Peptide for Metal Surface Coating

UNIVERSITÄT LEIPZIG
Life Science Transfer Office

Project: 18001

Background /medical problem

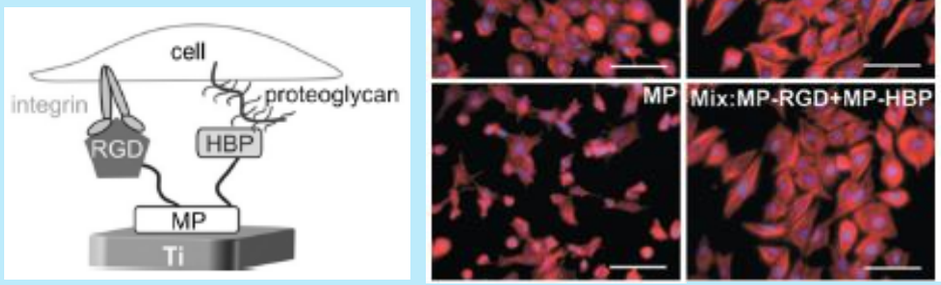
Titanium (Ti) is the material of choice for orthopedic and dental implants. During the osseous healing process the osteoblasts grow directly onto the implant resulting in a firm adhesion to the implant surface. However, poor osseointegration can result in inflammation, loosening or subsidence of the implant. Attempts have been made to reinforce the osseointegration by using components of the extracellular matrix to improve the biocompatibility of the titanium surface. Such peptide coatings play an important role in the imitation of celladhesive properties. Next to the integrin-binding peptides a binding of transmembrane proteoglycans for proteins with basic amino acids could be shown. It is assumed that the peptide sequence FHRRIKA (Phe - His - Arg - Arg - Ile - Lys - Ala) binds to proteoglycans that contain heparin and thereby promotes cell attachment. But yet functionalization of the surface is often necessary to achieve a direct immobilization of these molecules. It is known that L-3,4-dihydroxyphenylalanine (DOPA) can bind to the oxidized surface of titanium without previous chemical treatment. This posttranslational modified amino acids have been found in proteins secreted by the blue mussel (Mytilus edulis). Synthesis and modification of mussel adhesion proteins with various bioactive molecules remains difficult.

Technology / Solution

We succeeded in modifying a molecule in a way to effectively promote the osseointegration of implants. The peptide includes a main chain with at least one DOPA, at least one integrin-binding peptide and at least one heparin-binding peptide. This combination shows a synergetic effect on the cell adhesion to metallic surfaces that have been coated with this specific peptide.

Further reading:

Pagel *et al.* (2016) Multifunctional coating improves cell adhesion on titanium by using cooperatively acting peptides. Angew. Chem. Int. Ed. 55, 4826-30



a) b)

Figure:. a) Integrin- and proteoglycan-mediated cell adhesion on Ti through the peptide MP-RGD-HBP. b) Adhesion of cells after 6 h on the synthesized peptides and untreated Ti (blank Ti), scale bar: 100 mm. Coating with MP-RGD-HBP improves cell count, cell size and cell survival.

Advantages

The technology offers the following advantages:

- Effective, modified molecule for the improvement of the osseointegration of implants
- Excellent binding of the proteins to metal surfaces, in particular titanium
- Very good peptide stability in aqueous solution
- Coating may be enhanced with other substances

Possible application

- Surface coating for all metal implants such as stents, orthopaedic, or dental implants

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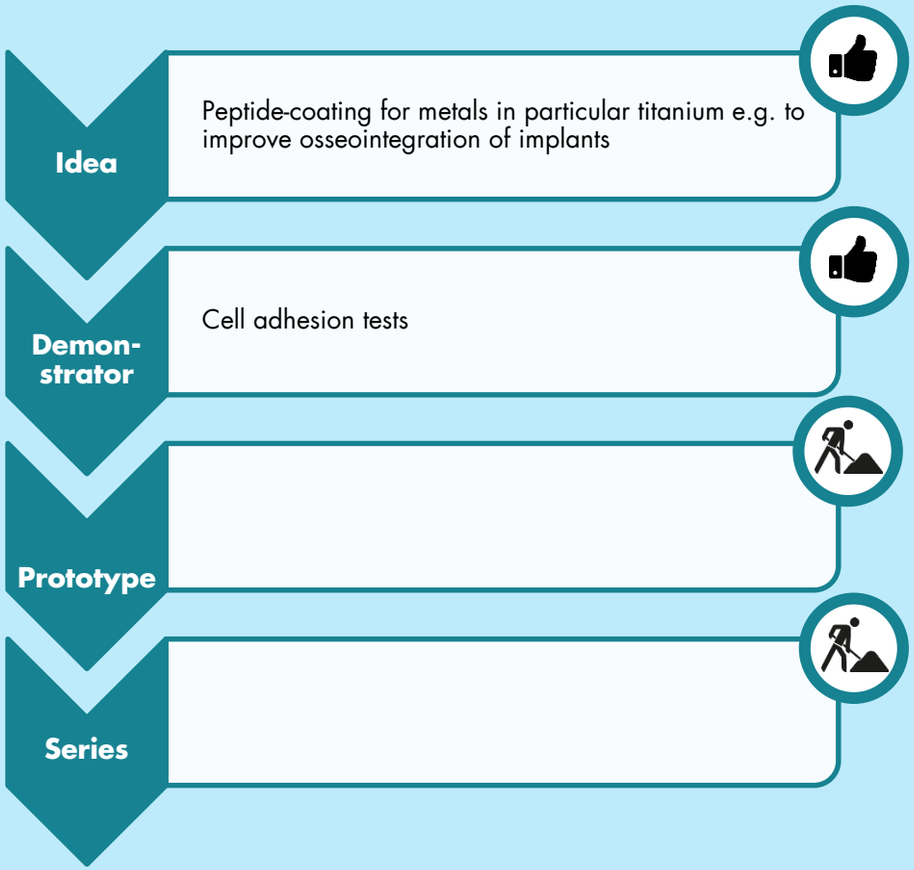
Status and next steps



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Cooperation

- License Agreement
- R&D Agreement
- Ownership Agreement

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