

CHITIN IN BIOGEOCHEMICAL CYCLES

Organizers;

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Chitin is a high polymer of N-acetylglucosamine, the synthesis and degradation of which play a significant role in the biogeochemical cycles of carbon and nitrogen, owing to the high amount of chitin produced in the biosphere, just after cellulose. Chitin indeed is produced not only by most invertebrate animals and by fungi, but also by diatoms ("chitan" according to Smucker) and other lower plants. Chitin primary production appears as a significant chitin source in pelagic systems. In marine and freshwater ecosystems, crustaceans (either planktonic or benthic) are the dominant chitin producers, while bryozoans, mollusks and insects are also important.

The recycling of C and N from chitin requires first steps of biodegradation performed by chitinases, i.e. poly (1,4- β -2-acetamido-2-deoxy-D-glucoside) glycanohydrolases (Enzyme Nomenclature : 3.2.1.14), highly specific of β -1,4 linkages between acetylglucosamine units. Chitinases are secreted in digestive tracts of most animals, allowing more or less complete hydrolysis of prey chitin. In marine and freshwater sediments, extracellular chitinases are produced by bacteria, in aerobic as well as anaerobic conditions. In estuaries, chitin deacetylation by bacteria occurs, leading to chitosan accumulation. In soils, exochitinases are produced by bacteria and molds, but plant chitinases play an important role in hydrolysing chitin of pathogen organisms. All these enzymatic reactions are highly efficient and explain the low amount of residual chitin in soils and sediments, in spite of high chitin production in the biosphere.

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