

Rini, Novi Dwi Widya. 2019. **Biokomposit Kolagen – Kitosan – Natrium Hialuronat sebagai Solusi Alternatif Kornea Artifisial untuk Kasus Kebutaan**. Skripsi dibawah bimbingan Dr. Prihartini Widiyanti, drg., M.Kes dan Drs. Siswanto, M.Si. Program Studi S1 Teknik Biomedis, Departemen Fisika, Fakultas Sains dan Teknologi, Universitas Airlangga.

ABSTRAK

Berdasarkan riset Kesehatan Dasar tahun 2013, sebanyak 966.329 dari 224.714.112 penduduk Indonesia mengalami kebutaan, dimana kerusakan kornea menjadi penyebab kebutaan kedua setelah katarak. *Gold* standar penanganan kebutaan kornea menggunakan keratoplasti belum mampu mengatasi masalah tersebut dikarenakan jumlah pendonor yang terbatas serta adanya respon penolakan tubuh. Kolagen dan kitosan diketahui memiliki biokompatibilitas yang baik sebagai kornea artifisial, selain itu natrium hialuronat (NaHA) 0.5% w/v pada kolagen 1% w/v dan kitosan 2% w/v memberikan persentase transmitansi yang sesuai dengan kornea manusia. Berdasarkan latar belakang tersebut, penelitian ini dilakukan untuk mengetahui pengaruh NaHA terhadap transmitansi kornea artifisial berbasis kolagen – kitosan – NaHA, serta karakteristiknya melalui uji sitotoksitas, hidrofilitas, degradasi, morfologi permukaan, dan indeks bias. Kornea artifisial dibuat dari kolagen, kitosan, dan NaHA dengan rasio 20% w/v kolagen, 10% w/v kitosan, dan NaHA yang divariasikan dengan rasio 0%; 0,3%; dan 0,6% w/v. Kornea artifisial dibuat dengan menautsilang kolagen dengan *Hydroxypropyl methylcellulose* (HPMC) yang kemudian dicampurkan dengan kitosan dan NaHA menggunakan *magnetic stirrer*. Setelah itu, pemanasan dilakukan menggunakan inkubator. Hasil uji transmitansi menunjukkan bahwa penambahan konsentrasi NaHA memberikan nilai transmitansi yang sesuai dengan kornea manusia. Uji sitotoksitas menunjukkan persentase viabilitas sel di atas 70%. Uji hidrofilitas memberikan hasil ketiga sampel bersifat hidrofilik. Uji degradasi memberikan hasil laju degradasi kornea artifisial lebih cepat dari laju degradasi kornea manusia. Uji morfologi permukaan memberikan gambaran ketiga sampel memiliki struktur yang kurang kuat dan rapuh. Uji indeks bias memberikan hasil nilai indeks bias kornea artifisial yaitu $1,499 \pm 0,25836$. Berdasarkan penelitian ini, disimpulkan bahwa NaHA mampu meningkatkan transmitansi kornea artifisial, serta kornea artifisial berbasis kolagen – kitosan – NaHA telah memenuhi persyaratan kornea pada sifat toksitas, hidrofilitas, dan indeks bias, sedangkan pada sifat degradabilitas dan morfologi permukaan perlu untuk dilakukan studi lebih lanjut.

Kata kunci: kebutaan kornea, kornea artifisial, kolagen, kitosan, natrium hialuronat.

Rini, Novi Dwi Widya. 2019. **Collagen - Chitosan - Sodium Hyaluronate Biocomposite as an Artificial Corneal Alternative Solution for Cases of Blindness**. Thesis under the guidance of Dr. Prihartini Widiyanti, drg., M.Kes and Drs. Siswanto, M.Si. Bachelor of Biomedical Engineering, Departement of Physic, Faculty of Science and Technology, Airlangga University.

ABSTRACT

Based on Basic Health research in 2013, there were 966,329 of 224,714,112 Indonesians suffering from blindness, where corneal damage was the second cause of blindness after cataracts. The gold standard for treating corneal blindness using keratoplasty couldn't completely heal cornea injury due to the limited number of donors and the body's rejection respons. Collagen and chitosan was known to have good biocompatibility as an artificial cornea, besides sodium hyaluronate (NaHA) 0.5% w/v in collagen 1% w / v and chitosan 2% w/v provide a percentage of transmittance that was in accordance with the human cornea. Based on this background, this study was conducted to determine the effect of NaHA on collagen-chitosan-NaHA-based artificial corneal transmittance, and its characteristics through cytotoxicity, hydrophilicity, degradation, surface morphology, and refractive index test. Artificial corneas were made from collagen, chitosan, and NaHA with a ratio of 20% w/v collagen, 10% w/v chitosan, and NaHA which are varied with a ratio of 0%; 0.3%; and 0.6% w/v. Artificial corneas were made by linking collagen with Hydroxypropyl methylcellulose (HPMC) which is then mixed with chitosan and NaHA using a magnetic stirrer. After that, heating was done using an incubator. The transmittance test results showed that the addition of NaHA concentration gave a transmittance value that was in accordance with the human cornea. Cytotoxicity tests showed the percentage of cell viability above 70%. The hydrophilicity test gave the results of the three samples to be hydrophilic. The degradation test gave the results of the artificial corneal degradation rate faster than the rate of degradation of the human cornea. The surface morphology test provided a third picture of the sample having a less strong and brittle structure. The refractive index test results in an artificial corneal refractive index of 1.499 ± 0.25836 . Based on this study, it was concluded that NaHA was able to increase artificial corneal transmittance and collagen-chitosan-NaHA-based artificial cornea in accordance with corneal requirements for toxicity, hydrophilicity and refractive index, whereas further studies are needed in degradability and surface morphology characteristic.

Keywords: corneal blindness, artificial cornea, collagen, chitosan, sodium hyaluronate.