Antibody glycomics signatures of SARS-CoV-2 infection and vaccination

Pongrácz, T.

CURRICULUM VITAE

Tamas Pongracz was born on 30 September 1991 in Pécs, Hungary. He obtained both his Bachelor's degree in Medical analytics (2015) and Master's degree in Medical Biotechnology (2017) at the University of Pécs, Hungary, where he received the Republican Grant and the National Excellence Grant issued by the Ministry of Human Capacities for students with outstanding performance. During his studies, his work focused on the analysis of clinically relevant glycosylated proteins, such as transferrin and prostate specific antigen, using capillary electrophoresis hyphenated to mass spectrometry. He learnt these techniques in the laboratories of Prof. Dr. Ferenc Kilár (University of Pécs) and Prof. Dr. Manfred Wuhrer (Leiden University Medical Center, Leiden, The Netherlands). Tamas' journey in Leiden started as a 3-month Erasmus traineeship in 2017. During this period, his work set the cornerstone for intact prostate specific antigen separation by capillary electrophoresis and detection by mass spectrometry in the Wuhrer lab under the supervision of Dr. Guinevere Lageveen-Kammeijer, which laid the foundation for his Master's thesis.

In 2018, Tamas moved to the Netherlands as a PhD candidate and Marie Curie Fellow at Leiden University Medical Center in the department of Center for Proteomics and Metabolomics under the supervision of Prof. Dr. Manfred Wuhrer and Dr. Noortje de Haan. As part of his PhD, he was involved in a multidisciplinary and intersectoral research training program IMforFUTURE within the frames of Horizon 2020 Marie Skłodowska-Curie Actions. His projects focused on high-throughput clinical glycomics in various disease settings, such as autoimmune hepatitis, transplantation and COVID-19, as well as mechanistic studies in the field of linkage-specific sialic acid derivatization. He presented his research results at 6 international conferences and published five first author and two co-author publications. Tamas is co-inventor on two patent applications involving glycan biomarkers for autoimmune hepatitis and acute antibody-mediated kidney transplant rejection. His social engagement was marked by organizing an Aging Workshop and by volunteering as Network Lead for the Mass Spectrometry & Advances in the Clinical Lab.

Before his PhD defense, Tamas spent 6 weeks as external researcher in the Abdel-Mohsen laboratory at Wistar Institute (Philadelphia, Pennsylvania, USA), where he studied effector functions elicited by spike-protein specific antibodies isolated from patients. The obtained results on effector functions are envisioned to be linked to existing data on antibody

glycosylation, hence providing insights on structure-function relationships of antibodies and their potential role in COVID-19 disease course.

After his PhD defense, Tamas is going to continue to work as a postdoctoral researcher in his current research group to finish ongoing projects, including the supervision of the development of a data analysis software and the processing of and publication on the results of various clinical glycomics cohort studies. In the future, he plans to apply for a postdoctoral grant and continue his academic career in Hungary.

PHD PORTFOLIO

MANDATORY COURSES

- Basic Methods and Reasoning in Biostatistics (2019)
- BROK course on regulations for conducting clinical research in the Netherlands (2019)

ELECTIVE, TRAINING AND SOFT SKILL COURSES

- Commerce and entrepreneurship (IMforFUTURE meeting, Zagreb, Croatia) (2018)
- Scientific integrity, data and analysis stewardship (IMforFUTURE ITN meeting, Zagreb, Croatia) (2018)
- High-throughput data processing of MALDI-TOF-MS data (GlyCoCan ETN workshop, Leiden, The Netherlands) (2018)
- Communication in Science workshop (LUMC) (2018)
- Negotiating for PhDs (Leiden University) (2018)
- Improve your memory (Leiden University) (2018)
- Using R for data analysis (LUMC) (2019)
- Effective Researcher Training (communication, planning and time management, problem solving, leadership, assertiveness) (IMforFUTURE ITN Training Meeting, Leeds, United Kingdom) (2019)
- Scientific writing and presentations (IMforFUTURE ITN Training Meeting, Leeds, United Kingdom) (2019)
- Public engagement, dissemination to the general public (IMforFUTURE ITN Workshop, Leeds, United Kingdom) (2019)
- Elsevier Workshop on *"How to Write a Great Research Paper, and get it Accepted by a Good Journal"* (LUMC) (2019)
- Academic – industrial collaborations (IMforFUTURE ITN Interim Meeting, Edinburgh, United Kingdom & IMforFUTURE ITN Annual Network meeting, Leiden, The Netherlands) (2019 & 2020)
- GDRP and European law (IMforFUTURE ITN Annual Network meeting, Leiden, The Netherlands) (2020)
- Technology transfer, valorisation, spin-off and intellectual property rights (IMforFUTURE ITN Annual Network meeting, Leiden, The Netherlands) (2020)

- Introduction to Glycoinformatics (online, Swiss Institute for Bioinformatics) (2021)

COURSES HELD

- Frontiers in Science course for Biomedical Researcher MSc students (LUMC) 2019
- Frontiers in Science course for Biomedical Researcher MSc students (LUMC) 2020
- Frontiers in Science course for Biomedical Researcher MSc students (LUMC) 2021 (training material contribution)

SUPERVISION

- Linh Nguyen (MSc student)
- Sterre Siekman (Bioinformatician)

CONFERENCE ATTENDANCES AND PRESENTATIONS THEREOF

- Mass Spectrometry School in Biotechnology and Medicine (Dubrovnik, Croatia) – poster presentation (2018)
- GlycoBioTec2019 (Berlin, Germany) – oral presentation (2019)
- 2nd Human Glycome Meeting, Split, Croatia (2019)
- Spinoza Symposium Glyco Science and its Medical Implications (Amsterdam, The Netherlands) (2019)
- NVMS Fall meeting – New Talents in Mass Spectrometry (Leiden, The Netherlands) (2019)
- IMforFUTURE ITN Aging Workshop (online) – poster presentation
- Mass Spectrometry & Advances in the Clinical Lab (MSACL) 2021 EU (online) – oral presentation (2021)
- American Society for Mass Spectrometry (Philadelphia, Pennsylvania, USA) – accepted oral presentation could not be held due to COVID-related travel restrictions (2021)
- METT25 – 25th Anniversary Conference of the Hungarian Society for Separation Sciences (Egerszalók, Hungary) – oral presentation (2021)
- Translational Glycoscience Symposium (online) – poster presentation (2021)
- MSACL 2022 US (Monterey, California USA) – oral presentation (2022)
- 24th IMSC (Maastricht, The Netherlands) – poster presentation (2022)

SECONDMENTS

- GlyXera GmbH & Max Planck Institute for Dynamics of Complex Technical Systems, (Magdeburg, Germany) – Erdmann Rapp's lab (2019)
- Wistar Institute, within the frames of the Wistar-Schoemaker International Postdoctoral Fellowship program (Philadelphia, Pennsylvania, USA) – Mohamed Abdel-Mohsen's lab (2022)

PATENT APPLICATIONS

- Autoimmune hepatitis biomarkers (2021)
- Potential Diagnostic Utility of FcγRIIIa binding and Fc Glycan features of Donor Specific Antibodies in predicting the outcome of Organ Transplantation (2022)

GRANTS

- MSACL Young Investigator Grantee (2022)

SOCIAL ACTIVITIES

- Early Stage Researcher Forum co-chair – 1st year (IMforFUTURE) (2018)
- Lab outing organizing committee member (2018)
- Public engagement activity co-organizer in Split, Croatia (2019)
- Aging Workshop organizing committee member (2021)
- Co-writer of a cartoon on *"Uncover the secret of healthy aging"* available on vimeo.com
- Mass Spectrometry & Advances in the Clinical Lab Early Career Network Lead (2020-2021)

INTERVIEWS

- LUMC and Leiden University: *"BEAT-COVID group discovers sugar coated antibodies help predict disease severity"*
- Wistar Institute: *"Wistar Science Synergy Through Fostering International Collaborations"*

LIST OF PUBLICATIONS

1. Páger C, Biherczová N, Ligetvári R, Berkics BV, **Pongracz T**, et al. Advanced online mass spectrometry detection of proteins separated by capillary isoelectric focusing after sequential injection. *Journal of Separation Science* 2017; 40(24): 4825-34.
2. Kramer CSM, Franke-van Dijk MEI, Priddey AJ, **Pongracz T**, et al. Recombinant human monoclonal HLA antibodies of different IgG subclasses recognising the same epitope: Excellent tools to study differential effects of donor-specific antibodies. *HLA* 2019; 94(5): 415-24.
3. **Pongracz T**, Wuhrer M, de Haan N. Expanding the Reaction Space of Linkage-Specific Sialic Acid Derivatization. *Molecules* 2019; 24(19).
4. Moran AB, Dominguez-Vega E, Nouta J, **Pongracz T**, et al. Profiling the proteoforms of urinary prostate-specific antigen by capillary electrophoresis - mass spectrometry. *J Proteomics* 2021; 238: 104148.
5. **Pongracz T**, Verhoeven A, Wuhrer M, de Haan N. The structure and role of lactone intermediates in linkage-specific sialic acid derivatization reactions. *Glycoconj J* 2021; 38(2): 157-66.
6. Bharadwaj P*, Shrestha S*, **Pongracz T***, et al. Afucosylation of HLA-specific IgG1 as a potential predictor of antibody pathogenicity in kidney transplantation. *medRxiv* 2022. (manuscript submitted)
7. **Pongracz T**, Nouta J, Wang W, et al. Immunoglobulin G1 Fc glycosylation as an early hallmark of severe COVID-19. *eBioMedicine* 2022; 78.
8. **Pongracz T**, Vidarsson G, Wuhrer M. Antibody glycosylation in COVID-19. *Glycoconj J* 2022.
9. Van Coillie J*, **Pongracz T***, Rahmöller J*, et al. The BNT162b2 mRNA SARS-CoV-2 vaccine induces transient afucosylated IgG1 in naive but not antigen-experienced vaccinees. *bioRxiv* 2022. (manuscript submitted)
10. van Osch TLJ, **Pongracz T**, Geerdes DM, et al. Altered Fc glycosylation of anti-HLA alloantibodies in haemato-oncological patients receiving platelet transfusions. (manuscript submitted)

11. Siekman S*, **Pongracz, T***, et al. The IgG glycome of SARS-CoV-2 infected individuals reflects severity-associated alterations. (manuscript submitted)

12. Buhre SJ*, **Pongracz T***, et al. Adenovirus- and mRNA-based SARS-CoV-2 vaccines induce comparably low long-term IgG Fc galactosylation and sialylation levels. (manuscript submitted)

*contributed equally

ACKNOWLEDGEMENTS

During a PhD, one becomes a scientist, and at a certain point realizes that science is much like an artistic endeavor. Valleys, peaks and boulders in between trap you for a shorter or longer period of time in this occupation. Nevertheless, the various trails between the valley floor and the summit continuously change, take shape and develop as the seasons alternate, exposing the PhD student to a broad spectrum of challenges. Such exposure can be demanding, which I first interpret as a microevolutionary process with a strong selection pressure. Later I realized that this microevolutionary process was imaginary, I was competing with myself, while you, readers of this thesis, were actually there to elevate me.

It is hard to estimate the amount of selfless support I received from the beginning from my promotor, Manfred. Thank you for the swift and insightful feedbacks and your constructive leadership style. I was lucky enough to be supervised by my co-promotor, Noortje, for the first two years. There is no doubt that you are one of the smartest and most analytical people walking on planet Earth, and I am thankful that you exposed me to a steep learning curve. Guinevere, you were my very first contact person as well as daily supervisor at CPM during the aforementioned traineeship. I am grateful for your lasting support ever since.

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Kedves barátaim, az elmúlt négy év nélkületek nem ment volna, köszönöm, hogy vagytok nekem.

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