Livestock

Evaluating zoonotic malaria transmission and agricultural land use in Indonesia

Indonesia

Overview

In Southeast Asia, *Plasmodium knowlesi*, an emerging malaria parasite of long-tailed and pig-tailed macaques transmitted by the *Anopheles leucosphyrus* mosquito group, is now the most common cause of human malaria in Malaysia. The parasite has been reported in all Southeast Asian countries where the relevant macaque hosts and mosquito vectors are present.

While information on the epidemiology and transmission dynamics of *Plasmodium knowlesi* is limited, it is clear the parasite disproportionately affects agricultural workers. Studies across Southeast Asia show that subsistence farmers have an increased risk of acquiring the parasite, and that risk increases again for agricultural workers near forest and fragmented forest areas.

This project will facilitate sustainable agricultural development by addressing the direct association between agricultural activities and zoonotic malaria transmission in Indonesia. It will work towards the development of intersectoral interventions by evaluating the burden of zoonotic malaria together with the environmental risk and land use factors associated with infection.

There will also be a focus on strengthening the national public health system's ability to detect zoonotic malaria infections and inform best-practice malaria control. In turn, the reduced disease burden will facilitate growth of the agricultural sector.

KEY FACTS

ACIAR Project No. LS/2019/116
Duration: January 2020 to June 2022 (2.5 years)
Target areas: Indonesia
Budget: A$3,025,060

Project Leader
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Key partners
- University of Sumatera Utara, Indonesia
- Eijkman Institute for Molecular Biology, Indonesia
- James Cook University, Australia

ACIAR Research Program Manager
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Objective

The project will study zoonotic malaria in Indonesia, by evaluating the disease burden, agricultural practices and mosquito vectors associated with transmission. The data gathered will inform public health control efforts and sustain agricultural development.

Specific objectives are to:

- Improve detection methods for zoonotic malaria surveillance and use them to define the disease burden.
- Evaluate agricultural and land-use factors associated with zoonotic malaria transmission.
- Evaluate mosquito vectors transmitting zoonotic malaria and the effect of agricultural land-types and practices on their behaviour.

Expected scientific results

- Use of optimised molecular detection methods for zoonotic malaria found in natural macaque hosts to drive changes to passive surveillance activities in countries where *Plasmodium knowlesi* and other macaque species are endemic.
- This molecular protocol could also be used in international reference laboratories requiring accurate diagnoses of malaria species in returned travellers from Southeast Asia.
- Implementation of this molecular protocol to enable national malaria control programs in countries co-endemic for zoonotic malaria and other human malaria species to monitor real progress towards their elimination.
- Geospatial and mathematical modelling strategies to map zoonotic malaria transmission risk, which could have a broader application to relevant Indonesian scientific institutions or public health departments interested in either targeted interventions or control efforts for zoonotic malaria, or applied to other relevant zoonotic diseases associated with agricultural land use change.
- The identification of specific *Anopheles* mosquito species that transmit zoonotic malaria in Indonesia and their relationship to agricultural practices and land-types, to assist local malaria vector research.

Expected impact/outcomes

- Reduced threat of zoonotic malaria in Indonesia through improved surveillance methods and understanding of risks related to agricultural practices.
- Strengthened zoonotic malaria surveillance systems and practices to provide a local evidence base to help Indonesian policy makers reduce disease transmission and facilitate sustainable agricultural development.
- Enhanced regional research capacity regarding One Health methodologies.
- Accurate monitoring of progress towards elimination of human-only malaria species.
- Provision of a local evidence base for policy makers regarding the incidence, clinical spectrum and disease burden of *Plasmodium knowlesi* malaria in Indonesia.
- Key stakeholders and end-users engaged to increase recognition of *Plasmodium knowlesi* and improve prevention and management to reduce morbidity and mortality from malaria.
- Promotion of agricultural practices shown to mitigate risk of zoonotic malaria transmission.
- Identification of the *Plasmodium knowlesi* mosquito vector, its bionomics and insecticide resistance profile to develop effective vector control strategies.
- Promotion of malaria control strategies that improve the health security of agricultural workers and communities, and provide economic and social benefits through sustainable agricultural development.

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