

Heavy metal: Titanium implant safety under scrutiny

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A new strategy to quantify the levels of titanium in the blood of patients fitted with titanium orthopaedic implants is presented in *Analytical and Bioanalytical Chemistry*, a Springer journal. Yoana Nuevo-Ordóñez and colleagues of the Sanz-Medel research group from the University of Oviedo in Spain have developed a highly sensitive method to determine the levels of titanium in human blood, establishing a baseline for natural levels of titanium in untreated individuals as well as measuring levels in patients with surgical implants.

Titanium [implants](#) are routinely used for bone fractures as well as dental work. It has recently been shown that titanium-based implants both corrode and degrade, generating metallic debris. There is some concern over the increased concentrations of circulating metal-degradation products derived from these implants, and their potential harmful biological effects over a period of time, including hepatic injury and renal lesions. In order to assess the implications of these 'leaks', it is essential to accurately measure the basal, normal levels of [titanium](#) in the bloodstream, as well as quantify how much higher levels are in patients with implants.

Nuevo-Ordóñez and team collected blood from 40 healthy individuals and 37 patients with titanium implants - 15 had tibia implants, eight had femur implants, and 14 had humerus implants (eight internal and six external fixation implants). They used their new method, based on isotope dilution analysis and mass spectrometry, or IDA-ICP-MS, to analyze the blood samples.

They found that control individuals had very low levels of titanium in the blood whereas titanium concentrations were significantly higher for all the patients with implants. The sensitivity of the method was such that the researchers were also able to show significant differences in titanium levels for different types of bone fixation devices. The more invasive implants shed more metallic debris into the [blood](#) than the external, superficial designs. The work also identified how the titanium from the implants is transported in the bloodstream and potentially distributed and accumulated.

The authors conclude: "The simplicity of the methodology based on isotope dilution analysis and the accuracy and precision of the obtained results should encourage the use of the proposed strategy on a routine basis."

More information: Nuevo-Ordóñez Y, Montes-Bayón M, Blanco-Gonzalez E, Paz J, Dianez Raimundez J, Tejerina Lobo J, Peña M, Sanz-Medel A (2011). Titanium release in serum of patients with different bone fixation implants and its interaction with serum biomolecules at physiological levels. *Analytical and Bioanalytical Chemistry*; [DOI 10.1007/s00216-011-5232-8](#)

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