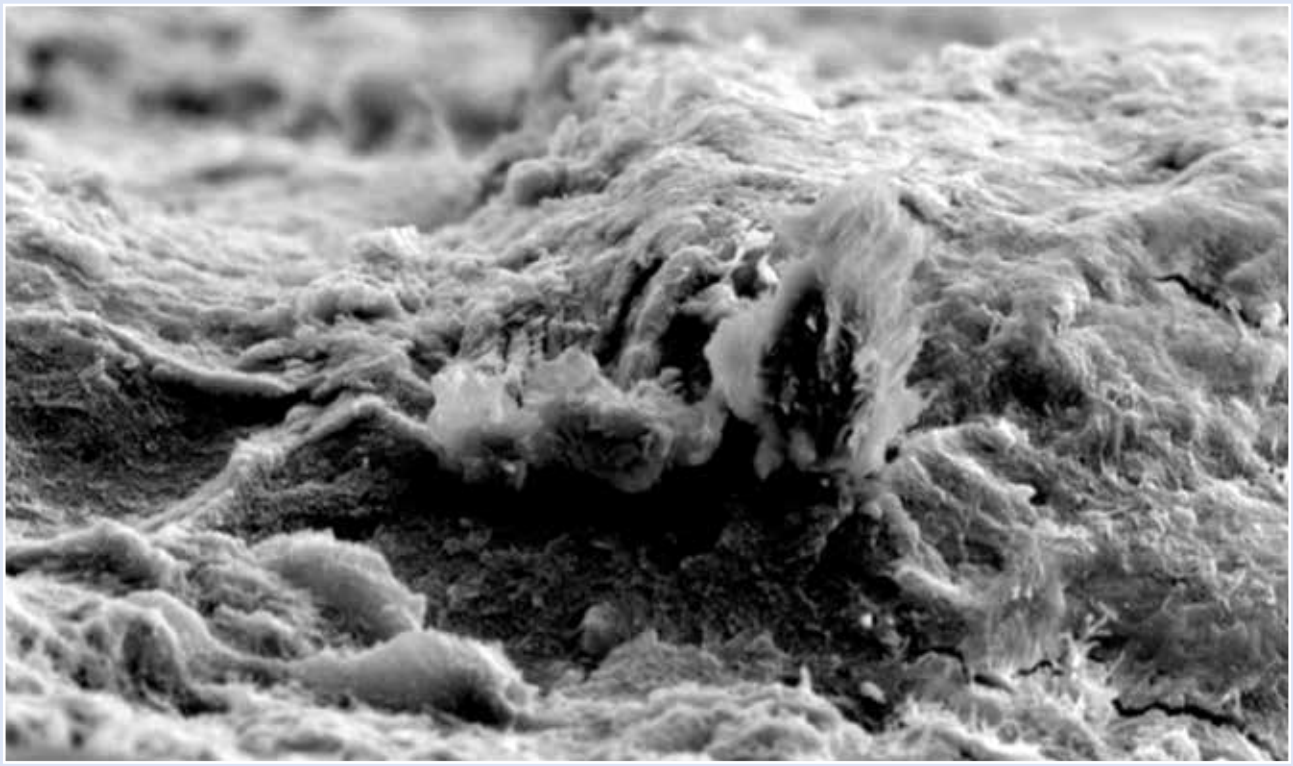
NBM®
Nano Bridging Molecules

SurfLink® Dental



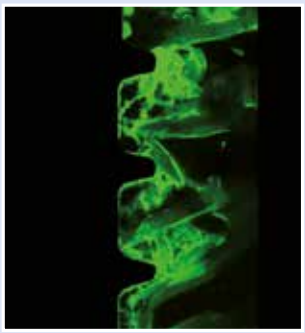
-where true osseointegration becomes a reality

Scanning Electron Microscopy (SEM, X2500) image of SurfLink® Dental treated implant subjected to removal torque testing 52 weeks after placement in sheep. The image shows the implant surface fully covered with bone tissue, with some bone cells stretched out.

Most notably, it can be observed that the fracture occurred within the bone rather than at the bone-to-implant interface.

SurfLink® Dental by NBMolecules®

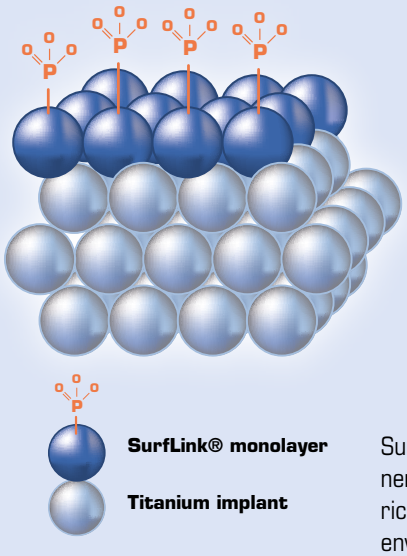
Microradiographic image of SurfLink® Dental treated implant at two weeks after placement in sheep.
The implant is closely in contact with both cortical and cancellous bone.



Fluorescent image of SurfLink® Dental treated implant at two weeks after placement in sheep. Early osseointegration with active bone modelling is evident by the presence of calcein green at the bone-to-implant interface.

SEM (X1000) image of SurfLink® Dental treated dental implant subjected to removal torque testing 52 weeks after placement in sheep. The image shows the implant surface fully covered with bone tissue and that fracture occurred within the bone rather than at the bone-to-implant interface.

SurfLink® Dental implant surface treatment significantly increases early implant stability, true long-term osseointegration, and implant success.



Schematic drawing illustrating a SurfLink® monolayer permanently bound to the titanium dental implant with phosphate-like groups presented to the implant environment.

SurfLink® Dental implant surface treatment by NBMolecules® produces a monolayer of permanently bound multi-phosphonate molecules on the surface of an implant. This novel phosphonate-rich surface mimics one of the main constituents of bone, hydroxyapatite, providing a favourable environment for cell colonisation.

SurfLink® Dental is easy to use directly in the clinic and the majority of dental implant designs and surfaces, available on today's dental implant market, qualify for SurfLink® Dental surface treatment. SurfLink® Dental is CE-marked* and delivered as a sterile powder, ready-to-use to treat dental implants.

The biomimetic properties of the SurfLink® treated surface will:

- **Increase hydrophilicity of the implant surface**
- **Favour bone cell adhesion and cell colonisation**
- **Enable early bone formation on the implant surface**
- **Yield considerably greater bone-to-implant contact**
- **Enhance early and long-term biomechanical fixation**
- **Promise long-term implant stability and true osseointegration**

Over the past decades, advances in refining the surface properties of titanium dental implants have dramatically reduced implant failure rate. The use of biomimetic agents has substantially increased our understanding of what takes place at the bone-to-implant interface. As a result, biocompatibility of implants has improved. Osseointegration and subsequent implant stability have been furthered.

Biomimetic agent coatings, such as bioceramics (hydroxyapatite, and other calcium phosphate phases), have been placed on the implant market. Such surface coatings have presented some advantages, but have also produced certain integrity problems (dissolution, delamination, particle release) increasing implant failure rate. The SurfLink® Dental surface treatment, which permanently modifies the surface chemistry of implants, was developed to overcome the shortcomings of coatings.

*SurfLink® products are not cleared for sale in the US

SurfLink® Dental - Scientifically Proven

Experimental studies on the SurfLink® Dental treated titanium implants are summarised in a series of White Papers (WP). Their conclusions are briefly presented below. For the complete set of current White Papers, please consult www.SurfLink.info.

WP1 Surface characterisation
SurfLink® binds efficiently to titanium and results in a highly hydrophilic dental implant by virtue of a biomimetic phosphate-like monolayer on the surface.

WP2 Chemical stability
SurfLink® remains firmly bound to the dental implant surface between pH 1 and 9. The shortcomings of today's calcium phosphate coatings whereby degradation leads to dissolution, delamination and particle release into the body under certain physiological conditions are avoided by using SurfLink® Dental surface treatment, which promises long-term implant stability over a wide pH range.

WP3 A variety of dental implants and materials
Most dental implant designs and surfaces qualify for SurfLink® Dental surface treatment by NBMolecules®. SurfLink® Dental treatment can even be used with various oxide implant surfaces, such as zirconia, which only recently have reached the dental implant market.

WPs 4-6 summarise a pre-clinical experimental study in sheep:

Histological image of SurfLink® Dental treated implant 52 weeks after surgery showing the great amount of bone surrounding the implant and high BIC.

WP4 Histology
Histological and radiographic evidence clearly show, even by 2 weeks, that SurfLink® Dental treatment prompts early bone formation on and around the implant surface. And, at 52 weeks, SurfLink® Dental treated implants show a considerably greater bone-to-implant contact (BIC).

WP5 Scanning Electron Microscopy
SEM observations of SurfLink® Dental treated implants show abundant bone coverage with fractures occurring within bone rather than at the bone to implant interface.

WP6 Biomechanics
SurfLink® Dental treated implants show enhanced biomechanical fixation at both early and long-term time points. A pairwise relative difference in torque values of +32.0% at 2 weeks and +6.6% at 52 weeks for SurfLink® versus control implants.

WP7 SurfLink® Dental Clinical Trials in Progress
Two major prospective Randomised Clinical Trials (RCTs) have been designed and launched with the aim of evaluating patient safety and effectiveness of the SurfLink® Dental surface treatment.

WP-8 SurfLink® Dental layer thickness and implant surface roughness characterisation
SurfLink® Dental surface treatment by NBMolecules® produces a SurfLink® monolayer less than 1 nm thick.
SurfLink® Dental surface treated implants have exactly the same implant dimensions, topographical and roughness characteristics as the untreated implant. Thus surgical implant site preparation remains the same as for an untreated implant.

WP-9 Pre-clinical experimental study with SurfLink® Dental treated implants: Fluorescence Analysis Qualitative fluorescence analysis showed that early bone mineralisation on the implant surface is encouraged by SurfLink® Dental surface treatment as opposed to conventional implant surfaces where integration mainly relies on bone growth from the surrounding old bone.

In the clinical situation, based on these results, SurfLink® Dental surface treatment would substantially improve both early osseointegration and long-term implant stability, considerably reducing the risk of micromotion.

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