

Enhanced Sealing by Hydrophobic Modification of Alaska Pollock-Derived Gelatin-Based Surgical Sealants for the Treatment of Pulmonary Air Leaks.

Authors: Mizuta R., Taguchi T.

Publication Date: 2017

Abstract:

Pulmonary air leaks are medical complications of thoracic surgery for which fibrin sealant is the main treatment. In this study, innovative sealants based on hydrophobically modified Alaska pollock-derived gelatin (hm-ApGln) and a poly(ethylene)glycol-based 4-armed cross-linker (4S-PEG) have been developed and their burst strengths have been evaluated using fresh rat lung. The developed sealants show higher lung burst strength compared with the nonmodified original ApGln (Org-ApGln)-based sealant and a commercial fibrin sealant. The maximum burst strength of the hm-ApGln-based sealant is 1.6-fold higher than the Org-ApGln-based sealant ($n = 5$, $p < 0.05$), and 2.1-fold higher than the commercial fibrin sealant ($n = 5$, $p < 0.05$). Cell culture experiments show that modification of ApGln with cholesteryl or stearyl groups effectively enhances anchoring to the cell surface. In addition, binding constants between hm-ApGln and extracellular matrix proteins such as fibronectin and fibrillin are increased. Therefore, the new hm-ApGln/4S-PEG-based sealant has the potential for applications in thoracic surgery. (Figure presented.).

Copyright © 2016 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim