

Nature is smart, smart by nature...

The trends in medicine and dentistry are moving more and more in the direction of mimicking nature. Currently, biomimetics is one of the main topics of our profession. The subject of biomimetics is based on the concept of taking ideas from nature and implementing them in technology, for instance, engineering, design, computing, etc. The concept is very old. The Chinese wanted to make artificial silk 3000 years ago; Daedalus' wings in Greek mythology were one of the early design failures. Real implementation started to gain momentum only relatively recently with advanced techniques. It is, however, worth comparing the design philosophy of nature with that of an engineer. Nature employs techniques that involve miniaturization and excellent integration. Take the pulp-dentin complex; despite the differences in structure and composition, pulp and dentin are integrally connected. Enamel and dentin are also two dissimilar structures, but enamel laminates dentin with extraordinarily good adhesion what is fascinating is that they communicate with one another.

Nature creates teeth, but unfortunately cannot protect them for a lifetime. Moreover, the oral milieu is aggressive, perhaps more aggressive than we imagine. The efforts spent in engineering to mimic nature, its proteins, its polymers, and its fibers have made it possible today to restore the missing dental tissues in a minimally invasive manner with the help of adhesive applications. However, despite the increased effort to improve the adhesion between various restorative materials in dental applications, failures still occasionally occur, either in the form of debonding, delamination, or fractures under clinical conditions. Such failures are not always a result of lack of meticulous work, but sometimes simply due to the aggressiveness of nature. On the other hand, nature tries to solve such problems with its repair mechanisms. Why shouldn't we mimic this and try a repair option?

Adhesive technologies and their applications allow us today to condition the failed surfaces and relaminate them directly in the mouth, without requiring the replacement of restorations. Replacement is often associated with the loss of tooth tissues or the restorative material. Experience indi-


cates that it is possible to achieve durable restorations or repairs using either fibers or adhesion promoters in a less interventionist procedure without removing an integral part of the tooth or the restoration, and to do this in a cost-effective way. Chemistry may be of interest in this case, namely, controlling interactions between dissimilar restorative materials during repair, mimicking the communication between the enamel and dentin or the dentin and the pulp.

Perhaps nature still makes the best materials, e.g., wood and antler bone, the latter of which is still tougher than any man-made ceramic composite. However, when artificial materials are handled correctly, the fibers and the resin-based composite materials that are employed in dentistry can serve as excellent materials for restoring or repairing the dentition.

While nature takes its time to create beautiful, complex structures, laminating them with diligence, we try to establish a similar lamination in minutes. Because many factors affect the adhesion of polymers to restorative materials, it is necessary for clinicians to understand the characteristics of the substrate and condition them accordingly for ideal adhesion in order to prolong the service life of repaired restorations.

What nature creates also has a certain lifespan. Similarly, artificial materials last in the mouth only for a certain period of time. But with repair options, we can still respect nature and also the nature of the artificial materials. Repair and maintenance should be practiced in dentistry, as aging of any material – even the dental tissues themselves – is unavoidable.

Sincerely yours,



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