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Uncovering the diagnostic power of exosomes for prosthetic joint failure

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The effect of debris exposure on the osteoimmunological crosstalk is poorly understood. For the first time, we report that titanium dioxide nanoparticles (TiO2 NPs), similar in size and composition to wear debris associated with prosthetic implants, altered bone exosomes biogenesis and cargo. Using mass spectrometry analysis, we identified urokinase-type plasminogen activator (uPA), specifically enriched in exosomes derived from bone cells pre-incubated with TiO2 NPs. Besides uPA contribution to the generation of inflammatory signals, uPA was also previously reported in patients with aseptic loosening of total hip prosthesis. Functional tests with isolated bone derived exosomes confirmed the activation of human macrophages with consequent secretion of inflammatory cytokines that may contribute to particle induced osteolysis and implant loosening. These findings, indicate that the osteoimmunological communication trough exosomes was disturbed by TiO2 NPs and that uPA may be proposed as a biomarker to early diagnose nanoparticle induced osteolysis, avoiding or delaying a revision surgery, thereby decreasing disease burden and improving patient health.

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