Hypopulvin, novel peptaibiotics from the polyporicolous fungus Hypocrea pulvinata, are produced during infection of its natural hosts - DTU Orbit (18/12/2018)

In order to investigate the significance of antibiotics for the producing organism(s) in the natural habitat, we screened specimens of the polyporicolous fungus Hypocrea pulvinata growing on its natural hosts Piptoporus betulinus and Fomitopsis pinicola. Results showed that a particular group of nonribosomally biosynthesised antibiotic polypeptides, the peptaibiotics, which contain the nonproteinogenic marker amino acid α-aminoisobutyric acid (Aib), was produced in the natural habitat by the fungicolous producer and, consequently, released into the host. Using liquid chromatography coupled to electrospray high-resolution mass spectrometry we detected especially 19-, but also 11-, 18-, and 20-residue peptaibiotics in the five infected specimens analysed. Structures of peptaibiotics found were confirmed by analysing the peptaibiome of pure agar cultures obtained by single-ascospore isolation from the specimens. The 19-residue peptaibols were determined as deletion sequences of the trichosporins B lacking the Aib residue in position 6. Notably, 26 of the 28 peptaibiotics sequenced were novel; therefore the name 'hypopulvins' was introduced. Considering not only the ubiquity of both the two host species but also the highly specific association between H. pulvinata and P. betulinus/F. pinicola, and the abundance of this fungicolous species in north temperate regions of the world, a decisive role for the peptaibiotics detected in this study is predicted, which may act as mediators of the complex interactions between the basidiomycetous host and its fungicolous ascomycete ‘partner’. Structural analogies of the hypopulvins, particularly with other 18-, 19-, and 20-residue peptaibiotics, suggest that the hypopulvins are forming transmembrane ion channels and could thus support the hypothesis of a parasitic lifestyle of the fungicolous producer.