HOKKAIDO UNIVERSITY

Title	Characterization and antibacterial assessments of Ag nanoclusters/rose bengal nanocomposite for antimicrobial photodynamic therapy [an abstract of entire text]
Author(s)	蔀, 佳奈子
Description	この博士論文全文の閲覧方法については、以下のサイトをご参照ください。 https://www.lib.hokudai.ac.jp/dissertations/copy-guides/
Degree Grantor	北海道大学
Degree Name	博士(歯学)
Dissertation Number	甲第13482号
Issue Date	2019-03-25
Doc URL	https://hdl.handle.net/2115/74019
Type	doctoral thesis
File Information	Kanako_Shitomi_summary.pdf

Hokkaido University Collection of Scholarly and Academic Papers : HUSCAP

学位論文内容の要約

学位論文題目

Characterization and antibacterial assessments of Ag nanoclusters / rose bengal nanocomposite for antimicrobial photodynamic therapy

（抗菌的光線力学療法に向けた銀ナノクラスター/ローズベンガル複合体の特性並びに抗菌性評価）

博士の専攻分野名称　　博士（歯学）　　氏名　蔀　佳奈子

Ag nanoclusters (AgNCs) / rose bengal (RB) nanocomposite (AgNCs/RB) as a novel photosensitizer was created for antibacterial photodynamic therapy (a-PDT). We proposed double antibacterial effects of photoexcited AgNCs/RB; (1) singlet oxygen ($^1O_2$) generated by irradiated RB and (2) Ag^+ ion released by AgNCs oxidized by $^1O_2$. In present study, inactivation of oral bacterial cells with photoexcited AgNCs/RB were evaluated. In addition, the biosafe assessments of AgNCs/RB was carried out.

$^1O_2$ generation, zeta potential and Ag^+ release of synthesized AgNCs/RB was characterized. Subsequently, the antimicrobial effect of AgNCs/RB irradiated by white light-emitting diode (LED) was evaluated using oral bacterial cells; *Streptococcus mutans, Porphyromonas gingivalis and Aggregatibacter actinomycetemcomitans.* The cytotoxicity of AgNCs/RB was investigated on NIH3T3 mammalian cells.

The binding of AgNCs and RB, $^1O_2$ generation and Ag^+ ion release of photoexcited AgNCs/RB were estimated. AgNCs/RB irradiated by white LED (60 sec) showed significantly inhibited the growth of oral bacteria when compared to AgNCs or RB. In addition, photoexcited AgNCs/RB did not negatively affect the adhesion, spreading and proliferation of mammalian cells, even at concentrations that showed antibacterial activity.

In conclusion, AgNCs/RB irradiated by white LED showed great antimicrobial effects via $^1O_2$ generation and Ag^+ ion releasing and low cytotoxic properties to be provided for dental a-PDT.