Eosinophil Cationic Protein (ECP) Protects hearts against myocardial infarction

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Objective: ECP is a basic protein secreted from activated eosinophils. Recently, we found that ECP accelerates cardiomyocyte differentiation. Here we examined the protective effects of ECP against myocardial infarction (MI).

Methods: Adult male Sprague-Dawley rats were anesthetized, and the left anterior descending coronary artery was ligated. First, ECP or saline (PS) was injected directly to the heart. Next, we administered ECP or PS systemically using osmotic pump (Alzet model 2ML2). After 7 days, cardiac function was examined using ultrasound and recorded LV systolic and diastolic parameters. Then the heart was taken and embedded in paraffin, and embedded sections were cut (5 μm) and stained with hematoxylin and eosin or Masson Trichrome. Ventricular remodeling after MI was calculated as a width of left ventricle divided by a width of septum.

Results: ECP injection attenuated ventricular remodeling after MI compared with control rats. Echocardiography demonstrated an improvement of cardiac function after MI in ECP-treated rats compared with PS-treated rats.

Conclusions: Our results indicate that ECP has protecting effects on hearts against myocardial infarction.

Recombinant α1 chain of human type I collagen in the silkworms Bombyx mori: production of human gelatin as a novel biomaterial

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Objective: Most of the marketed collagens and gelatins are currently derived from animal skins or bones. Recently we generated the transgenic silkworms producing a recombinant α1 chain of human type I collagen (rα1) into their cocoons. Because of the absence of hydroxyprolines, rα1 does not possess the triple helical structure. In the present study we analyzed biochemical and cell biological properties of rα1 to demonstrate its usability as a novel biomaterial.

Methods: Purified rα1 was characterized on amino acid composition, N-terminal sequence, and CD spectra. We also analyzed the attachment and spreading of human skin fibroblasts on dishes coated with rα1. Cynomolgus monkey ES cells were cultured with murine embryonic fibroblast feeder cells on dishes coated with rα1.

Results: Analysis of amino acid composition and N-terminal sequence showed that the primary structure of rα1 was identical to that of native type I collagen except for the absence of hydroxyprolines and hydroxylsines. CD spectra of rα1 showed that the secondary structure was similar to denatured type I collagen, confirming the absence of the triple helical structure in rα1. rα1 was also shown to be the useful substrata to promote the attachment and spreading of fibroblasts at appropriate concentrations. ES cell colonies cultured on the dishes coated with rα1 expressed markers for the undifferentiated state after seeding 30 passages. The cells implanted into immunodeficient mice formed teratomas, demonstrating that the ES cells actually possessed pluripotency after culturing in this condition.

Conclusions: This study showed that the biochemical property of rα1 was similar to that of denatured collagen. Cell biological analyses suggested that rα1 may be used as an alternative to gelatins derived from animal tissues. Since rα1 has a very low risk of contamination of animal-derived materials, rα1 promises to be useful as a novel biomaterial for regenerative medicine.