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学位論文内容の要約

学位論文題目

Characterization of minocycline-carbon nanohorn
conjugates and their antibacterial activity
(ミノサイクリン - カーボンナノホーンの複合体の製
作ならびにその静菌効果について)

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Carbon nanohorns (CNHs) is a graphene-like tubule with a cone-shaped tip. Because of the high biocompatibility and the feature to become porous by oxidation, the application as a carrier for drug transport has been widely studied. In this study, we adhered minocycline (MC) with CNHs to be used for local drug delivery against peri-implantitis which is the biggest problem in implant treatment.

Two types of CNHs (unoxidized: as-CNH, oxidized: CNHox550) were dispersed in the MC aqueous solution. dispersibility was improved by mixing MC aqueous solution with CNHs while CNHs are known to have low dispersibility. TEM observation confirmed the structure that seems to be MC around CNHs. Besides, the absorption spectrum measurement confirmed that MC can be supported by ultrasonic treatment of CNHs with MC aqueous solution. Almost all the MC carrier diffuses through the dialysis membrane within 24 hours after dialysis, whereas MC/as-CNH shows significant elution in 24-48 hours. In addition, MC/CNHox550 continues with a small amount until 7 days. This reveals that the amount of MC released varies depending on the presence of CNHs and the pre-oxidation treatment. After *Streptococcus mutans* and *Aggregatibacter actinomycetemcomitans* were cultured, MC alone and MC/as-CNH showed similar bacterial growth inhibitory effects, whereas the attenuation of the effect was confirmed with MC/CNHox550. CNHs were observed to touch the cell walls of dead bacteria. Based on this difference, it is expected that MC/as-CNH can distribute more amount of MC to the surrounding environment than MC/CNHox550, and probably the released MC is effective to bacteria.

As a result of this study, MC could be adhered with CNHs by mixing CNHs with MC aqueous solution. MC/as-CNH were found to retain MC bacteriostatic properties. Therefore MC/CNHs would be advantageous for local drug delivery therapy especially for peri-implantitis.