New Bioactive Orthopedic Nano-coating

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The Australian Research Network is a consulting company focused on emerging Australian technologies.

SUMMARY OF THE OPPORTUNITY

Researchers at the University of South Australia have developed technology that has the potential to reduce the incidence of revision surgery by providing quicker, stronger, bone integration for implants. This new bioactive nanocoating enhances the effectiveness and improves the long term stability of orthopaedic and dental implants.

The Wark Nanocoating, as it is referred to, is functionally graded from metal through oxides, silcates, silica, hydroxyl groups and hydroxyapatite (HA). The arrangement and integration of the layers enable the great bonding strength of the layer, and bioactivity is achieved by high silanol (hydroxyl) and HA content.

THE FOCUS

A major problem for surgical implants has been the incompatibility of metal and bone. A number of methods for bonding metal to bone have been developed, but few are satisfactory. This technology is significant in offering implant surgeons a substantial leap in metal to bone bonding technology.

Currently, the revision rate for orthopaedic implants is around 17% due mainly to loosening implants and infection caused by gaps. This technology has the potential to reduce revision surgery thus reducing the suffering of patients, and the associated costs to the health industry. In dentistry it has the potential to speed up implant integration reducing the time patients must wait before applying load to their implanted teeth, possibly from 3 months to 2 months.

KEY ADVANTAGES OVER COMPETING TECHNOLOGY

This bioactive coating is an incredibly thin, very strongly bonded and functionally graded nano-coating for orthopedic and dental implants. It encourages bone to grow around the coated implant faster and develop a bond between the implant and the bone that is much stronger. The size of this advance is indicated by the Nanocoating being in the order of 100 times thinner, from 50 to 100nm thin, and bonding 8 times stronger than current technologies.

The increase in bone growth rate has been determined in both human and animal studies and compared with uncoated controls, indicating that the nano-coating offers better performance over current uncoated implants.

The principle of action is to enable press-fit implants to achieve very small gaps at insertion, for the HA layer to be rapidly re-absorbed to promote bone growth into the implant surface (causing improved osseo-integration during healing), and strong bonding to the bioactive silica layer for long term stability.

17 months after implantation

4 years after implementation

Early Qualitative Human Trial Dental - Bone growth and density is equivalent to normal teeth both shortly after implantation and years later. After constant monitoring, no adverse side effects have been caused by the coating.

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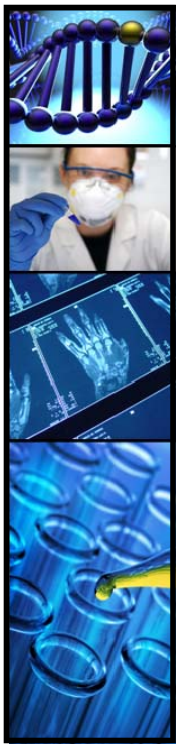
PROOF OF CONCEPT STUDIES

The Wark Nanocoating has undergone extensive testing including animal and physical trials. The first trial measured bone and extracellular matrix compounds along the interface between the bone and the implant in six sheep. The results showed an average increase of 36% in bone compounds and a 35% decline in extracellular matrix compounds on the coated implants. The percentage of the interface between bone tissue and implant was calculated at 68.7% for the silica coated implant specimens and 43.2% at the uncoated implant site. This further suggests that at the uncoated implant sites, the bone remodelling is at an earlier stage than at the coated implant sites.

In further studies, the nano-coated implants showed bone contact with the implant was 51% greater than uncoated controls, this means a greater area of implant can bond with the bone. Major concerns for orthopaedic surgeons are the speed of closing gaps between implant and bone as these allow loosening and sites for infection (the two biggest causes of revision surgery). The Nanocoating's ability to increase the speed of bone bonding and reduce gaps is what will cause surgeons to adopt the orthopedic nano-coating.



INTELLECTUAL PROPERTY

Methods of manufacture for the Wark Nanocoating are protected by a national phase patent in the USA, Europe, and Australia. These patents are owned by the University of South Australia. Modified hybrid coatings additional methods of application are under development and will be protected with additional patent applications.

OPPORTUNITY

Dental applications have been licensed and are under development. An opportunity exists for the orthopaedic market where rapid resorption and recrystalisation incorporating natural bone growth factors results in active bone formation close to the bioactive silica. The result is increased osseo-integration with powerful bone/implant bonding.

ABOUT TM VENTURES AND THE AUSTRALIAN RESEARCH NETWORK

From the Black Box Flight Recorder to Google Maps, Australia's innovation system is transforming the world we live in. CSL's anti-cancer vaccine (Gardasil), Biota's flu treatment (Relenza) and Cochlear's Bionic Ear are but a handful of medical technologies that were born of Aussie talent.

The Australian Research Network is a boutique consulting and business development company focused on emerging Australian innovation. The Network is committed to maximizing the value of technologies for both our domestic and international clients and if your company is considering Australian investment opportunities, contact us.

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