Progression Toward an Artificial TM

John Danias, MD, PhD

Departments of Ophthalmology & Cell Biology
SUNY Downstate Medical School

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Disclosure

• Consultant for Bausch and Lomb
Need for an “Artificial TM”

• Understanding TM physiology at the molecular level

• Screening medications for human use

• Therapeutic replacement of diseased TM
SU-8 fabrication process

a

b

c

d

Substrate
OmniCoat™
SU-8
Mask

f

e

SU-8 fabrication process
hTM cells grown on SU-8 scaffolds
Effect of coating on hTM cell growth

Polylysine

Gelatin
hTM cells grown on SU-8 on for 1 or 2 weeks
Expression of hTM markers

[A] α SMA

[B] αβ crystalline
Location of hTM cells on SU8 grid
Diagram of the flow system used for perfusion studies
“Outflow facility” of bioengineered TM

Outflow facility = 4.7 µl/min/mmHg

\[ y = 0.21283x \]
R-square = 0.99286

Pressure (mmHg) vs. Flow Rate (µl/min)
Effect of Latranculin B on flow resistance

- Before treatment
- After Lat-B treatment

Pressure (mmHg)

- SU-8 alone
- Artificial TM
Effect of Latranculin B

Non-perfused

Perfused with medium

Perfused with medium + Lat-B
Concept of a bi-layered “Artificial TM”
Artistic rendering of a potential high-throughput screening artificial TM

Illustration showing a) exploded, and b) cross-sectional view of 6-channel perfusion array for “artificial TM”.

c) Schematic of proposed system setup.

Disposable cell-culture insert with SU-8 porous substrate

Re-usable effluent wells (bottom) and fixed lid with fluidic inlets (top). Connection to cell-culture inserts is through O-ring compression seals.

6-channel artificial TM array
Conclusions

• Development of “Artificial TM” is in early stage
• “Physiologic” behavior is first milestone
• Complexity of tissue can be simulated
• High through-put screening of outflow facility drugs will be first practical application
• Therapeutic application is far off
• Lab members
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