

The Liquid Bandage Research Project at the University of Nebraska

Mark A. Carlson, MD

University of Nebraska Medical Center
Veterans Administration Health Center

Omaha, Nebraska, USA



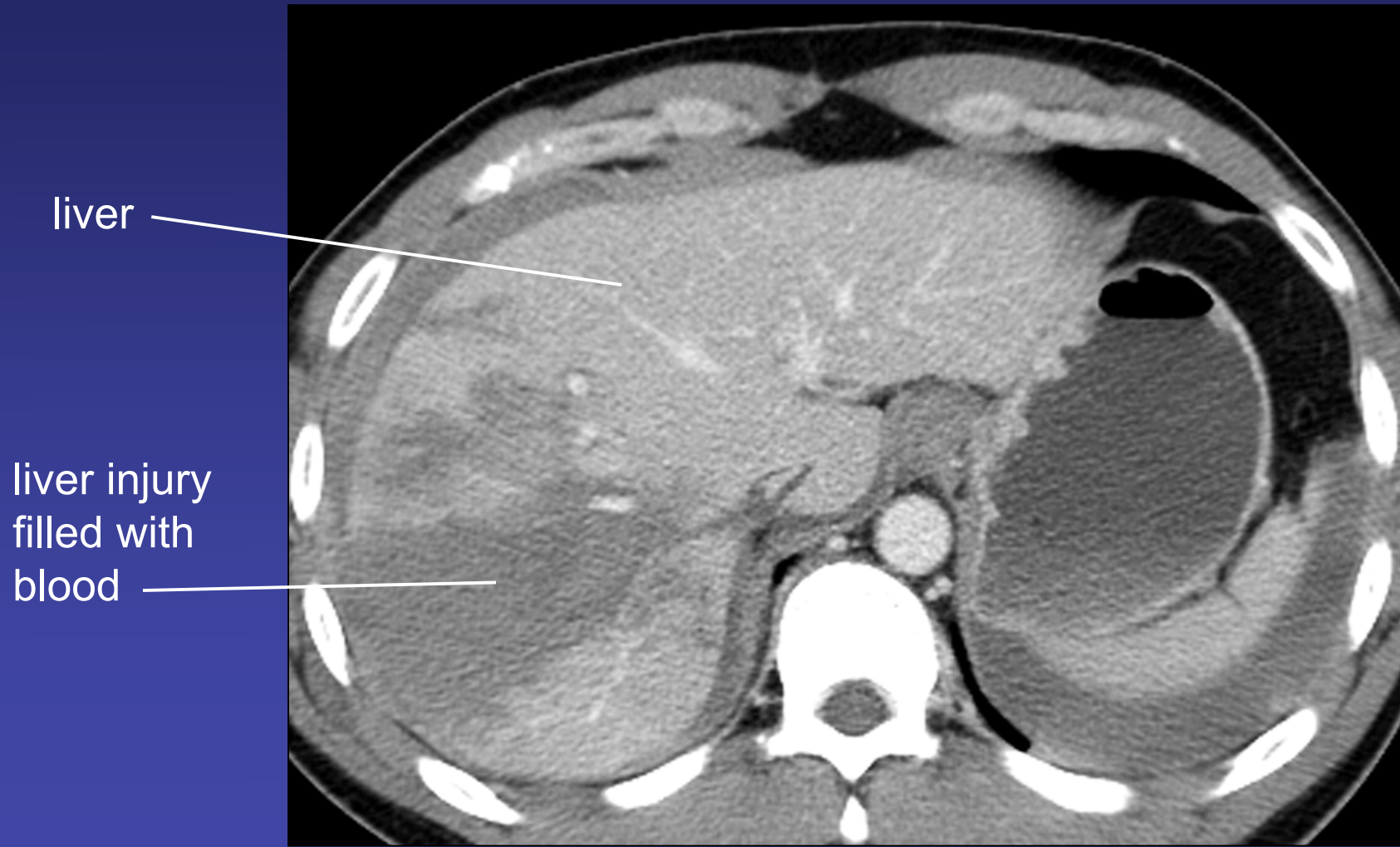
Part 1: Liquid Bandage

Part 2: Tissue Regeneration

Problem: bleeding from a blood vessel



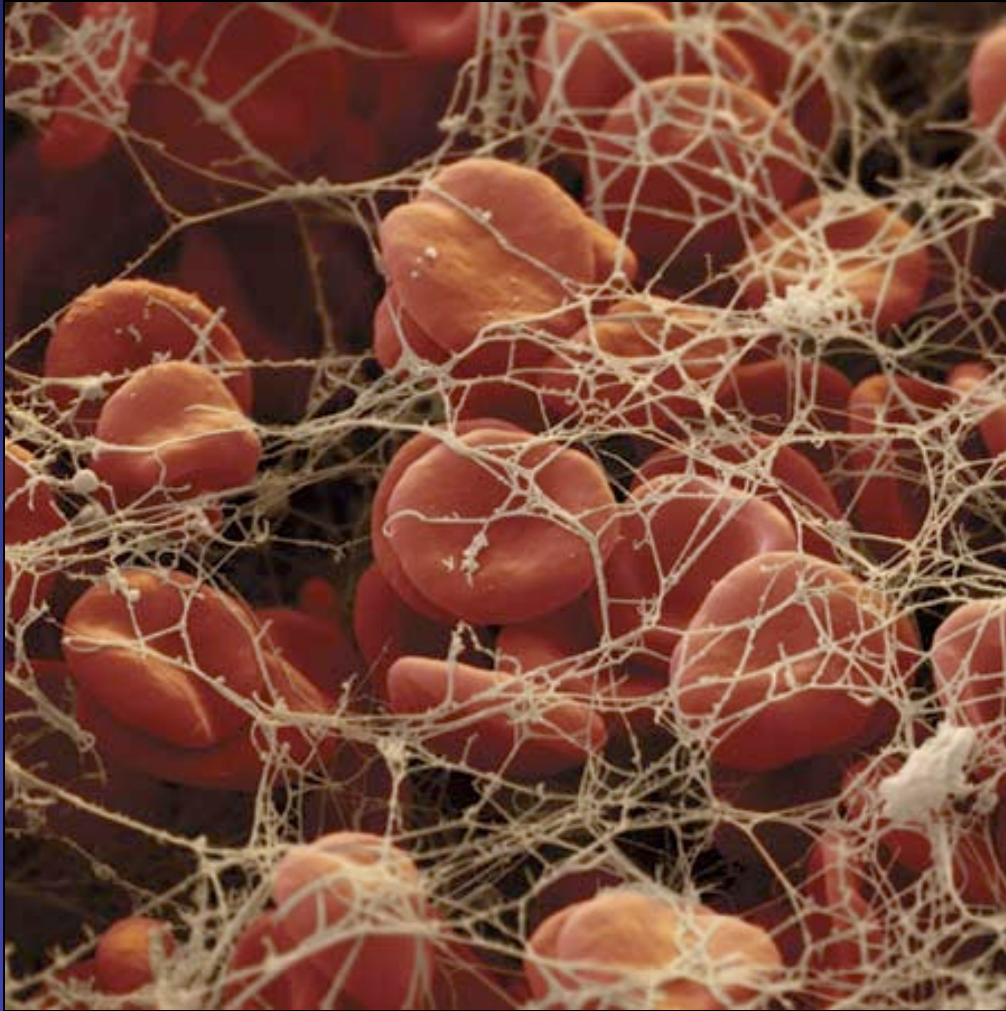
Problem: bleeding from an internal organ



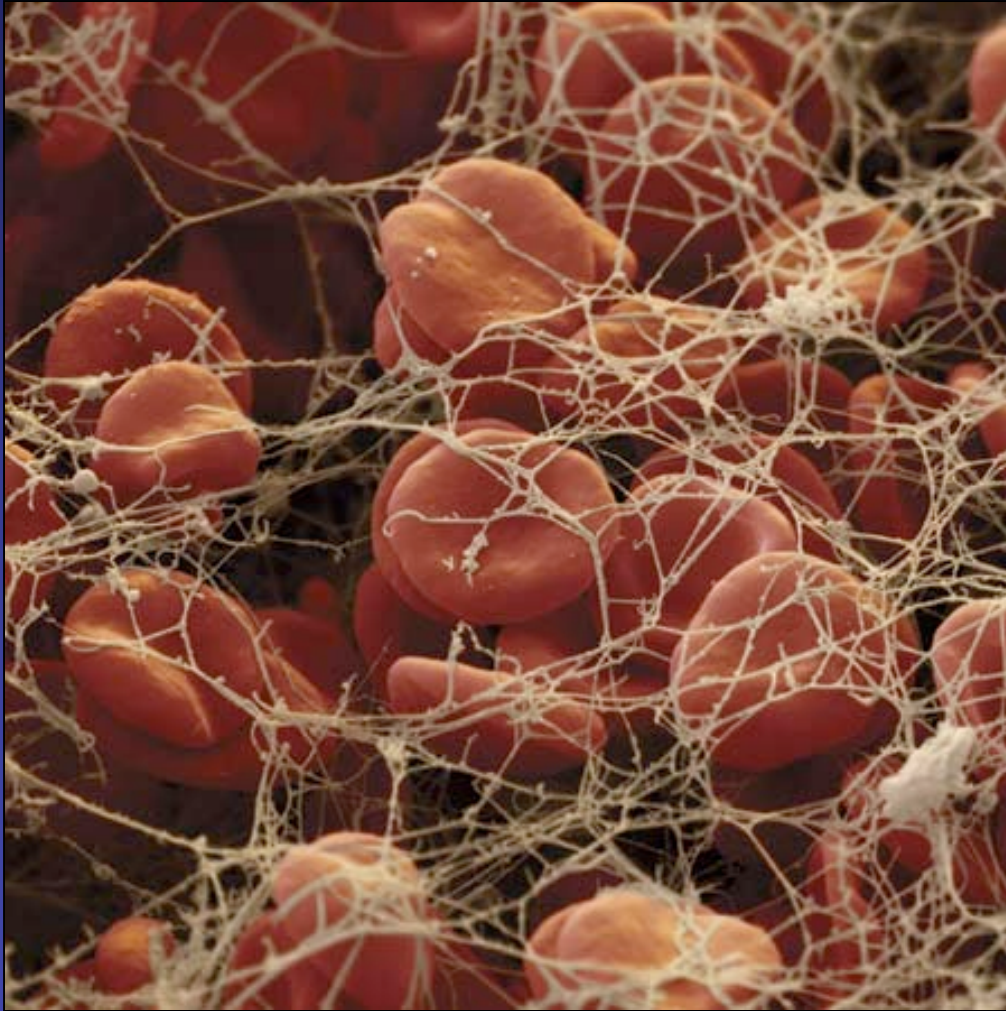
CT scan of abdomen in a patient after an automobile accident

How does the body stop bleeding?

How does the body stop bleeding?



How does the body stop bleeding?



What is the “Liquid Bandage?”

What is the “Liquid Bandage?”

- A liquid or semi-liquid material that is applied to a bleeding injury.



Liquid Bandage: ingredients

Liquid Bandage: ingredients

- Natural clotting proteins

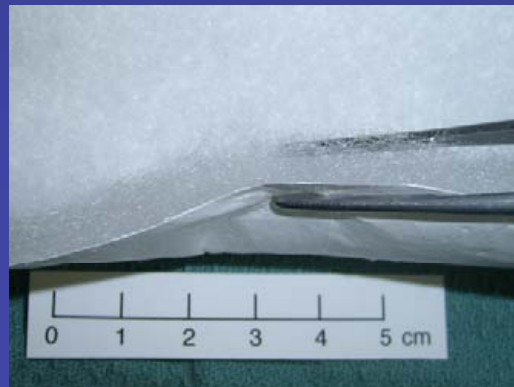


Liquid Bandage: ingredients

- Natural clotting proteins



- Absorbable synthetic mesh



Why is the Liquid Bandage important?

Why is the Liquid Bandage important?

Because it is extremely effective at stopping blood loss.



[go to video "KrazyGlue.mov"]

Why is the Liquid Bandage important?

Because it is extremely effective at stopping blood loss.



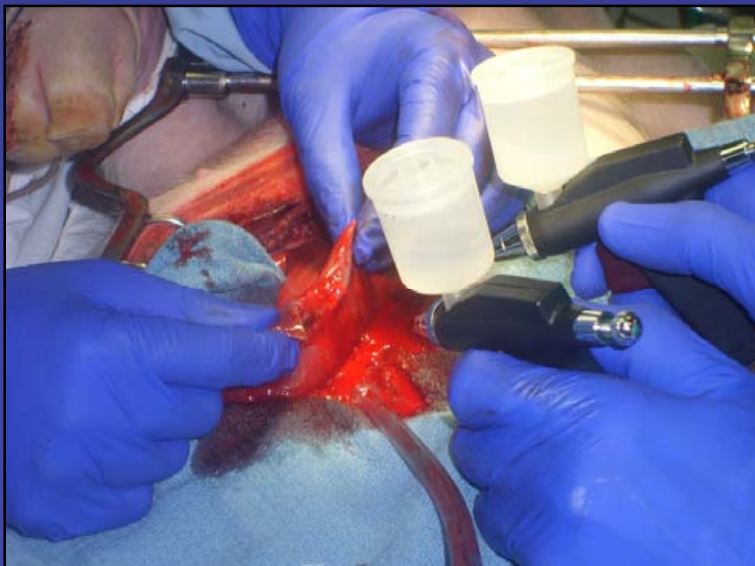
Why is the Liquid Bandage important?

Because it is extremely effective at stopping blood loss.



Why is the Liquid Bandage important?

Because it is extremely effective at stopping blood loss.



Other advantages of the liquid bandage

- No risk of transfusion-related infection
- Absorbable
- Safe
- Large scale production
- Cost-effective

Who will benefit from the liquid bandage?

Who will benefit from the liquid bandage?

Anyone with severe, life-threatening bleeding, including:

- A soldier injured by an improvised explosive device

Who will benefit from the liquid bandage?

Anyone with severe, life-threatening bleeding, including:

- A soldier injured by an improvised explosive device
- An injured farmer, hundreds of miles from a hospital

Who will benefit from the liquid bandage?

Anyone with severe, life-threatening bleeding, including:

- A soldier injured by an improvised explosive device
- An injured farmer, hundreds of miles from a hospital
- A police officer shot in the line of duty

Who will benefit from the liquid bandage?

Anyone with severe, life-threatening bleeding, including:

- A soldier injured by an improvised explosive device
- An injured farmer, hundreds of miles from a hospital
- A police officer shot in the line of duty
- A motor vehicle accident victim with a fractured spleen

Who will benefit from the liquid bandage?

Anyone with severe, life-threatening bleeding, including:

- A soldier injured by an improvised explosive device
- An injured farmer, hundreds of miles from a hospital
- A police officer shot in the line of duty
- A motor vehicle accident victim with a fractured spleen
- An operating room patient with a ruptured aneurysm

Who will benefit from the liquid bandage?

Anyone with severe, life-threatening bleeding, including:

- A soldier injured by an improvised explosive device
- An injured farmer, hundreds of miles from a hospital
- A police officer shot in the line of duty
- A motor vehicle accident victim with a fractured spleen
- An operating room patient with a ruptured aneurysm
- A child injured during a civil conflict in a remote area

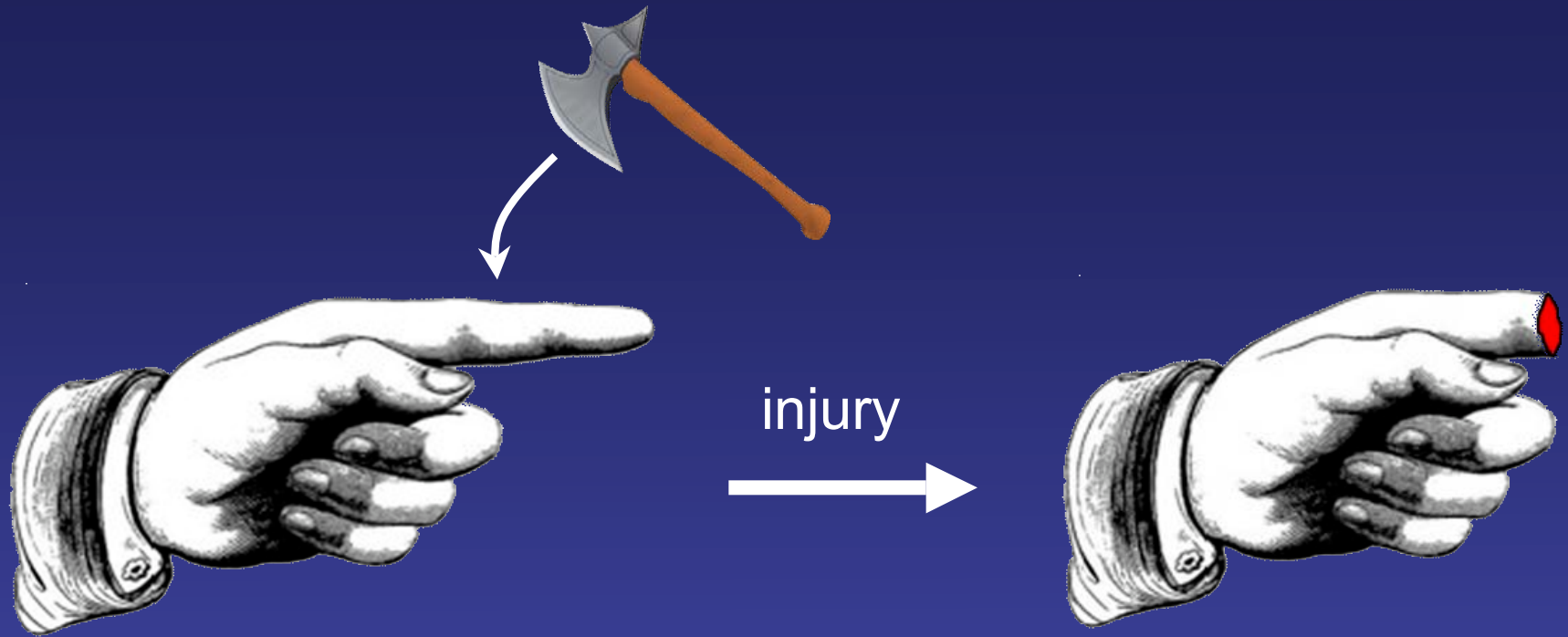
Part 2: Tissue Regeneration

Healing vs. Regeneration

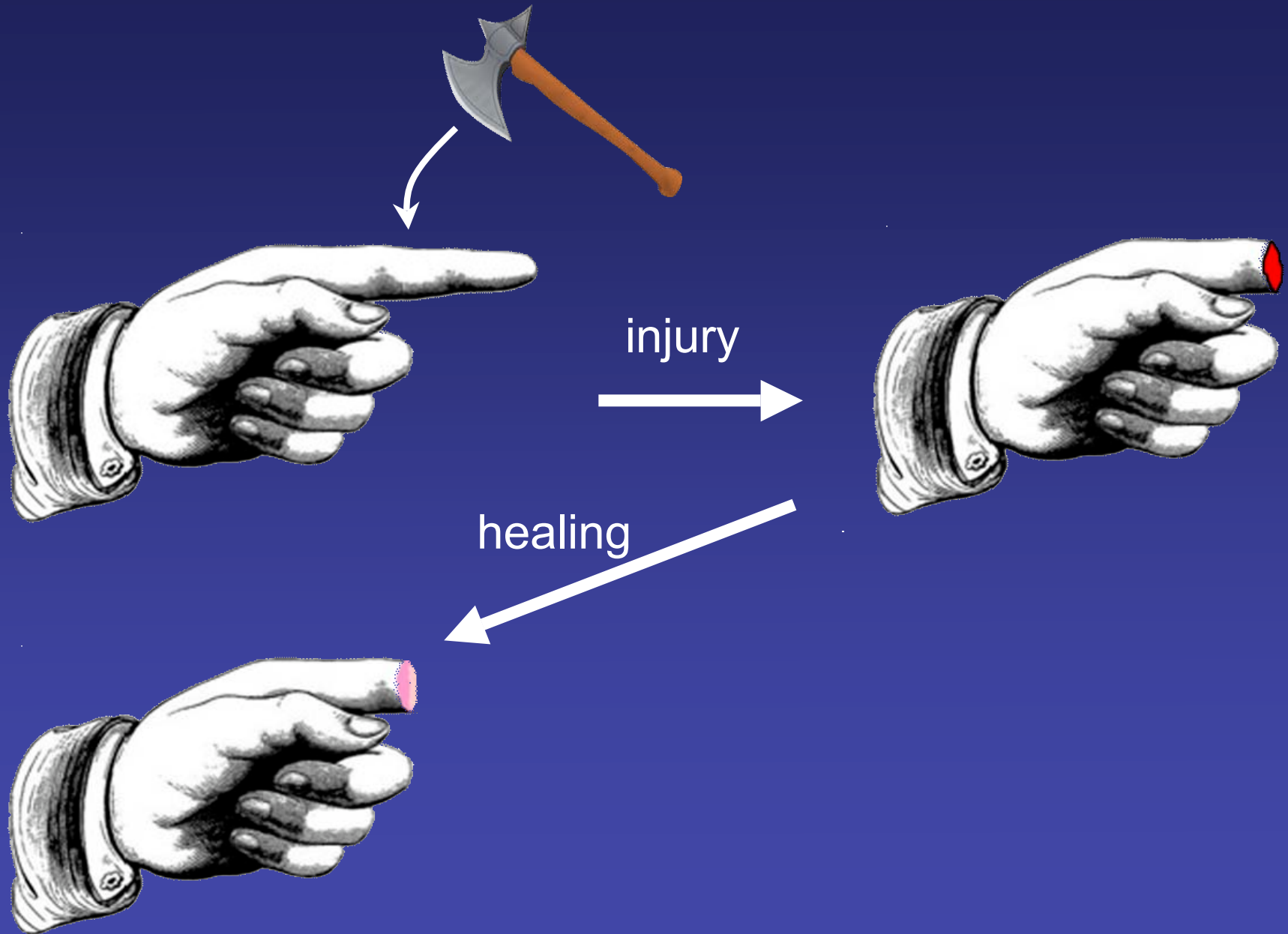


intact structure

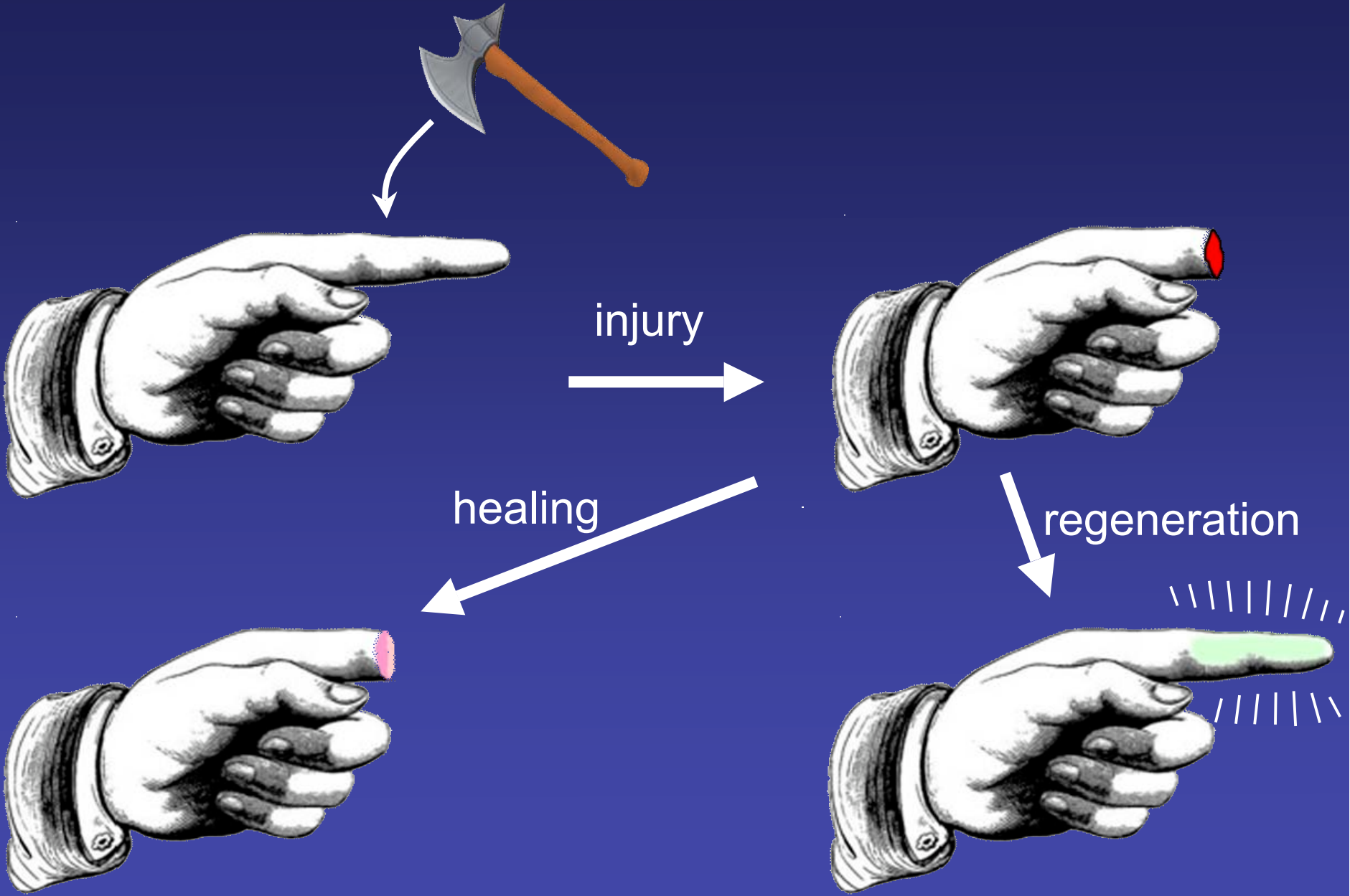
Healing vs. Regeneration



Healing vs. Regeneration



Healing vs. Regeneration



Tissue regeneration: getting back the original

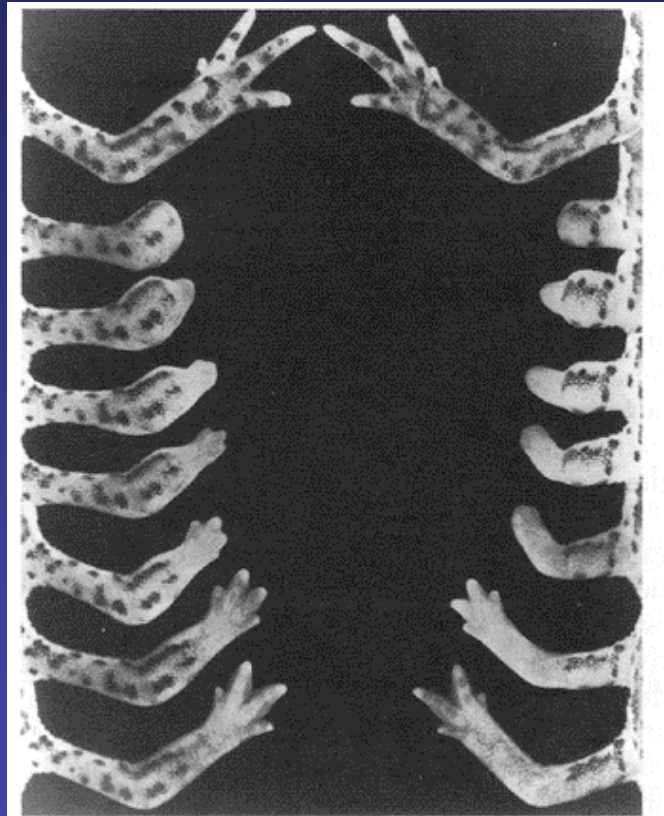


Figure 2-4. Montage of individual newt limbs amputated across lower or upper arms, as photographed after 7, 21, 25, 28, 32, 42, and 70 days of regeneration (From Goss RJ: Principles of Regeneration. New York, Academic Press, 1969.)

Target for tissue regeneration:

SKIN

Target for tissue regeneration:

SKIN

Skin loss may occur from:

- Severe burns

Target for tissue regeneration:

SKIN

Skin loss may occur from:

- Severe burns
- Blast injury

Target for tissue regeneration:

SKIN

Skin loss may occur from:

- Severe burns
- Blast injury
- Caustic chemicals

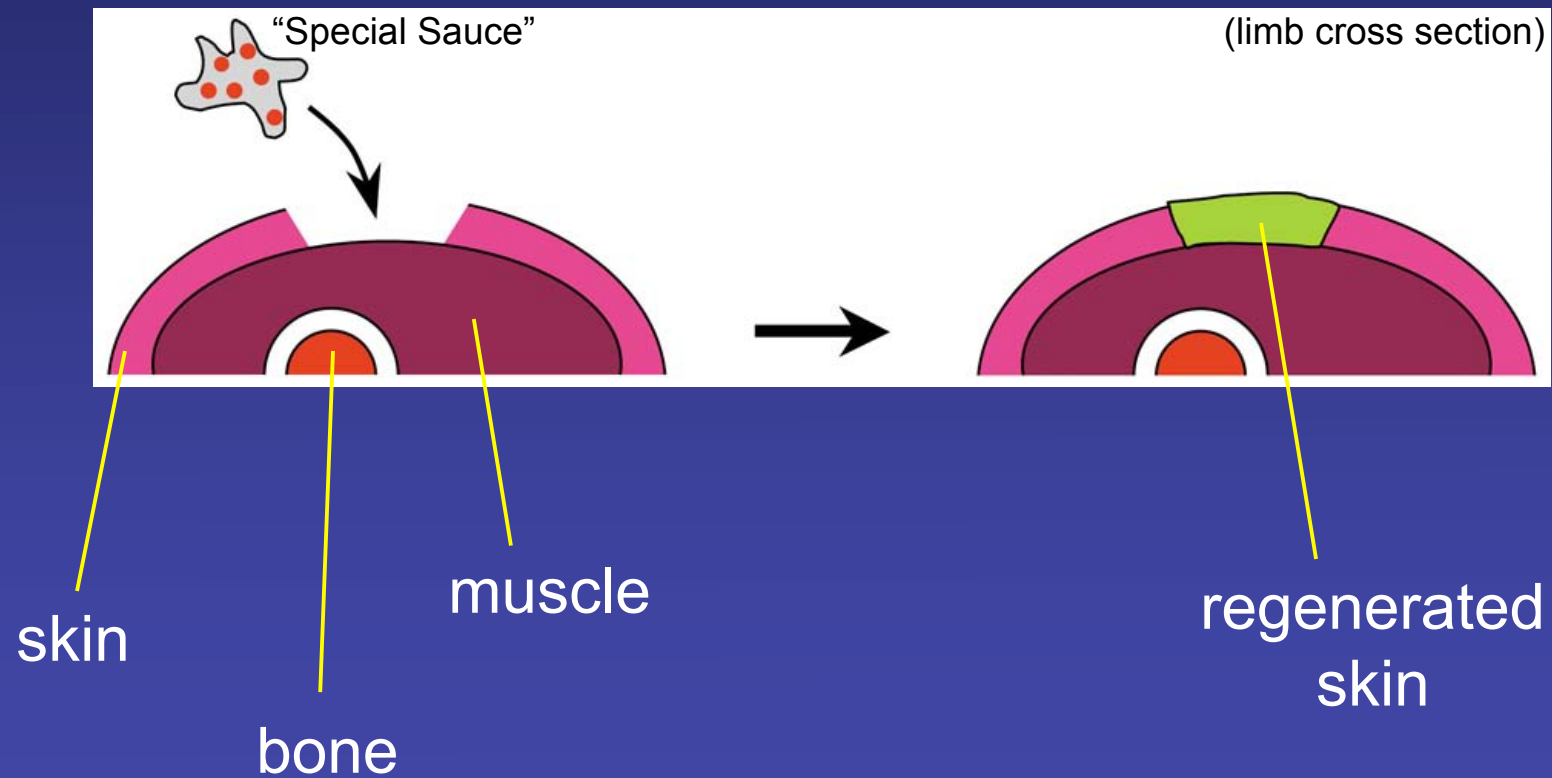
Target for tissue regeneration:

SKIN

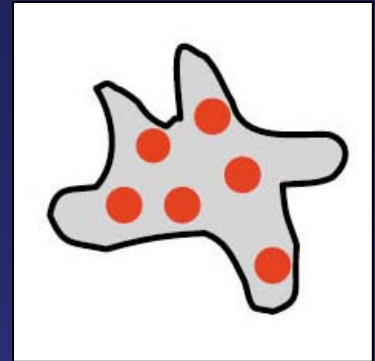
Skin loss may occur from:

- Severe burns
- Blast injury
- Caustic chemicals
- Disease (cancer, infections, others)

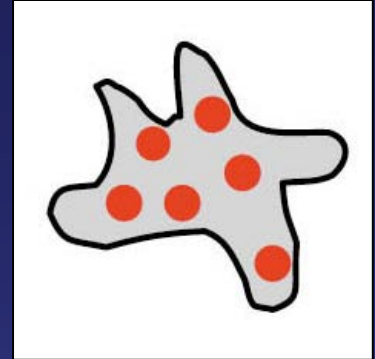
Stem cell-assisted regeneration of the skin (SCARS)



What's in the "special sauce?"

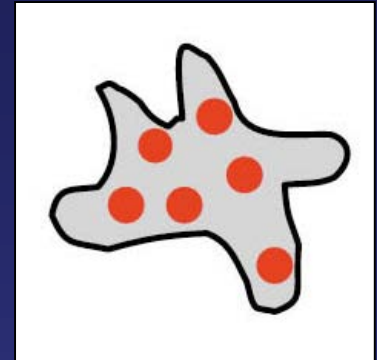


What's in the "special sauce?"



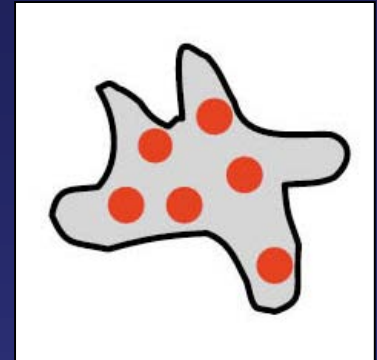
- Mesenchymal (adult) stem cells

What's in the “special sauce?”



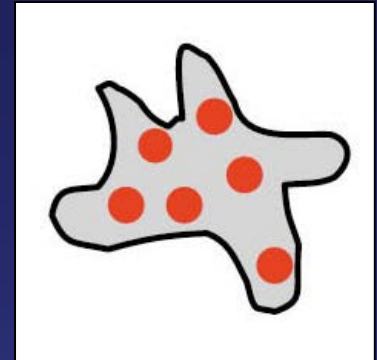
- Mesenchymal (adult) stem cells
- An absorbable scaffold, or matrix

What's in the "special sauce?"



- Mesenchymal (adult) stem cells
- An absorbable scaffold, or matrix
- Growth factors

What's in the “special sauce?”



- Mesenchymal (adult) stem cells
- An absorbable scaffold, or matrix
- Growth factors
- Technology similar to liquid bandage

Project funding

Current: NIH and US Army

*New: FY10 congressional earmark

(administered by the US Army's Telemedicine and Advanced Technology Research Center—TATRC)



<http://www.nih.gov>



<http://www.army.mil>



<http://www.tatrc.org>

Liquid bandage research consortium

UNMC { Mark A. Carlson, MD
Iraklis I. Pipinos, MD
Jason M. Johanning, MD
Crystal Cordes, PhD
Tiffany Peña, MS

UNL { William H. Velander, PhD
Jennifer Calcaterra, PhD

LNKChemsolutions,
Lincoln NE { Gustavo Larsen, PhD
Sandra Noriega, PhD
Ruben Spretz, PhD
Wilson H. Burgess, PhD