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"Gheorghe Asachi" Technical University of Iasi, Romania

BIOACTIVE VOLATILE ORGANIC COMPOUNDS FROM ANTARCTIC SPONGES BACTERIA

M.C. Papaleo[1], D. De Pascale[2], M.L. Tutino[3], I. Maida[1], E. Perrin[1], M. Fondi[1], R. Fani[1]

[1]Department of Evolutionary Biology, University of Florence; [2]Department of Protein Biochemistry, University Federico II Naples, Italy; [3]Department of Organic Chemistry and Biochemistry, University Federico II Naples, Italy

Abstract

Antarctic bacteria represent a reservoir of unsampled biodiversity. These, in turn, might be correlated at least in some cases with synthesis of unusual bioactive molecules, such as antibiotics. This is particularly true for bacteria isolated from Antarctic sponges. The aim of this work was to check bacterial communities isolated from three Antarctic sponges (*H. verrucosa, A. joubini* and *L. nobilis*) for their ability to produce **new natural drugs** that could be exploited **in the control of infections in Cystic Fibrosis (CF) patients by** significant pathogens typically resistant to a plethora of antibiotics. Hence, 132 bacterial strains affiliated to different genera (e.g., *Pseudoalteromonas, Arthrobacter* and *Psychrobacter*) were tested (through the cross-streaking method) for their ability to inhibit the growth of a panel of more than 70 opportunistic CF pathogens. Data obtained clearly revealed that most of these sponge-associated Antarctic bacteria, were able to completely inhibit the growth of *Burkholderia cepacia* complex (Bcc) strains, representing one of the most important pathogens in CF. On the other hand, the same Antarctic strains did not have any effect on the growth of other pathogenic bacteria, such as *P. aeruginosa, S. aureus and S. maltophilia*, strongly suggesting that the inhibition is specific for Bcc bacteria. Overall, the most active Antarctic bacteria cross-streak experiments also revealed that the antimicrobial compounds are very likely VOCs, a finding that was further confirmed by the SPME-GC-MS technique within the mass interval of 40-450Da, which revealed the production of a large set of VOCs by a representative set of Antarctic bacteria. The obtained volatile profile of the analyzed samples was characterized by **128 different compounds**. Principal component analysis (PCA) and successive cluster discriminant analysis were applied to evaluate the relationships among the VOCs with the aim of classifying the microorganisms by their volatile profile. According to the hierarchical cluster analysis and the biological results, the Antarctic bacteria are divided into three different groups on the basis of their ability to inhibit the growth of Bcc strains: highly and intermediate active bacteria and bacteria exhibiting a low antimicrobial activity. Moreover, the synthesis of these VOCs appeared to be related neither to the presence of *pks* genes, nor the presence of plasmid molecules suggesting that the antimicrobial molecule might be synthesized via an unknown and, possibly different and unusual pathway. These data highlight the potentiality of Antarctic bacteria as novel sources of antibacterial substances to face Bcc infections in CF patients.