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Titanium levels in the organs and blood of rats with a titanium implant, in the absence of wear, as determined by double-focusing ICP-MS, *Analytical and bioanalytical chemistry*, Vol 393 (1), 335-43 January 2009

ABSTRACT: Titanium (Ti) has long been regarded as an inert and biocompatible metal, ideal for biomedical applications such as dental implants or joint replacements. However, concerns about the biocompatibility of Ti have lately arisen. Unfortunately, information on reliable Ti baseline physiological levels in blood and organ tissues is still pending and the real effects of physiological corrosion as opposed to wear processes of Ti or Ti alloys implants is controversial so far. In this work a previously developed and validated methodology, based on using double-focusing inductively coupled plasma mass spectrometry (DF-ICP-MS) has been used to establish Ti basal levels in blood and organs (heart, liver, spleen, kidneys, and lungs) of Wistar rats. These data were compared with the levels found in three Wistar rats implanted with a Ti wire embedded in their femur for 18 months, in order to assign possible Ti released purely due to non-wear physiological mechanisms. Results showed that Ti content in all the selected organ tissues and blood was higher than previously determined Ti basal levels, clearly showing both corrosion of the Ti implant and systemic Ti accumulation in target tissues. These results indicate that Ti metal corrosion occurs. This seems to be the only mechanism responsible in the long term for the observed passive dissolution of Ti of the implant in the absence of wear. A comparative study of the systemic distribution of the soluble and particulate Ti potentially released from Ti implants was also carried out by intraperitoneally injection of soluble Ti(citrate)(3) and insoluble TiO(2) particles, respectively. Different systemic Ti storage was observed. Whereas soluble Ti was rapidly transported to all distal organs under study, TiO(2) particles were only accumulated in lung tissue.

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