Recent concepts regarding the physical chemistry of chitosan and their applications

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The concept of the scaffold is the most commonly considered for materials used in tissue repair, for which a material must be colonized by living cells, initially or after implantation, to induce a new cellular matrix formation with a cell proliferation and differentiation. This concept is funded on the bio-mimicry.

We recently proposed a new concept based on bio-inspired polymer materials in which the material used must have some parts in common with living tissues and others quite different. This concept funded both on chemical and physical structure criteria is termed the concept of *materials decoys of biological media* [1,2].

On a chemical point of view, as a whole, the structure of a decoy polymer is fully absent in mammal tissues but some stones constituting its primary structure (monomer units, linkages between the residues) are present in extra-cellular matrixes (ECM) although some others must be absent. Then, the conjunction of both unknown and known entities is at the origin of necessarily erroneous biological responses, which can be favorable. Oligomers are particular decoys, and in the case of saccharidic copolymers, they can be assimilated to pseudo growth factors. Thus, we are involved in the use of naturally occurring decoys such as chitosan, but we also contribute to elaborate pseudo growth factors thanks to the total syntheses of oligomers of b1>4linked glucosamine and N-acetyl glucosamine.

On a physical point of view, we must have in mind that ECMs constituting mammal tissues are physical hydrogels corresponding to: multi-layer, multi-membrane or fibrous gels, which some of them are mineralized. These structures have a pore size sufficiently low to preclude any physical transfer of microorganisms such as living cells and bacteria. This is why we have developed a new way to synthesize new physical hydrogels only containing a polymer and water, and then, without any external cross-linking agent. These gels can be directly used, but they are also at the origin of the elaboration of secondary structures such as multi-layer, multi-membrane and fibrous materials. Our work is then focused on the knowledge of the solution properties then, on the understanding of the elaboration of all the physical forms mentioned above [2,3,4]

The last point of our studies corresponds to test our decoy materials in different biological situations corresponding to either *in-vivo* or *in-vitro* experiments with epithelial or endothelial cells[1].

References

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