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## Review of Local Cellular and Molecular Processes of Bone Tissue Regeneration Induced by Calcium Phosphate Materials

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One of the leading causes of hospitalization, disability and mortality of 50% of women and 20% of men over the age of 50 are bone fractures and their complications caused by diseases of the musculoskeletal system. In this regard, an active search for a solution to the problem associated with the limitations of the use of auto-, allo-, and xenografts in the clinic to replace bone defects initiated the development of a regenerative approach based on the gradual replacement of artificial material with growing bone tissue. Promising in this regard are materials based on calcium phosphates, which act as an active source of chemical elements (calcium, phosphorus, etc.), which can optimize the process of bone defect fusion and ensure the replacement of the implant with new bone tissue. The review summarizes literature data on local biological activity, target cells, and molecular effects of calcium phosphates. It has been shown that calcium phosphate materials are biocompatible, capable of adsorbing regulatory proteins and cells, influencing their genetic and secretory apparatus and triggering the process of MSC differentiation in the osteogenic direction. At the same time, the successful implementation of local mechanisms of osseointegration at the “bone/implant” interface reduces the risk of periprosthetic infection (PJI) and rejection of artificial devices. Further study and use of calcium phosphate materials will make it possible to make a significant breakthrough in solving modern problems of bone tissue regeneration associated with an accurate (digital) bioengineering approach based on additive technologies and artificial intelligence.

**Keywords:** calcium phosphate materials, osteoinduction, osteogenic cells, osteogenesis, regeneration, mesenchymal stem cells, cellular and molecular mechanisms