ONLINE ISSN : 1880-313X
PRINT ISSN : 0388-6107

Biomedical Research
Vol. 27 (2006) , No. 1 February pp.29-36

Oxygen plasma surface modification enhances immobilization of simvastatin acid

Masao YOSHINARI[1)], Tohru HAYAKAWA[2)], Kenichi MATSUZAKA[3)], Takashi INOUE[3)], Yutaka ODA[1)], Masaki SHIMONO[4)], Takaharu IDE[5)] and Teruo TANAKA[5)]

1) Department of Dental Materials Science, Oral Health Science Center, Tokyo Dental College
2) Department of Dental Biomaterials, Nihon University School of Dentistry at Matsudo
3) Department of Clinical Pathophysiology, Oral Health Science Center, Tokyo Dental College
4) Department of Pathology, Oral Health Science Center, Tokyo Dental College
5) Department of Oral Anatomy & Cell Biology, Graduate School of Dental Science, Kyushu University

(Received December 20, 2005)
(Accepted January 7, 2006)

ABSTRACT

Simvastatin acid (SVA) has been reported to stimulate bone formation with increased expression of BMP-2. Therefore, immobilization of SVA onto dental implants is expected to promote osteogenesis at the bone tissue/implant interface. The aim of this study was to evaluate the immobilization behavior of SVA onto titanium (Ti), O_2-plasma treated titanium (Ti + O_2), thin-film coatings of hexamethyldisiloxane (HMDSO), and O_2-plasma treated HMDSO (HMDSO + O_2) by using the quartz crystal microbalance-dissipation (QCM-D) technique. HMDSO surfaces were activated by the introduction of an OH group and/or O_2-functional groups by O_2-plasma treatment. In contrast, titanium surfaces showed no appreciable compositional changes by O_2-plasma treatment. The QCM-D technique enabled evaluation even at the adsorption behavior of a substance with a low molecular weight such as simvastatin. The largest amount of SVA was adsorbed on O_2-plasma

treated HMDSO surfaces compared to untreated titanium, HMDSO-coated titanium, and O_2-plasma treated titanium. These findings suggested that the adsorption of SVA was enhanced on more hydrophilic surfaces concomitant with the presence of an OH group and/or O_2-functional group resulting from the O_2-plasma treatment, and that an organic film of HMDSO followed by O_2-plasma treatment is a promising method for the adsorption of SVA in dental implant systems.

To cite this article:
Masao YOSHINARI, Tohru HAYAKAWA, Kenichi MATSUZAKA, Takashi INOUE, Yutaka ODA, Masaki SHIMONO, Takaharu IDE and Teruo TANAKA; "Oxygen plasma surface modification enhances immobilization of simvastatin acid", *Biomedical Research*, Vol. **27**, pp.29-36 (2006) .

doi:10.2220/biomedres.27.29
JOI JST.JSTAGE/biomedres/27.29