# Breathing in thin air: structure, function and therapeutic opportunities of bd type oxidases

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# Curriculum vitae

Tijn van der Velden was born in Zoetermeer, The Netherlands, on January the 31st 1997. In 2014 he finished his higher secondary education at the Erasmus College in Zoetermeer, raising his interest in chemistry and biology. That same year he started the bachelor's program Chemistry at the Leiden University of Applied Sciences, where he gained interest in how the simple molecules found in pharmaceuticals are able to affect the complex human physiology. To better understand the development of pharmaceuticals and their mechanism of action he moved to Leiden university to start the bachelor program Biopharmaceutical sciences in 2015. In 2018 he completed the program, where he wrote his bachelor thesis at the Leiden Academic Centre of Drug Research (LACDR) in the group of Prof. Dr. Joke Bouwstra on the effect of the ceramide lipid chain length on phase separation in the skin lipid matrix. This same year he started as an analyst next generation sequencing at the company Baseclear, gaining industry experience and broadening his research skills. In 2019, Tijn moved back to Leiden university to start the master's program Biopharmaceutical sciences, deepening his knowledge in pharmaceutical research and science commercialization. He completed the program (cum laude) with a double specialization in Biotherapeutics, and Business studies. Tijn performed internships in the group of Prof. Dr. Joke Bouwstra (LACDR), Dr. Thomas Sharp (LUMC), and the organ-on-a-chip company MIMETAS. During these research internships he studied adjuvant incorporation into hybrid nanoparticle vaccines, and pentraxin-mediated complement activation on lipid cell mimetics. At MIMETAS, he learned how to convey scientific insights from organ-on-a-chip technology to a broader audience by the development of application notes, webinars, e-books and an online conference. After his Masters, Tijn moved to the group of Prof. Dr. Lars Jeuken for his PhD, the results of which are presented in this thesis. During his PhD, Tijn presented his work at several national and international conferences including Metals in biology 2022, France (Travel grant and poster prize), Surface modification for chemical and biochemical sensing, Poland (Poster prize), European Bioenergetics conference, Austria (Travel grant), circuits of life, UK, and the Kroese Duijster Symposium (Poster award). In addition to his research, he completed courses in project management, scientific writing, presentation skills and pharmaceutical CMC.

# List of publications

**T.T. van der Velden**, A. Halimi, J. pols, W.S. Lam, S. M Hacker, L.J.C. Jeuken, (2026) *Discovery of a novel chemotype targeting Mycobacterium tuberculosis cytochrome bd through rapid screening and structural elucidation.* (Submitted)

**T.T. van der Velden**, K. Kayastha, F. pelser, S. Brünle, L.J.C. Jeuken, (2026) *Visualizing the mechanism of quinol oxidation and inhibition of a bd-type oxidase using cryo-EM.* Science Advances, DOI:10.1126/sciadv.aec9946

**T.T. van der Velden**, K. Kayastha, C.Y.J. Waterham, S. Brünle, L.J.C. Jeuken, (2025) *Menaquinone-specific turnover by Mycobacterium tuberculosis cytochrome bd is redox regulated by the Q-loop disulfide bond.* Journal of Biological Chemistry. DOI: 10.1016/j.jbc.2024.108094

B.R. Streather, T.A. Eastwood, K. Baker, M. Liang, A.E. Bailie, **T.T. van der Velden**, L.J.C. Jeuken, S.W. Botchway, L. Wang, D.P. Mulvihill, (2026) *Peptide-Induced Formation of Extracellular Vesicles that are Distinct From Endogenous E. coli OMVs, and Provide an Enhanced Platform for Protein Production and Purification.* (in review)

D.P. Noone, M.M.E. Isendoorn, S.M.W.R. Hamers, M.E. Keizer, J. Wulffelé, **T.T. van der Velden**, D.J. Dijkstra, L.A. Trouw, D.V. Filippov, & T.H. Sharp, (2024) *Structural basis for surface activation of the classical complement cascade by the short pentraxin C-reactive protein.* PNAS DOI: 10.1073/pnas.2404542121.

D.P. Noone, **T.T. van der Velden**, T. Sharp, (2021) *Cryo-Electron Microscopy and Biochemical Analysis Offer Insights Into the Effects of Acidic pH, Such as Occur During Acidosis, on the Complement Binding Properties of C-Reactive Protein*. Frontiers in Immunology. DOI: 10.3389/fimmu.2021.757633

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First, I want to thank my promotor, **Lars**. The relationship between promotor and PhD candidate is a precarious one. Receiving critique can easily be mistaken for being personal. In the end, all the critique I received was to improve our output and challenged me to go beyond what I thought to be sufficient. I also want to thank you for giving me the freedom to explore my own ideas. Looking at other research groups, this freedom is not a given and has very much molded my experience. You allowed me to explore cryo-EM, making mistakes and eventually reaching successes that now fill this thesis. I also want to thank my second promotor, **Meindert**, who guarded the progress of my thesis during our yearly meetings.

This brings me to **Steffen**, **Kanwal** and **Willem**. **Willem**, thank you for teaching me cryo-EM how to use the Glacios. Being able to use this microscope boosted my output and allowed me to reach the detail to describe the catalytic cycle discussed in chapter 3. Also, I really enjoyed our conversations at NeCEN about strategies to capture specific enzyme states. It was a joy to talk with someone to bounce my ideas off and equally receive ideas back. Then, **Kanwal**, I want to thank you introducing me to cryo-EM and helping me find my way around data processing, interpretation and model building. Our collaboration has been fruitful and resulted in two manuscripts presented in this thesis. **Steffen**, I want to thank you for helping me get into structural biology and taking the time to help write my first structural chapters.

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