

Humana tkiva iz laboratorije za regenerativnu medicinu i nove lekove



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Krivak i SANU

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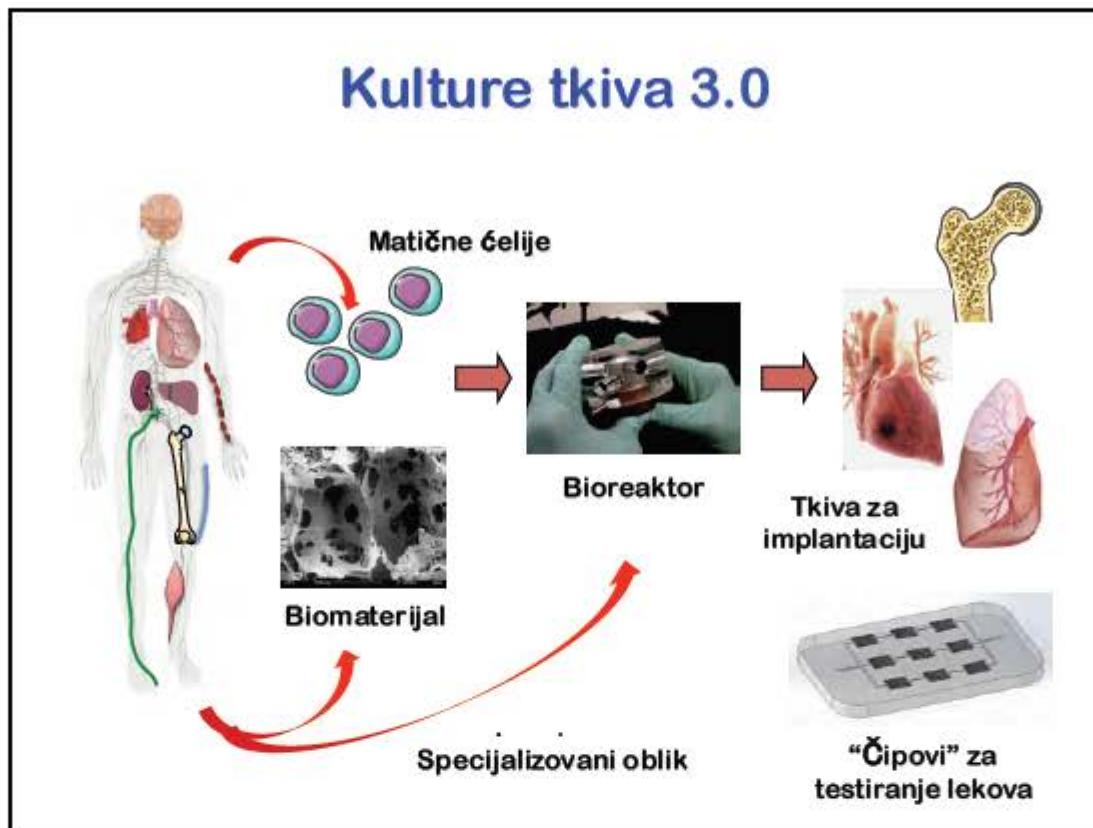
Motivacija:

- Živimo duže i bolje nego ikada pre, sve više su nam potrebni "rezervni delovi"
- Humana tkiva mogu da se gaje u laboratoriji
 - Implantacija
 - Testiranje novih lekova

Prosečan životni vek

Stara Grčka	28
Kraj 19 veka	40
Danas	80





Prirodni biomaterijali:

Extracellular Matrix Biomaterials

ECM Scaffolds | Sponges | Hydrogels | Solutions
Specific organ- and tissue-derived ECM Biomaterials

Next generation three-dimensional, 100% natural, bioactive, tissue-specific micro-environments for stem cell differentiation, maturation, and tissue engineering

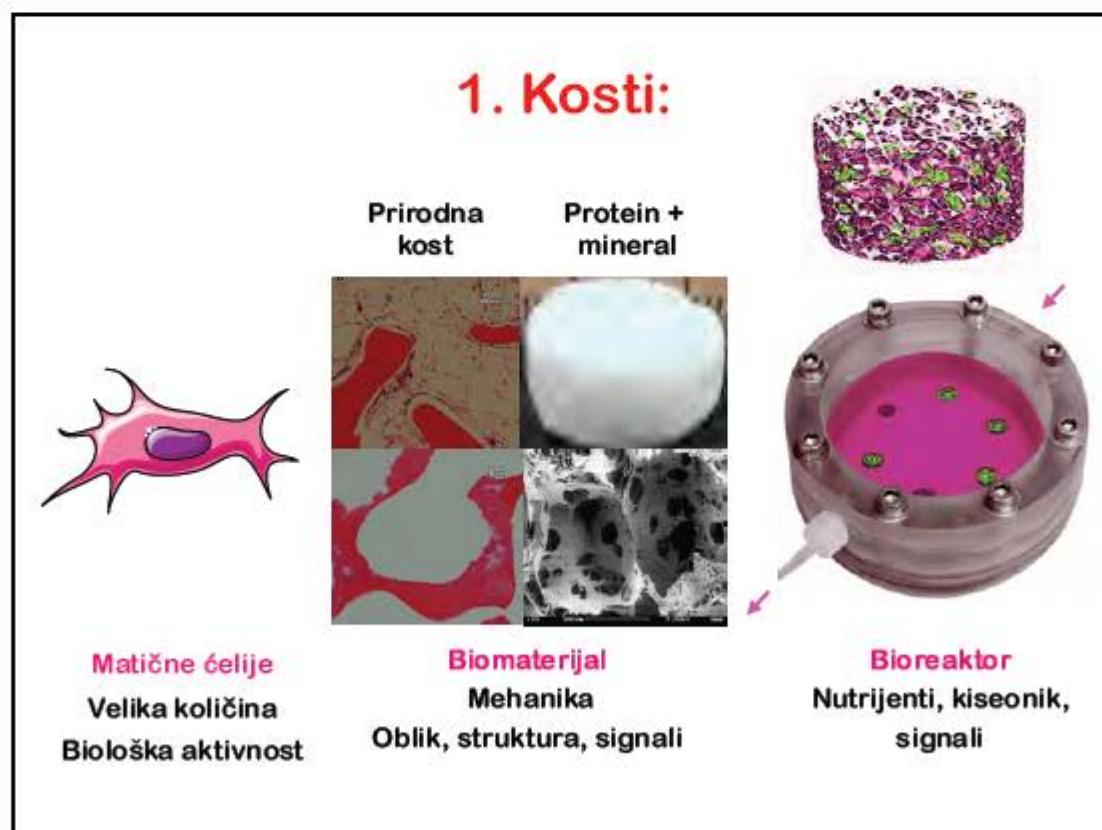
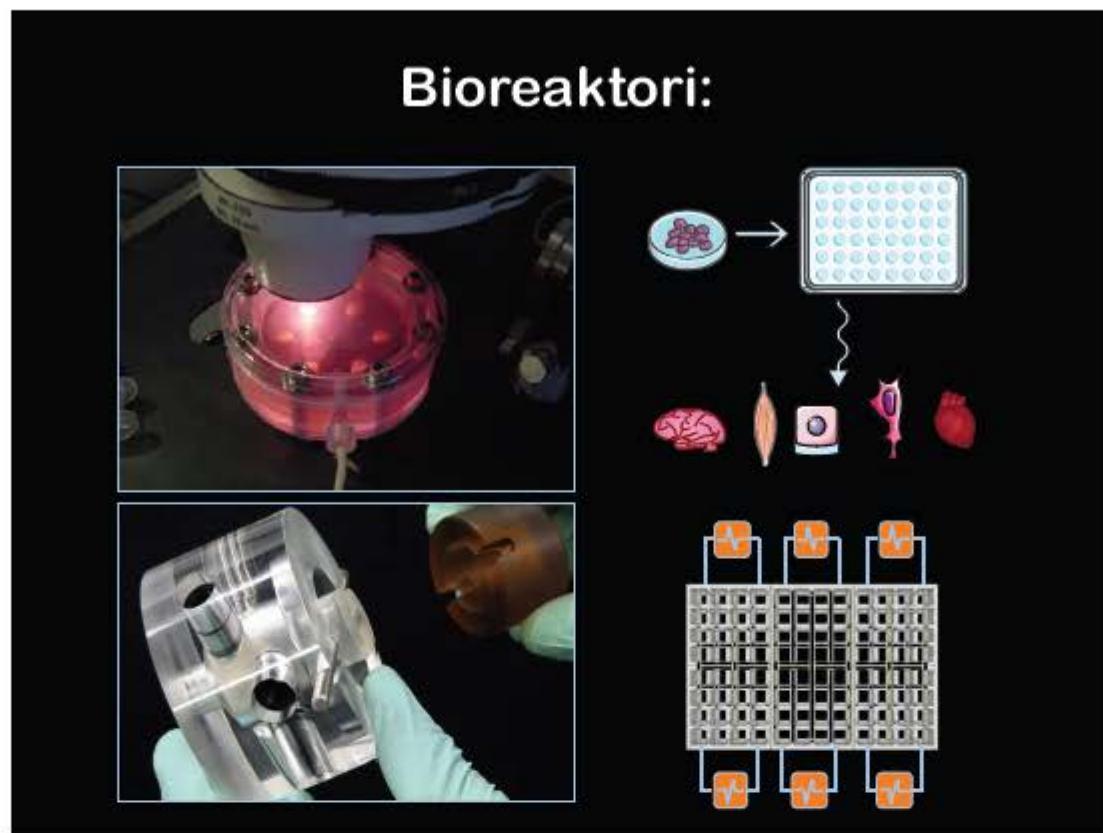
14 organ sources | human | animal | healthy | diseased

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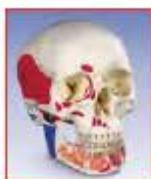
Kost

Srce

Bubrež

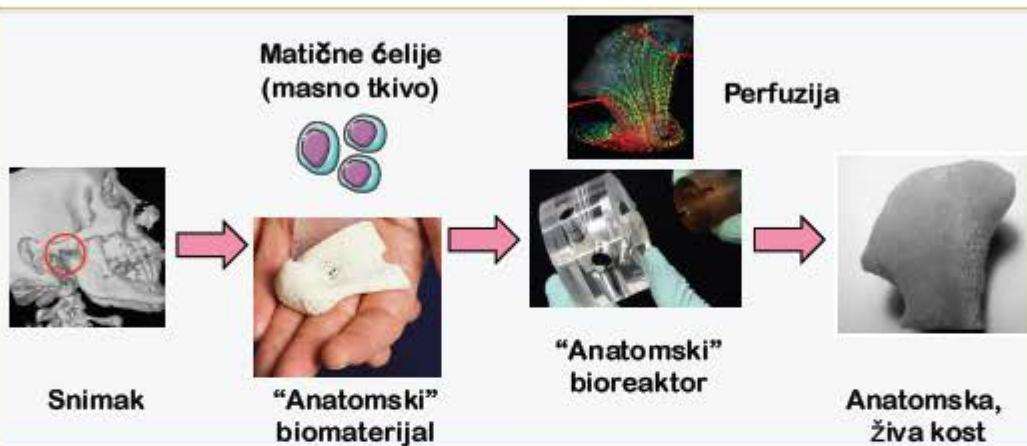


Veliki problem, novi pristup:



Defekti lica i glave

- Urodjene mane, povrede, kancer
- Fizička i psihološka trauma



"A splendid example of tissue engineering at its best"

The New York Times

"An advance which could revolutionize reconstructive surgery"

BBC

CBSNEWS

REUTERS

SCIENTIFIC AMERICAN

PNAS

Science
Translational
Medicine

October 8, 2008 | 10 comments

Engineering anatomically shaped human bone grafts

Werner E. Gasser¹, William R. Lichtenstein², Rudolf W. Hünig³, Berndt R. von Recum⁴, M. Eric Choi⁵, Christopher C. Lutz⁵,...
Last updated: 10:40 AM (ET) October 10, 2008 © 2008 Lippincott Williams & Wilkins, Inc. All rights reserved.
This article is available online at www.jbm.boneandtissuebiology.org. DOI: 10.1007/s10919-008-9160-z

October 8, 2008 | 10 comments

Breakthrough: Bone Graft Grown in Exact Shape of Complex Skull-Jaw Joint

Technique could be a preferred substitute for replacing missing or damaged bones with titanium, donated bones or those harvested from elsewhere in a patient's body

By Charles Q. Choi

October 8, 2008 | 10 comments

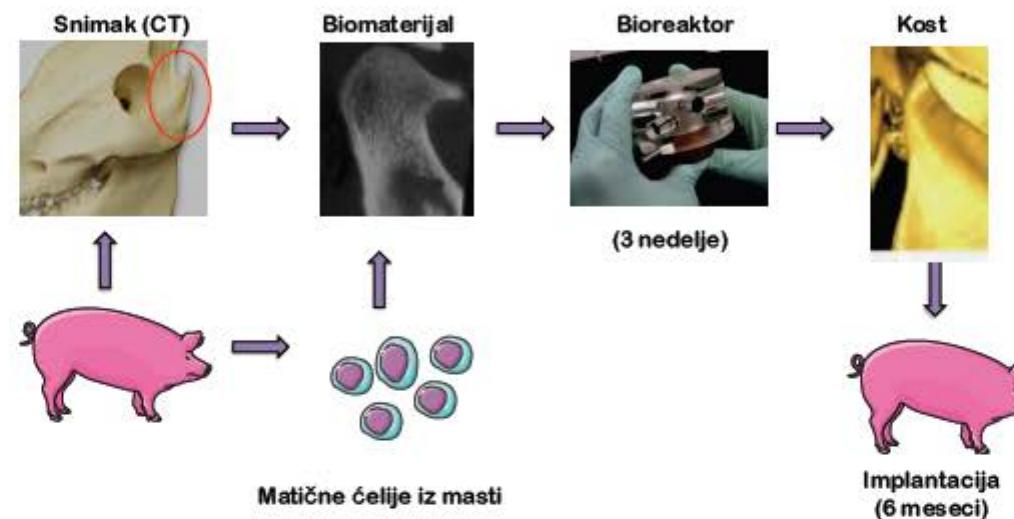
Replacement Bones, Grown to Order in the Lab

In growing older, we all experience some degree of bone loss. In many cases, the loss is gradual and can be managed with exercise, diet, and other non-surgical treatments. But in other cases, the loss is sudden and severe, leaving a patient with a painful, disfiguring, and potentially life-threatening condition. Now, researchers have developed a technique that can regenerate bone tissue in the lab, creating replacement bones that are perfectly matched to a patient's needs.

The new technique, developed by researchers at the University of Michigan, uses a combination of stem cells and a porous scaffold to create bone tissue. The stem cells are taken from the patient's own bone marrow, where they are plentiful and can easily be harvested. These stem cells are then placed into a porous scaffold, which provides a structure for the bone tissue to grow on. The scaffold is made of a biodegradable polymer that can be easily shaped to fit the patient's needs. The scaffold is then placed into a bioreactor, where it is exposed to a special growth factor that stimulates the stem cells to differentiate into bone-forming cells. After a few weeks, the new bone tissue is ready to be implanted into the patient.

The new technique has several advantages over traditional bone grafting. First, it is much faster and easier to perform. Traditional bone grafting requires a large incision and can take several hours. The new technique can be completed in just a few days. Second, it is much more precise. Traditional bone grafting can be difficult to match the shape of the patient's bone, which can lead to complications. The new technique creates replacement bones that are perfectly matched to the patient's needs, ensuring a better outcome.

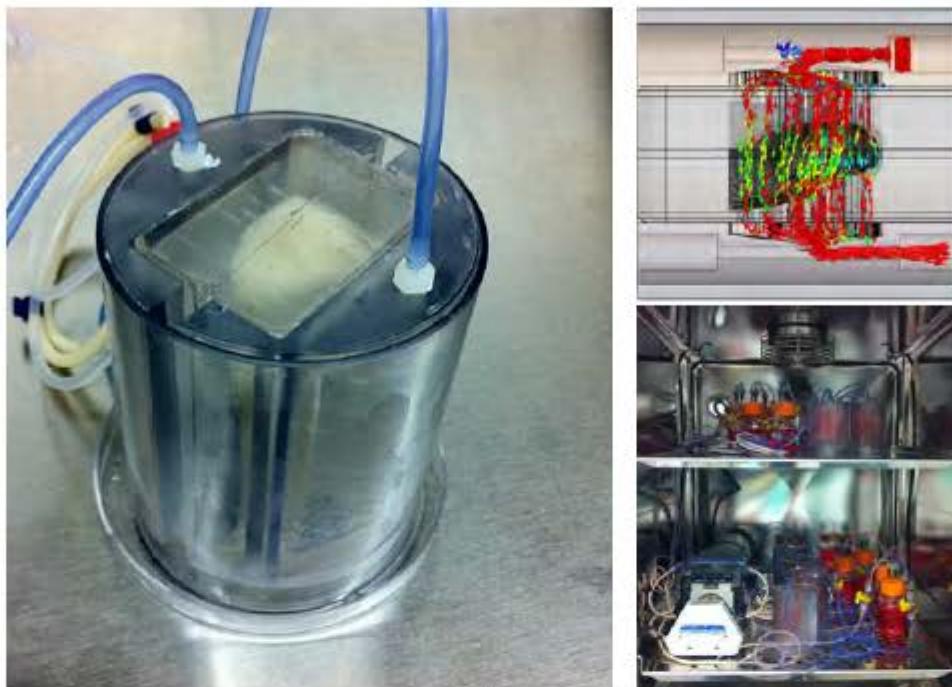
Testovi u prekliničkom modelu:



Organizacija:



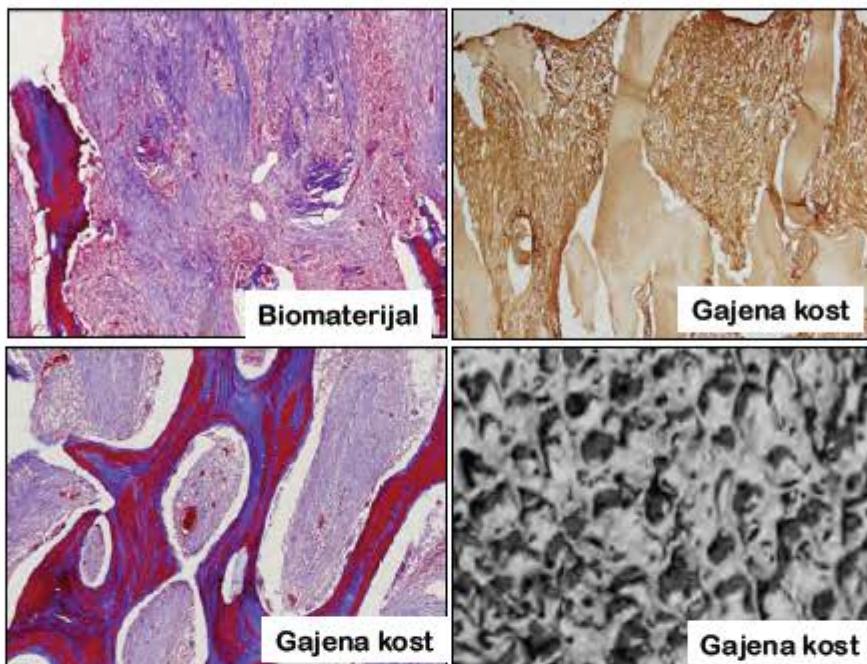
Novi bioreaktor:



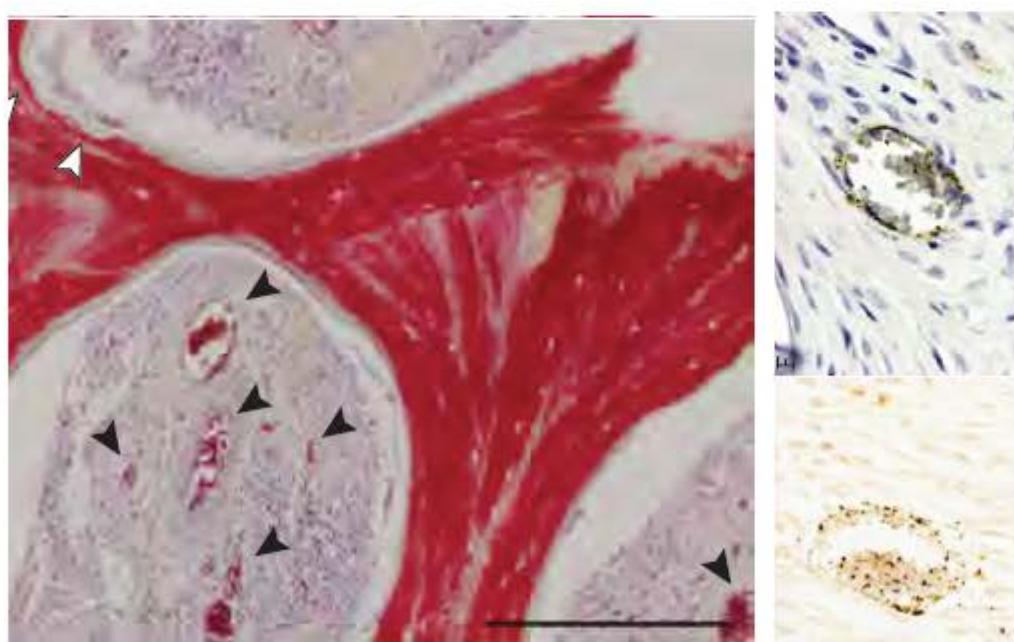
Implantacija:



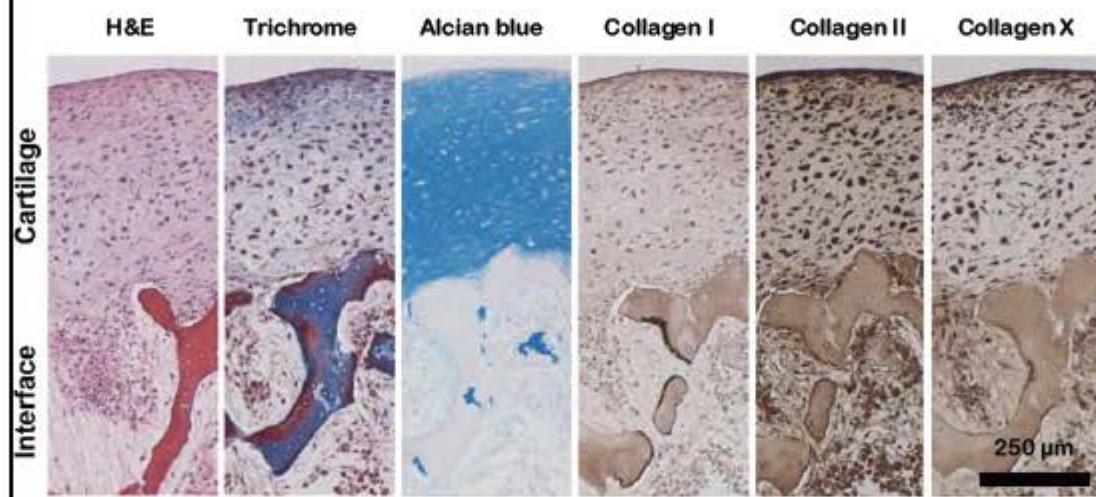
Implantirana kost (posle 6 meseci):



Gajena kost (6 meseci):



Fiziološki jaka humana hrskavica:



5 nedelja *in vitro*; matične ćelije iz koštane srži

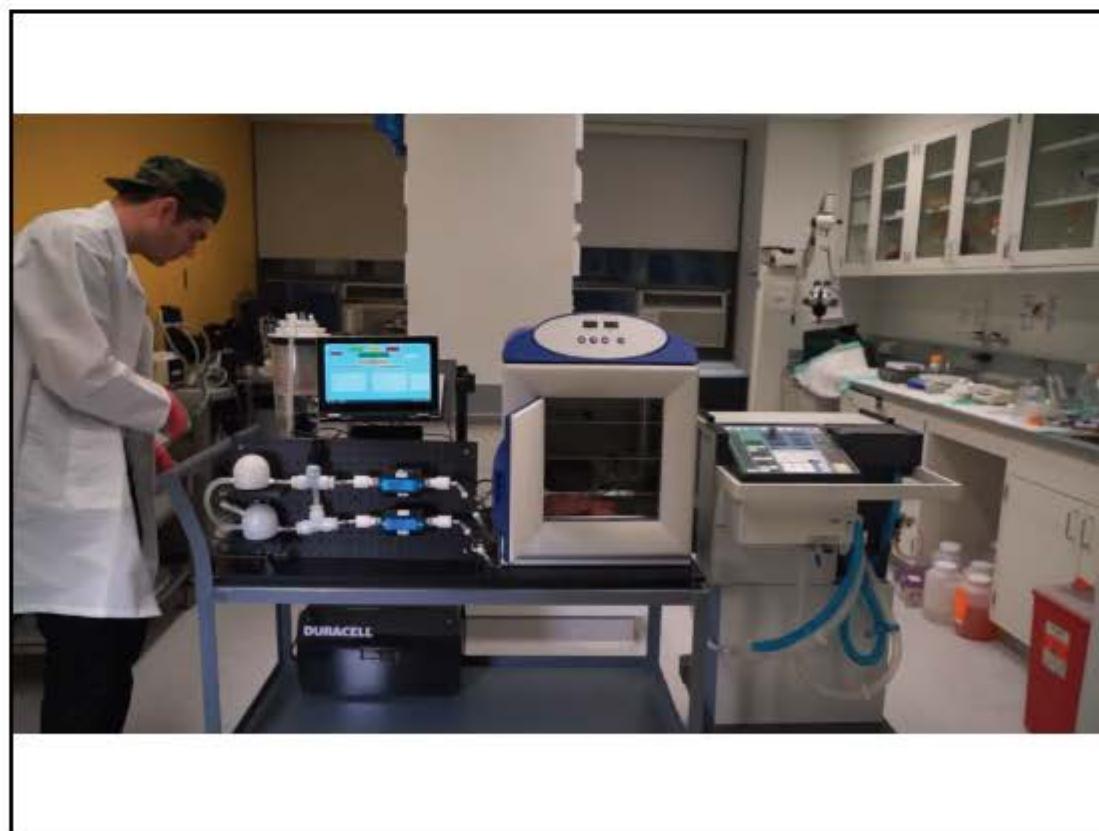
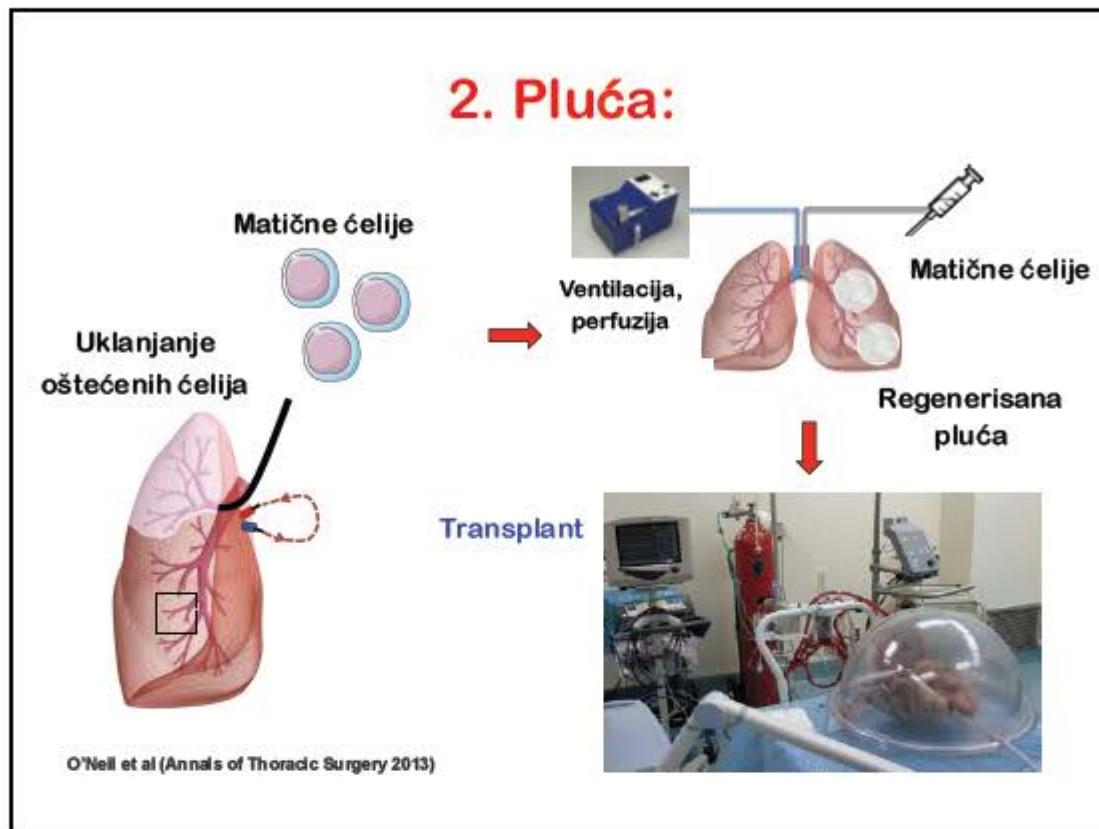
Jungov modul: ~800 kPa

Koeficijent trenja: $\mu_{\max} < 0.3$

Bhumiratana et al (PNAS 2014)

EPIBONE
grow your own bone

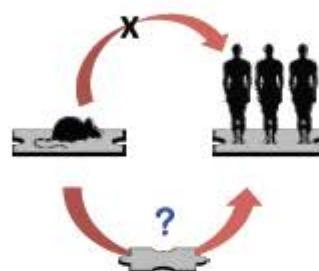




3. Mikro-organi za ispitivanje lekova

8/9 lekova testiranih u životinjama pokazuju toksične efekte u kliničkim ispitivanjima

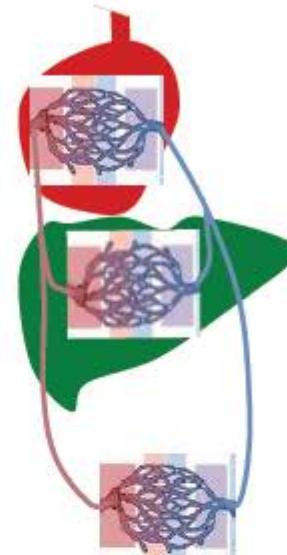
1/3 srce, 1/3 jetra, 1/3 sve ostalo



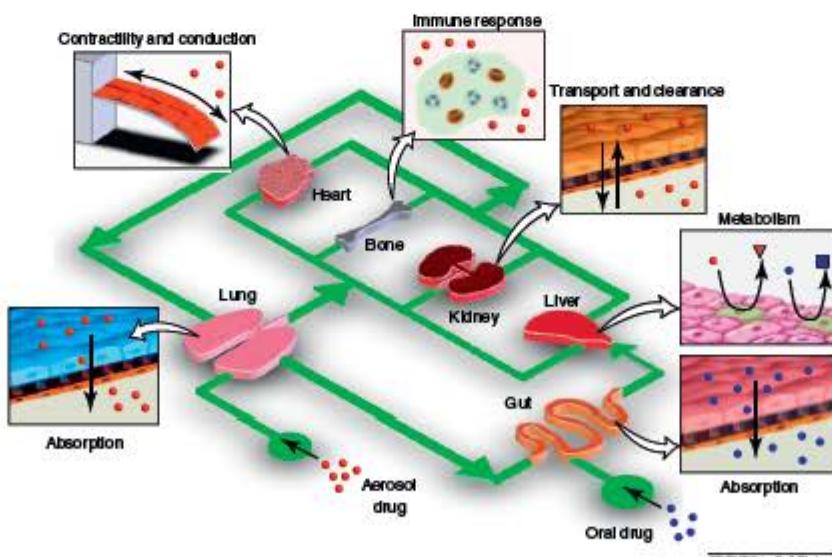
Ćelije pacijenta



Mikro-čkiva

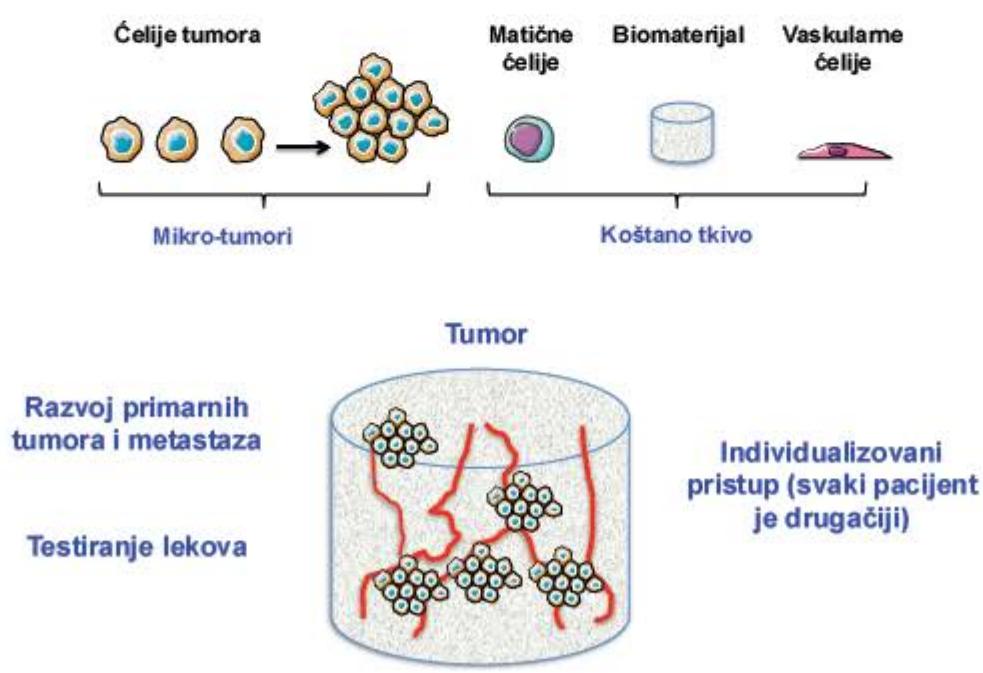


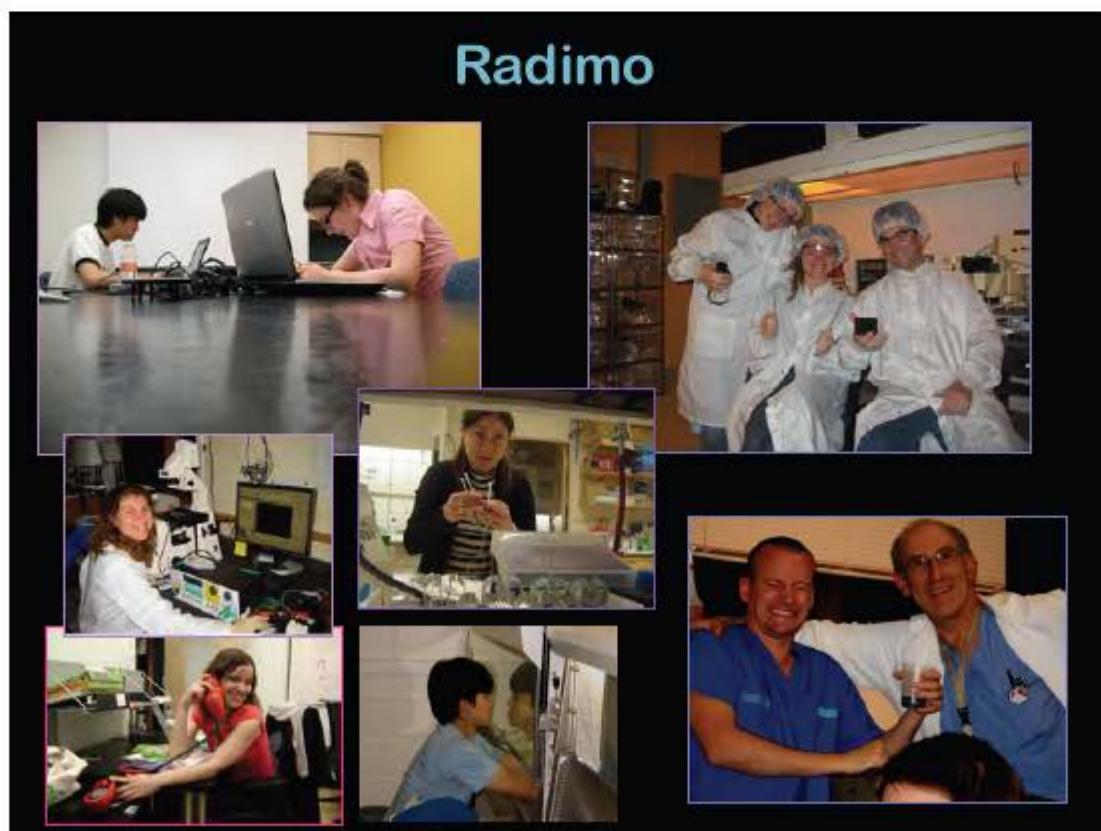
Organi na čipu:





4. Modeli tumora:







Puno vam hvala!

