Bilateral Project of JSPS with Royal Society

"Development of a novel malaria transmission blocking vaccine based on a non-infectious insect viral vector"

Description of project

The UK has been a leader of malaria research since Sir Ronaid Ross discovered the transmission of malaria by mosquitoes in 1897, earning the Nobel Prize in 1902. Now, Imperial College London is a centre of excellence for malaria research, and continues to publish many high impact papers. Prof. Yoshida's group has recently developed a new-concept malaria vaccine platform based on the Baculovirus Dual Expression System (BDES). Researchers at Imperial College have evaluated this novel malaria vaccine. Our data indicates that our BDES system, which functions as both a subunit and DNA vaccine, can offer a promising multistage vaccine capable of delivering a potent anti-malarial pre-erythrocytic and transmission-blocking responses, via a single immunization regimen.

Departments and institutions involved

Laboratory of Vaccinology and Applied Immunology, Kanazawa University School of Pharmacy, Japan

Division of Cell and Molecular Biology, Department of Life Sciences, Imperial College London, United Kingdom

How our collaboration started

Our collaboration started in 2008 with an exchange of scientific information relating to transmission-blocking in *Plasmodium*. We have previously received three JSPS funded grants for the Bilateral Joint Research Project (listed below).

These grants effectively supported not only the research activity of our UK-Japan collaboration, but also international exchange between young researchers:

1). 1999, Bilateral Joint Research Project (short-term UK) supported by JSPS. "Generation of a transgenic mosquito refractory to malaria parasites"

Collaboration: Dr. Yoshida and Dr. Sinden. Dr. Yoshida visited Prof. Sinden's lab at Imperial College and worked for the transgenic mosquitoes for two weeks.

Publications:

Yoshida S, Matsuoka H, Luo E, Iwai K, Arai M, Sinden, RE, Ishii A.: A single-chain antibody fragment specific for the Plasmodium berghei ookinete protein Pbs21 confers transmission blockade in the mosquito midgut. Mol Biochem Parasitol 104: 195-204,1999.

Yoshida S, Shimada Y, Kondoh D, Kouzuma Y, Ghosh AK, Jacobs-Lorena M, Sinden RE.: Hemolytic C-type lectin CEL-III from sea cucumber expressed in transgenic mosquitoes impairs malaria parasite development. PLoS Pathog 3:e192, 2007.

2). 2009-2011, Bilateral Joint Research Project (Japan-UK) supported by JSPS. "Evaluation of a novel human transmission-blocking vaccine using rodent parasites bearing Plasmodium vivax Pvs25 protein"

Collaboration: Dr. Yoshida and Dr. Sinden

Publications:

Blagborough AM, Yoshida S, Sattabongkot J, Tsuboi T, Sinden RE.: Intranasal and intramuscular immunization with Baculovirus Dual Expression System-based Pvs25 vaccine substantially blocks Plasmodium vivax transmission. Vaccine 28:6014-20, 2010.

International Conferences:

Blagborough AM et al. Intranasal and intramuscular immunization with Baculovirus Dual Expression System-based Pvs25 vaccine substantially blocks Plasmodium vivax transmission. Malaria Vaccines for the World, 2012, Washington DC, USA

(3) 2012-2014, Bilateral Joint Research Project (Japan-UK) supported by JSPS. "Development of a novel malaria transmission blocking vaccine based on a non-infectious insect viral vector"

Collaboration: Dr. Yoshida and Dr. Sinden

Publications:

Mizutani M, Iyori M, Blagborough AM, Fukumoto S, Funatsu T, Sinden RE, Yoshida S.: Baculovirus-Vectored Multistage Plasmodium vivax Vaccine Induces Both Protective and Transmission-blocking Immunities against Transgenic Rodent Malaria Parasites. (in submission 2014)

International Conferences:

Iyori et al., Protective efficacy of baculovirus dual expression system that displays the Plasmodium falciparum circumsporozoite protein in a murine infection model. Keystone Symposia A8 Malaria 2013, New Orleans, USA.

Amount of money awarded

The grant was 4,150,000 yen (24,000 GBP).

60% of the money was spent for travel (Iyori and Mizutani in 2013, and Yoshida and Nishiura in 2014) from Japan to UK.

How the matching funds were sourced from your side and how it was used

The ongoing work regarding the design, assay and implementation of transmission blocking vaccines fits exceptionally well with our current funding streams, and is hugely complimentary to our ongoing work. The funds were used to assess and compare the potency of multiple baculovirus-derived vaccines.

How participants are benefitting from the scheme

As with previous funding, both labs have shared knowledge regarding each other's traditional field of interest. This international exchange has led to a successful study, and the results offer a useful tool for the development of a potent anti-malarial vaccine. Results are being published. Young post-doc researchers of both labs presented their data at International Conferences. Thus, our collaboration has encouraged and supported career buildings of young researchers.

The collaborative developments since the project started and plans for the future

Our UK-Japan collaboration has shown that our vaccine system offer a promising new alternative to current human malaria vaccine delivery platforms for first-in-human clinical trials. We are planning to collaborate with the Jenner Institute at Oxford University for the progression of clinical trials to examine the utility of our vaccine.

Further applications to JSPS for funding or plans for this

To this end, we have applied for a Bilateral Joint Research Project (Japan-UK) for 2014-2016.

"Development of a malaria bivalent vaccine effective both for protection and transmission-blocking"