

CHALLENGES TO THE BIOTECHNOLOGICAL TREATMENT OF CHITIN AND CHITOSAN

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ABSTRACT

In the distant past chitin and chitosan were considered to be primary products derived, principally, from crustacean processing by-products. They had many commercial applications and chitosan, in particular, could be readily modified by chemical means to increase the number of applications. It can be fairly said that all aspects of chitin and chitosan production and modification were chemically driven. The lack of specificity and depolymerisation caused by acid and alkali treatments were well recognised and recent work has been directed to alleviating these problems.

The use of microbial and enzymic technology to produce and modify chitin and chitosan as industrial processes has developed from studies of the biology of chitin turn-over in nature. Chitinases, chitosanases and chitin deacetylases have been isolated and characterised from a variety of sources. In addition, other enzymes have been identified as responsible for the digestion of chitin in marine creatures and, further, non-specific enzymes capable of hydrolysing chitin and chitosan have been identified.

It has been accepted that the use of enzymes in chitin and chitosan modification offers greater specificity and control of the final products compared with chemically-based processes. However, the application of these biotechnologically-based processes is limited although fermentations and enzyme processes are well-established in other industrial sectors.

What are the challenges? The following issues must be addressed:

- Availability of active enzymes at reasonable cost
- Presentation of chitin and chitosan in forms suitable for treatment
- Optimisation of fermentation systems - possibly as solid-state or semi-solid state formats
- Definition of the products of biotechnological processes
- True economic analysis of the cost of biotechnological and chemical processing

It is possible that biotechnology products will occupy niche roles within the wide spectrum of chitin/chitosan technology based on the specific activity that biological agents offer until more general approaches are developed.