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Biomaterials Solutions to Medical Problems: A Technical Review

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Abstract : This technical paper was written in view of focusing the biomaterials and its various applications in modern industries. Author tires to elaborate not only the medical, infect plenty of application in other industries. The scope of the research area covers the wide range of physical, biological and chemical sciences that underpin the design of biomaterials and the clinical disciplines in which they are used. A biomaterial is now defined as a substance that has been engineered to take a form which, alone or as part of a complex system, is used to direct, by control of interactions with components of living systems, the course of any therapeutic or diagnostic procedure. Biomaterials are invariably in contact with living tissues. Thus, interactions between the surface of a synthetic material and biological environment must be well understood. This paper reviews the benefits and challenges associated with surface modification of the metals in biomedical applications. The paper also elaborates how the surface characteristics of metallic biomaterials, such as surface chemistry, topography, surface charge, and wettability, influence the protein adsorption and subsequent cell behavior in terms of adhesion, proliferation, and differentiation at the biomaterial–tissue interface. The chapter also highlights various techniques required for surface modification and coating of metallic biomaterials, including physicochemical and biochemical surface treatments and calcium phosphate and oxide coatings. In this review, the attention is focused on the biomaterial-associated infections, from which the need for anti-infective biomaterials originates. Biomaterial-associated infections differ markedly for epidemiology, aetiology and severity, depending mainly on the anatomic site, on the time of biomaterial application, and on the depth of the tissues harbouring the prosthesis. Here, the diversity and complexity of the different scenarios where medical devices are currently utilised are explored, providing an overview of the emblematic applicative fields and of the requirements for anti-infective biomaterials. In addition to this, chapter introduces nanomedicine and the use of both natural and synthetic polymeric biomaterials, focuses on specific current polymeric nanomedicine applications and research, and concludes with the challenges of nanomedicine research. Infection is currently regarded as the most severe and devastating complication associated to the use of biomaterials. Osteoporosis is a worldwide disease with a very high prevalence in humans older than 50. The main clinical consequences are bone fractures, which often lead to patient disability or even death. A number of commercial biomaterials are currently used to treat osteoporotic bone fractures, but most of these have not been specifically designed for that purpose. Many drug- or cell-loaded biomaterials have been proposed in research laboratories, but very few have received approval for commercial use. Polymeric nanomaterial-based therapeutics plays a key role in the field of medicine in treatment areas such as drug delivery, tissue engineering, cancer, diabetes, and neurodegenerative diseases. Advantages in the use of polymers over other materials for nanomedicine include increased functionality, design flexibility, improved processability, and, in some cases, biocompatibility.

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