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Natural product antibiotics: synthesis and next generation analogues

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Curriculum vitae

Vladyslav Lysenko was born in August 1999 in Poltava, Ukraine. From an early age, he showed a keen interest in the science, particularly chemistry, and participated in various chemistry competitions during his high school years. In 2016, Vlad enrolled in a Bachelor's degree program in Chemistry at the Institute of High Technology at Taras Shevchenko National University of Kyiv. Shortly after beginning his undergraduate studies, he joined Curpys Chemicals as an intern, where he learnt practical basics of organic chemistry. In 2017, he transitioned to a research assistant role at Enamine Ltd. Over the course of four years with the company, he worked on multiple commercial and scientific projects and received professional training as an organic chemist. Alongside his job, he worked on his Bachelor's thesis project titled "Preparative Approaches to the Synthesis of Heterotwistanes and Their Analogues," under the supervision of Professors Sergey Ryabuchin and Dmitriy Volochnuk. In 2020, he graduated with honors and enrolled in a Master's program at the same faculty.

During the second year of his Master's program, Vlad moved to the Netherlands, where he joined Professor Nathaniel Martin's group at Leiden University as part of the Erasmus exchange program. There, he was introduced to the field of antimicrobials with projects focused on designing rifampicin and polymyxin analogues with enhanced properties. Based on this research, Vlad defended his Master's thesis with honors, and in late 2022, he began his PhD journey in the same group.

Vlad's PhD work focused on the discovery, synthesis, and modification of natural product antibiotics. While his primary efforts were directed towards working with paenilipoheptins, evybactins, and rifampicins, as detailed in his thesis, he also contributed to various other projects within the group, drawing on his industry experience to advance the improved synthesis of a variety of antimicrobials, including modified bacitracins, polymyxins, and vancomycins.

Currently, he is continuing his research as a Postdoctoral Fellow in Martin's group at Leiden University, furthering his work on the discovery and development of next-generation antibiotics.

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Publications

From this thesis:

Lysenko, V.*; Son, S.*; Theriault, M. E.; Slingerland, C. J.; Hauk, G.; Cleenewerk, L.; Speer, A.; Berger, J. M.; Lewis, K.; Martin, N. I. Total Synthesis and Structural Reassignment of the Antitubercular Natural Product Evybactin. *Chem. Eur. J.* **2025**, *31* (1), e202403767.

Machushynets, N. V.*; Lysenko, V.*; Du, C.; Slingerland, C. J.; Elsayed, S. S.; Liles, M. R.; Martin, N. I.; van Wezel, G. P. Exploring the chemical space of *Paenibacillus* NRPs: discovery of paenilipoheptin B. *Org. Lett.* **2025**, *27* (12), 2821–2825.

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Other publications:

Slingerland, C. J.; Lysenko, V.; Chaudhuri, S.; Wesseling, C. M. J.; Barnes, D.; Masereeuw, R.; Martin, N. I. Semisynthetic Polymyxins with Potent Antibacterial Activity and Reduced Kidney Cell Toxicity. *RSC Med. Chem.* **2023**, *14* (11), 2417–2425.

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Cleenewerk, L.; Otto, A.; Wouters, W.; Willemse, J.; Gao, M.; Lysenko, V.; Punt, J. M.; van der Stelt, M.; Martin, N. I.; van Ulsen, P.; Luirink, J. An Rcs Stress-Based High-Throughput Screen Reveals Novel Gyrase Inhibitors as Indirect Inducers of Cell Envelope Stress in Gram-Negative Bacteria. *ACS Infect. Dis.* **2025**, *11* (9), 2577–2592.

Machushynets, N.V.; Elsayed, S.S.; Du, C.; Lysenko, V.; de la Cruz, M., Sanchez, P.; Genilloud, O.; Martin, N.I.; Liles, M.R.; van Wezel, G.P. Paenitracins, a Novel Family of Bacitracin-type Nonribosomal Peptide Antibiotics Produced by Plant-associated *Paenibacillus* Species. *mSystems* **2026**, *11* (3).

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Patents

Netherlands Priority Patent Application Number: 4000361. Title: Antibacterial compounds. Inventors: Martin N. I.; Lysenko V.; Sterk F. A. C. Priority date: November 13, 2025.

U.S. Provisional Patent Application Number: 63/916,641. Title: Evybactin analogues bearing N-terminal acyl groups with potent activity against *M. tuberculosis*. Inventors: Martin N. I.; Lysenko V.; Sterk F. A. C.; Lewis K. Priority date: November 13, 2025.