

# Biomaterials from Regenerated Silk Fibroin

## EXECUTIVE SUMMARY

Various novel methods for producing 3D porous biomaterials from regenerated silk fibroin (RSF) – which has wide ranging applications in tissue engineering, wound healing bandages, drug delivery, cosmetic applications etc.

## TECHNOLOGY DESCRIPTION

NCL scientists have developed various processes for producing 3D porous biomaterials from regenerated silk fibroin (RSF). Our process for the accelerated gelation of RSF- resulting in a porous structure lowers the gelation time to a few hours instead of several days. The protein concentration can be between 0.1- 40%. It works in a broad pH range of 5 – 7.5, within temperatures ranging from 20-70°C. Another process using electrospinning of RSF from an aqueous solution, forms 3D porous structures (like non-woven mats) which have various biomedical applications. Surface modification of such biomaterials for improved performance is currently under progress.

## MARKET POTENTIAL

- The market for biomaterials such as RSF was predicted to be of \$37.6 billion for 2011 and projected to reach \$64.7 billion by 2015\*<sup>^</sup>
- The global market potential for tissue engineering and regenerative medicines has been expected to exceed \$118 billion by year 2013- mainly in the target potential areas of wound care and orthopaedics.\*\*

\* <http://www.the-infoshop.com/report/mama179926-global-biomaterial.html> - viewed 16/05/11 ^ <http://www.the-infoshop.com/report/inde180852-glob-biomaterial.html> - viewed 16/05/11 \*\*<http://www.medicalnewstoday.com/releases/141341.php> - viewed 18/05/11

## VALUE/ADVANTAGES

- Free of microbial growth (superior performance of implants, lower toxicity)
- Shorter gelation time opens-up the potential spectrum of applications of the materials developed using this method
- Process is cheaper and faster (aqueous solution used instead of organic solvent-eliminates several intermediate steps)
- Implant that could be reproduced with great consistency and quality
- Wide range of pore sizes: 1-10 microns

## APPLICATIONS

- In tissue engineering- as bio-degradable bio-absorbable scaffolds (due to lower inflammatory and superior mechanical properties) and damaged tissue regeneration (For ex. bone, nerves, ligament, etc)
- In wound healing bandages (provides a moist environment to facilitate re-epithilization, re-modeling of connective tissues and collagenization)
- As controlled drug delivery vehicles
- Silk fibroin peptides are used in cosmetics due to their glossy, flexible, elastic coating power, easy spreading and adhesion

## TECHNOLOGY STATUS

- Demonstrated at the lab scale
- On the lookout for potential partners for licensing
- Patent application filed: PCT filed- [PCT/IN2010/000506](http://www.nclinnovations.org/PCT/IN2010/000506)