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学位論文内容の要約

学位論文題目

**Characterization and evaluation of graphene oxide scaffold for
periodontal wound healing of dog class II furcation**

（イヌ根分岐部Ⅱ級欠損の歯周組織治癒のための
酸化グラフェンスキャフォールドの特性評価）

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The three dimensional (3D) scaffold plays a key role in volume and quality of repairing tissue in periodontal tissue engineering therapy. We fabricated novel 3D collagen scaffold containing nanocarbon material; graphene oxide (GO). Reportedly, GO exhibited good cytocompatibility and protein adsorption ability. The aim of this study was to characterize and assess the GO scaffold for periodontal tissue healing of dog furcation defect.

GO scaffolds were prepared by coating the surface of a 3D collagen sponge scaffold with 1 $\mu\text{g/mL}$ GO dispersion. Scaffolds were characterized using scanning electron microscopy (SEM), compressive strength and cytotoxicity test. Subsequently, we examined the cellular and tissue behaviors to GO scaffold on 10 day specimens of rat when GO scaffold was implanted onto rat cranial bone. In addition, measurements of bone augmentation were carried out at 4week postsurgery. Then, GO scaffold was implanted into dog class II furcation defects. Periodontal healing was investigated at 4week postsurgery.

In SEM observation, thin layer of GO was observed on the strut surface of the collagen scaffold. GO scaffold exhibited the 3D interconnected structure similar to untreated scaffold. GO application promoted the physical strength and exhibited good cytocompatibility against MC3T3-E1 cells. In bone forming assessment, placement of GO scaffold onto rat cranial bone significantly promoted early cell ingrowth, angiogenesis and bone augmentation compared to untreated scaffold. Furthermore, GO scaffold stimulated healing of dog class II furcation defect, in particular, formation of periodontal attachment, including alveolar bone, periodontal ligament-like tissue and cementum-like tissue was significantly formed by GO scaffold implantation.

These results suggest that GO scaffold is biocompatible and possess the excellent capability of bone and periodontal tissue formation. Therefore, GO scaffold would be beneficial for periodontal tissue engineering therapy.