



INJECTABLE BIODEGRADABLE GELS WITH HYDROPHOBIC POCKETS/CAVITY FOR DELIVERY OF DRUGS

NCL Innovations: Solutions from CSIR India

Technology

- Hydrogels are 3-D polymer networks with an unique ability to hold water, maintaining semi-solid state giving them physical characteristics similar to soft tissues
- Their applications in biomedicine require them to be easily administrable as preformed hydrogels are difficult to mould to the cavity shape
- Hydrogels are hydrophilic, and it is difficult to load drugs into them, as most drugs are hydrophobic in nature
- Should be able to exist as flowable aqueous solutions before injection and immediately turn in to standing gels upon administration (*in situ* crosslinked)
- The hydrogel disclosed here is *in situ* crosslinked (which makes it suitable for injectable systems), with one or more hydrophobic pocket(s) which can be used to deliver desired drugs
 - Delivers the drugs with desired release profile
 - Gelation time- 1 to 30 minutes; Degradation time- 1- 30 days; Storage modulus (capacity) from 5- 110 Kpas
- Comprises of a polymer backbone, a hydrophobic pocket (moiety being triclosan) and a water soluble cross linker for the formation of the gel (paclitaxel solubilized in alpha tocopherol)

Applications

- In site specific drug delivery systems/depots
 - Many important drugs are hydrophobic in nature and need to be administered in a solubilized form for the expected therapeutic effect- using our gel system, which has hydrophobic pockets to hold these drugs, the drugs can be delivered directly
- Biomedicine
 - Cell growing depots for tissue regeneration
 - Protective membranes for the treatment of wounds
- Tissue engineering
 - Space filling agents
 - Delivery vehicles for bioactive molecules
 - Tissue formation directing scaffolds

Market Potential

- There has been a growing demand for novel drug delivery technologies
- The US market for advanced drug delivery has been projected to exceed \$76 billion by 2014¹ and face a sales of \$153.5 billion by 2011²
 - Not many organizations exist which can fulfill the task of making such specialized delivery techniques on a large scale¹
- The worldwide market value for wound-care management is expected to come in at \$19.7 billion in 2016³
 - Companies are focused on delivering advanced treatments necessary to heal wounds and improve lives³
- The tissue engineering market in US is expected to reach \$50 million by the year 2015⁴ and the worldwide market is expected to pass the \$15 billion mark by 2012⁵ signifying significant market potential for these gels

<http://www.pharmameddevice.com/App/homepage.cfm?appname=100485&linkid=23294&moduleid=3162> (viewed 13/06/11)¹

<http://www.hbs.edu/units/tom/conferences/docs/Highly%20Responsive%20Hydrogel%20Scaffold.pdf> (viewed 13/06/11)²

<http://www.medtechinsight.com/ReportA125.html> (viewed 13/06/11)³

http://www.idataresearch.net/idata/articleUpload/28c541a169fa276c552233149a262fa2_1259794435_december2009.pdf (viewed 21/07/11)⁴

<http://www.tissuegenesis.com/TGI%20Market%20Opportunity%20Brochure.pdf> (viewed 21/07/11)⁵

Value

- Can be useful for administering agents such as drugs, proteins, etc. through various delivery profiles (slow, sustained, pulsatile release)
- Overcome the barrier of surgical implantation
 - Injectable & *in situ* cross linked
 - Biodegradable
- Does not require solvents as other biodegradable polymers might require
 - Solvents harmful to the human body
 - Some drugs may become inactive on coming in contact with the solvent
- In drug delivery applications, drugs can be loaded in the hydrophobic pockets present in the gels
- Provides precise control over the chain length, sequence and 3D arrangement of the polymer networks in the gels - hence prevents side reactions caused which may influence their performance

Technology Status, IP Status

- Patent application filed
- Ready to be licensed/commercialized
- Demonstrated at lab scale

Links & References

- [PCT application](#) filed
- Mooney, D. J. & Drury, J. L. (2003) Hydrogels for tissue engineering: scaffold design variables and applications, *Biomaterials*, 24, 4337-4351 (Review)

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Summary

Technology Summary	
Technology title	<i>In situ</i> biodegradable gel with hydrophobic pockets for delivery of desired agents
Industry /sector	Biomedical/Pharmaceuticals
Year of development	2009
Related patents (with links)	Patent application filed
Technology readiness level	Demonstrated at lab scale
Licensing status	Ready to be licensed/commercialized
Encumbrances	None
Availability	Yes