Towards a vaccine for *Plasmodium vivax*: Landscaping review

Deep Dive updated in 2024, with 64 new projects added

Several *P. vivax* vaccine candidates are in various stages of development, aiming to enhance immune response and prevent relapses. While some are in clinical trials, many remain in preclinical and discovery phases, requiring sustained investment to advance toward licensure.

Background

2022 ➡

- **249 million people** impacted by malaria
- More than **600,000 deaths** globally
- Majority due to ***Plasmodium falciparum*** and ***Plasmodium vivax*** (1).

Despite progress toward malaria elimination, *P. vivax* remains a challenge due to its ability to form dormant liver stages, causing relapses and sustaining transmission.

World Health Organization

- ***P. falciparum*:** two vaccines approved—RTS,S in 2021 and R21/Matrix-M in 2023
- ***P. vivax*:** no existing vaccine

Developing a *P. vivax* vaccine is crucial to prevent relapses, curb transmission, and advance malaria control.

Objectives

- Map out the geographical scale and scope of ongoing *P. vivax* vaccine research.
- Provide an overview and analysis of *P. vivax* vaccine related research.
- Outline the investments in *P. vivax* vaccine research and the institutions involved in them.
- Describe the research areas being explored by the projects.
- Identify knowledge gaps.

Methods

Inclusion criteria: Projects related to *P. vivax* vaccine | Active ≥ 2012 + in English

Systematic data collection from multiple sources, curation, and review of active research

Principal investigators contacted to verify project details and fill information gaps

Projects categorized into research areas based on common objectives.

Project search flowchart – Initial Screening in 2020

Projects identified from all sources (146) → Potential projects assessed (86)

Total projects included in the Deep Dive (53)

Projects excluded: duplicates (60) and ineligibility (33)

Discussion

***P.vivax* vaccines in development**

- *Pv*s230D1-EPA/Matrix-M
- *Pv*s25-IMX313
- *PV*DBPII in Matrix M1
- ChAd63/MVA *PV*DBP
- *P. vivax* irradiated sporozoite
- *Pv*CSP

Challenges in Vaccine Development:

Research on *P. vivax* vaccine is still in early stages, facing multiple scientific and structural barriers including:

- Unavailability of an in vitro blood-culture system, limiting parasite study outside the host.
- Lack of knowledge on immune responses to *P. vivax*, hindering target identification.
- Limited antigen discovery, restricting potential vaccine candidates.

Financial and Structural Barriers:

- Funding gaps prevent large-scale research initiatives.
- Lack of sustained commitment slows down progress in vaccine formulation and trials.
- Limited investment restricts the translation of scientific findings into viable vaccine candidates.

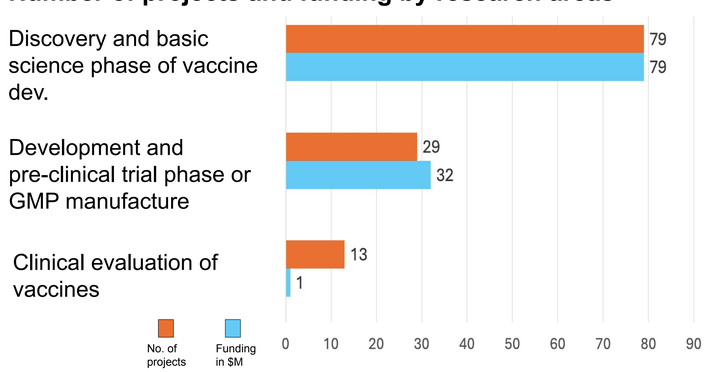
Results

Total projects
117 (15 active)

Total funding
$108.59M

Project sites
22

Number of projects and funding by research areas



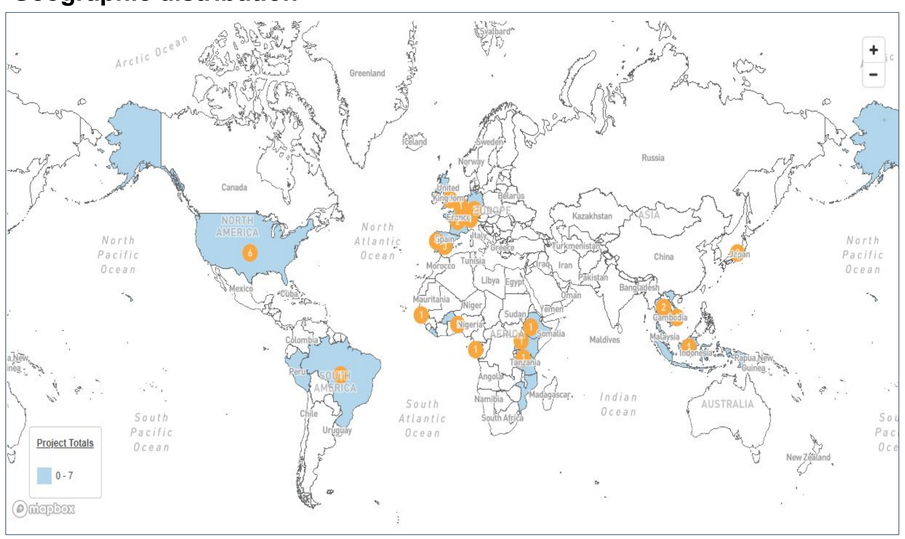
Funding amount in millions

1. NIAID **$75**
2. Wellcome Trust **$15**
3. European Commission **$9**

1. CDMRP **$3**
2. ANR **$2**
3. MRC **$2**

1. La Caixa Foundation **$2**
2. NHLBI **$1**
3. Other **$1**

Geographic distribution



Call-to-action

1. Recognizing the urgency of *P.vivax* vaccine development is crucial.
2. Requires strong commitment, interdisciplinary collaboration, and sustained funding from researchers, policymakers, and funding agencies.
3. Achieving elimination and control of *P. vivax* depends on overcoming barriers through dedicated research efforts and strategic investments.

References

1. WHO. World malaria report 2023 [Internet]. Geneva: World Health Organization; 2023. https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2023
2. MESA. Towards a vaccine for Plasmodium vivax - MESA [Internet]. https://mesamalaria.org/mesa-track/deep-dives/towards-vaccine-plasmodium-vivax/

Explore Deep Dive

Beena Bhamani, on behalf of MESA - hosted by Barcelona Institute for Global Health (ISGlobal), Hospital Clínic – University of Barcelona, Barcelona, Spain