[Metal ions: important co-players in aseptic loosening]

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AIM: The aims of this review were to discuss the different mechanisms of biocorrosion of orthopaedic metal implants in the human body, as well as the effects of the released metal ions on bone metabolism and the immune system in regard to their involvement in the pathophysiological mechanisms of aseptic loosening and metal hypersensitivity. Implant failure due to aseptic loosening is thought to occur in about 10-15% of cases. METHODS: A review of the literature (using PubMed with the search terms: biocorrosion, metal ions and bone metabolism) was performed. Additionally, we discuss our research results in the field of aseptic loosening. RESULTS: Despite a great effort in developing new implants, metal devices used in orthopaedic and trauma surgery remain prone to biocorrosion by several mechanisms including the direct corrosion by osteoclasts, leading to the production of significant amounts of wear particles and metal ions. In addition to the well documented increased osteolytic activity caused by large (in the nanometer range) wear particles, increasing evidence strongly suggests that the released metal ions contribute to the pathophysiological mechanism of aseptic loosening. Metal ions stimulate both the immune system and bone metabolism through a series of direct and indirect pathways leading to an increased osteolytic activity at the bone-implant interface. CONCLUSION: To date, revision surgery remains the only option for the treatment of a failed orthopaedic implant caused by aseptic loosening. A better understanding of the complex pathophysiological mechanisms (including the effects caused by the released metal ions) of aseptic loosening may have a significant potential in developing novel implants and therapies in order to reduce the incidence of this complication.

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