Unraveling mucin type o-glycosylation signatures of colorectal cancer

Madunić. K.

CURRICULUM VITAE

Katarina Madunić was born on March 29th, 1989 in Split, Croatia. Her interest in medicine and biochemistry began early in her education and she wrote her elementary school thesis about tumors in 2008. She followed her passion and joined an integrated 5-year master program in Pharmacy from the Faculty of Pharmacy and Medicinal Biochemistry, University of Zagreb, Croatia in 2012. During her studies she was particularly interested in courses such as molecular biology and biochemistry and here it was the first time she heard about glycans from prof. Gordan Lauc. She was immediately intrigued by the importance of these sugars in human diseases and was determined to do her thesis project about glycosylation. In 2011 she joined Genos Ltd as a master thesis intern and worked on the optimization of a high throughput HILIC analysis of fluorescently labelled *N*-glycans isolated from human leukocytes under supervision of dr. Irma Mahmuljin (Redžić) and prof.dr.sc. Gordan Lauc. After graduation in 2012, she worked in a pharmacy and later she joined the clinical research organization Optimapharm to work as a clinical research associate in phase 3 clinical trials (2015). Here she realized that she wanted to pursue a scientific career, and in 2016, she got the opportunity to start her PhD project at the Center for Proteomics and Metabolomics, Leiden University Medical Center in the Netherlands. In this project she explored glycosylation signatures of colorectal cancer using PGC-nano-LC-MS/MS under the supervision of prof. Manfred Wuhrer and dr. Guinevere Lageveen-Kammeijer. As part of the Marie Curie European Training Network, "GlycoCan", she visited the group of prof. Daniel Kolarich at Max Planck Institute for colloids and interfaces (Berlin, Gemany), where she received PGC-nanoLC-MS/MS method transfer training and applied it for glycomic analysis of proteins isolated from laser captured tissue microdissections. Additionally, she visited the industrial collaborator Ludger Ltd (Oxfordshire, UK) where she obtained experience with automated high throughput glycan analysis using Hamilton liquid handling robot and MALDI mass spectrometry of permethylated *O*-glycans. During her PhD she received extensive interdisciplinary scientific and soft skills training and was involved in various projects of her fellow PhD-students. She presented her research at eight Dutch and international conferences, for which she received three young investigator travel grants. The results of her work and many collaborations were published in peer-reviewed journals resulting in three first author and ten co-author publications.

Currently, she is employed within the same research group in Leiden, where she continued her research in the field of glycoproteomics. After her PhD defense she will spend 6 weeks in the lab of prof. Mohamed Abdel-Mohsen at the Wistar institute in Philadelphia, USA. There she will study the role of the gut glycome in regulating the homeostatic relationship between the host and its gut microbiota, during HIV infection. Finally, she is going to continue her academic career as a postdoctoral researcher at the Copenhagen Center for Glycomics in Denmark where she will focus on understanding cellular processes related to the function of cadherin-specific *O*-mannosylation in health and disease.

PHD PORTFOLIO

MANDATORY COURSES

-	PhD Introductory Meeting	2019
-	BROK Course- regulations for conducting clinical research in the Netherlands	2017
-	Basic Methods and Reasoning in Biostatistics	2017

GENERIC/DISCIPLINARY COURSES

-	Glycobiology and Glycochemistry International ELearning Course (NOVA Medical School, Lisbon, Portugal)	2017
-	Glycan analysis workshop (Glycocan ETN workshop, Ludger, Oxfordshire, UK)	2016
-	High-throughput data processing of MALDI-TOF-MS data (Glycocan ETN workshop, Leiden, The Netherlands)	2018
-	Storytelling and Stagecraft for Scientists (Glycocan ETN workshop, Leiden, The Netherlands)	2018
-	Business Process and Quality Management Workshop (Glycocan ETN workshop, Leiden, The Netherlands)	2018
-	Breaking up with Excel: An Introduction to the R Statistical Programming Language (MSACL 2018 short course)	2018
-	Introduction to Cytoscape (LUMC)	2018
-	Leadership framework, Business Model Canvas, Quality management, SIPOC workshop (Glycocan ETN workshop, Ludger, Oxfordshire, UK)	2019
-	Using R for data analysis (LUMC)	2019
-	Academic Writing for Phds (Leiden University)	2019
-	Advanced Data Science course in R Statistical Programming language (MSACL 2019 short course)	2019
-	Clinical Internship at Pathology Department (LUMC)	2019
-	MultiOmics Data integration in R (LUMC)	2019
-	Writing an excellent research grant proposal (Leiden University)	2020
-	Job Orientation for PhDs (Leiden University)	2020
-	Job interview skills Training (Leiden University)	2020
-	Develop Successful Methods for Identification and Quantitation in Complex Matrices (MSACL 2020 short course)	2020
-	Basic management and leadership skills (Leiden University)	2020

CONGRESS ATTENDANCE AND POSTER OR ORAL PRESENTATIONS

- 27th Joint Glycobiology meeting (Nijmegen, The Netherlands) 2016
- 28th Joint Glycobiology meeting (Aachen, Germany) 2017
- NVMS Spring meeting- New Talents in Mass Spectrometry (Amsterdam, The Netherlands) 2017
- Clinical Mass Spectrometry Imaging symposium (Leiden, The Netherlands) 2017
- Mutanome analysis finding neoepitopes in cancer-mini-symposium (Leiden, The Netherlands) 2018
- CESI-MS Symposium (Leiden, The Netherlands) 2018
- Data science seminar LUMC (Leiden, The Netherlands) 2018
- Mass Spectrometry Applications to the Clinical Lab (MSACL) 2018 EU (Salzburg, Austria)- oral presentation 2018
- Mini-symposium: Glycobiology at the LUMC and beyond (Leiden, The Netherlands) 2019
- Gordon Research Seminar on Glycobiology (GRS) (Lucca, Italy)- oral presentation 2019
- Gordon Research Conference on Glycobiology (GRC) (Lucca, Italy)- poster presentation 2019
- Mass Spectrometry Applications to the Clinical Lab (MSACL) EU 2019 (Salzburg, Austria)- oral presentation 2019
- Annual Oncode-CGC conference (Amsterdam, The Netherlands)- poster presentation 2019
- Spinoza Symposium Glyco-Science and its Medical Implications (Amsterdam, The Netherlands) 2019
- NVMS Fall meeting- New Talents in Mass Spectrometry (Leiden, The Netherlands)- poster presentation 2019
- 2020 Society for Glycobiology Virtual Meeting (online)- poster presentation 2020
- Joint Warren and Beilstein Symposium on Glycosciences 2021 (online) 2021
- 37th International Symposium on Microscale Separations and Bioanalysis (online)- oral presentation 2021
- MSACL 2021 EU 7th European Congress (online)- oral presentation 2021

SECONDMENTS

- Max Planck institute of Colloids and Interfaces, Berlin, Germany- prof.dr. Daniel Kolarich' lab 2016
- Ludger Ltd, Oxfordshire, UK- industrial collaboration 2018
- Sahlgrenska Academy, Gothenburg, Sweden- prof.dr. Niclas Karlsson's lab 2018

AWARDS AND GRANTS

- MSACL young investigator travel grant 2018
- MSACL young investigator travel grant 2019

LIST OF PUBLICATIONS

1) Zhang, T.‡, **Madunić, K**.‡, Holst, S., Zhang, J., Jin, C., Ten Dijke, P., Karlsson, N.G., Stavenhagen, K. and Wuhrer, M., 2020. Development of a 96-well plate sample preparation method for integrated *N*-and *O*-glycomics using porous graphitized carbon liquid chromatography-mass spectrometry. *Molecular omics*, *16*(4), pp.355-363.
‡ These authors contributed equally to this paper.

2) **Madunić, K**., Zhang, T., Mayboroda, O.A., Holst, S., Stavenhagen, K., Jin, C., Karlsson, N.G., Lageveen-Kammeijer, G.S.M. and Wuhrer, M., 2021. Colorectal cancer cell lines show striking diversity of their *O*-glycome reflecting the cellular differentiation phenotype. *Cellular and Molecular Life Sciences*, *78*(1), pp.337-350.

3) **Madunić, K**., Wagt, S., Zhang, T., Wuhrer, M. and Lageveen-Kammeijer, G.S.M., 2021. Dopant-Enriched Nitrogen Gas for Enhanced Electrospray Ionization of Released Glycans in Negative Ion Mode. *Analytical chemistry*, *93*(18), pp.6919-6923.

4) Biwi, J., Clarisse, C., Biot, C., Kozak, R.P., **Madunić, K**., Mortuaire, M., Wuhrer, M., Spencer, D.I.R., Schulz, C., Guerardel, Y. and Lefebvre, T., 2019. OGT Controls the Expression and the Glycosylation of E-cadherin and Affects Glycosphingolipid Structures in Human Colon Cell Lines. *Proteomics*, *19*(21-22), p.1800452.

5) Rojas-Macias, M.A., Mariethoz, J., Andersson, P., Jin, C., Venkatakrishnan, V., Aoki, N.P., Shinmachi, D., Ashwood, C., **Madunić, K**., Zhang, T. and Miller, R.L., 2019. Towards a standardized bioinformatics infrastructure for *N*- and *O*-glycomics. *Nature communications*, *10*(1), pp.1-10.

6) Vreeker, G.C., Nicolardi, S., **Madunić, K**., Kotsias, M., van der Burgt, Y.E. and Wuhrer, M., 2020. *O*- and *N*-glycosylation analysis of cell lines by ultrahigh resolution MALDI-FTICR-MS. *International Journal of Mass Spectrometry*, *448*, p.116267.

7) Crouch, L.I., Liberato, M.V., Urbanowicz, P.A., Baslé, A., Lamb, C.A., Stewart, C.J., Cooke, K., Doona, M., Needham, S., Brady, R.R. and Berrington, J.E., **Madunić**, **K.**, Wuhrer, M., Chater, P., Pearson, J.P., Glowacki, R., Martens, E.C., Zhang, F.,Linhardt, R.J.,Spencer, D.I.R. andBolam, D.N. 2020. Prominent members of the human gut microbiota express endo-acting O-glycanases to initiate mucin breakdown. *Nature communications*, *11*(1), pp.1-13.

8) Pirro, M., Mohammed, Y., de Ru, A.H., Janssen, G., Tjokrodirijo, R.T., **Madunić, K**., Wuhrer, M., van Veelen, P.A. and Hensbergen, P.J., 2021. Oxonium Ion Guided Analysis of Quantitative Proteomics Data Reveals Site-Specific *O*-Glycosylation of Anterior Gradient Protein 2 (AGR2). *International journal of molecular sciences*, *22*(10), p.5369.

9) Kotsias, M., **Madunić, K**., Nicolardi, S., Kozak, R.P., Gardner, R.A., Jansen, B.C., Spencer, D.I. and Wuhrer, M., 2021. A semi-automated, high throughput approach for *O*-glycosylation profiling of in vitro established cancer cell lines by MALDI-FT-ICR MS. *Glycoconjugate Journal*, pp.1-10.

10) Blöchl, C., Wang, D., **Madunić, K**., Lageveen-Kammeijer, G.S.M., Huber, C.G., Wuhrer, M., Zhang, T., 2021. Integrated *N*- and *O*-Glycomics of Acute Myeloid Leukemia (AML) Cell Lines. *Cells* 10, 3058.

11) Rodriguez, E., Boelaars, K., Brown, K., **Madunić, K**., van Ee, T., Dijk, F., Verheij, J., Li, R. J. E., Schetters, S. T. T., Meijer, L. L., Le Large, T. Y. S., Driehuis, E., Clevers, H., Bruijns, S. C. M., O'Toole, T., van Vliet, S. J., Bijlsma, M. F., Wuhrer, M., Kazemier, G., van Kooyk, Y. 2022. Analysis of the glyco-code in pancreatic ductal adenocarcinoma identifies glycan-mediated immune regulatory circuits. *Communications Biology*, *5*(1), 41.

12) Zhang, J., Zhang, Z., Holst, S., Blöchl, C., **Madunić, K**., Wuhrer, M., Ten Dijke, P. and Zhang, T., 2022. "Transforming Growth Factor-β Challenge Alters the *N*-, *O*-, and Glycosphingolipid Glycomes in PaTu-S Pancreatic Adenocarcinoma Cells." *The Journal of Biological Chemistry* 0 (101717): 101717.

13) Wang, D., Zhang, T., **Madunić, K**., de Waard, A.A., Blöchl, C., Mayboroda, O.A., Griffioen, M., et al. 2022. "Glycosphingolipid-Glycan Signatures of Acute Myeloid Leukemia Cell Lines Reflect Hematopoietic Differentiation." *Journal of Proteome Research*, 2022.

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