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Safety and efficacy after immunization with *Plasmodium falciparum* sporozoites in the controlled human malaria infection model

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Cover Page



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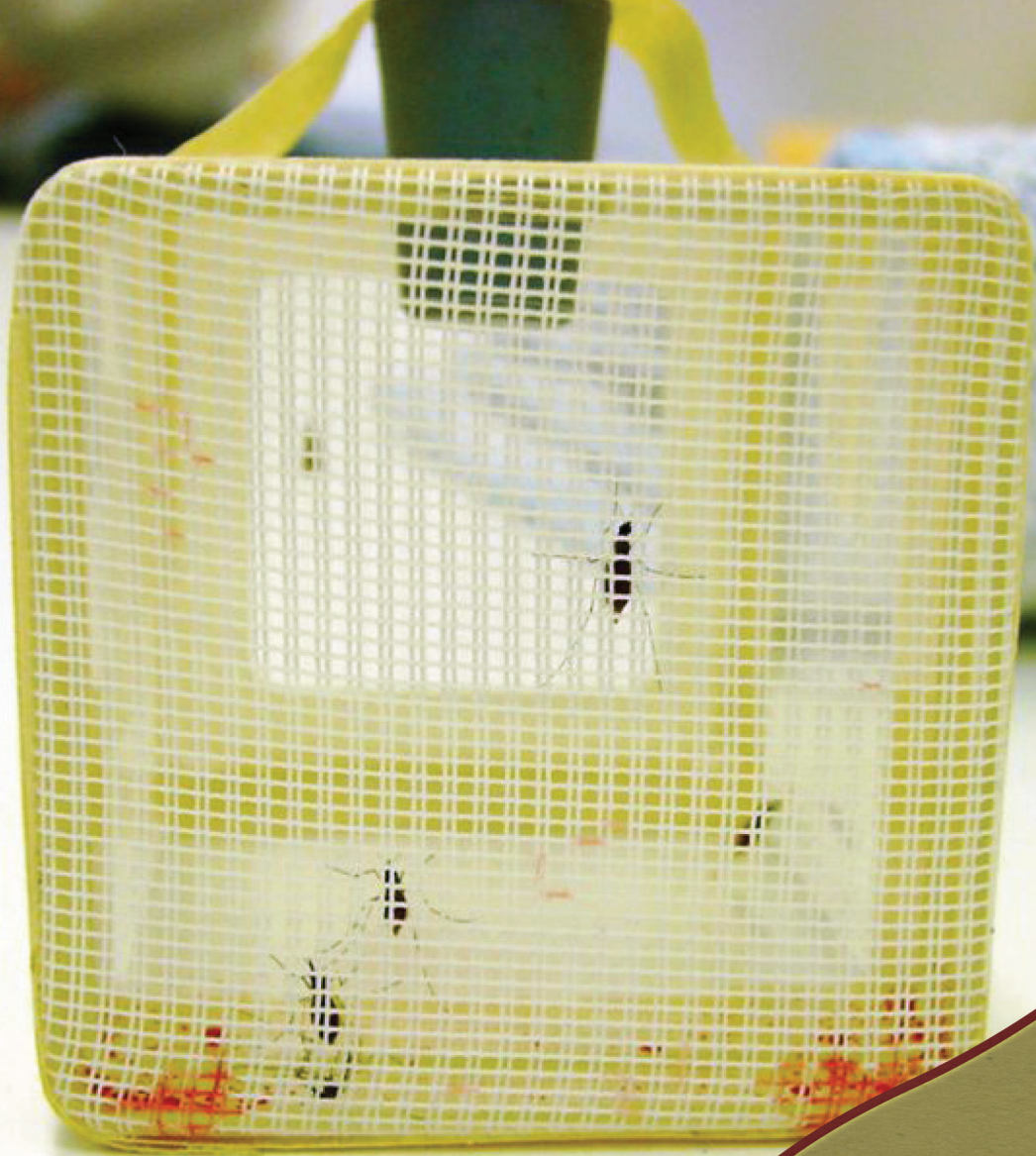


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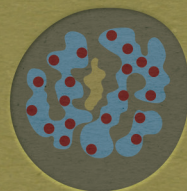
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Netherlands, 2011. *Anopheles* mosquitoes infected with *malaria tropica* after taking a blood meal on the arms of a volunteer in the Controlled Human Malaria Infections.

CHAPTER 9

Curriculum Vitae
Publications
Dankwoord



CURRICULUM VITAE

Remko Schats was born in Eindhoven on the 25th of March 1975. He graduated from Atheneum at the Bisschop Bekkers College in Eindhoven in 1994 and started medical school at the University of Utrecht in the same year.

Already during his medical school Remko showed his immense drive for Tropical Medicine and International Health. He followed lectures in tropical medicine in his second year and this inspired him to go to Ghana for a clinical internship Surgery at the Korle Bu Hospital the following year. Afterwards, he went to Calcutta for an internship in primary health care in 1999 followed by a gynaecology internship in Suriname in 2000.

Straight after medical school he specialized into Tropical Medicine & International Health and did two years of training into surgery, gynaecology/obstetrics and traumatology in a Dutch hospital. He finished his training at the Royal Institute for Tropical Medicine (KIT) in Amsterdam involving a three months training in tropical diseases and public health. During his entire Tropical Medicine training he was chairman of the Dutch 'tropical medicine doctors in training' (Troie) and fulfilled also several other positions within the board of The Netherlands Society for Tropical Medicine and International Health (NvTG).

He started his career as a global health doctor in 2003 and he has been on three international missions since. The first mission was located in Ghana in a rural 50-bed hospital part of a large timber company, serving both 2000 employees and their families as well as expats and people living in villages in the surrounding areas. In collaboration with GSMF Int, Pharmaccess Int and the Royal Dutch Embassy he initiated an HIV prevention and treatment programme. In 2005 he worked in Chad for Doctors Without Borders/ Médecins Sans Frontières (MSF) as the only doctor in a camp serving 17.000 refugees from Darfur bearing both the physical and mental scars of a prolonged ethnic conflict. In one episode of *R_x for Survival*, a PBS documentary, footage of his mission in Chad was broadcasted to gain awareness for this humanitarian crisis in Darfur. In the aftermath of the 2004 tsunami in Asia, he worked as a clinical trainer of malaria and other vector-born tropical diseases in Aceh. Indonesia was severely hit and nearly 130.000 people died in Aceh during and after the tsunami. Remko and the team of The Mentor Initiative made efforts to prevent a malaria epidemic by controlling malaria in these flooded areas.

His fieldwork, among others, was recently recognized by the NvTG and was highlighted in the media campaign 'Into the World'. A campaign to engage other physicians to work in International Health.

After returning to the Netherlands in 2007, he started the specialization to become a general practitioner (GP). Besides his work as a GP, he has contin-

ued his efforts in global health as board member for the WHIG, a platform for family medicine and international health.

During his GP specialization, he made efforts to establish a PhD research project in Urban Malaria in Ghana by himself. In joint venture with several national and international universities, he applied for funding but turned out to be difficult to achieve. Shortly afterwards, Remko started malaria vaccine research, as part of this PhD, at the Leids Universitair Medisch Centrum (LUMC) department of Infectious Diseases, in collaboration with Radboud University Nijmegen (Radboudumc). He performed clinical trials immunizing and challenging healthy volunteers with live, deadly malaria parasites by bites of malaria mosquitoes. At the annual conference of 'The American Society of Tropical Medicine and Hygiene (ASTMH)' in 2013 his work was recognized and rewarded with the first prize of the 'Elsevier Clinical Research Award'.

Remko Schats is currently a GP and works mainly with patients having (relatively) poor access to health care: seamen, prisoners, arrested people, refugees and illegal patients. Furthermore, he continues to be involved in International Health by teaching malaria master classes and other travel medicine related topics for health care professionals throughout the Netherlands. He recently became a board member of SANO; a Dutch foundation facilitating doctors to aid in developing countries.

His work was several times covered in national and international media.

The Netherlands Society for Tropical Medicine and International Health Campaign 'Into the World':

<https://www.artsinternationalegezondheidszorg.nl/throwback-thursday-21-remko-schats/>

https://www.nvtg.org/uploads/MTb-PDF/2018_MT_1_IntoTheWorld.pdf

The mission in Chad:

<https://www.pbs.org/wgbh/rxforsurvival/series/about/episodes.html>

https://www.pbs.org/wgbh/rxforsurvival/series/champions/remko_schats_lina_gustin.html

<https://www.pbs.org/wgbh/rxforsurvival/series/dispatches/pebble-dropped-pond.html>

The mission in Aceh Indonesia:

<https://www.rd.nl/vandaag/buitenland/i-atjehs-grote-meevaller-epidemie%C3%ABn-bleven-uit-i-1.7606>

Malaria research in the LUMC:

<http://archieff.mareonline.nl/artikel/1011/24/0101/>

During the Ebola crisis in 2014, he was interviewed by a Dutch newspaper in order to gain awareness for the urgent need of doctors in the Ebola crisis. This resulted in a front-page media coverage in 'Trouw':

<https://www.trouw.nl/nieuws/net-als-anderen-heb-ik-verplichtingen-op-het-werk~bf6b07c7/>

<http://whig.nl/schrijnend-tekort-aan-ebola-artsen/>

Radio interview:

<https://www.nporadio1.nl/de-ochtend/onderwerpen/228335-stand-nl-europa-moet-meer-doen-in-de-strijd-tegen-ebola>

PUBLICATIONS

Whole-blood transcriptomic signatures induced during immunization by chloroquine prophylaxis and *Plasmodium falciparum* sporozoites. Tran TM, Bijker EM, Haks MC, Ottenhoff THM, Visser L, **Schats R**, Venepally P, Lorenzi H, Crompton PD, Sauerwein RW.

Sci Rep. 2019 Jun 10;9(1):8386. doi: 10.1038/s41598-019-44924-7.

Transcriptomic evidence for modulation of host inflammatory responses during febrile *Plasmodium falciparum* malaria. Tran TM, Jones MB, Ongoiba A, Bijker EM, **Schats R**, Venepally P, Skinner J, Doumbo S, Quinten E, Visser LG, Whalen E, Presnell S, O'Connell EM, Kayentao K, Doumbo OK, Chaussabel D, Lorenzi H, Nutman TB, Ottenhoff TH, Haks MC, Traore B, Kirkness EF, Sauerwein RW, Crompton PD.

Sci Rep. 2016 Aug 10;6:31291. doi: 10.1038/srep31291.

Diagnosis and treatment based on quantitative PCR after controlled human malaria infection.

Walk J[#], **Schats R[#]**, Langenberg MC, Reuling IJ, Teelen K, Roestenberg M, Hermesen CC, Visser LG, Sauerwein RW.

Malar J. 2016 Aug 5;15(1):398. doi: 10.1186/s12936-016-1434-z. Erratum in: Malar J. 2016 Oct 28;15(1):522. Malar J. 2016 Oct 28;15:522.

Erratum to: Diagnosis and treatment based on quantitative PCR after controlled human malaria infection. Walk J[#], **Schats R[#]**, Langenberg MCC, Reuling IJ, Teelen K, Roestenberg M, Hermesen CC, Visser LG, Sauerwein RW.

Malar J. 2016 Oct 28;15:522. doi: 10.1186/s12936-016-1571-4. eCollection 2016.

Ex vivo lymphocyte phenotyping during *Plasmodium falciparum* sporozoite immunization in humans.

Bijker EM, **Schats R**, Visser LG, Sauerwein RW, Scholzen A.

Parasite Immunol. 2015 Nov;37(11):590-8. doi: 10.1111/pim.12276.

Heterologous Protection against Malaria after Immunization with *Plasmodium falciparum* Sporozoites.

Schats R[#], Bijker EM[#], van Gemert GJ, Graumans W, van de Vegte-Bolmer M, van Lieshout L, Haks MC, Hermesen CC, Scholzen A, Visser LG, Sauerwein RW.

PLoS One. 2015 May 1;10(5):e0124243. doi: 10.1371/journal.pone.0124243. eCollection 2015.

Sporozoite immunization of human volunteers under mefloquine prophylaxis is safe, immunogenic and protective: a double-blind randomized controlled clinical trial.

Bijker EM[#], **Schats R[#]**, Obiero JM, Behet MC, van Gemert GJ, van de Vegte-Bolmer M, Graumans W, van Lieshout L, Bastiaens GJ, Teelen K, Hermesen CC, Scholzen A, Visser LG, Sauerwein RW.

PLoS One. 2014 Nov 14;9(11):e112910. doi: 10.1371/journal.pone.0112910. eCollection 2014.

Memory B-cell and antibody responses induced by *Plasmodium falciparum* sporozoite immunization.

Nahrendorf W, Scholzen A, Bijker EM, Teirlinck AC, Bastiaens GJ, **Schats R**, Hermesen CC, Visser LG, Langhorne J, Sauerwein RW.

J Infect Dis. 2014 Dec 15;210(12):1981-90. doi: 10.1093/infdis/jiu354. Epub 2014 Jun 25.

Cytotoxic markers associate with protection against malaria in human volunteers immunized with *Plasmodium falciparum* sporozoites.

Bijker EM, Teirlinck AC, **Schats R**, van Gemert GJ, van de Vegte-Bolmer M, van Lieshout L, Int'Hout J, Hermesen CC, Scholzen A, Visser LG, Sauerwein RW.

J Infect Dis. 2014 Nov 15;210(10):1605-15. doi: 10.1093/infdis/jiu293. Epub 2014 May 27.

Informed consent in trials for neurological emergencies: the example of subarachnoid haemorrhage.

Schats R, Brilstra EH, Rinkel GJ, Algra A, Van Gijn J.

J Neurol Neurosurg Psychiatry. 2003 Jul;74(7):988-91.

[#]: contributed equally

Other publications:

Reizen en Ziekte; Chapter 22 Travelers' diarrhoea

Remko Schats, Niek J de Wit en Pieter PAM van Thiel

Reizen en Ziekte, Bohn Stafleu van Loghum. Februari 2010. Onder redactie van Prof A.M.L van Gompel (ITG Antwerpen) en dr G.J.B. Sonder (LCR, GGD Amsterdam)

DANKWOORD

'Als ik ooit zo gek zou zijn te willen promoveren dan absoluut op malaria!' Dat heb ik geweten!

Leo: Alweer 10 jaar geleden stond ik bij je op de stoep voor wetenschappelijk onderzoek. Dankbaar ben ik toen je mij vroeg voor dit vaccinonderzoek, na 2 jaar geploeterd te hebben voor fondsen voor het project Urban Malaria. Jouw oog voor details, toegankelijkheid en geduld hebben mij gebracht tot dit resultaat!

Robert: zonder jouw immense drive voor het ontwikkelen van een malaria-vaccin was dit proefschrift uiteraard niet mogelijk geweest! Bedankt voor jouw vertrouwen en steun.

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Marianne, Els, Fons, Heleen, Jolanda, Jeanette, Eric, Jaco, Jacqueline en Jan: bedankt voor gezelligheid en voor het lezen van dikke druppels tijdens de trials.

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Stephen, Kim Lee, Peter, Eric: thank you very much for hosting me in Washington during the ASTMH and at **Sanaria**. My collapsing bed in the middle of the night I still remember as an epic experience!

Martin and Eveline (LSTM), Michael (Copenhagen), Daniel (Ghana), Willem and Sander (WUR), Annemiek and Pauline (KIT), Maria and Lisette (LUMC): I want to thank you all for the tremendous input and inspiration delivered to the Urban Malaria project. If there is no risk of failure, there can be no success.

Leah: in search for a proper coffee at a malaria congress: thank you for the great time and support!

Clara: gedurende jaren tropenopleiding/voorzitterschap; jij 'het hart van de NvTG' heeft een hele bijzondere vriendschap opgebouwd! **Maartje:** Op tropenartsen kun je altijd aan!

Friends: Jeronimo, Milco, Marion, Pieter, Albert, Ruben, Ivar, Niels, Roald en Wil thanks voor een onuitputtelijke bron van inspiratie, vriendschap en met name lol!

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#BlackRockCity2019: thank you for life-changing experiences. A true **MətəMφ.pHθΞθ-ç.**

Ghana. July 2004.
Hospital Ward.



Ghana. June 2004.
Peer-educators trained by NGO's GSMF
Int. and Pharmaccess Int. to inform other
company workers and their peers about HIV
and STD prevention.



Ghana. September 2004.
Generous gift from the company
workers for having protected their
Human Rights and initiation of an
HIV-prevention programme.



Chad. April 2005.
Medical examination of a refugee at Forchana camp.



Chad. April 2005.
Health centre camp Gaga performing a
vaccination campaign against measles and
meningitis.



*Chad. March 2005.
Footage taken for the PBS documentary
Rx for Survival: Delivering the Goods.*



*Indonesia, Aceh.
December 2005.
Clinical Malaria
training to local
doctors and nurses.*



*Indonesia. April 2006.
Malaria survey team in Aceh province.*

*Indonesia, Aceh. January 2006.
Taking a helicopter flight to the tsunami destroyed
and flooded region of Calang was the only means
of travel.*



