

Title: Macrophage polarization in aseptic bone resorption around dental implants induced by Ti particles in a murine model

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Do Leaked Titanium Particles from Dental Implants Cause Bone Loss?

Dental implants are the primary choice for replacing lost teeth for functional and aesthetic reasons. In modern dentistry, titanium is a popular choice of material for dental implants, but while they have many advantages, they are also known to have a failure rate as high as 5–10% due bone loss in the area surrounding the implant. The reason for this bone loss and the processes involved in it are unclear. While there can be many reasons for bone loss around an implant, titanium particles that are released from dental implants due to wear and friction into the surrounding tissue have been suggested to be a contributing factor. Researchers conducted a study to clarify whether this is indeed true.

To this purpose, they implanted sixteen 8-week-old male laboratory rats with titanium tooth implants. After 4 weeks, they were divided into four groups. The tissue surrounding the implant of rats in the first group were injected with titanium particles and clodronate, which suppresses inflammation-associated cells called macrophages (delivered in a drug carrier known as liposomes), that in the second group were injected with titanium and saline, that in the third group was injected with titanium and empty liposomes, and that in the fourth group was injected with saline only. The rats were assessed 8 weeks later; the degree of bone loss, presence of macrophages, and production of proinflammatory cytokine molecules were analyzed.

Compared to rats receiving saline only, rats injected with titanium particles showed increased bone loss, inflammatory macrophages, and production of inflammation-enhancing cytokines. Moreover, when both titanium particles and clodronate were given, the inflammatory response was suppressed, and the bone loss was reduced to normal levels. These findings confirmed that leakage of titanium particles from implants can cause bone loss by inducing an inflammatory reaction.

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