

Malaria parasites use camouflage to trick immune defences of pregnant women

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Copenhagen University Hospital and the University of Copenhagen have discovered why malaria parasites are able to hide from the immune defences of expectant mothers, allowing the parasite to attack the placenta. The discovery is an important part of the efforts researchers are making to understand this frequently fatal disease and to develop a vaccine.

Staff member at CMP. Photo: Lars Hviid "We have found one likely explanation for the length of time it takes for the expectant mother's immune defences to discover the infection in the [placenta](#)," says Lea Barfod, MSc, who is working with Professor Lars Hviid at the Centre for Medical Parasitology, University of Copenhagen.

"The [parasites](#) are able to assume a camouflage that prevents their recognition by the [immune system](#) antibodies which would otherwise combat them. So although the immune system has all the weapons it needs to fight the infection of the placenta, these weapons are ineffectual simply because the enemy is hard to spot. Ironically the camouflage also consists of antibodies, but of a type that does not help to fight infection."

The malaria parasite at war with the immune system

One human being in twelve is infected with malaria. That means 500 million people are carrying the tiny parasite, and it kills a million of

them a year. The disease costs so many lives because the parasite constantly outmanoeuvres the [human immune system](#). It starts by hiding in the red blood cells. The immune system does not bother with these as the spleen usually filters defective blood cells.

To avoid this filter, the parasite ejects a protein hook which attaches to the inner wall of the blood vessel, and even if the immune system antibodies destroy one such hook, the parasite has more than sixty in its arsenal. One of them has evolved specially to attach to the placenta. While the war is being waged the parasite propagates and infects more and more [red blood cells](#), which are normally used for transporting [nutrients](#) and oxygen around the body.

Fighting from house to house

"In an advanced version of hide-and-seek the parasites keep looking for new ways of preventing the [antibodies](#) from recognising them. It is a kind of urban guerrilla war in which the fighting is conducted from house to house," says Lars Hviid.

"One example is the ability of the parasites to hide in the placenta. The first time an African woman conceives her placenta provides a new opportunity for the parasite to hide: a new house, so to speak, and in a way that prevents discovery by the immune system. It takes time for the immune defences to react to the new threat, and meanwhile the camouflaged parasite harms the woman and her unborn child."

The researchers are now going to study whether the [malaria parasite](#) also uses its camouflage at other stages of an infection.

"Perhaps it is not only the parasites in the placenta that are capable of hiding like this," Lars Hviid says.

"It takes the body a surprisingly long time to develop protection from Malaria, and perhaps the trick we have just discovered is part of the explanation. It is important for us to find out if this is the case in order to help us to understand [malaria](#) in general, but also to help us in our efforts to develop a vaccination. We have plenty of work to be going on with," Lars Hviid concludes.

Lea Barfod and Lars Hviid's discovery has just been published in the *Proceedings of the National Academy of Sciences*.

More information: Barfod, L., et al. (2011) 'Evasion of immunity to Plasmodium falciparum malaria by IgM masking of protective IgG epitopes in infected erythrocyte surface-exposed PfEMP1'. *PNAS*, published 11 July. DOI:10.1073/pnas.1103708108

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