PB 7 - Chitinolytic Bacteria from the Soil of a Chitosan-Producing Company

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Chitin, the structural component of insect and crab skeletons as well as of fungal cell walls, is one of the most abundant biomolecules on earth and, thus, one of the richest renewable resources worldwide. Chitin can be partially or fully de-N-acetylated to yield chitosans, the only natural polycationic polymers with supreme and versatile material properties and highly interesting biological activities. Chitin and chitosans can also be partially or fully depolymerised to yield N-acetylglucosamine and glucosamine oligomers or monomers, respectively. While the monomers are used successfully to treat arthritis, the medical potential of the oligomers is highly promising, but still requires ex-tensive research. Indeed, the biological activities exhibited by chitosans - e.g. in agriculture or in medicine - are believed to be mediated largely by oligomers. Clearly, the po-tential of chitin and chitosan applications is far from being fully exploited today.

Partially acetylated chitosan oligomers can be generated chemically by partial hydrolys-is of polymers, or they can be synthesised from the monomers. Alternatively, oligomers can be generated using chitosan degrading enzymes. While chemical hydrolysis yields random oligomers, synthesis can provide oligomers with fully known architecture but, so far, in very limited amounts only. While enzymic hydrolysis is not likely to yield pure oligomers, defined mixtures of specific oligomers might be obtained depending on the substrate specificites of the enzymes used. While the enzymic properties of a sizeable number of chitinases from both plant and mi-crobial origin have been characterised in molecular detail, rather little is known on chi-tin de-N-acetylases and on chitosanases. The strategic basis for enzymic exploitation of the wast potential of chitin/chitosan modifying enzymes is still rather thin. Therefore, we have started a project to isolate micro-organisms with chitin and chitosan modifying enzymes from different soil samples obtained at the plant of Mahtani Chitosan in Guja-rat where shrimp shells from all along the Western coast of India have been processed on an increasingly large scale for the past ten years. In parallel to isolating bacteria and fungi from the soil samples, we have also started a metagenomic approach to identify relevant, novel microbial genes and to characterise their products. Metagenomics - by analysing DNA directly isolated from soil samples without the need of first cultivating the respective micro-organisms - will allow us to tap not only the potential of the few culturable micro-organisms, but also that of the overwhelming majority of non-culturable microbes.