

University of Groningen

## Exploring the genetics of asthma

Elhousseini, Zaid

DOI:  
[10.33612/diss.785021201](https://doi.org/10.33612/diss.785021201)

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2023

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*  
Elhousseini, Z. (2023). *Exploring the genetics of asthma: from gene variants to targeted treatments*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.  
<https://doi.org/10.33612/diss.785021201>

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

**Exploring the Genetics of Asthma**  
From Gene Variants to Targeted Treatment

**Zaid Elhousseini**

The studies presented in this thesis were conducted in the context of the PROMINENT project of the Groningen University Institute for Drug Exploration (GUIDE). This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 754425.



**Printing of this thesis was financially supported by:**

The University Medical Center Groningen (UMCG), The Graduate School of Medical Science (GSMS), and Stichting Astma Bestrijding (SAB).

**Paranymphs**

Yehya Al-Adwi  
Sara Russo

**Cover design**

Dana Arabi

**Printing**

Proefschriften printen

Copyright ©, 2023, Zaid Elhusseini, Groningen, The Netherlands

All rights reserved. No part of this thesis may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronically or mechanically by photocopying, recording, or otherwise, without the prior written permission of the author.



university of  
 groningen

# Exploring the genetics of asthma

*from gene variants to targeted treatments*

PhD thesis

to obtain the degree of PhD at the  
University of Groningen  
on the authority of the  
Rector Magnificus Prof. C. Wijmenga  
and in accordance with  
the decision by the College of Deans.

This thesis will be defended in public on  
Wednesday 18 October 2023 at 9.00 hours

by

**Zaid Elhusseini**

born on 13 December 1993  
in Gaza, Palestina

**Supervisors**

Prof. G.H. Koppelman  
Prof. R. Gosens

**Co-supervisor**

Prof. F.J. Dekker

**Assessment Committee**

Prof. H.J. Lambers Heerspink  
Prof. J.M. Beekman  
Prof. L. Lahousse

**Table of content**

Chapter 1	General Introduction	7
Chapter 2	The genetics of asthma and the promise of genomics-guided drug target discovery <i>The Lancet Respiratory Medicine. Oct 2020, 8(10):1045-56.</i>	19
Chapter 3	Association of asthma genetic variants with asthma-associated traits reveals molecular pathways of eosinophilic asthma <i>Clinical and translational allergy. Apr 2023, 13(4): e12239</i>	49
Chapter 4	Improved annotation of asthma gene variants with cell type deconvolution of nasal and lung expression-Quantitative Trait Loci	73
Chapter 5	An epithelial gene signature of trans-IL-6 signaling defines a subgroup of type-2 low asthma	95
Chapter 6	Summary, Discussion, and Future Perspectives	117
Appendices	Nederlandse samenvatting	133
	Acknowledgments	136
	About the author	141