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Controlled human infection models as a tool for malaria and schistosomiasis vaccine research

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Citation

Langenberg, M. C. C. (2021, June 10). *Controlled human infection models as a tool for malaria and schistosomiasis vaccine research*. Retrieved from <https://hdl.handle.net/1887/3185761>

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Issue Date: 2021-06-10

Dankwoord

Bedankt vrijwilligers! Zonder jullie zou dit proefschrift er niet zijn geweest.

Meta, I am so grateful that I had you as my promotor. Your inexhaustible enthusiasm was contagious. Besides teaching me to design, execute and analyse data of clinical trials, you taught me to discuss problems, set boundaries and delegate when necessary. Maria, thank you for being such an inspirational supervisor and for your scientific input.

Beatrice, Jacqueline, Marie-Astrid en Jan Pieter. Jullie hebben allemaal een enorme steen bijgedragen aan mijn promotieonderzoek. Ik weet niet of ik het zonder jullie gered zou hebben. Bedankt dat jullie er altijd voor me waren.

To my other T5-roomies of the past years; Mikhael, Abena, Katja, Eunice, Alice, Maria K, Simone, Leonard, Mathilde. Thank you for the valuable, fun, and teaching conversations we had over liters of tea and coffee.

Thank you, Séverine, Blandine, Carola, Munisha, Amanda, Ko and Vanessa for your guidance, and for teaching me how to work in the lab. Lisa, wat waren we een goed team. Ooit gaan we de paper publiceren. Clarize, ik heb genoten van onze gezamenlijke dissecteer/kijk op de wereld sessies. Roos, ik weet niet hoe we al het CoHSI labonderzoek ooit zonder jou voor elkaar hadden kunnen krijgen. Bedankt voor je enorme enthousiasme en input.

Ton, Eric en Lisette, jullie hebben me in 2007 de wereld van de parasitologie ingeloodst. Bedankt voor jullie wetenschappelijke input en aanstekelijke enthousiasme over de parasitologie.

Diantha, mijn enige student. Bedankt voor al je hulp.

The rest of the parasitology department, but in particular: Alwin, Angela, Arifa, Astrid, Bart, Bruno, Catherin, Chris, Corrie, Dian, Dicky, Erliyani, Fiona, Frank, Govert, Hans, Hermelijn, Jai, Jantien, Karin, Koen, Laudine, Linh, Łucja, Marije, Michele, Miriam, Noemí, Patrick, Pytsje, Ron, Sanne, Shahid, Shinya, Simone, Surendra, Suzanne, Syibli, Takashi, Yianne, Yolanda, Yukiko, Yvonne, and all other para's. Thank you for the conversations, scientific discussions and help in the lab. Each of you helped me in other ways during my PhD period. Thank you.

Kitty, Jos, Gerdien, Petra en Leo: Bedankt voor al jullie hulp rondom de klinische studies.

Linda, Matthew en Perry bedankt voor de inwijding in de controlled human malaria infections. Door jullie is mijn liefde voor CHIs begonnen. Ik heb enorm veel van jullie geleerd en een leuke tijd met jullie gehad. Jona, Robert, Geert Jan en de rest van het RadboudUMC malaria clinical trial team en Ruurdije bedankt voor de fijne samenwerking.

Beste vriendinnen; Purdey, Patries, Femke en Sanne, Cynthia, Jacoline en Christien, Christine, Evelien, Maartje en Pauline, Ilona, Tine, Jonna en Lieke en Roos bedankt voor alle afleiding van mijn werk de afgelopen jaren. Meiden, ik ben blij dat jullie er zijn.

Mijn (schoon-)familie, bedankt voor alle goede gesprekken, luisterend oor, afleiding en gezelligheid tijdens mijn onderzoek. Paps en mams, van jongs af aan hebben jullie me het gevoel gegeven dat ik alles kan doen wat ik wil en hebben jullie altijd achter me gestaan. De afgelopen jaren heb ik veel aan jullie luisterend oor en adviezen gehad. Ik ben trots dat ik jullie nu het resultaat van jaren werk kan laten zien.

En dan natuurlijk Ben. Je hebt me tijdens mijn onderzoeksperiode in goede en slechte tijden meegemaakt, waarbij je er altijd voor me was. Bedankt! Seth, Liv en Mila, jullie zijn de drie wondertjes in mijn leven. Jullie hebben me zoveel geluk, vreugde en liefde gebracht. Jullie maken iedere dag goed.

Curriculum vitae

Marijke Langenberg was born in Tholen, the Netherlands, on the 15th of January 1985. After completing her higher education in Bergen op Zoom she went to Leiden to study medicine. During the second year of study she performed research on psychosocial care for HIV/AIDS patients in Surinam. During her scientific internship at the department of parasitology she investigated the use of different laboratory techniques for nematodes in Beira, Mozambique. Her last clinical internship was at the tropical diseases outpatient clinic of the Harbour hospital in Rotterdam. In February 2010 she got her medical degree.

After receiving her medical degree she worked on a voluntary base as a doctor in Mongolia for several weeks. In May 2010 she started working at the department of internal medicine at the Maastad hospital in Rotterdam. Here she started her residency to become a specialist in internal medicine in 2011. In 2014 she continued her residency at the department of internal medicine at the Leiden University Medical Center (LUMC) in Leiden. Later that year she worked as an investigator in a controlled human malaria infection study at the Harbour hospital in Rotterdam. Hereafter she started her PhD project at the parasitology group at the LUMC. During her PhD she mainly focused on malaria and schistosomiasis controlled human infection studies.

In April 2019 she continued with her residency to become a doctor in internal medicine specialising in infectious diseases. In July 2020 she decided to switch career and started to work as a doctor in infectious disease control at the GGD Rotterdam-Rijnmond.

List of publications

1. R Hoekstra, **MCC Langenberg**, D Terlouw, R van Schuijlenburg, JC Sijtsma, S Chevalley-Maurel, BMD Franke-Fayard, M Roestenberg. *Plasmodium falciparum* infectivity & development in human liver cell lines HepaRG and HepaRG-CAR. (Submitted)
2. BMF Winkel, L Pelgrom, R van Schuijlenburg, E Baalbergen, MS Ganesh, H Gerritsma, CM de Korne, N Duszenko, **MCC Langenberg**, SC Chevalley-Maurel, HH Smits, EC de Jong, M Yazdanbakhsh, B Everts, B Franke-Fayard, M Roestenberg. *Plasmodium* sporozoites induce regulatory macrophages. *PLoS Pathog.* 2020 Sep 8;16(9):e1008799
3. MA Hoogerwerf, JPR Koopman, JJ Janse, **MCC Langenberg**, R van Schuijlenburg, Y Kruize, EAT Brienens, M Manurung, P Verbeek-Menken, M van Beek, P Meij, LG Visser, L van Lieshout, S de Vlas, M Yazdanbakhsh, LE Coffeng, M Roestenberg. A randomized controlled trial to investigate safety and variability of egg excretion after repeated controlled human hookworm infection. *J Infect Dis.* 2021 Mar 3;223(5):905-913
4. C Crosnier, CH Hokke, AV Protasio, C Brandt, G Rinaldi, **MCC Langenberg**, S Clare, JJ Janse, S Wilson, M Berriman, M Roestenberg, GJ Wright. Screening of a library of recombinant *Schistosoma mansoni* proteins with sera from murine and human controlled infections identifies early serological markers. *J. Infect Dis.* 2020 Jun 10 (epub ahead of print)
5. M Roestenberg*, J Walk*, SC van der Boor**, **MCC Langenberg****, MA Hoogerwerf, JJ Janse, MD Manurung, XZ Yap, A Fabra García, JPR Koopman, P Meij, E Wessels, K Teelen, YM van Waardenburg, M van de Vegte-Bolmer, GJ van Gemert, LG Visser, AJAM van der Ven, Q de Mast, KC Natasha, Y Abebe, T Murshedkar, PF Billingsley, TL Richie, BKL Sim, CJ Janse, SL Hoffman, SM Khan***, RW Sauerwein***. A double-blind, placebo-controlled phase 1/2a trial of the genetically attenuated malaria vaccine PfSPZ-GA1. *Sci Transl Med.* 2020 May 20;12(544) (*thesis Chapter 4*)
6. **MCC Langenberg**, OM Dekkers, M Roestenberg. Are placebo controls necessary in controlled human infection trials for vaccines? *Lancet Infect Dis.* 2020 Apr;20(4):e69-e74 (*thesis Chapter 8*)
7. **MCC Langenberg**, MA Hoogerwerf*, JPR Koopman*, JJ Janse, J Kos-van Oosterhoud, C Feijt, SP Jochems, CJ de Dood, R van Schuijlenburg, A Ozir-Fazalalikhani, MD Manurung, E Sartono, MT van der Beek, BMF Winkel, PH Verbeek-Menken, KA Stam, FWB van Leeuwen, P Meij, A van Diepen, L van Lieshout, GJ van Dam, PLAM Corstjens, CH Hokke**, M Yazdanbakhsh**, LG Visser**, M Roestenberg. A Controlled Human *Schistosoma mansoni* Infection model to advance novel drugs, vaccines and diagnostics. *Nat. Med.* 2020 Mar;26(3):326-332 (*thesis Chapter 7*)
8. BMF Winkel, CM de Korne, MN van Oosterom, D Staphorst, A Bunschoten, **MCC Langenberg**, SC Chevalley-Maurel, CJ Janse, B Franke-Fayard, FWB van Leeuwen, M Roestenberg. A tracer-

- based method enables tracking of *Plasmodium falciparum* malaria parasites during human skin infection *Theranostics* 2019; Apr 13;9(10):2768-2778
9. MA Hoogerwerf*, LE Coffeng*, EAT Brienen, JJ Janse, **MCC Langenberg**, YCM Kruize, C Gootjes, MD Manurung, M Dekker, L Becker, MAA Erkens, MT van der Beek, MS Ganesh, C Feijt, BMF Winkel, IM Westra, P Meij, A Loukas, LG Visser, SJ de Vlas, M Yazdanbakhsh, L van Lieshout, M Roestenberg. New insights into the kinetics and variability of egg excretion in controlled human hookworm infections. *J Infect Dis.* 2019 Aug 9;220(6):1044-1048
 10. **MCC Langenberg**, MA Hoogerwerf, JJ Janse, L van Lieshout, PLAM Corstjens, M Roestenberg. Katayama Syndrome Without *Schistosoma mansoni* Eggs. *Ann Intern Med.* 2019 May 21;170(10):732-733 (thesis Chapter 6)
 11. BMF Winkel, MR Dalenberg, CM de Korne, C Feijt, **MCC Langenberg**, LR Pelgrom, MS Ganesh, M Yazdanbakhsh, HH Smits, EC de Jong, B Everts, FWB van Leeuwen, CH Hokke, M Roestenberg. Early Induction of Human Regulatory Dermal Antigen Presenting Cells by Skin-Penetrating *Schistosoma mansoni* Cercariae. *Front Immunol.* 2018 Oct 31; 9: 2510
 12. **MCC Langenberg**, LJ Wammes, MBB McCall, EM Bijker, GJ van Gemert, W Graumans, MG van de Vegte-Bolmer, K Teelen, CC Hermsen, R Koelewijn, JJ van Hellemond, PJJ van Genderen, RW Sauerwein. Controlled Human Malaria Infection with Graded Numbers of *Plasmodium falciparum* NF135.C10- or NF166.C8-Infected Mosquitoes. *Am J Trop Med Hyg.* 2018 Sep;99(3):709-712 (thesis Chapter 3)
 13. JJ Janse, **MCC Langenberg**, J Kos-Van Oosterhoud, A Ozir-Fazalikhhan, EAT Brienen, BMF Winkel, MAA Erkens, MT van der Beek, L van Lieshout, HH Smits, BL Webster, ML Zandvliet, R Verbeek, IM Westra, P Meij, LG Visser, A van Diepen, CH Hokke, M Yazdanbakhsh, M Roestenberg. Establishing the Production of Male *Schistosoma mansoni* Cercariae for a Controlled Human Infection Model. *J Infect Dis.* 2018 Aug 24;218(7):1142-1146 (thesis Chapter 5)
 14. ME van Wolfswinkel, **MCC Langenberg**, LJ Wammes, RW Sauerwein, R Koelewijn, CC Hermsen, JJ van Hellemond, PJ van Genderen. Changes in total and differential leukocyte counts during the clinically silent liver phase in a controlled human malaria infection in malaria-naïve Dutch volunteers. *Malar J.* 2017 Nov 10;16(1):457
 15. MBB McCall*, LJ Wammes*, **MCC Langenberg**, GJ van Gemert, J Walk, CC Hermsen, W Graumans, R Koelewijn, JF Franetich, S Chishimba, M Gerdson, A Lorthiois, M van de Vegte, D Mazier, EM Bijker, JJ van Hellemond, PJJ van Genderen, RW Sauerwein. Infectivity of *Plasmodium falciparum* sporozoites determines emerging parasitemia in infected volunteers. *Sci Transl Med.* 2017 Jun 21;9(395) (thesis Chapter 2)
 16. L Meurs, AM Polderman, NV Vinkeles Melchers, EA Brienen, JJ Verweij, B Groosjohan, F Mendes, M Mechendura, DH Hepp, **MCC Langenberg**, R Edelenbosch, K Polman, L van Lieshout. Diagnosing Polyparasitism in a High-Prevalence Setting in Beira, Mozambique:

Detection of Intestinal Parasites in Fecal Samples by Microscopy and Real-Time PCR. PLoS Negl Trop Dis. 2017 Jan 23;11(1)

17. J Walk*, R Schats*, **MCC Langenberg**, IJ Reuling, K Teelen, M Roestenberg, CC Hermsen, LG Visser, RW Sauerwein. Diagnosis and treatment based on quantitative PCR after controlled human malaria infection. Malar J. 2016 Aug 5;15(1):398.

18. **MCC Langenberg**, PJ Wismans, PJJ van Genderen. Distinguishing tropical sprue from celiac disease in returning travellers with chronic diarrhoea: A diagnostic challenge? Travel Med Inf Dis. 2014 Jul-Aug;12(4):401-405

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