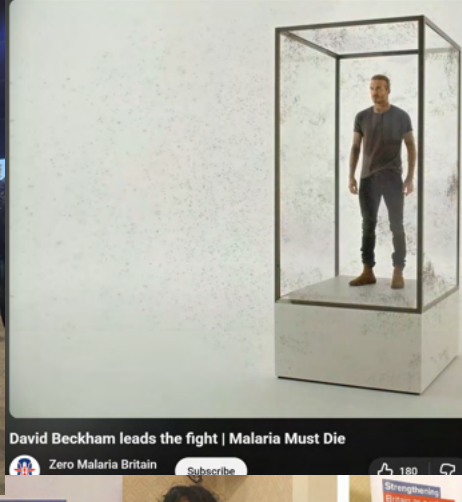


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Communication & Engagement



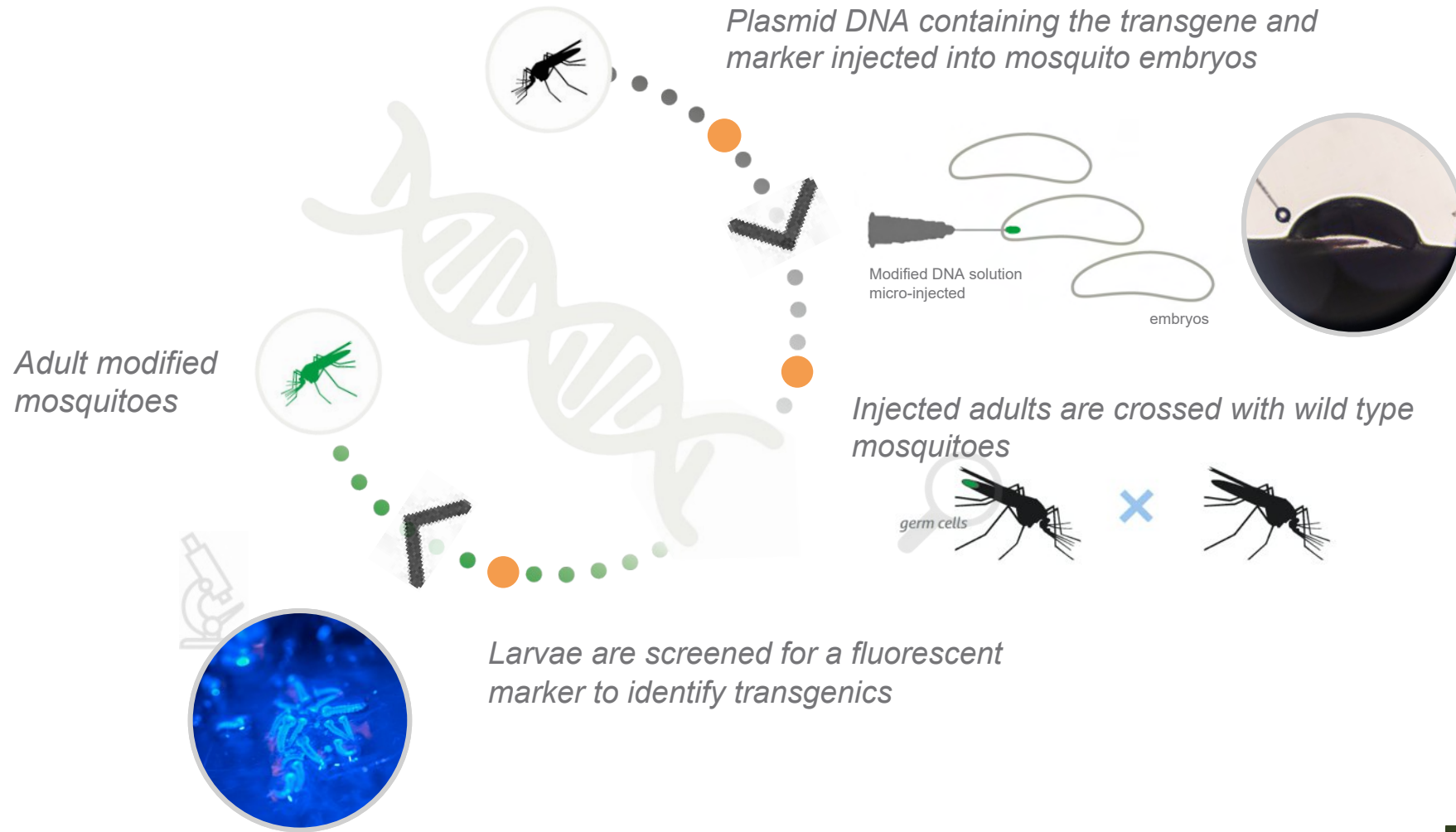


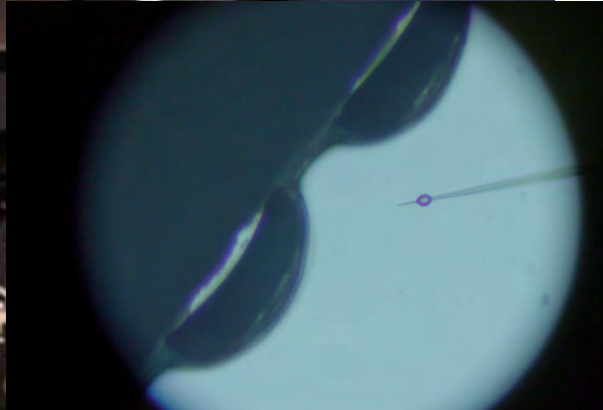


Target Malaria: The Game



In the lab





Microinjection



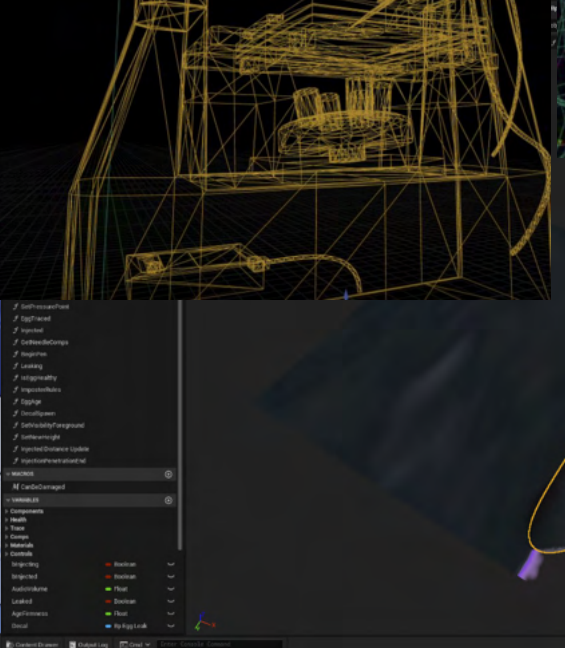
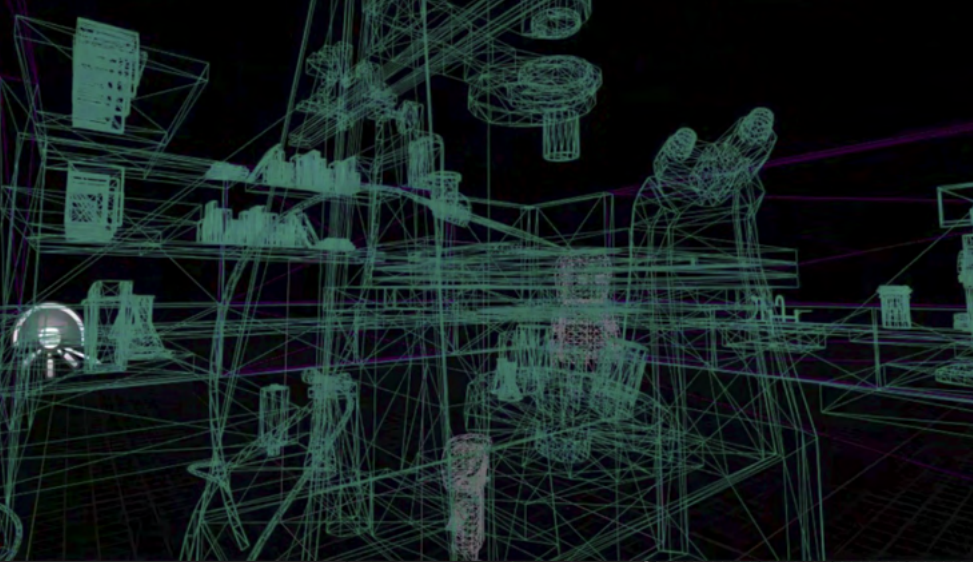
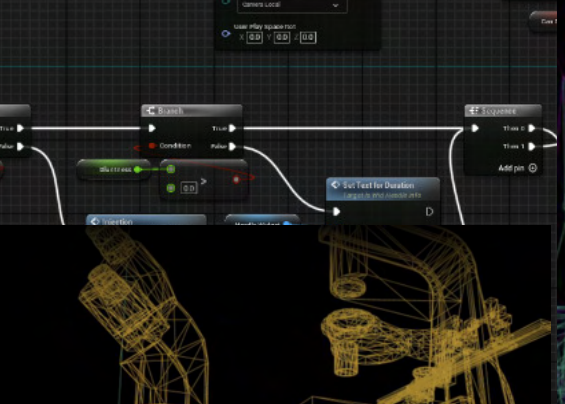
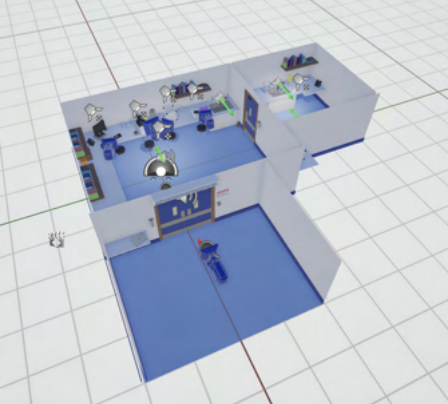
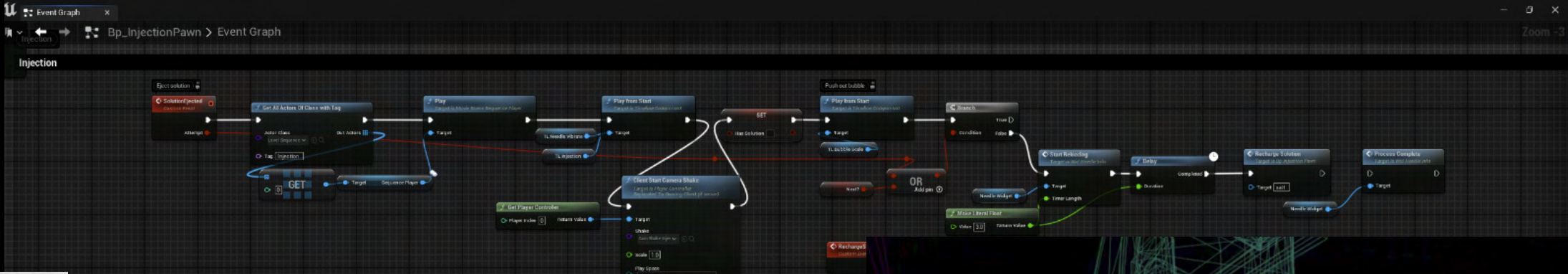
Exhibition

S



Michael Marston

- › Games Developer, Freelance
- › Norwich University of the Arts
- › Unreal Engine, 3D Generalist, AV Technician, LED displays, Creative and Immersive Technologies



The bottom right image shows the Unreal Engine software interface. It includes a 'Hierarchy' panel on the left, a 'Details' panel on the right, and a 'Console' panel at the bottom. The main view shows a 3D scene with a character and a yellow wireframe overlay. The interface is dark-themed and contains various settings and tools.

Unreal Engine

Software :

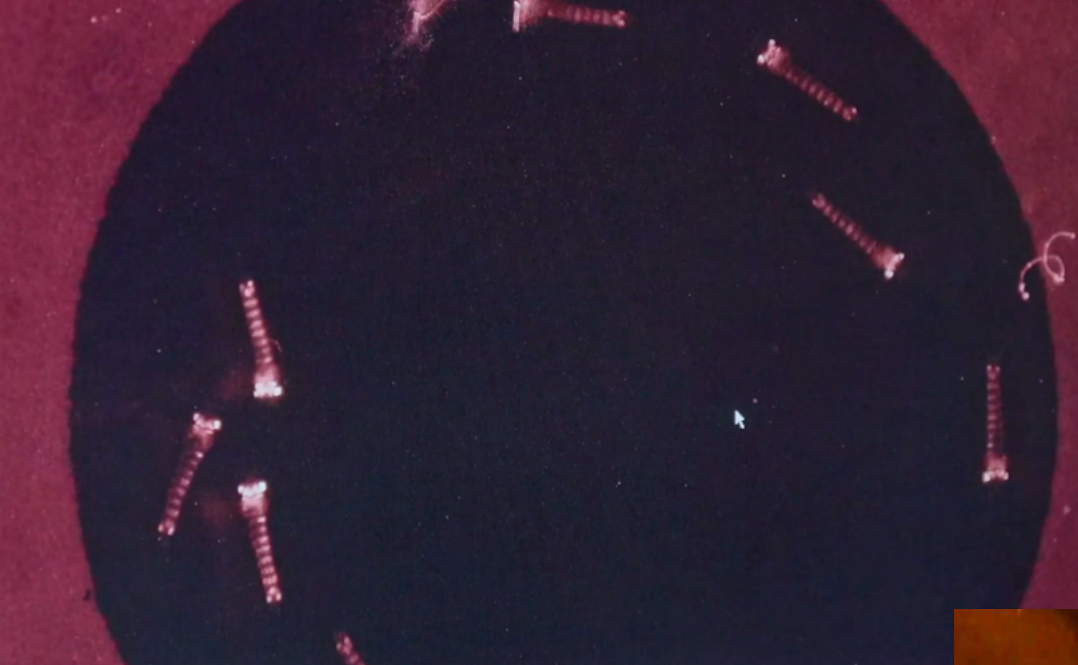
Unreal Engine is a series of 3D computer graphics game engines developed by Epic Games, first showcased in the 1998 first-person shooter video game Unreal. Wikipedia

Programming languages: C++, Blueprint

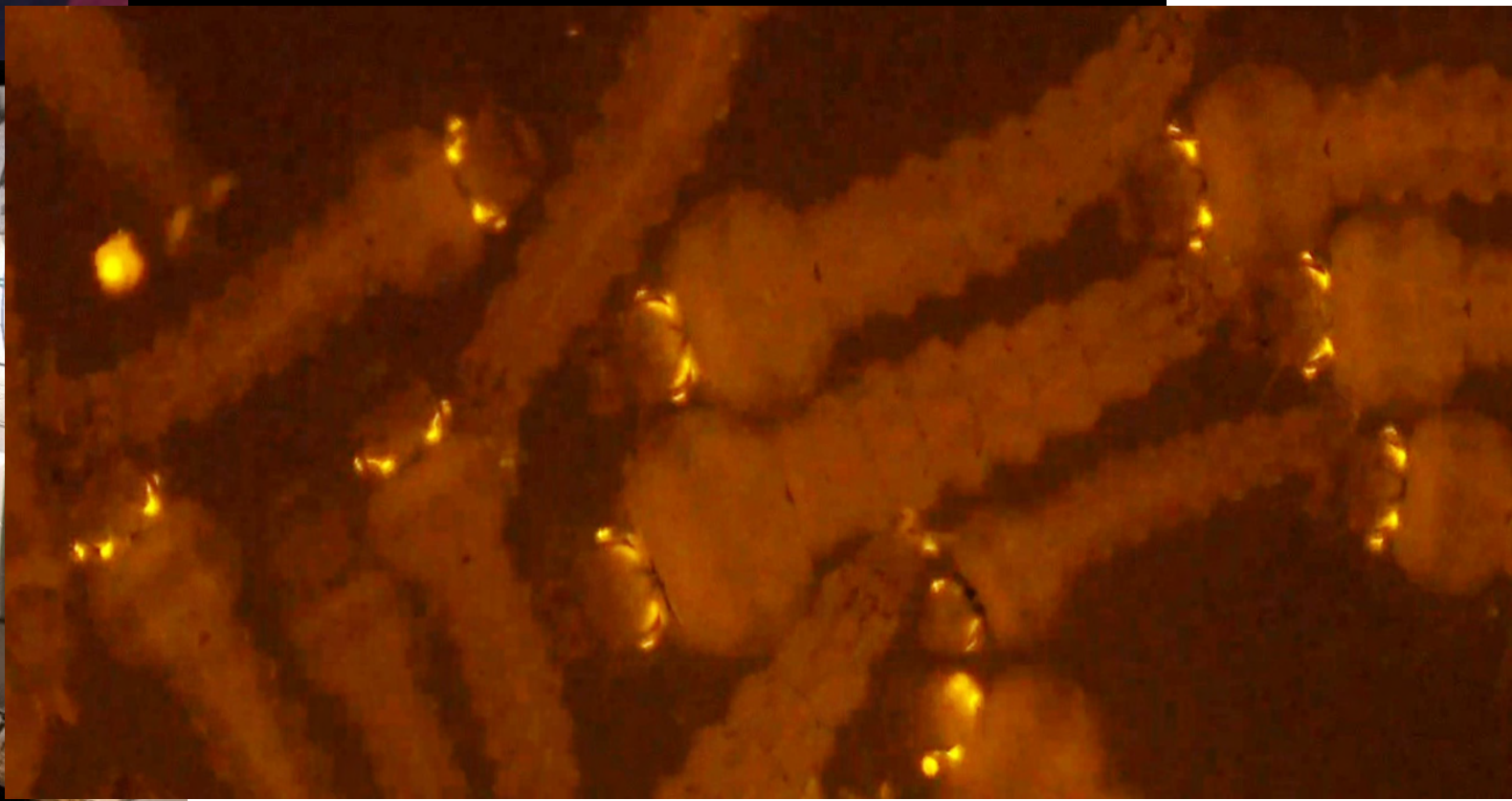
Developer: Epic Games

License: Source-available commercial software with royalty model for commercial use

Operating system: Windows, Linux, macOS



—
Screening





Lab “hub”

- For all the techniques / “minigames”, each is a different piece of equipment



Design

Accessible

- Downloadable for free
- Playable on low-spec PCs
- Length - short - a few mins only (exhibitions, queues)
- Settings: language, text size, colours, etc

Realistic but simplified

- Choosing which aspects to include

Life-real aspects

- Objects, audio

Classic gaming elements

- Scores



Score!

- Debuted at exhibitions
 - New Scientist Live
 - Imperial Lates
 - Great Exhibition Road Festival
- Also useful for other visitors:
 - Capacity building, journalists
- Video games get the most attention
- Explains the work for us
- Other research groups want the same

Game is evolving

Simulation for
exhibitions and
training
On PC



Storytelling

New audiences & changing purposes

Stakeholder engagement in Africa

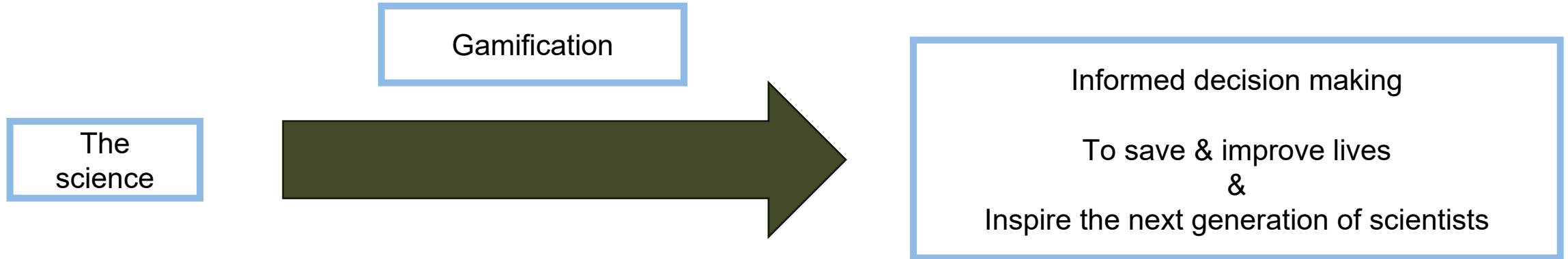
Different devices:

From PC to mobile (Android & Apple)

Coming soon

Complete the story

Power of play



Acknowledgements

Target Malaria receives core funding from the **Gates Foundation**
& from **Coefficient Giving** (Open Philanthropy)

Gates Foundation

Coefficient
Giving



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The game
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www.linkedin.com/in/louise-anna-marston



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