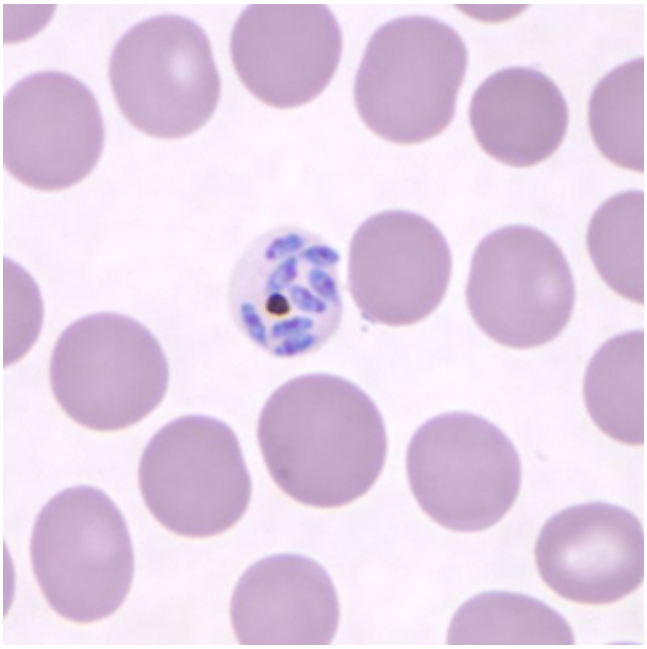
Deforestation linked to rise in cases of emerging zoonotic malaria

December 17 2015



Plasmodium knowlesi sporozoites inside a Blood cells from a Blood smears. Credit: CDC

A steep rise in human cases of *P. knowlesi* malaria in Malaysia is likely to be linked to deforestation and associated environmental changes, according to new research published in *Emerging Infectious Diseases*. The study, led by the London School of Hygiene & Tropical Medicine, is the first to explore how changes in land use are impacting the emergence of the disease.

Plasmodium knowlesi is a zoonotic malaria parasite, transmitted between hosts by mosquitoes, which is common in forest-dwelling macaque monkeys. Although only recently reported in humans, it is now the most common form of human malaria in many areas of Malaysia, and has been reported across southeast Asia. In recent years, Malaysia has seen widespread deforestation alongside rapid oil palm and other agricultural expansion. It is thought changes in the way land is used could be a key driver in the emergence of *P. knowlesi*, but until now this has not been investigated in detail.

The study focused on the Kudat and Kota Marudu districts in Sabah, Malaysia, covering an area of more than 3,000km^2 with a population of approximately 120,000 people. Researchers used hospital records for 2008-2012 to collect data on the number of *P. knowlesi* malaria cases from villages in the districts. Information collected from satellite data helped the team to map the local forest, land use, and environmental changes around 450 villages, in order to correlate how these changes might affect human infection.

They found that the number of *P. knowlesi* cases was strongly linked to deforestation in areas surrounding the villages. This could be explained by a number of factors, including humans coming into closer contact with the forest inhabited by the macaques and the mosquito vectors, due to employment in tree clearance and expanding agriculture. Another factor could be that as land use changes in this way, macaque populations are becoming more densely concentrated in areas of forest where humans are present.

Lead author Kimberly Fornace, Research Fellow at the London School of Hygiene & Tropical Medicine, said: "The dramatic rise in the number of *P. knowlesi* malaria cases in humans in Malaysia in the past ten years has been most common in areas with deforestation, as well as areas that are close to patches of forest where humans, macaques and mosquitoes

are coming into closer and more frequent contact. This suggests that there is a higher risk of *P. knowlesi* transmission in areas where land use is changing, and this knowledge will help focus efforts on these areas and also predict and respond to future outbreaks. Given our findings, we view deforestation as having distinct public health consequences which need to be urgently addressed."

The findings show the study region had undergone significant environmental changes, with many villages substantially affected by deforestation. During the five-year study alone, 39% of the region's villages lost more than 10% of the forest cover in their surrounding 1km radius, and half of villages lost more than 10% within a 5km radius. Overall, forest cover in Kudat and Kota Marudu declined by 4.8% during the study period.

The findings also confirmed that *P. knowlesi* is the most common cause of human malaria cases in the region.

The authors note that some cases of malaria may have been unreported as they were asymptomatic or resolved without treatment. *P. knowlesi* can be mistaken for other forms of human malaria in microscope diagnosis, however the authors adjusted for this uncertainty in the study. They also highlight that the environmental data were limited as they could not discriminate between types of forest or crops, meaning further work is needed to investigate whether vegetation type is a risk factor for *P. knowlesi*.

More information: Kimberly M Fornace, Tommy Rowel Abidin, Neal Alexander, Paddy Brock, Matthew J Grigg, Amanda Murphy, Timothy William, Jayaram Menon, Chris J Drakeley and Jonathan Cox. Association between landscape factors and spatial patterns of emergent Plasmodium knowlesi infections in Sabah, Malaysia. *Emerging Infectious Diseases*. DOI: 10.3201/eid2202.150656