

Processing of Metals by Human Bone and Immune Cells

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The purpose of this study was to explore functional and morphological intracellular detection of immunogenic metal ions by osteoclasts (bone resorbing cells) and human dendritic cells (most potent antigen presenting immune cells). We exposed the human cells in vitro to a variety of metal surfaces, metal particles and metal ions. Newport GreenTM was used to fluorescently label intracellular protein-metal complexes. Confocal imaging and flow cytometry analysis showed specific staining for cells containing aluminium, chromium, nickel, titanium and zirconium ions. The intensity of staining varied between ion types, whereby Ti³⁺ resulted in the brightest fluorescence signal. Metal particle and metal ion distribution within the cells

could be confirmed using transmission electron microscopy. In addition, human immune cells were tested for reactivity against metal ions in vitro, indicating that patients treated with metal implants develop immune reactivity against metals of their implant. In conclusion we can say that human osteoclasts corrode pure metal surfaces and that dendritic cells process intracellular metal particles and metal ion protein complexes. Metals processed by immune cells induce immune reactions in vivo.

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