Editorial

ANATOMY AND BIOMIMETICS

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Probably, Antoni Gaudi (1852-1925), the great Catalan architect, one century ago when he enunciated that "the architect of the future will base his creations emulating nature, because is the more rational way, durable and cheap", did not know that he was also speaking about Biomimetics. For over 3800 it has been demonstrated that the evolution of nature and its structures have an optimal design. Even though the concept of bioinspiration has existed for more than two hundred years, it was only in the last 40 years that was defined as Biomimetics.

Anatomy is undoubtedly the pillar of medical sciences, no professional in the art of healing will be able to exercise their knowledge without knowing the minimum morphological detail of the organism they study, in order to contrast it with the anomaly that leads to the genesis of the diagnosis and its subsequent treatment.

It was Andreas Vesalius, a 16th century Belgian doctor and considered as the father of modern anatomy, who understood that anatomical knowledge is acquired through the study based on the dissection of the human body, which allowed him to describe it in detail and capture it in his leading work ¨De Corporis Humani Factory" (1543). The morphological knowledge had been the first step to give back the naturalness in our treatments searching form and function in a macro and micro scale.

Classic biomimetics inspired by biological structures and their functions, focused on emulating or duplicating biosystems using mostly synthetic components and following traditional approaches (Sarikaya et al. 2003). With the recent developments of molecular and nanoscale engineering in physical sciences, and advances in molecular biology, biomimetics is now entering the molecular scale (Niemeyer, 2001). By combining nature's molecular tools with synthetic nanoscale constructs, molecular biomimetics is emerging as a hybrid methodology which expands human knowledge to unknown limits (Ball, 2001).

Biomimetics is divided in two categories. First biomimicking which takes place when we face the possibility of finding a biomaterial that achieves, in the best way and a in any scale, to emulate the structure of the tissue we have decided to reproduce in its shape and function with accuracy. In the field of dentistry there are multiple examples of this kind of materials such as ceramics/composites which intend to emulate artificial enamel and dentins to restore decay tooth with similarity bond strength, elastic module and esthetics appearance than natural. The second category involves mastering the molecular synthesis and processing mechanisms of biomaterials and applying these, until now unknown, methodologies to produce new complex materials superior to those presently available, this approach is called as bioduplication. This approach is much more complex and will require a long-term commitment, not only to learn the intricacies of bioprocessing by using organisms, but also the development of new strategies to process these materials synthetically from the molecular level up to achieve the same size, shape, complexity, and multifunctionality as the biocomposites. In that sense, current bone regeneration procedures use recombinant bone morphogenic proteins (rhBMP) and recombinant platelet derived grow factors (rhPDGF) which have a profound role in osseous wound healing and cicatrization to reestablish the appropriate morphology making a significant impact in clinical practice (Reddi, 2000).

Also in periodontal regeneration therapies there was developed an enamel matrix derivative (EMD) composed of a mixture of hydrophobic enamel protein with amelogenin, enamelin, tuftelin, amelin and ameloblastin that induce reparative processes in dentin, cementum, periodontal ligament, alveolar bone and it is used as a biological active pulp dressing agent (Nakamura et al., 2002). In regenerative tissue engineering, there are many issues to consider in the process of creating a functional, implantable replacement tissue. What is most important is that there must be an easily accessible, readily abundant cell source with the capacity to express the desired tissue's phenotype, and a biocompatible inert scaffold to deliver the cells to the damaged zone. (Vernon et al., 2012).

Although by no means simple, the biomimicking approach will require a shorter commitment time and the dental clinicians are very familiar with that kind of procedures.

Biomaterials and techniques face us with demanding patients who look for naturality in their oral restorative procedures, not just for an optimal function but also for a social and esthetic compromise. The possibility of adhering organic composites and ceramics to the tooth surface, taking advantages of the inorganic and organic components such as the hydroxyapatite and collagen fibers present in dental tissues, give us the advantage to mimic not only the form but also the mechanical properties of the natural teeth.

Anatomy, as a timeless science, becomes once again the model to follow in the intent to reproduce and imitate the natural tissues with new procedures and biomaterials.

Then, biomimetics may be one of the major ways to produce next generation materials that would meet the demand of the technologies in immediate future.

During millions of years of evolution nature has developed fantastic forms and organisms. Anatomists as experts in morphological sciences have a very hard work offering the health community with the best knowledge to reach the optimal way to emulate it.

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