

ASTROBIOLOGY: SEARCH FOR BIOTIC α -AMINOISOBUTYRIC ACID (AIB) AND ISOVALINE (IVA) ENANTIOMERS. H. Brückner¹, W. Gams², T. Degenkolb¹ ¹Interdisciplinary Research Centre (IFZ) for BioSystems, Land Use and Nutrition, University of Giessen, 35392 Giessen, Germany, ²Formerly with the Centraalbureau voor Schimmelcultures (CBS), Utrecht, The Netherlands

Introduction: Astrobiology is the study of the living universe, be it here or elsewhere. Life as we know is based predominantly on genetically encoded L-amino acids. However, the corresponding D-amino acids [1] as well as non-proteinogenic amino acids play an important – but frequently underestimated – role in the living world. Among these particular amino acids, α -dialkylated α -amino acids such as Aib and Iva are still considered as being exceedingly rare in the biosphere. We demonstrate that polypeptides rich in Aib as well as D- and/or L-Iva are produced by an abundance of cosmopolitan microfungi. For this group of bioactive peptides the names ‘peptaibols’ or ‘peptaibiotics’ became established [2].

Results: Micromycetous fungi of genera (deposited with CBS) such as *Acemonium*, *Emericellopsis*, *Stilbella*, *Hypocea/Trichoderma*, or *Tolypocladium* were grown on nutrient agar plates. Mycelia were extracted with organic solvents and Aib and D/L-Iva detected by GC-MS using chiral capillary columns. Sequences of isolated peptides were determined by LC-ESI-MS/MS. Typically, the N-terminal acylated, linear peptides are composed of 15–20 amino acids and, besides protein amino acids, are rich in Aib serving as characteristic marker. Many peptides contain D- or L-Iva, and some both enantiomers [3].

Conclusions: Habitats of these fungi are soil, mud, litter, and decaying plant materials, as well as aquatic and marine biotops. Fungal spores are also part of bioaerosols, and airborne fungi are ubiquitous in the earth’s atmosphere. Owing to the general spreading of some of the fungal taxa producing peptaibiotics [4], Aib and Iva can no longer be regarded as exceedingly rare in the biosphere or of exclusively abiotic origin. Consequently, contamination of materials of definitely extraterrestrial origin has to be taken into account and the possible relevance of biotic Aib and Iva in the expanding field of astrobiology has to be recognized.

References: [1] Konno R. et al. (Eds.). D-Amino Acids – A New Frontier in Amino Acids and Protein Research. Nova Science, New York, 2007. [2] Toniolo C. and Brückner H. (Eds.). Peptaibiotics – Fungal Peptides Containing α -Dialkyl α -Amino Acids. Verlag Helvetica Chimica Acta, Zürich, 2009. [3] Brückner H., Becker D., Gams W., Degenkolb T. (2009). *Chemistry and Biodiversity* 6:38-56. [4] Degenkolb T. and Brückner H. (2008). *Chemistry and Biodiversity* 5:1817-1843.