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Modeling the genetic and mechanical interplay in osteoarthritis: from in vitro systems to mechanistic insights

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List of Publications

R. G. Timmermans, N. G. Bloks, M. H. van den Bosch, R. G. Nelissen, A. B. Blom, I. Meulenbelt, Y. F. Ramos, Mechanical Stress Induces ADAMTS Mediated Cartilage Damage in Human Neo-Cartilage and Activates Non-Canonical Wnt Signaling and Transcription Factor. *Osteoarthritis and Cartilage* 29, S120-S121 (2021).

M. Haroon, H. E. Boers, A. D. Bakker, N. G. C. Bloks, W. M. H. Hoogaars, L. Giordani, R. J. P. Musters, L. Deldicque, K. Koppo, F. Le Grand, J. Klein-Nulend, R. T. Jaspers, Reduced growth rate of aged muscle stem cells is associated with impaired mechanosensitivity. *Aging-Us* 14, 28-53 (2022).

R. G. M. Timmermans, N. G. C. Bloks, M. Tuerlings, M. van Hoolwerff, R. Nelissen, R. J. P. van der Wal, P. M. van der Kraan, A. B. Blom, M. H. J. van den Bosch, Y. F. M. Ramos, I. Meulenbelt, A human in vitro 3D neo-cartilage model to explore the response of OA risk genes to hyper-physiological mechanical stress. *Osteoarthr Cartil Open* 4, 100231 (2022).

M. Haroon, N. G. Bloks, L. Deldicque, K. Koppo, H. Seddiqi, A. D. Bakker, J. Klein-Nulend, R. T. Jaspers, Fluid shear stress-induced mechanotransduction in myoblasts: Does it depend on the glycocalyx? *J Experimental cell research* 417, 113204 (2022).

R. G. Timmermans, A. B. Blom, N. G. Bloks, R. G. Nelissen, E. H. van der Linden, P. M. van der Kraan, I. Meulenbelt, Y. F. Ramos, M. H. van den Bosch, CCN4/WISP1 Promotes Migration of Human Primary Osteoarthritic Chondrocytes. *J Cartilage* 14, 67-75 (2023).

N. G. Bloks, A. Dicks, Z. Harissa, R. G. Nelissen, G. Hajmoussa, Y. F. Ramos, R. C. de Almeida, F. Guilak, I. J. C. E. Meulenbelt, Hyper-physiologic mechanical cues, as an osteoarthritis disease-relevant environmental perturbation, cause a critical shift in set points of methylation at transcriptionally active CpG sites in neo-cartilage organoids. 16, 64 (2024).

N. G. Bloks, Z. Harissa, G. Mazzini, S. S. Adkar, A. R. Dicks, G. Hajmoussa, N. Steward, R. I. Koning, A. Mulder, B. B. de Koning, A Damaging COL6A3 Variant Alters the MIR31HG-Regulated Response of Chondrocytes in Neocartilage Organoids to Hyperphysiologic Mechanical Loading. *Advanced Science* 11, 2400720 (2024).

G. Hajmoussa, R. C. de Almeida, N. Bloks, A. R. Ruiz, M. Bouma, R. Slieker, T. B. Kuipers, R. G. H. H. Nelissen, K. Ito, C. Freund, Y. F. M. Ramos, I. Meulenbelt, The role of DNA methylation in chondrogenesis of human iPSCs as a stable marker of cartilage quality. *Clinical Epigenetics* 16, 141 (2024).

Curriculum Vitae

Niek Bloks was born in 1992 in Sittard, the Netherlands. He completed his secondary education at Connect College in Echt. After obtaining his BSc in Physiotherapy at the Fontys University of Applied Sciences in Eindhoven, he obtained a Research Master Human Movement Sciences cum laude at the Vrije Universiteit Amsterdam.

Niek wrote his master's thesis based on a research internship at the Myology Lab at the VU. This research was aimed at understanding how aging affects the mechanosensitivity and function of muscle stem cells. By using in vitro paradigms of mechanical loading, he investigated the effect of mechanical stimuli on (aged) muscle stem cells.

In 2019, Niek started his doctoral research within the department of Biomedical Data Sciences, section Molecular Epidemiology at the LUMC under the supervision of Professor Ingrid Meulenbelt. This research project was a collaboration with the lab of Farshid Guilak at Washington University, St. Louis. He combined experimental work with bioinformatics to gain insight into the regulation of gene expression within cartilage, and the interaction between genetic variation and mechanical loading. With this, he has contributed in recent years to a better understanding of the molecular mechanisms involved in osteoarthritis. For this work, he received the Young Investigator Award (2022) from the OARSI.

During his doctoral research, Niek presented his work at national and international conferences, including the Dutch Society for Matrix Biology (NVMB), the annual congress of the Osteoarthritis Research Society International (OARSI) in Berlin, and the annual congress of the Orthopaedic Research Society in Dallas, Texas. For the further development of his doctoral research, Niek received an OARSI Travel Scholarship (2022), as well as a scholarship from the Leiden University Fund to carry out part of his research in the Guilak Lab in St. Louis, under the guidance of Professor Farshid Guilak.

Since completing his doctoral research, Niek has worked as a Senior Data Scientist and Machine Learning Engineer, where he specializes in building GenAI and data solutions in various industries. The knowledge and technical skills he acquired during his MSc and PhD, in which he performed many complex data analysis, form the basis for this.