June 3rd, 2024
16:00

Prof. Elżbieta Gumienna-Kontecka
University of Wroclaw, Wroclaw, Poland

BACKGROUND

Elżbieta Gumienna-Kontecka (PhD, DSc) is a Full Professor of Chemistry at the Univ. Wroclaw, Poland, where she obtained her PhD in 2002. followed by a postdoctoral fellowship at the University of L. Pasteur in Strasbourg, (Marie Skłodowska-Curie fellowship). At present, she is the head of the Research Group of Biological Inorganic Chemistry and the head of the Department of Biological and Medicinal Chemistry at the Faculty of Chemistry of the Univ. Wroclaw.

Her research interests focus on the structure and thermodynamics of bioinorganic systems, research on natural metallophores, and development of their biomimetics as structural probes of iron and other metals assimilation processes by microorganisms, aiming the design of novel diagnostic tools and therapeutics against antibiotic resistant microbes.

She is a co-author of 90 scientific publications, and an elected member of the Society of Biological Inorg. Chem. Council 2021-2025. In 2022 she was awarded the prize of the Minister of Education and Science of Poland.

SideroArt: How to Exploit Artificial Siderophores for Molecular Imaging Applications

Abstract

Under iron-deficient conditions most aerobic microorganisms secret low molecular-weight chelating compounds – siderophores, which actively transport ferric ions into the cells via specific transporters in the microbial membranes. The difficulties in synthesis of structurally complicated natural siderophores has directed us towards biomimetic chemistry, aiming at mimicking or reproducing the function of the natural product rather than its detailed structure. This approach allowed us to diversify the arsenal of biologically active siderophore-type molecules, introduce additional desired chemical and/or physical properties, and provide means to identify general motifs governing an interplay between structure and function in biological activity. Taking into account that siderophores are absent in the host cells, they are tempting targets for microbial imaging, e.g. with ^{68}Ga or ^{89}Zr using positron emission tomography (PET). ^{68}Ga-ferrioxamine E and its close biomimetic analogues were shown as the most promising for possible applications in PET imaging of *S. aureus* and *A. fumigatus* species. Currently we are working on other bacterial (*P. aeruginosa*) and fungal species, to better understand the in vivo speciation and differences in the biological recognition and uptake of these artificial siderophores. Overall, mimics of siderophores may hold potential as inert and stable carriers for Fe(III), Ga(III) and Zr(IV) ions for diagnostic medical applications. They could also allow identifying critical microbial compartments in which siderophores accumulate and thus illuminate key targets for specific drugs against microbial diseases.

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