Prolonged-release of ceftriaxone from microchamber arrays of polylactic acid

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Drug delivery systems

The creation of systems for the controlled delivery of drugs is a promising scientific direction in recent years since the use of such systems can significantly increase the therapeutic effect and reduce the negative impact of potent drugs on healthy tissues of the body.

Microchamber arrays (MCA) are promising systems for controlled delivery, which are thin polymer films with ordered microcontainers allowing the encapsulation of various substances. The use of MCA for medical purposes can be carried out by the introduction of MCA during surgery, as a coating for implants/stents, or through the skin in combination with various variants of poration.
Design of MCA

- **Glass**
- **PDMS**
- **PLA**

**Drug**

1 mm/sec

15 sec

T ≈ 50-60 °C

**PLA**

- **flat film**
- **patterned film**

**cones height 21±1 µm**
Dependence of the film thickness on the initial PLA concentration

<table>
<thead>
<tr>
<th>PLA flat film (3.5%) + patterned film (%)</th>
<th>1%</th>
<th>1.5%</th>
<th>2%</th>
<th>2.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 µm</td>
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![Graph showing the dependence of film thickness on initial PLA concentration]
Changes in the microwells morphology and ceftriaxone loading at initial concentrations of PLA

* insert size 40x40 µm
Release of ceftriaxone from microchamber arrays

MCA with Ceftriaxone

NaCl 0.9%

Thermo Shaker 37 °C.

Incubation time

Optical density at 275 nm

Calibration Curve

Absorbance

Concentration (μg/ml)

y = 0.0453x
R² = 0.9989
The total amount of the drug in the microchamber arrays and bacteriological activity

![Graph showing concentration (µg/cm²) of drug in flat film (3.5%) + patterned film (%)

Concentration (µg/cm²)

- 1%
- 1.5%
- 2%
- 2.5%

Flat film (3.5%) + patterned film (%)

Suspension of Staphylococcus aureus

MCA with Ceftriaxone

Zone of retardation

24 h

48 h

Images of petri dishes with bacterial growth at 24 h and 48 h.
Thank you for your attention