



Regulating Stem Cell Behavior with High Throughput Mineral Coatings

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WARF: P110350US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing methods of using biodegradable mineral coatings for enhanced non-viral cell transfection.

Overview

Transfection is the process of introducing nucleic acids into cells. Two main strategies are viral (utilizing viruses as vectors) and non-viral. Non-viral methods are less efficient but attractive for many reasons, including improved safety, lower cost and ease of preparation.

One method that can be used to enhance non-viral transfection involves co-localizing DNA and cells on the same substrate. The properties of the substrate material potentially can be optimized to encourage high levels of transfection. One type of substrate that could be particularly attractive for this purpose is a calcium phosphate (CaP) mineral surface, as nanostructured substrates and CaP minerals have each been shown to increase transfection efficiency in cell culture.

CaP minerals can be deposited on bioactive substrates and studied for their effects on cell behavior, including stem cell attachment. However, previous studies have not been capable of systemically assessing how CaP minerals influence stem cell behaviors, including proliferation, differentiation and transfection. An efficient means of identifying useful CaP mineral coatings could lead to new transfection strategies.

The Invention

UW–Madison researchers have developed methods of non-viral cell transfection and regulating cell behavior using mineral coatings. The coatings bind polynucleotides and provide a source of calcium and phosphate ions to enhance transfection.

More specifically, a mineral coating is formed by incubating a substrate in a simulated body fluid (SBF). The substrate then is loaded with a polynucleotide (e.g., plasmids, mRNA or proteins), which binds to the coating. Next, a solution of cells is deposited and cultured until a desired level of transfection occurs.

Applications

- High throughput screening platform
- Researching the effects of specific mineral coatings on cellular behavior
- Developing medical device and implant coatings

Key Benefits

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- Determines best mineral coating for particular cell and conditions

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Stage of Development

A 70-fold increase in expression of a transgene (when compared to gold standard transfection methods) has been demonstrated using the mineral coatings.

Additional Information

For More Information About the Inventors

- [William Murphy](#)

Related Technologies

- [WARF reference number P06064US describes a DNA delivery method that enables spatial and temporal control over the transfection of stem cells.](#)

Related Intellectual Property

- [View Divisional Patent in PDF format.](#)

Tech Fields

- [Medical Devices : Device coatings](#)
- [Pluripotent Stem Cells : Tools](#)
- [Research Tools : DNA & RNA tools](#)

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