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Research in our laboratory focuses on understanding the ways in which parasites of red blood cells cause disease and death in humans or animals.

A. Studies on malaria: Malaria causes severe morbidity, mortality and socio-economic hardship particularly in Africa, South America and Asia. The disease is caused by protozoan parasites of the genus Plasmodium, with at least five species known to infect humans. Symptoms, including fever, chills, headaches and anaemia, are attributable to replication of parasites within red blood cells (RBCs) and vary in severity depending on the parasite species and the immune status of the host. In the case of falciparum malaria, serious complications can arise due to sequestration of parasitised RBCs (pRBCs) in the microvasculature of the brain or the placenta resulting in cerebral malaria and pregnancy associated malaria respectively.

B. Studies on babesia: *Babesia bovis* is an important haemoprotozoan parasite of cattle that shows striking similarities with human malaria parasites. The disease is of major national and international importance and imposes huge economic burdens on the beef and dairy industries. A better understanding of the basic biology of these parasites and the relationship between parasites and their host is required for the development of anti-parasitic vaccines, drugs and new therapeutic regimens for this important disease. We are also interested in learning more about the basic biology of this parasite since it offers a unique opportunity to answer important questions about malaria infection that are not currently possible to perform in humans.

Cellular renovations. The surface of a human red blood cell infected with a malaria parasite imaged by atomic force microscopy.

Research Projects

1. **Characterisation of malaria PHIST-domain proteins**
2. **Understanding the function of unique *P. falciparum* FIKK kinases**
3. **Characterisation of novel Babesia bovis exported parasite proteins**
4. **Identification of the Babesia bovis ridge protein**

Selected significant publications:

1. Kats LM, Fernandez KM, Glenister FK, Herrmann S, Buckingham DW, Siddiqui G, Sharma L, Bamert R, Lucet I, Guillotte M, Mercereau-Puijalon O, **Cooke BM**. 2014. An exported kinase (FIKK4.2) that mediates virulence associated-changes in Plasmodium falciparum-infected red blood cells. *International Journal for Parasitology*, **44**, 319–328

2. Proellocks NI, Herrmann S, Buckingham DW, Hanssen E, Hodges E, Elsworth B, Morahan BJ, Coppel RL, **Cooke BM**. 2014. A lysine-rich membrane-associated PHISTb protein involved in alteration of the cytoadhesive properties of Plasmodium falciparum-infected red blood cells. *FASEB Journal*, vol 28, issue 7: 3103-3113.

3. Glenister FK, Fernandez KM, Kats LM, Hanssen E, Mohandas N, Coppel RL, **Cooke BM**. 2009. Functional alteration of red blood cells by a megadalton protein of Plasmodium falciparum. *Blood*, vol 113, issue 4: 919-928.

4. Hutchings CL, Li A, Fernandez KM, Fletcher T, Jackson LA, Molloy JB, Jorgensen WK, Lim CT, **Cooke BM**. 2007. New insights into the altered adhesive and mechanical properties of red blood cells parasitized by Babesia bovis. *Molecular Microbiology*, vol 65, issue 4: 1092-1105.

5. **Cooke BM**, Buckingham DW, Glenister FK, Fernandez KM, Bannister LH, Marti M, Mohandas N, Coppel RL. 2006. A Maurer's cleft-associated protein is essential for expression of the major malaria virulence antigen on the surface of infected red blood cells. *Journal of Cell Biology*, vol 172, issue 6: 899-908.