Expanding the Scope of Antimicrobial Peptides: Anti-infectives and Beyond

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Abstract (300 word limit)

The emergence and spread of multi-drug (MRD) resistant bacteria have initiated intense search for new antibiotics. Infections caused by Gram negative bacteria are even more difficult to remove due to low efficacy of several frontline existing antibiotics (vancomycin, novobiocin etc). The outer membrane-LPS protects Gram negative bacteria that limits entry of antibiotics to the cellular targets. Host defense antimicrobial peptides (AMPs) demonstrate high potential in developing anti-infective molecules against MDR pathogens. Apart from killing pathogens, AMPs are also known to be important in other health problems e.g. inflammation, wound healing and septic shock. We are investigating molecular mechanism of outer membrane-LPS disruption of potent and clinically relevant AMPs. In this talk, I will present: (i) NMR structure and interactions of thanatin, an insect derived cell agglutinating AMP, (ii) discovery of novel AMPs of human furin prodomain and (iii) preclinical development of de-novo designed b-boomerang cyclic peptide. In addition, we propose an expanding scope of multifunctional AMPs in inhibiting protein amyloids.

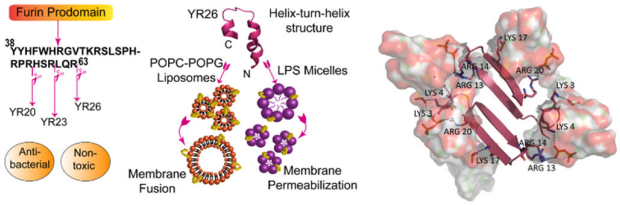


Figure 1: Discovery of novel AMPs from Furin (left and middle panels); bacterial cell agglutination by insect AMP thanatin (right panel).

Recent Publications (minimum 5)

1. Rachita Dash and Surajit Bhattacharjya. (2021). Thanatin: an emerging host defense peptide with multiple mode of actions. Int J Mol Sci. 22(4):1522
2. Surajit Bhattacharjya & Suzana Straus. (2020). Design, engineering and discovery of novel α-helical and β-boomerang antimicrobial peptides against drug resistant bacteria. Int J Mol Sci. 21(16):5773
3. Sheetal Sinha, Munesh Kumar Harioudh, Rikeshwer P. Dewangan, Wun Jern Ng, Jimut Kanti Ghosh and Surajit Bhattacharjya^. (2018). Cell selective pore forming antimicrobial peptides of the prodomain of human furin: a conserved aromatic/cationic sequence mapping, membrane disruption and atomic-resolution structure and dynamics. ACS-Omega, 3, 14650-14664
4. Sheetal Sinha, Liangzhen Zheng, Yuguang Mu, Wun Jern Ng and Surajit Bhattacharjya^. (2017). Structure and interactions of a host defense antimicrobial peptide thanatin in lipopolysaccharide micelle reveal mechanism of bacterial cell agglutination Scientific Reports, 7(1):17795. doi: 10.1038/s41598-017-18102-6
5. Areetha D'Souza, Xiangyang Wu, Edwin Kok Lee Yeow and Surajit Bhattacharjya^. (2017). Designed heme-cage beta-sheet mini-proteins. Angew. Chem. Int. Ed. 56, 5904-5908



Prof Surajit Bhattacharyya has been an Associate Professor, at the School of Biological Sciences, Nanyang Technological University. Prof. Bhattacharyya received his PhD degree from Indian Institute of Science, Bangalore, India and carried out Post-doctoral research in Biotechnology Research Institute, Montreal, Canada. His research interests include Structural and Chemical Biology using NMR spectroscopy as the primary technique. His group has done significant research in the area of antimicrobial peptides and cell adhesion proteins, integrins and more recently de novo designing of heme b-sheet proteins and published over 80 top quality international journal papers. Prof Bhattacharyya is a Fellow of the Royal Society of Chemistry and an Overseas Fellow of the Royal Society of Medicine.

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