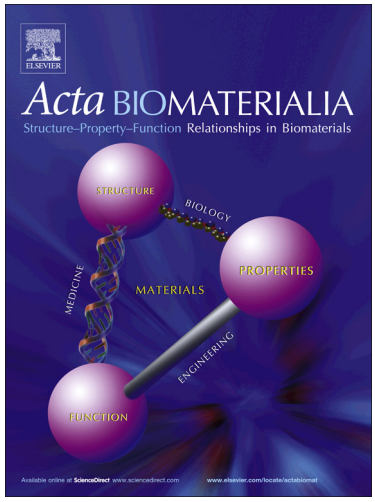

Full length article

Bioinspired Capsules based on Nanocellulose, Xyloglucan and Pectin – the influence of Capsule Wall Composition on Permeability Properties

T. Paulraj, A.V. Riazanova, A.J. Svagan

PII: S1742-7061(18)30014-X
DOI: https://doi.org/10.1016/j.actbio.2018.01.003
Reference: ACTBIO 5258

To appear in: *Acta Biomaterialia*

Received Date: 1 October 2017
Revised Date: 1 January 2018
Accepted Date: 8 January 2018

Please cite this article as: Paulraj, T., Riazanova, A.V., Svagan, A.J., Bioinspired Capsules based on Nanocellulose, Xyloglucan and Pectin – the influence of Capsule Wall Composition on Permeability Properties, *Acta Biomaterialia* (2018), doi: https://doi.org/10.1016/j.actbio.2018.01.003

Bioinspired Capsules based on Nanocellulose, Xyloglucan and Pectin – the influence of Capsule Wall Composition on Permeability Properties

Authors: T. Paulraj, A. V. Riazanova and A. J. Svagan*

Address: Wallenberg Wood Science Center and Department of Fiber and Polymer Technology, KTH Royal Institute of Technology, SE-100 44 Stockholm, Sweden

*corresponding author: svagan@kth.se, phone number: +46 8 790 80 00

ABSTRACT. Materials based on renewable biopolymers, selective permeability and stimuli-responsive release/loading properties play an important role in biomedical applications. Here, in order to mimic the plant primary cell-wall, microcapsules have been fabricated using cell wall polysaccharides, namely pectin, xyloglucan and cellulose nanofibers. For the first time, a large amount of xyloglucan was successfully included in such capsules. These capsules demonstrated stimuli-responsive (ON/OFF) permeability and biocompatibility. The live cell staining revealed that the microcapsules' surface enhanced cell growth and also the non-toxic nature of the microcapsules. In water, the microcapsules were completely and partially permeable to fluorescent dextrans with an average molecular weight of 70 kDa (hydrodynamic diameter of ca. 12 nm) and 2000 kDa (ca. 54 nm), respectively. On the other hand, the permeability dropped quickly when the capsules were exposed to 250 mM NaCl solution, trapping a fraction of the 70 kDa dextrans in the capsule interior. The decrease in permeability was a direct consequence of the capsule-wall composition, i.e. the presence of xyloglucan and a low amount of charged molecules such as pectin. The low permeability of capsules in saline conditions (and in a model biological medium), combined with a capsule wall that is made from dietary fibers only, potentially enables their use in biological applications, such as colon targeted delivery in the gastro-intestinal tract.