Benedict Matern, PhD

Bioinformatician

Laan van Vollenhove 2341

3706 HD Zeist

The Netherlands

+31 65 721 8246

+1 763 229 8208

ben.matern@gmail.com

# SUMMARY

As a bioinformatician in the field of immunology, I am an expert in exploring scientific questions in the context of HLA polymorphism and immunogenicity. I use computational strategies to examine HLA polymorphism in the context of T-cell and B-cell epitopes, and elucidate how this may lead to an immune response. By analyzing polymorphism of HLA amino acid sequences, especially in the context of world populations, I work to predict the biological and immunological determinants of the HLA molecules and apply these concepts in the practical and scientific settings.

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# PROFESSIONAL APPOINTMENTS

## PIRCHE AG., Berlin, DE *Director of Bioinformatics* February 2023 - Present

* Created an AI prediction model for T-cell epitope presentation model
* Directing projects for developing bioinformatic tools and performing scientific analysis
* Simulated swine transplantation to predict epitope immunogenicity and immune memory
* Investigated the effects of HLA imputation on epitope analysis in world populations
* Promotion from Senior Bioinformatics Scientist to Director of Bioinformatics in October 2023
* Liaison with UMC Utrecht CTI for scientific collaborations

## University Medical Center Utrecht, Utrecht, NL *Bioinformatics Postdoctoral Researcher*

February 2020 - February 2023

* Defined epitope-focused HLA immunogenicity models
* Developed the cloud-based Workshop Database for the 18th IHIW
* Collected and Analyzed Data with 18th IHIW Project Leaders
* Simulated T-cell and B-cell epitopes in a ULISES Tumor Therapy model
* Developed sequence analysis techniques for implementation of a genome-wide CRISPR knockout assay

## Maastricht University Medical Center, Maastricht, NL *Bioinformatics PhD Candidate*

February 2016 - February 2020

* Thesis: Prospecting the MHC: A Bioinformatic View of HLA Polymorphism and Gene Organization - Defended June 2020
* Elucidated patterns in class II HLA gene organization.
* Analyzed and interpreted nanopore sequencing data.
* Explored patterns in HLA peptide sequences.
* PhD Promoter: Em. Prof. Dr. M.G.J Tilanus
* PhD Co-Promoter: Dr. M. Groeneweg

## NMDP - BeTheMatch, Minneapolis, MN, USA *Student Researcher*

February 2015 - September 2016

* Explored concepts in HLA matching for Stem Cell Transplantation.
* Developed MIRING validator for high-quality genotyping data.

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# EDUCATION

## University of Minnesota, Minneapolis, MN, USA *M.S. Biomedical Informatics & Computational Biology*

September 2013 - December 2015

* Courses in Biostatistics, Statistics for Human Genetics, Database Design, Machine Learning, Metagenomics
* Bioinformatics Journal Club

## University of Wisconsin - Stout, Menomonie, WI, USA *B.S. Applied Mathematics & Computer Science Concentrations in Bioinformatics & Software Development*

September 2004 - May 2009

* Implemented BLAST algorithm for a database of oligonucleotides
* Molecular Cell Biology, Microbiology, Computer Science, Data Structures, Database Design

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# TEACHING EXPERIENCE

## UMC Utrecht CTI Theme Meeting Presentation

**Nov 10 2022**Modeling Linked Recognition of HLA: Allele-Specific Definitions of B-Cell Epitopes

**Sept 16 2021**HLA Immunogenicity as a Targeted Tumor Therapy

## Educational Session - EFI 2022 May 2022 : Amsterdam NL

Tools for analysis of HLA epitopes in transplantation.

## Advisement of Master’s Students - UMCU Feb 2020 - Feb 2022

Typing of Eplets from SSO Genotyping Assays  
HLA Genotyping from WES/WGS  
HLA Genotyping from RNA-Seq

## SLPHS Presentation - Spring Lake Park High School, MN, USA Dec 20, 2018

Oral Presentation: Transplantation, with the help of a MinION

## Advisement of Master’s Student - MUMC November 2017 - June 2018

Advised Master’s Thesis: The identification of intronic polymorphism in HLA-DRA

## BICB Journal Club, University of Minnesota, Minneapolis, MN October 6, 2016

Oral Presentation: Rules and Tools of N-NGS

## Lunch & Learn, BeTheMatch, Minneapolis, MN September 23, 2016

Oral Presentation: Analysis of Nanopore Sequencing Data, or How Ben Learned to Stop Worrying and Love the MinION

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# CONFERENCES

## DASH Data Standards Hackathons September 2022 : Online Feb 2022 : Online April 2021 : Online April 2020 : Online August 2019 : Minneapolis, MN, USA October 2018 : Baltimore, MD, USA November 2017 : Utrecht, Netherlands

## September 2017 : Pacific Grove, CA, USA

## May 2017 : Heidelberg, Germany

## November 2016 : Vienna, Austria

## January 2016 : Minneapolis, MN, USA

Participant and Contributor

## American Transplant Congress June 1-5, 2024 : Philadelphia, PA, USA Oral Presentation: Swine Xenografts Share Few Predicted Indirectly Recognizable SLA-Derived Epitopes with HLA-Derived Epitopes from Human Kidney Grafts ISHLT Annual Meeting April 10-13, 2024 : Prague, Czech Republic Poster: Interplay and Divergent Effects of PIRCHE-II Scores & Eplet Mismatch Loads on De Novo DSA Development and Clinical Parameters in Lung Transplantation Bootcongres March 6-7, 2024 : Utrecht, Netherlands EFI Conference May 20-23, 2024 : Geneva, Switzerland Poster: PIRCHE application versions 3 and 4 lead to equivalent T cell epitope mismatch scores in solid organ and stem cell transplantation modules April 26-29, 2023 : Nantes, France May 17-20, 2022 : Amsterdam, NL

Oral Presentation: The Role of HLA Epitope Mismatches in Antibody Development and Refractoriness to Optimize Allocation in Platelet Transfusion

Organized Educational Session: Bioinformatics & HLA

Organized Hands-On Session: Tools for analysis of HLA epitopes

**April 22-25 2021 : Glasgow, UK (Online)  
May 8-11, 2019 : Lisbon, Portugal**

Poster: Multiple lineages of DRB1\*13~DRB3~DQB1 haplotypes identified by HLA-DRA polymorphism (Best Poster Prize)

**May 9-12, 2018 : Venice, Italy  
May 30-June 2, 2017 : Mannheim & Heidelberg, Germany**

Poster: Nanopore sequencing is coming of age: a new analysis platform for HLA allele assignment based on full length de novo assembly.  
Poster : ABO blood group typing with Oxford Nanopore MinION sequencing

## 18th International Histocompatibility and Immunogenetics Workshop May 11-15, 2022 : Noordwijkerhout, Netherlands

Developed IHIW database & interfaced with project leaders to coordinate data collection and analysis. Participant of several components

## 17th International Histocompatibility and Immunogenetics Workshop September 6-10, 2017 : Pacific Grove, CA, USA

Participated in Component: Extension of HLA allele sequences by full-length HLA allele-specific hemizygous Sanger sequencing (SSBT)

## APHIA Conference November 11-14, 2018 : Sydney, Australia

Oral Presentation: The highly polymorphic HLA-DRA gene: an implication for DRA~DRB3/4/5~DRB1 haplotypes

## ASHI Annual Meeting October 16-20, 2023 : San Antonio, TX, USA Abstract Session Chair: Data Alchemy: Translating HLA Insights through Bioinformatics

## October 23-28, 2022 : Las Vegas, NV, USA

**September 26-October 1, 2021 : Orlando, FL, USA (Online)  
October 19-21 2020 : Online  
September 23-27, 2019 : Pittsburg, PA, USA**Poster: HLA-DRA POLYMORPHISM DEFINES MULTIPLE LINEAGES OF DRB1\*13~DRB3~DQB1 HAPLOTYPES

**October 1-5, 2018 : Baltimore, MD, USA**Oral Presentation: The Highly Polymorphic HLA-DRA Gene: Conserved and Diverse Regions within the HLA-DRA Gene imply Haplotypes of DRA~DRB3/4/5~DRB1~DQB1

## Dutch Hematology Congress 2018 January 24, 2018 : Arnhem, Netherlands Oral Presentation: The power of nanopore MinION single molecule sequencing for HLA and ABO typing.

## EFI Summer School July 24-26, 2017 : Dublin, Ireland Participant, and Oral Presentation: MinION Sequencing: Research and Applications in HLA

## ULISES Annual Meeting

**November 17, 2022 : Barcelona, Spain**

## London Calling Nanopore Sequencing Conference May 4-5, 2017 : London, England

Oral Presentation: Identification of Human Leukocyte Antigen Splice Variants by MinION cDNA Sequencing

**May 26-27, 2016 : London, England**

Oral Presentation: De novo Assembly of HLA Nanopore Reads

# PUBLICATIONS

[Matern BM, Niemann M. PIRCHE application major versions 3 and 4 lead to equivalent T cell epitope mismatch scores in solid organ and stem cell transplantation modules. *Hum Immunol*. 2024;85(3):110789.](https://www.zotero.org/google-docs/?DdQY6z)

[Niemann M, Matern BM, Spierings E. Repeated local ellipsoid protrusion supplements HLA surface characterization. *HLA*. 2024;103(1):e15260.](https://www.zotero.org/google-docs/?DdQY6z)  
  
PIRCHE II Risk and Acceptable Mismatch Profile Analysis in Solid Organ Transplantation. Niemann et al. [Boegel, Sebastian (Editor). 2023. HLA Typing 2nd Edition: Methods and Protocols.](http://paperpile.com/b/uWycJ9/ccyT) Springer (in press)

[Truong L, Matern BM, El‐Lagta N, et al. Report from the extended HLA‐DPA1 ~ promoter ~ HLA‐DPB1 haplotype of the 18th international HLA and immunogenetics workshop. *HLA*. 2023;102(6):690-706.](https://www.zotero.org/google-docs/?DdQY6z)

[Matern BM, Niemann M, Nemparis I, et al. Using cloud infrastructure to facilitate data collection and conversion of HLA diagnostic data for the 18th International HLA and Immunogenetics Workshop. *HLA*. 2023;101(5):484-495.](https://www.zotero.org/google-docs/?DdQY6z)  
  
Niemann M, Strehler Y, Lachmann N, et al. Snowflake epitope matching correlates with child-specific antibodies during pregnancy and donor-specific antibodies after kidney transplantation. Front Immunol. 2022;13.

Niemann M, Matern BM, Spierings E. Snowflake: A deep learning-based human leukocyte antigen matching algorithm considering allele-specific surface accessibility. Front Immunol. 2022;13:937587.

Peereboom ETM, Matern BM, Spierings E, Geneugelijk K. The Value of Single-cell Technologies in Solid Organ Transplantation Studies. Transplantation. 2022;106(12):2325-2337.

Carapito R, Aouadi I, Verniquet M, et al. The MHC class I MICA gene is a histocompatibility antigen in kidney transplantation. Nat Med. 2022;28(5):989-998.

Niemann M, Matern BM, Spierings E, Schaub S, Hönger G. Peptides Derived From Mismatched Paternal Human Leukocyte Antigen Predicted to Be Presented by HLA-DRB1, -DRB3/4/5, -DQ, and -DP Induce Child-Specific Antibodies in Pregnant Women. Front Immunol. 2021;12.

Peereboom ETM, Matern BM, Tomosugi T, et al. T-Cell Epitopes Shared Between Immunizing HLA and Donor HLA Associate With Graft Failure After Kidney Transplantation. Front Immunol. 2021;12.

Matern BM, Mack SJ, Osoegawa K, et al. Standard reference sequences for submission of HLA genotyping for the 18th International HLA and Immunogenetics Workshop. HLA. 2021;97(6):512-519.

Duygu B, Matern BM, Wieten L, Voorter CEM, Tilanus MGJ. Specific amino acid patterns define split specificities of HLA-B15 antigens enabling conversion from DNA-based typing to serological equivalents. Immunogenetics. 2020;72(6-7):339-346.

Truong L, Matern BM, Groeneweg M, et al. Polymorphism clustering of the 21.5 kb DPA-promoter-DPB region reveals novel extended full-length haplotypes. HLA. 2020;96(3):299-311.

Matern BM, Olieslagers TI, Groeneweg M, et al. Long-Read Nanopore Sequencing Validated for Human Leukocyte Antigen Class I Typing in Routine Diagnostics. J Mol Diagn JMD. 2020;22(7):912-919.

Matern BM, Olieslagers TI, Voorter CEM, Groeneweg M, Tilanus MGJ. Insights into the polymorphism in HLA-DRA and its evolutionary relationship with HLA haplotypes. HLA. Published online October 16, 2019.

Truong L, Matern B, D’Orsogna L, Martinez P, Tilanus MGJ, De Santis D. A novel multiplexed 11 locus HLA full gene amplification assay using next generation sequencing. HLA. Published online October 16, 2019.

Voorter CEM, Matern B, Tran TH, et al. Full-length extension of HLA allele sequences by HLA allele-specific hemizygous Sanger sequencing (SSBT). Hum Immunol. 2018;79(11):763-772.

Matern BM, Groeneweg M, Voorter CEM, Tilanus MGJ. Saddlebags: A software interface for submitting full-length HLA allele sequences to the EMBL-ENA nucleotide database. HLA. 2018;91(1):29-35.

Duygu B, Matern BM, Groeneweg M, Voorter CEM, Tilanus MGJ. Polymorphism at residue 156 of the new HLA-A\*02:683 allele suggests immunological relevance. HLA. 2017;90(2):107-109.

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# AWARDS

Best Poster Award - EFI 2019 - Multiple lineages of DRB1\*13~DRB3~DQB1 haplotypes identified by HLA-DRA polymorphism

EFI Education & Training Bursary - 2018 - MUMC / PathWest Perth Collaboration

EFI Travel Bursary - 2017 - 13th International Summer School on Immunogenetics