

Targeted and controlled release drug delivery using a multi-reservoir microdevice

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Technology description

UCSF investigators have developed a method of fabricating multi-reservoir microdevices comprised of bio-compatible material using photolithography and reactive ion etching (RIE). Application of a bioadhesive coating enables its attachment to target tissues, and the resulting microdevices can be used to deliver small molecules, peptides or biologics either singly or in combination. Additional design features permit unidirectional and sustained drug release which results a higher local concentration and hence more effective drug delivery to the tissue or area of interest.

The researchers have successfully demonstrated the method for:

- 1) generating multiple reservoirs of the microdevice;
- 2) application of various bioadhesive molecules;
- 3) sequential loading of multiple drugs; and
- 4) preparing drug-containing biopolymers with different release dynamics.

A major challenge in developing effective therapies is getting the drug to the right place at the right time. A variety of drug administration paradigms have been developed in an attempt to overcome this issue of bioavailability, but each is susceptible to one or more hurdles including drug aggregation, inability to target the drug to the organ or tissue of interest, and inefficient permeation and subsequent clearance of the drug once it arrives at the target site. Furthermore, the treatment of some conditions such as cancer, AIDS, and malaria require drug “cocktails” that involve complicated dosing regimens for each individual therapeutic. As a result of these issues, patients oftentimes are receiving complicated or ineffective treatments at elevated costs due to the loss of precious drug substance. The development of microdevices and the methods of customizing them to provide independent and controlled delivery of multiple drugs could transform the current standard of care.

Additional Information

Inventor Information

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Related Materials

[Chirra HD, Desai TA. Multi-reservoir bioadhesive microdevices for independent rate-controlled delivery of multiple drugs. Small. 2012 Dec 21;8\(24\):3839-46.](#)

Application area

Single or multi-drug loaded microdevices for mucosal tissue drug delivery (e.g., nose, mouth, lungs, genitourinary tract)

Single or multi-drug loaded medical implants for single or combinatorial drug delivery (e.g., dental, cardiovascular, neurological, neurovascular, muscular, ocular)

Single or multi-drug loaded micropatches for single or combinatorial transdermal delivery

Fabrication of lab-on-a-chip microdevices for use as diagnostic tools

Advantages

Microdevice is fabricated from materials with greater biocompatibility than existing products

Multiple reservoirs provide option to administer single or multiple therapeutic agents

Multiple reservoirs enable drug delivery with independent and customizable controlled release properties

Unidirectional flow design results in higher drug concentrations at desired site of action

Bioadhesive coating aids in targeting and adherence of microdevice to tissue of interest

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