

Ionic liquids as potential anti bacterial agents

Field: Biotechnology/Green Chemistry

Laboratory: Applied and Environmental Mycology

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Ionic liquids are, by definition, salts that are liquid at, or near, room temperature, completely composed of ions.¹ They can be, by design, chemically and thermally stable, recyclable, and with tunable physical and chemical properties. Integration with their outstanding solvation ability opens doors for numerous industrial and biotechnological applications. In fact, ionic liquids toxicity to distinct organism (from bacteria and fungi to human cell lines) may suggest their exploitation as active pharmaceutical ingredients (APIs) (for e.g. see ²). Interestingly, Gram(-) and Gram(+) bacteria have different susceptibility towards these liquid salts. The latter, with a thicker peptidoglycan* layer, are more susceptible.

Our vision is to identify ionic liquids with bactericidal properties. Project execution will produce fundamental insights to their mechanism of action, especially towards Gram(+) bacteria, however very distinct sources of peptidoglycan will be covered (isolated from both G(+) and G(-) model bacteria). Very different techniques will be used, e.g. FPLC, UPLC, FTIR and microscopy.

*Bacterial peptidoglycan is formed by linear chains of two amino sugars, N-acetylglucosamine and N-acetylmuramic acid. The latter is attached to a short (4- to 5-residue) amino acid chain, normally containing D-alanine, D-glutamic acid, and mesodiaminopimelic acid. The thickness of this layer in Gram(+) and Gram(-) is 20-80 nm and 7-8 nm, respectively.

(An adequate knowledge of English is required for this project)

References:

- 1 M. Deetlefs and K. R. Seddon, *Chimica Oggi-Chemistry Today*, 2006, **24**, 16-+.
- 2 M. Petkovic, J. Ferguson, A. Bohn, J. R. Trindade, I. Martins, M. Carvalho, M. C. Leitão, C. Rodrigues, H. Garcia, R. Ferreira, K. R. Seddon, L. P. N. Rebelo and C. Silva Pereira, *Green Chem.*, 2009, DOI: 10.1039/B823225C.