

Point-of-care immunodiagnostic tests for detection of leprosy and detection of *Mycobacterium leprae* infection in high and low endemic areas in the South American Amazon

LRI Spring Meeting
7th of April 2022
Louise Pierneef



UCP-LFA for POC testing

High tech @ low complexity

Basic research for field application

- **UCP**: upconverting reporter particles
- **LFA**: lateral flow assay
- **Field friendly** alternative for ELISA
- **Quantitative** assay: correlation signal & amount of biomarker
- Highly **sensitive**: no background
- **Stable**: transport without cold chain
- Do not bleach: **permanent record**



UCP-LFA from 2007 - 2020

Available online at www.sciencedirect.com
ScienceDirect
 Clinical Biochemistry 41 (2008) 440–444

CLINICAL BIOCHEMISTRY

A user-friendly, highly sensitive assay to detect the IFN- γ secretion by T cells

Paul L.A.M. Corstjens ^{a,*}, Michel Zuiderdijk ^a, Hans J. Tanke ^a, Jolien J. van der Ploeg-van Schip ^b, Tom H.M. Ottenhoff ^b, Annemieke Geluk ^b

^a Leiden University Medical Center, Department of Molecular Cell Biology, Leiden, The Netherlands
^b Leiden University Medical Center, Department of Infectious Diseases, Leiden, The Netherlands

Received 15 July 2007

2007, PBMC: IFN- γ

Clinical Biochemistry 44 (2011) 1241–1246

Contents lists available at ScienceDirect
Clinical Biochemistry
 journal homepage: www.elsevier.com/locate/clinbiochem

Lateral flow assay for simultaneous detection of cellular- and humoral immune responses

Paul L.A.M. Corstjens ^{a,*}, Claudia J. de Dood ^a, Jolien J. van der Ploeg-van Schip ^b, Karien C. Wiesmeijer ^a, Terhi Riittamäki ^c, Krista E. van Meijgaard ^b, John S. Spencer ^d, Hans J. Tanke ^a, Tom H.M. Ottenhoff ^b

^a Department of Molecular Cell Biology, Leiden University Medical Center, Leiden, The Netherlands
^b Department of Infectious Diseases, Leiden University Medical Center, Leiden, The Netherlands
^c Department of Microbiology, Immunology and Pathology, Colorado State University, Fort Collins, CO 80523-1603, USA

2011, PBMC/WBA: IFN- γ , IL-10, IgM

www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN **Quantitative lateral flow strip assays as User-Friendly Tools To Detect Biomarker Profiles For Leprosy**

Received: 14 July 2016
 Accepted: 08 September 2016
 Published: 20 September 2016

Anouk van Hooij ¹, Elisa M. Tjon Kon Fat ¹, Susan J. Moises Batista da Silva ², Claudio G. Salgado ³, John Anemiek Geluk ¹

2016, WBA: IP-10, IgM, CCL4, IL-10

iScience **Article**
 Prototype multi-biomarker test for point-of-care leprosy diagnostics

Anouk van Hooij, Elisa M. Tjon Kon Fat, Danielle de Jong, Jan Hendrik Richardus, Annemieke Geluk, Paul L.A.M. Corstjens

2020, Multi Biomarker Test

OPEN ACCESS Freely available online

PLOS ONE NEGLECTED TROPICAL DISEASES

Field-Evaluation of a New Lateral Flow Assay for Detection of Cellular and Humoral Immunity against *Mycobacterium leprae*

Kidist Bobosha ^{1,2}, Elisa M. Tjon Kon Fat ³, Susan J. F. van den Eeden ⁴, Yonas Bekele ², Jolien J. van der Ploeg-van Schip ¹, Claudia J. de Dood ³, Karin Dijkman ¹, Kees L. M. C. Franken ¹, Louis Wilson ¹, Abraham Aseffa ⁵, John S. Spencer ⁶, Tom H. M. Ottenhoff ¹, Paul L. A. M. Corstjens ¹, Annemieke Geluk ^{1*}

¹ Department of Infectious Diseases, Leiden University Medical Center, Leiden, The Netherlands
² Department of Molecular Cell Biology, Leiden University Medical Center, Leiden, The Netherlands
³ Department of Molecular Cell Biology, Leiden University Medical Center, Leiden, The Netherlands
⁴ Department of Infectious Diseases, Leiden University Medical Center, Leiden, The Netherlands
⁵ Addis Ababa, Ethiopia
⁶ Department of Microbiology, Immunology & Pathology, Colorado State University, Fort Collins, Colorado

2014, WBA: IP-10, IgM

AMERICAN SOCIETY FOR MICROBIOLOGY Clinical and Vaccine Immunology

Field-Friendly Test for Monitoring Multiple Immune Response Markers during Onset and Treatment of Exacerbated Immunity in Leprosy

Paul L. A. M. Corstjens ¹, Anouk van Hooij ², Elisa M. Tjon Kon Fat ³, Susan J. F. van den Eeden ⁴, Louis Wilson ⁵, Annemieke Geluk ^{1*}

¹ Department of Molecular Cell Biology, Leiden University Medical Center, Leiden, The Netherlands
² Department of Molecular Cell Biology, Leiden University Medical Center, Leiden, The Netherlands
³ Department of Infectious Diseases, Leiden University Medical Center, Leiden, The Netherlands
⁴ Department of Infectious Diseases, Leiden University Medical Center, Leiden, The Netherlands
⁵ Department of Infectious Diseases, Leiden University Medical Center, Leiden, The Netherlands

2016, multiplex IP-10 and IgM

www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN **Field-friendly serological tests for determination of *M. leprae*-specific antibodies**

Received: 20 April 2017
 Accepted: 29 June 2017
 Published online: 21 August 2017

Anouk van Hooij ¹, Elisa M. Tjon Kon Fat ¹, Susan J. Moises Batista da Silva ², Claudio G. Salgado ³, John Anemiek Geluk ¹

2017, IgM

frontiers in Immunology ORIGINAL RESEARCH published: 11 August 2020 doi: 10.3389/fimmu.2020.01811

Household Contacts of Leprosy Patients in Endemic Areas Display a Specific Innate Immunity Profile

2020, ApoA1, CCL4, CRP, IL-1Ra, IL-6, IP-10, and S100A12

Contents lists available at ScienceDirect
Clinical Biochemistry
 journal homepage: www.elsevier.com/locate/clinbiochem

Multi-center evaluation of a user-friendly lateral flow assay to determine IP-10 and CCL4 levels in blood of TB and non-TB cases in Africa

Paul L.A.M. Corstjens ^{a,*}, Elisa M. Tjon Kon Fat ^a, Claudia J. de Dood ^a, Jolien J. van der Ploeg-van Schip ^b, Kees L.M.C. Franken ^b, Novel N. Chegou ^c, Jayne S. Sutherland ^d, Rawleigh Howe ^e, Adane Mihret ^f, Desta Kassa ^f, Marieta van der Vyver ^g, Jacob Sheehama ^h, Felangi Simukonda ⁱ, Harriet Mayanja-Kizza ^j, Tom H.M. Ottenhoff ^b, Gerhard Walz ^k, Annemieke Geluk ^b, On behalf of the AE-TBC consortium ¹

^a Department of Molecular Cell Biology, Leiden University Medical Center, The Netherlands
^b Department of Infectious Diseases, Leiden University Medical Center, The Netherlands
^c DST/NCRF Centre of Excellence for Biomedical Tuberculosis Research and SAMRC Centre for Tuberculosis Research, Division of Molecular Biology and Human Genetics, Department of Biomedical Sciences, Stellenbosch University, Cape Town, South Africa
^d Victoria University, Wellington, New Zealand
^e Arusha Human Research Institute, Kilimanjaro Health and Nutrition Unit, Kilimanjaro, Tanzania
^f University of Namibia, Windhoek, Namibia
^g Geneva Prevention Study, Malawi
^h Department of Medicine, Malawi

2016, WBA: IP-10, CCL4

Tuberculosis 94 (2016) 31–36

Contents lists available at ScienceDirect
Tuberculosis
 journal homepage: <http://intl.elsevierhealth.com/journals/tube>

DIAGNOSTICS

Use of lateral flow assays to determine IP-10 and CCL4 levels in pleural effusions and whole blood for TB diagnosis

Jayne S. Olumuyi ^a, Tom H.M. Ottenhoff ^b

2016, pleural effusions: IP-10, CCL4

www.nature.com/scientificreports

SCIENTIFIC REPORTS

OPEN **Evaluation of Immunodiagnostic Tests for Leprosy in Brazil, China and Ethiopia**

Received: 8 June 2018
 Accepted: 10 November 2018
 Published online: 18 Dec 2018

Anouk van Hooij ¹, Susan van den Eeden ², Renate Richardus ^{3,4}, Elisa Tjon Kon Fat ⁵, Louis Wilson ⁶, Kees L.M.C. Franken ⁷, Roel Faber ⁸, Merufa Khatun ⁹, Khorsheed Alam ⁹, Abu Sufian Chowdhury ⁹, Jan Anemiek Geluk ¹

2018, WBA: IP-10, IgM, CCL4, IL-10

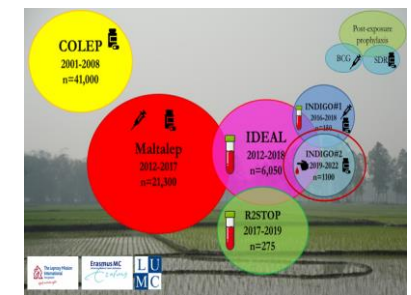
Contents lists available at ScienceDirect
EBioMedicine
 Published by THE LANCET

Research paper

Application of new host biomarker profiles in quantitative point-of-care tests facilitates leprosy diagnosis in the field

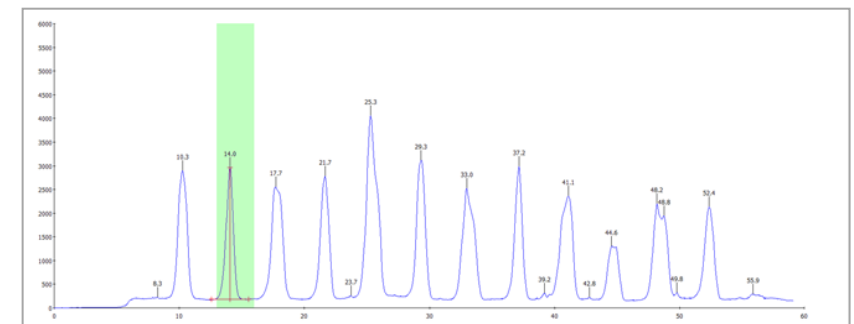
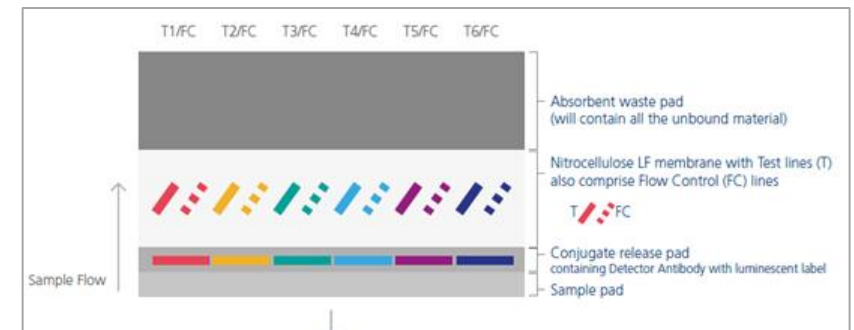
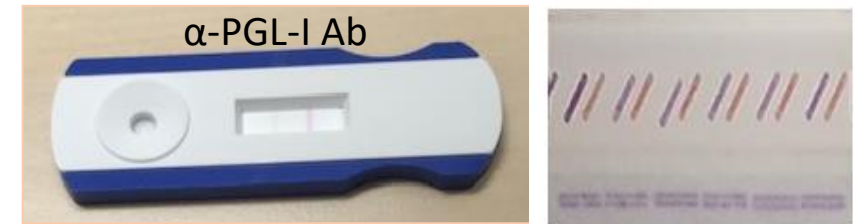
Anouk van Hooij ¹, Susan van den Eeden ², Renate Richardus ^{3,4}, Elisa Tjon Kon Fat ⁵, Louis Wilson ⁶, Kees L.M.C. Franken ⁷, Roel Faber ⁸, Merufa Khatun ⁹, Khorsheed Alam ⁹, Abu Sufian Chowdhury ⁹, Jan Anemiek Geluk ¹

2019, WBA & plasma: Apo, S100A12, CRP, IP-10

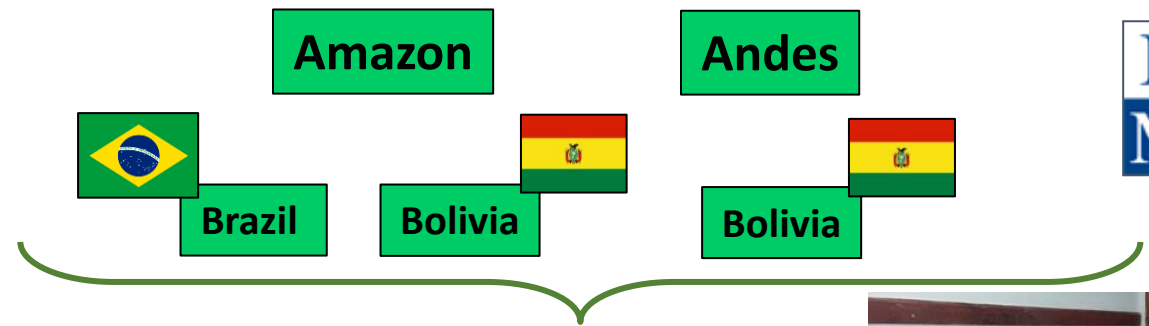


Study Main Aims

- Evaluate a quantitative **point-of-care test** for (longitudinal) detection of *M. leprae* infection both at an individual- and population level including adults and children within both populations (*Transmission monitoring*)
- Evaluate quantitative **multibiomarker test** (MBT) for detection of leprosy and *M. leprae* infection based on host immune markers previously identified in an Asian population in both South American populations (*Immunomonitoring*)



Recruitment & Sampling

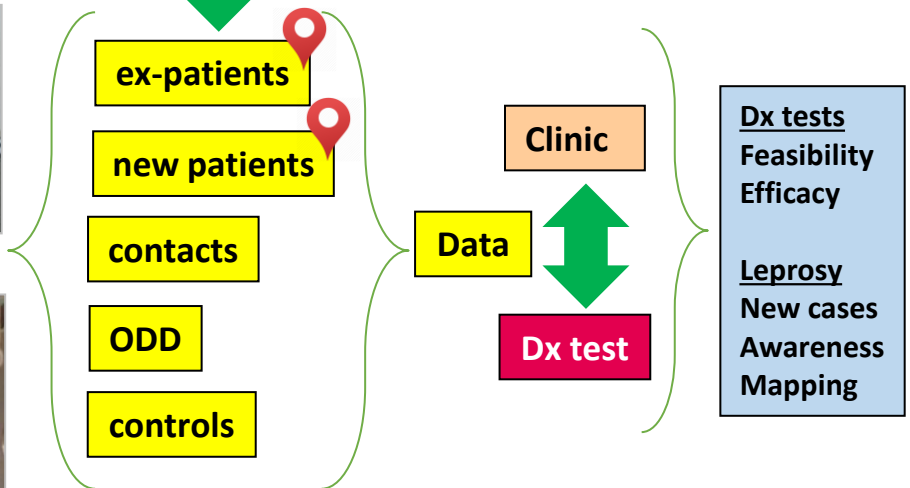


Active case finding

- door-to-door surveys
- expeditions
- intermediate self reporting



← **ex-patients**



Diagnostic tests

POC analysis



n=1,500 POC Dx



Brazilian cohort **t₀**
1,500

Bolivian cohort **t₀**
1,500

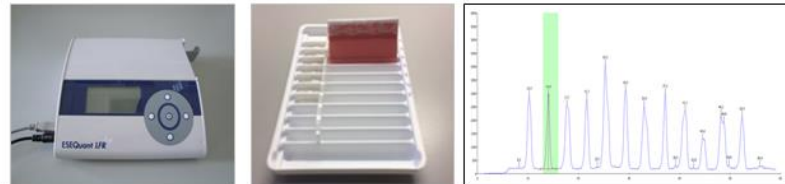
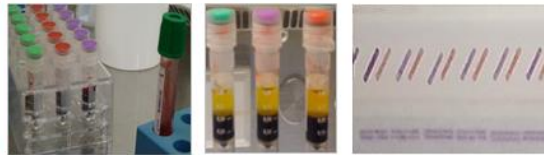
Brazilian cohort **FU**
1,500

Bolivian cohort **FU**
1,500

Analysis at LUMC



n= 100 MBT
WBA



Brazilian cohort **t₀**
100

Bolivian cohort **t₀**
100

Brazilian cohort **FU**
100

Bolivian cohort **FU**
100

LUMC

Anouk van Hooij

Els Verhard

Danielle de Jong

Paul Corstjens

Annemieke Geluk (PI)



IIBISMED



Ana Lineth Garcia

Field team Bolivia

Acknowledgements

PUCPR

Antoniella de Aguiar

Andressa Mayra dos Santos

Danilo Hamilko de Barros

Sergio Paulo Aguilera Machado

Luísa Polo Silveira

Breno Saty Kliemann

Marcelo Távora Mira

Field team Prata



DF

Nimer Ortuño-Gutiérrez



GWS | Q.M. Gastmann-Wichers Stichting