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Welcome to the 23nd edition of the Merck Young Chemists' Symposium (MYCS), formerly also known as SAYCS and MEYCS. This international conference is organized by the Young Group of Società Chimica Italiana (SCI Giovani) and the National Interuniversity Consortium of Materials Science and Technology (INSTM) with the financial support from Merck and several other sponsors, that you will meet during the conference.

The symposium covers all the disciplines of Chemistry, aiming to connect young researchers, inspire new ideas, and potentially trigger new collaborations. With the contributions of our five invited plenary speakers, and the international environment guaranteed by the presence of people coming from different countries, we truly hope that you will all enjoy this great event with us. We have worked hard to organize this meeting with 230 participants, prioritizing high-level scientific topics and other themes of crucial importance in our modern society. Thank you for the great trust shown towards SCI Giovani, Merck and all our supporters. Enjoy the conference and have a nice stay with us!

Marta Da Pian

SCI Giovani Coordinator

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I. Romeo
M. Sambucci
C. Sergi
S. Tortorella
F. Vincenti

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Optimization of enzymatic stability of the antimicrobial peptide calcitermin

Silvia Leveraro,[a] Denise Bellotti,[a] and Maurizio Remelli[a]

[a] *Dipartimento di Scienze Chimiche, Farmaceutiche e Agrarie, Università degli Studi di Ferrara, via Luigi Borsari 46, 44121 Ferrara, Italy.*
E-mail: silvia.leveraro@unife.it

Antibiotic resistance is one of the major threats to global health in the 21st century. Antibiotics are powerful life-saving drugs, but over time they are losing their effectiveness due to the emerging growth of antimicrobial resistance (AMR). Although the design of new drugs is necessary to slow-down the spread of AMR, a slow-down is instead registered in the development of new antibiotics, due to a decrease in investments. Among several approaches, the use of antimicrobial peptides (AMPs) is one of the most promising. Also known as host defense peptides, they are a wide group of natural peptides playing a critical role in the innate immune system of various organisms. They are characterized by a broad spectrum of activity and scarce attitude to induce antimicrobial resistance, since they can act through different mechanisms of action. However, they present some drawbacks; above all, they are often metabolically unstable, since they are subject to degradation by both human and pathogenic proteolytic enzymes. In fact, many endo- and exo- peptidases act to transform high molecular weight peptides into shorter oligopeptides, thus making them inactive. This translates in short half-lives and limited bioavailability.

Among several AMPs, we are interested in calcitermin [1], a human 15 amino-acids antimicrobial peptide: VAIALKAAHYHTHKE. Calcitermin presents an effective metal binding domain encompassing three alternated histidine residues (His 9, His 11 and His 13) in addition to its free terminal amino and carboxyl groups. However, it presents a rather low proteolytic stability with a half-life of 18 min. In the last few years, our research group synthesized and studied many derivatives of calcitermin, aimed at improving its biologic activity through a longer stability towards proteolytic enzymes. We introduced some substitutions such as Ala-to-Ser [2], Ala-to-His or Ala-to-Arg. We also studied terminally protected derivatives [3] and mutants in which some amino acids are substituted with their D-isomers. Some of these modifications have been proven excellent strategies for increasing the resistance to degradation.

[1] D. Bellotti, M. Toniolo, D. Dudek, A. Mikolajczyk, R. Guerrini, A. Matera-Witkiewicz, M. Remelli, M. Rowinska-Zyrek, Dalton Trans. 2019, 48 (36), 13740-13752.
[2] S. Leveraro, K. Garstka, P. Sliwka, T. Janek, M. Rowinska-Zyrek, M. Remelli, D. Bellotti, Dalton Transaction 2024.
[3] M. D'Accolti, D. Bellotti, E. Dzien, C. Leonetti, S. Leveraro, V. Albanese, E. Marzola, R. Guerrini, E. Caselli, M. Rowinska-Zyrek, M. Remelli, Sci Rep 2023, 13, 18228.

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