섬유아세포를 함유한 상처치료용 콜라겐 막의 제조 및 특성

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Preparation and characterization of collagen membrane for cultured dermal substitute with fibroblast

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1. Introduction

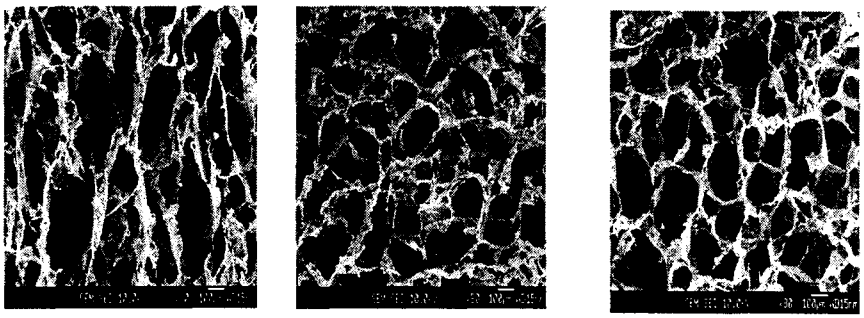
Macro-porous collagen membrane provides an extra cellular matrix analog which functions as a necessary template for host infiltration and physical support to guide the differentiation and proliferation of cells into the targeted functional tissue or organ. An ideal porous membrane used for skin tissue engineering should possess the characteristics of excellent biocompatibility, suitable microstructure such as 100~200㎛ mean pore size and porosity above 90%, controllable biodegradability and suitable mechanical property. Thus, macro-porous collagen membranes, extracted from fish, were prepared using the freeze-drying method. To prepare a thin-film with fibroblasts for wound dressing, fibroblast cell isolated from a child's foreskin was cultured in the macro-porous collagen membranes were cross-linked using ultraviolet(UV) irradiation. An *in vivo* study showed that after one week, the artificial dermis containing the fibroblasts enhanced the re-epithelialization of a full- thickness skin defect rather than the acellular macro-porous collagen membranes.

2. Experimental methods

Macro-porous collagen membranes, extracted from fish, were prepared using the freeze-drying method. To improve the biostability, the collagen membranes were treated with UV. The microstructure and mechanical property of the membranes were measured using morphology by scanning electron microscopy (SEM) and universal test machine (UTM). In addition, the cell attachment and proliferate were evaluated by *in vitro* and *in vivo* culture.

3. Results and discussion

Fig. 1 showed the cross-section SEM images of collagen membrane wiht various concentrations. Results for the microstructure of macro porous collagen membrane showed that the porosity was increased with collagen concentrate of solution. The microstructure such as pore size and its distribution, porosity as well as pore shape has prominent influence on cell intrusion, proliferation and function in tissue engineering.

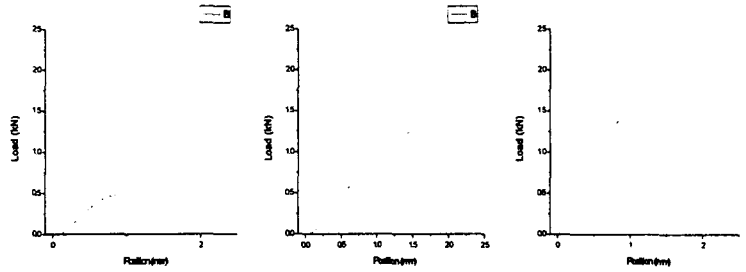


(a) (b) (c)

Fig.1. The cross-sectional SEM images of collagen different concentration:
(a) 1wt% , (b) 1.5wt% and (c) 2wt%

Tensile strength and *in vitro* culture see Fig.2 revealed that a high collagen content was suitable for mechanical property and cellular attachment and distribution in three-dimensional fibroblast cultures,

because the collagen had acidic residues, and arginine-glycine-aspartic acid (RGD) groups. An in vivo study showed that after one week, the artificial dermis containing the fibroblasts enhanced the re-epithelialization of a full- thickness skin defect rather than the acellular scaffold.



(a) (b) (c)

Fig.2. Tensile strength of collagen different concentration: (a) 1wt% , (b) 1.5wt% and (c) 2wt%

In summary, macro-porous collagen membrane is a promising material satisfying the properties of mechanical strength and cell adhesion ability, which are considered necessary for making successful membrain for cell culture.

4. Reference

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