



Universiteit
Leiden
The Netherlands

Metabolomics in community-acquired pneumonia: exploring metabolomics-based biomarkers for diagnosis and treatment response monitoring of community-acquired pneumonia

Hartog, I. den

Citation

Hartog, I. den. (2024, September 17). *Metabolomics in community-acquired pneumonia: exploring metabolomics-based biomarkers for diagnosis and treatment response monitoring of community-acquired pneumonia*. Retrieved from <https://hdl.handle.net/1887/4083598>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/4083598>

Note: To cite this publication please use the final published version (if applicable).

Metabolomics in community-acquired pneumonia

Exploring metabolomics-based biomarkers for
diagnosis and treatment response monitoring of
community-acquired pneumonia

Ilona den Hartog

Manuscript

Cover design: DALL·E 2, I. den Hartog , A. Kamer

Layout: I. den Hartog

Printed by: Ridderprint BV

Copyright

© I. den Hartog, 2024

All rights reserved. No part of this thesis may be reproduced in any form or by any means without permission of the author.

Funding

This work is part of the research program ‘Metabolomic fingerprint biomarkers to guide antibiotic therapy and reduce resistance’ with project number 541001007, which is financed by ZonMW, the Netherlands Organization for Health Research and Development associated with the Dutch Research Council (NWO).

Metabolomics in community-acquired pneumonia

Exploring metabolomics-based biomarkers for
diagnosis and treatment response monitoring of
community-acquired pneumonia

Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus, prof.dr.ir H. Bijl,
volgens het besluit van het college voor promoties
te verdedigen op dinsdag 17 september 2024
klokke 14:30 uur

door

Ilona den Hartog

geboren te Montfoort
in 1992

Promotores: Prof.dr. J.G.C. van Hasselt
Prof.dr. T. Hankemeier

Co-promotor: Dr. E.M.W. van de Garde (Universiteit Utrecht)

Promotiecommissie: Prof.dr. H. Irth
Prof.dr. E.C.M. de Lange
Prof.dr. M.G.J. de Boer (Leiden UMC)
Prof.dr. A. Geluk (Leiden UMC)
Dr. H. Endeman (Erasmus MC)

The research described in this thesis was performed at the Systems Pharmacology and Pharmacy division of the Leiden Academic Centre for Drug Research (LACDR), Leiden University, Leiden, The Netherlands.

Contents

1	Introduction	1
2	Metabolomic profiling of microbial disease etiology in community-acquired pneumonia	5
3	Differential metabolic host response to pathogens associated with community-acquired pneumonia	33
4	Longitudinal metabolite profiling of <i>Streptococcus pneumoniae</i>-associated community-acquired pneumonia	53
5	The Immunometabolic Atlas: a tool for design and interpretation of metabolomics studies in immunology	79
6	General discussion and summary	103
7	Nederlandse samenvatting	111
	Bibliography	115
	List of Abbreviations	127
	List of Publications	131
	List of Affiliations	133
	Dankwoord	135
	Curriculum Vitae	137

