



Localized Delivery of Nucleic Acid by Polyelectrolyte Assemblies

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Inventors: David Lynn, Jingtao Zhang, Christopher Jewell, Nathaniel Fredin

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing ultrathin, multilayered polyelectrolyte films that permit the localized delivery of nucleic acids to cells from the surfaces of implantable materials.

Overview

Thin films and coatings that allow the sustained release of DNA from surfaces play an important role in the development of localized approaches to gene therapy. For example, polymer-coated intravascular stents have been used to localize delivery of DNA to the vascular wall and could lead to innovative gene-based treatments for vascular diseases.

However, existing devices are coated with relatively thick films of polymers, which can lead to inflammatory responses *in vivo*. They also utilize DNA encapsulation methods that provide limited control over DNA loading and the spatial distribution of the encapsulated DNA.

The Invention

UW-Madison researchers have developed ultrathin, multilayered polyelectrolyte films that permit the localized delivery of nucleic acids to cells from the surfaces of implantable materials. To form the polyelectrolyte coating, nucleic acids and polycations are deposited layer-by-layer onto the surface of an implantable device. After implantation, nucleic acids are delivered only to the cells in direct contact with the device surface. The polyelectrolyte film promotes the direct and self-sufficient transfection of those cells to enable local production of therapeutic agents.

Applications

- Localized gene therapy
- Growth and regeneration of complex tissues
- Inhibition of the inflammation that occurs when medical devices are implanted
- Implantable materials and devices, including sutures, stents, pacemakers, defibrillators, artificial joints, prostheses, neurostimulators, indwelling catheters or insulin pumps

Key Benefits

- Ultrathin, conformal films can be deposited on devices with complex geometries.
- Promotes localized gene expression without requiring additional transfection agents
- Process can be used to incorporate and release multiple nucleic acid constructs.
- Composition of the nucleic acid and polycation layers can be varied to adjust the degradation rate of each layer within the film.
- Allows spatial and temporal control over the release of DNA

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Publications

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| info@warf.org | 608.960.9850

- Saurer E.M., Flessner R.M., Sullivan S.P, Prausnitz M.R. and Lynn D.M. 2010. Layer-by-Layer Assembly of DNA- and Protein-Containing Films on Microneedles for Drug Delivery to the Skin. Biomacromolecules 11, 3136–3143.

Tech Fields

- [Drug Delivery : Other drug delivery technologies](#)
- [Medical Devices : Device coatings](#)

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854

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