

Pengaruh Coating Umbilical Cord Blood Serum Dan Platelet Rich Plasma Terhadap Karakteristik Perancah Polikaprolakton Untuk Aplikasi Rekayasa Jaringan = The Effect of Umbilical Cord Blood Serum and Platelet Rich Plasma Coating on the Characteristics of Polycaprolactone Scaffolds for Tissue Engineering Applications

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Abstrak

Kulit artifisial adalah susunan biomaterial yang terdiri dari sel, perancah, dan molekul bioaktif dan diaplikasikan sebagai pengganti kulit yang rusak dalam terapi luka kronis. Perancah yang kompatibel secara biologis maupun fisikokimia masih menjadi fokus penelitian dari pengembangan kulit artifisial saat ini. Polikaprolakton (PCL) memiliki potensi sebagai material penyusun perancah karena biokompatibilitas, sifat mekanik, dan fleksibilitasnya. Namun, PCL memiliki bioaktivitas yang rendah sehingga perlu ditambahkan suatu bahan alami. Pada penelitian ini, Umbilical Cord Blood Serum atau Umbilical Cord Blood Serum (UCBS) dan Platelet-Rich Plasma (PRP) yang kaya akan molekul bioaktif dan matriks ekstraseluler ditambahkan ke perancah PCL sebagai coating. Perancah PCL difabrikasi terlebih dahulu dengan PCL 20% dengan metode freeze-drying. Kemudian, perancah di-coating dengan UCBS atau PRP dengan metode dip-coating dan gelasi termal atau dengan CaCl_2 . Pada penelitian ini, kedua coating meningkatkan biokompatibilitas perancah pcl yaitu perlekatan sel ($78.90 \pm 3.65\%$ - $89.45 \pm 3.65\%$) dan viabilitas sel hingga (84.99% - $99.23 \pm 3.72\%$). Perancah yang di-coating memiliki kekuatan tekan (2.78 ± 0.005 - 3.58 ± 0.64 Mpa) berpermukaan kasar, tingkat swelling ($33.48 \pm 3.32\%$ - $50.15 \pm 1.39\%$), dan porositas ($1.24 \pm 0.27\%$ - $1.79 \pm 0.12\%$). Maka dari itu, baik UCBS maupun PRP dapat meningkatkan biokompatibilitas perancah PCL sebagai kulit artifisial.

.....Artificial skin is a construct of biomaterials consisting of cells, scaffolds and bioactive molecules, and it is used as a substitute for damaged skin in chronic wound therapy. Scaffolds that are compatible both biological and physicochemical aspects are still the focus of research from the development of artificial skin recently. Polycaprolactone (PCL) has potential as a material for scaffold due to its biocompatibility, mechanical properties, and flexibility. However, PCL has low bioactivity, so it is necessary to add a natural ingredient. In this study, Umbilical Cord Blood Serum (UCBS) and Platelet Rich-Plasma (PRP) which are rich in bioactive molecules and extracellular matrix incorporated to the PCL scaffolds as coatings. The PCL scaffolds were fabricated with 20% PCL by freeze-drying method. Then, the scaffolds were coated with UCBS or PRP by dip-coating and gelation by temperature for UCBS and CaCl_2 for PRP to polymerize extracellular matrix in UCBS and fibrin matrix in PRP. In this study, both coatings increased the biocompatibility of the PCL scaffold, including cell attachment ($78.90 \pm 3.65\%$ - $89.45 \pm 3.65\%$) and cell viability (84.99% - $99.23 \pm 3.72\%$). The coated scaffolds also improved physicochemical property including compressive strength (2.78 ± 0.005 - 3.58 ± 0.64 Mpa), rough surface, swelling ratio ($33.48 \pm 3.32\%$ - $50.15 \pm 1.39\%$), and a porosity of $1.24 \pm 0.27\%$ - $1.79 \pm 0.12\%$. Therefore, both UCBS and PRP can be used as coatings to increase the biocompatibility of PCL scaffolds as artificial skins.