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EXOPOLYSACCHARIDES FROM YEASTS AND (YEAST-LIKE) FUNGI

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Several basidiomycetous and ascomycetous yeasts and fungi are known to produce (capsular) extracellular polysaccharides (EPS). Most of these EPS contain D-mannose, either alone or in combination with other sugars or phosphate. A large chemical and structural variability is found between yeast and fungal species and even among different strains. The types of polymers which are synthesized can be chemically characterized as mannans, glucans phosphomannans, galactomannans, glucomannans and glucuronoxylomannans. Despite these chemical differences, almost all of these fungal exopolysaccharides display some sort of biological activity, either malign or beneficial. The latter ones find already application in chemistry, pharmacy, cosmetics or as nutraceutical or probiotic. Furthermore, some yeast exopolysaccharides, such as pullulan, exhibit specific physicochemical and rheological properties, making them useful in a wide range of technical applications. Other fungal EPS, such as scleroglucan (produced by *Sclerotium glucanicum.*) find use in the oil industry, where it facilitates crude oil recovery, and as a matrix for drug delivery systems. Schizophyllan is produced by *Schizophyllum commune* and is in use as an immunostimulatory anti-malignant tumor agent. The biosynthesis, genetical and bioprocesstechnological aspects related to fungal EPS formation have so far not been sufficiently studied, so as to allow for improved high yielding fermentation and recovery processes. First, a survey is given of the characteristics, the production and the application potential of currently well studied yeast and fungal extracellular polysaccharides. Own research data will then focus on the exopolysaccharides produced by *Tremella mesenterica* NRRL-Y-6158, named tremellan. It is composed of an α1,3-D-mannan backbone, to which β1,2-side chains are attached, consisting of D-xylose and D-glucuronic acid. Physicochemical fermentation parameters were optimised to produce high tremellan levels. Implementation of fed-batch and cyclic fed-batch fermentation with extra glucose feed increased the EPS-yield further to 10 g/l. The *Tremella*-polymer displays a pseudoplastic behaviour, but its viscosity is – surprisingly – drastically lowered by the presence of starch. It is thixotropic with a very fast recovery, a characteristic which is also delayed by starch. Tremellan displays some useful technical properties, such as thickening and high waterholding capacity as well as film forming ability, which might result in its use as a coating material for pharmaceutical and food applications. Tremellan was also shown to stimulate the immune system, using an *in vitro* neutrophil cell assay system.

These examples indicate the great potential of yeasts and fungi to produce a wide variety of exopolysaccharides. This is a domain of industrial biotechnology, where so far only the tip of the iceberg has been explored.

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