

PB 5 - In Vivo Studies on the Biodegradation Processes of Chitin and Chitosan

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Chitin exists in the exoskeleton of crustaceans, such as insects, crabs and shrimps and the cell wall of the bacillus. It is known that chitosan, obtained by the alkaline deacetylation of chitin in industrial processing, possesses excellent biological properties of accelerating wound healing and enhancing osteogenesis. Furthermore, the biodegradation of chitosan through hydrolytic enzymes (mainly lysozyme) can release amino-sugars that are incorporated into glycosaminoglycans and glycoproteins. The present study was designed to investigate histochemically the biodegradation processes of chitin and chitosan implanted in the rat alveolar bone. Lysozyme was immunohistochemically detected by the postembedding immunogold labeling method. The degradation processes were ultrastructurally observed together with the lectin-colloidal gold techniques. The present immunohistochemical study indicated that lysozyme expression was not detected in the DDAC 100 (100% degree of deacetylated chitin) group. Furthermore, the present electron microscopy first and clearly demonstrated that the contour of implanted chitosan was changed in time and that chitosan-like fragments were present in the phagosomes in the DDAC50 and DDAC 100 groups. These findings strongly suggest that phagocytes, such as multinuclear cells, are easily supplied in bone tissue and that the phagocytosis is more effective than enzymatic digestion for chitin and chitosan biodegradation in bone tissue. The 100% degree of deacetylated chitin, chitosan, should be a suitable biomaterial for bone surgery and bone regeneration therapy.