



Bioactive Glass in Orthopedics

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The advance of prosthesis is a long journey in the field of Orthopedics. Dating back to Vedic period, the installation of prosthesis elephant head to lord Ganesh by lord Shiva. Twin Ashwini kumaras are also replaced many limbs in warfare in Indian history, same can be found in Greece and Latin Medicine. Aluminium replaced the heavier metals and it is also rust resistant [1]. Greater degree of freedom in articulation motion is achieved by myoelectric prosthesis [2]. Aesthetics of prosthesis drive the fell of comfort, particularly in lower limbs to avoid use of wheel chair or walker. Prosthetics material and design like Carbon fiber, silicone and advanced fiber are used now a days to give new look and feel of natural skin. 3D printing for prosthetics serves the individualization of the measurement for the particular patient. Neural interfaces in prosthetics will help in establishing the connection between user nervous system and prosthetic.

Bioactive glass is composed of phosphorous pentoxide, calcium oxide, sodium oxide and silicone dioxide. The material can yield a surface pore structure of 5-20nm, with excellent surface area, pore volume, ability to induce apatite formation and cyto-compatibility.

According to (Salinas AJ., et al., 2018) bioactive glasses are nontoxic, biocompatible, bactericidal and bioactive. A calcium phosphate layer is formed after implantation through which the host bone will grow along with the bioglass. It is absorbed and totally replaced with bone if the glass granules are small enough, or else only the bioglass particles surface dissolves. The clinical application are in Orthopedics, traumatology, cranial-facial, maxillofacial, otorhinolaryngology and in bone tumors [3].

(Madison Jena., et al. 2020) reported titanium and its alloys, cobalt- chromium alloys and stainless steel 316L are the material used for the manufacture of orthopedics implants. The bodily tissue and implant will react leading to tissue damage or rejection of implant. The bioactive glass can be used as an alternative mate-

rial to avoid rejection of implant, but the disadvantage is lack of strength, ductility and ability to with stand load bearing applications [4].

(Nawaz M H., et al., 2023) study revealed their is Ion leaching from substrate material used in implant and biofilm formation, to reduce this biopolymers and bioceramics functional composition were electrophoretically deposited on surgical grade stainless stell (316L SS). Lawsons, hydroxyapatite (HA) and bioglass (BG) composite coating are loaded into a polymeric matrix of Chondroitin Sulfate/ Xanthan Dialdehyde (CS/XDA). This showed a significant zone of inhibition of 21.04mm and 21.65mm against *Escherichia coli* (*E. Coli*) and *Staphylococcus aureus* (*S. Aureus*) respectively. After 28 days of submersion in simulated body fluid calcium (Ca) and HA crystals were seen. The results are positive to use lawsons/HA/BG/CS/XDA as coating materials for orthopedics implants [5].

The advantage of bioglass is clearly showing positive results and in coming days, we can see more clinical application.

Bibliography

1. Fliegel O and Feuer SG. *Archives of Physical Medicine and Rehabilitation* 47 (1966): 275-285.
2. Sherman ED. "*Canadian Medical Association Journal* 91 (1964): 1268-1270.
3. AJ Salinas., et al. "Use of bioactive glasses as bone substitutes in orthopedics and traumatology, Editor(s): Heimo Ylänen, In Woodhead Publishing Series in Biomaterials, Bioactive Glasses (Second Edition), Woodhead Publishing (2018): 337-364.
4. Madison J., et al. "Bioactive Glasses in Orthopedic Applications". In: Li, B., Moriarty, T., Webster, T., Xing, M. (eds) *Racing for the Surface*. Springer, Cham (2020).
5. Nawaz MH., et al. "A study on the effect of bioactive glass and hydroxyapatite-loaded Xanthan dialdehyde-based composite coatings for potential orthopedic applications". *Scientific Report* 13 (2023): 17842.