In Vitro Studies Suggest Accelerated Bone Remodelling on INICELL® Implant Surface

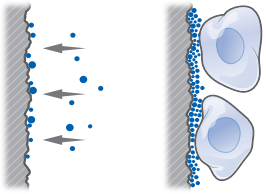
Tugulu S et al, J Mater Sci Mater Med. 2010;21:2751–63
Burkhardt MA et al, Sci Rep. 2016;6:21071
Burkhardt MA et al, Biomater Sci. 2017;5:2009–23

Background

INICELL® is the superhydrophilic dental implant surface from Thommen Medical. It is the conditioned state of a standard sandblasted and thermal acid-etched titanium surface.

1. Homogenous Protein Adsorption

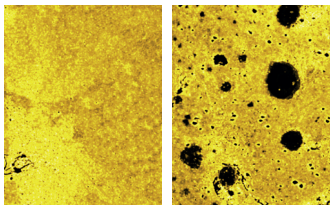
Protein adsorption is a crucial step following implantation, needed for **cellular interaction** with the implant surface and the subsequent osseointegration process.[1,2]



1. Protein adsorption

2. Cell attachment, adhesion, proliferation and differentiation

In vitro experiments revealed an **increased wettability** and **more homogenous protein adsorption** on the INICELL® implant surface (A) compared to the unconditioned standard surface (B).[2*]

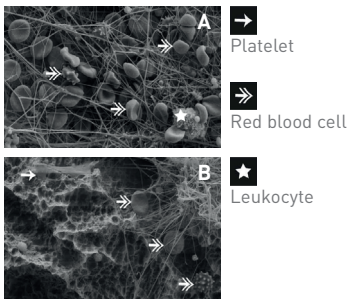


A. Conditioned INICELL® surface

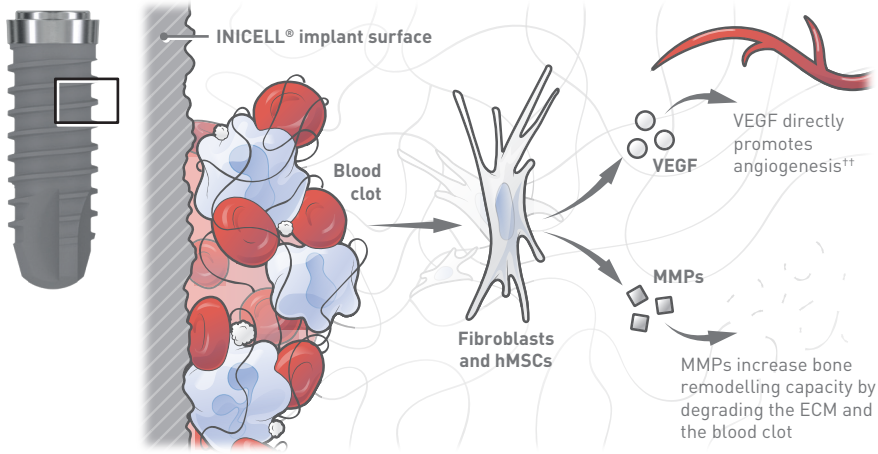
B. Unconditioned standard surface

2. Enhanced Blood Clot Formation and Establishment of a Pro-Angiogenic Healing Environment

The INICELL® surface (A) demonstrated an **increased blood clot thickness, platelet adherence**, and **fibroblast integration** in comparison to the unconditioned standard surface (B) in a human peri-implant wound healing model.[3**]



The blood clot on the INICELL® surface promoted a **pro-angiogenic healing environment** through synergistic interactions. Major factors of angiogenesis and healing, such as **VEGF** and **MMPs**, were found to be upregulated in co-culture experiments with fibroblasts or hMSCs.[3,4†]



Key Takeaways

- ✓ The **homogenous protein adsorption** observed on the superhydrophilic INICELL® surface may positively influence cellular responses after implantation[2]
- ✓ In vitro experiments showed **enhanced blood clot formation** on the INICELL® surface, leading to the activation of angiogenesis and healing processes[3,4]
- ✓ Combined, evidence suggests that the surface properties of INICELL® may contribute to **accelerated bone remodeling after implantation**[2-4]

*Determined through fluorescence micropgraphs of the surfaces incubated in a 1 µM fibrinogen Alexa Fluor solution for 5 minutes. Additional images were kindly provided by Stefano Tugulu and therefore not taken from the original publication **Assessed via scanning electron and immunofluorescent micrographs of titanium surfaces exposed to blood and/or fibroblasts for 2 and 24 hours. The images show a scanning electron micrograph after incubation with blood for 24 hours †MMP concentration was determined with a generic MMP assay. VEGF was analyzed by measuring soluble concentrations ††Scheme adapted from Burkhardt MA et al, Sci Rep. 2016;6:21071.

ECM, extracellular matrix; hMSCs, human mesenchymal stem cells; MMPs, matrix metalloproteinases; VEGF, vascular endothelial growth factor.

1. Jäger M er al, J Biomed Biotechnol. 2007;2007:69036; 2. Tugulu S et al, J Mater Sci Mater Med. 2010;21:2751–63; 3. Burkhardt MA et al, Sci Rep. 2016;6:21071; 4. Burkhardt MA et al, Biomater Sci. 2017;5:2009–23.

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