

# Synthetic Skin

# Guide Lines

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# Introduction

- Many burned people die , their body couldn't produce new skin
- Skin is important to protect body from infection and harmful bacteria
- Skin is largest organs in the body
- Skin keep vital fluid in

# Introduction

- Traditional solution replacing the skin with another human or animal skin
- Some of the body rejects others skin
- **So**, alternative solution needed
- Synthetic Skin is invented by Burke and Yannas

# Definition Synthetic Skin

- is laboratory production for substitution of human skin (tissue Engineering)
- Tissue Engineering is Knowledge of building or repairing human organ
- Cells brought from lab or patients blood used to initiate the process

# Industry State

- Tissue Engineering has made great progress in the Science
- However, It seemed to be less successful in business
- Two companies leading industry has went through a bankruptcy
- Though the need is high the margin profit is low relative to the high cost of the manufacturing
- Manufactures couldn't sustain its self

# Industry State

- Another reason of the failure is that the manufactures lack of automated processes
- Sales of Skin Engineered is about half the US ,50 million output of the tissue Engineering
- The rest comes from the Engineered joints replacements
- To transform the Skin Engineered process into automated processes high precise sensores are needed which added to the coast

# Synthetic Skin Manufacturing process

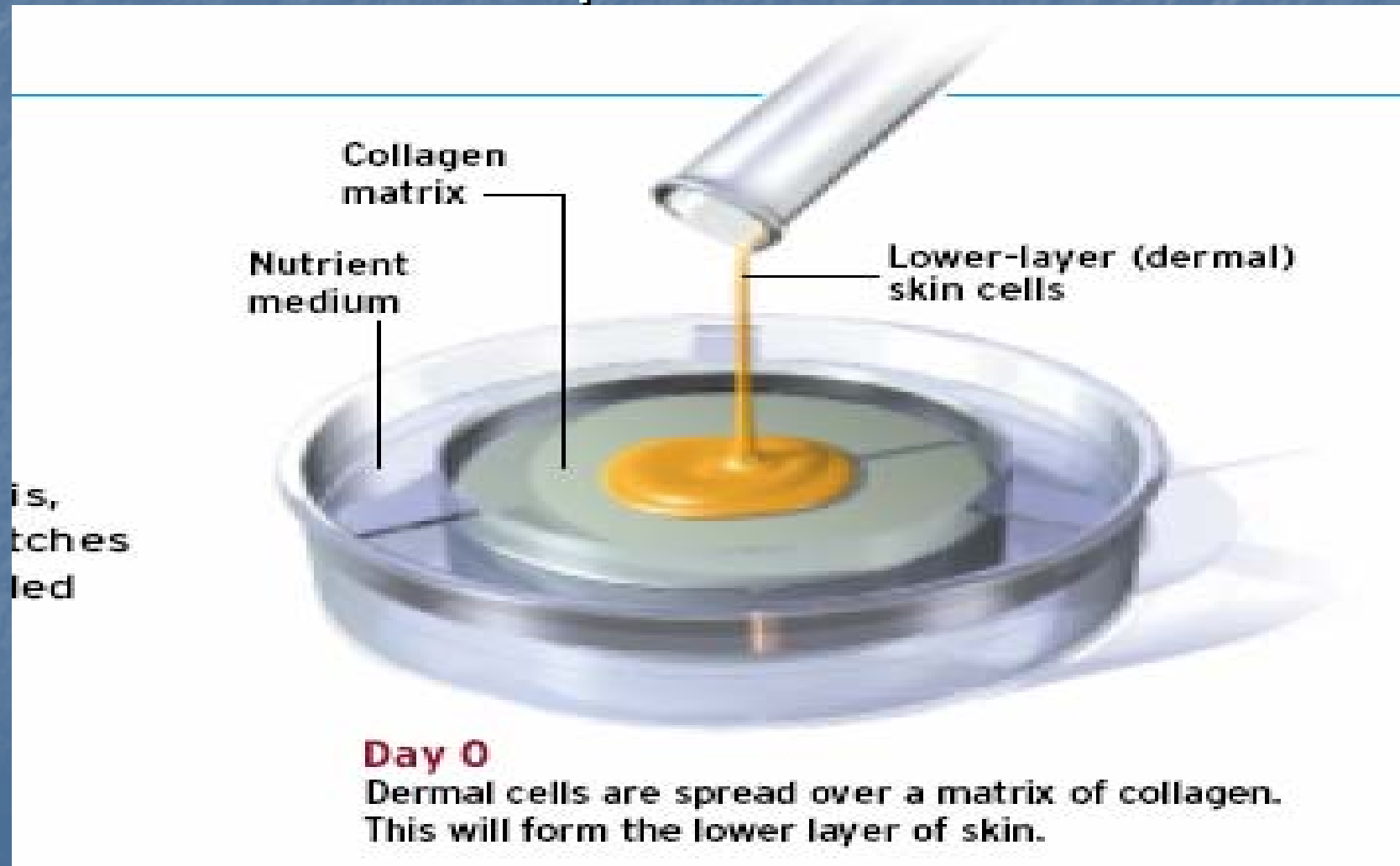
- Skin, composed of two layers called epidermal (the outer layer) and dermal (the inner layer)
- Outer layer protect the body from bacteria and infections
- Inner layer contains the blood vessels, nerves and hair



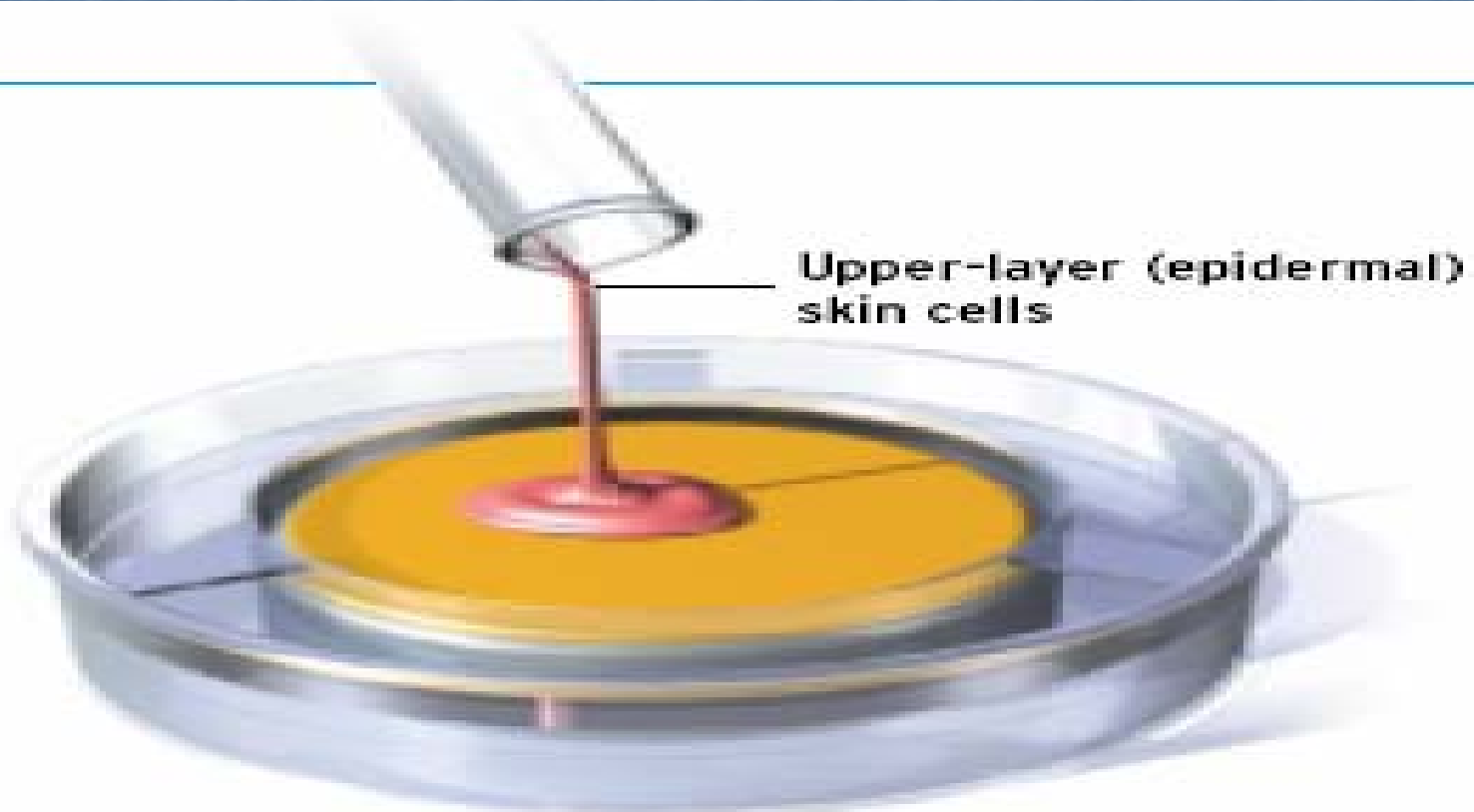
# Synthetic Skin Manufacturing process

- Dish fill of liquid of nutrient that helps in skin growth
- Process starts as donated foreskin cells
- Foreskin cells: epidermal and dermal

# Synthetic Skin Manufacturing process



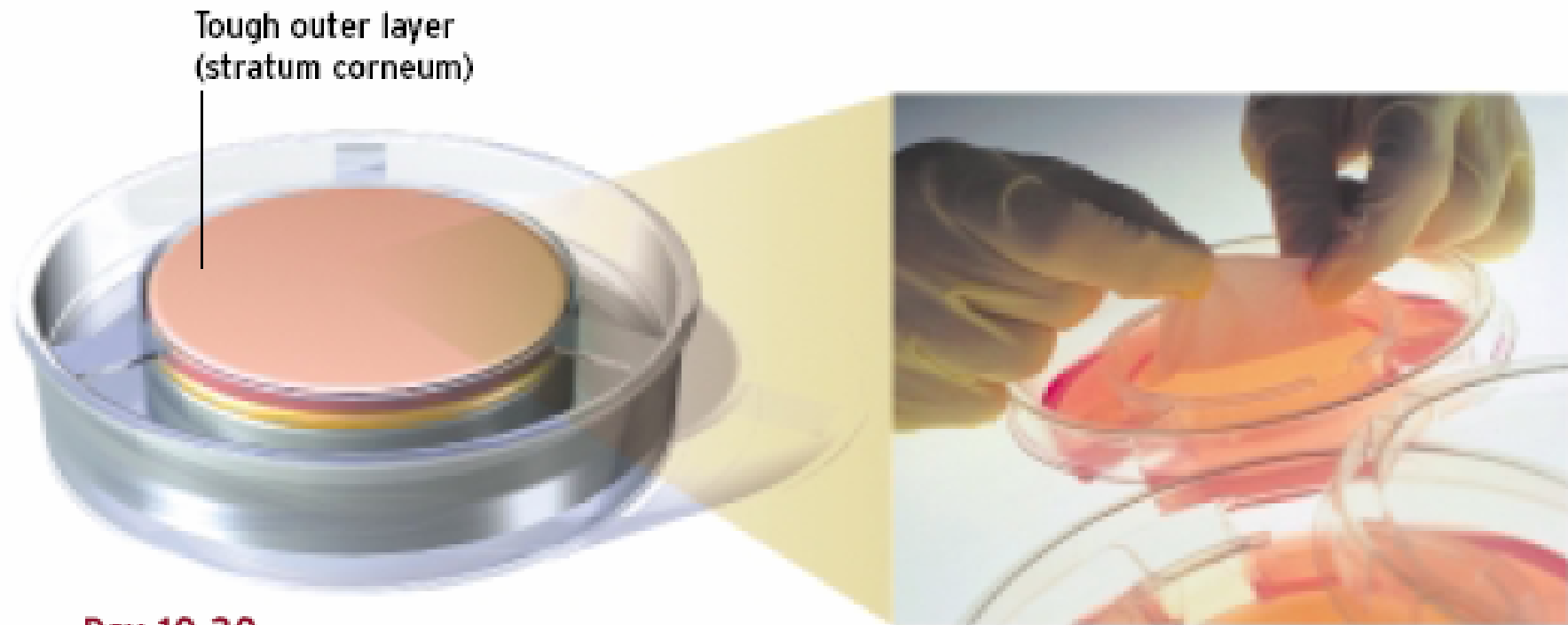
# Synthetic Skin Manufacturing process



## **Day 6**

Epidermal cells are spread over the lower layer of skin.

# Synthetic Skin Manufacturing process



## **Day 10-20**

The structure is exposed to air, triggering the development of the tough, outer skin layer known as the stratum corneum.

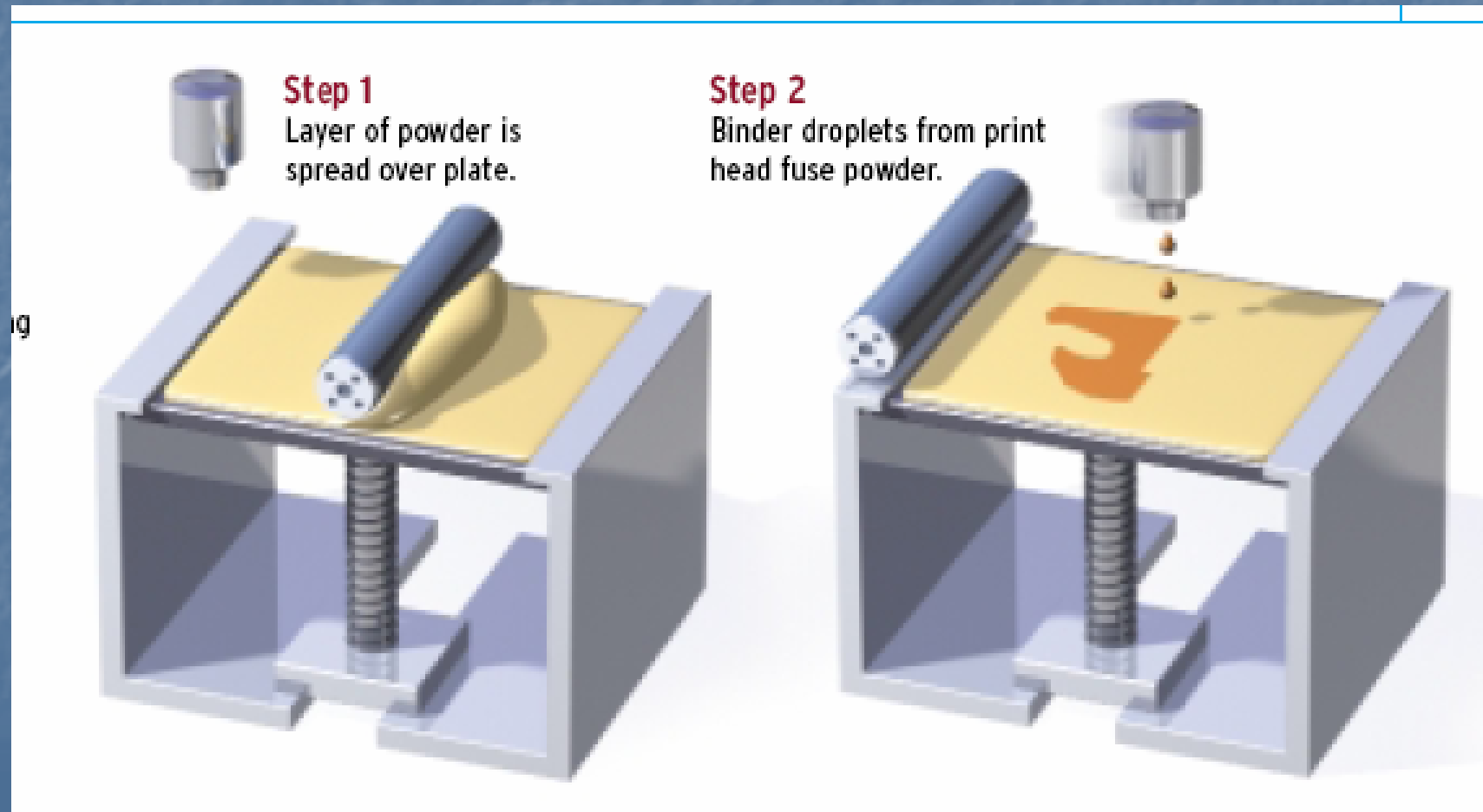
# Synthetic Skin Manufacturing process

- Using only labor manual process only 50,000 skins produces in a year
- So Automated processes needed
- Machine that refresh nutrient liquid every day (increase the time of growth)
- Temperature monitor , steady environment increase the growth

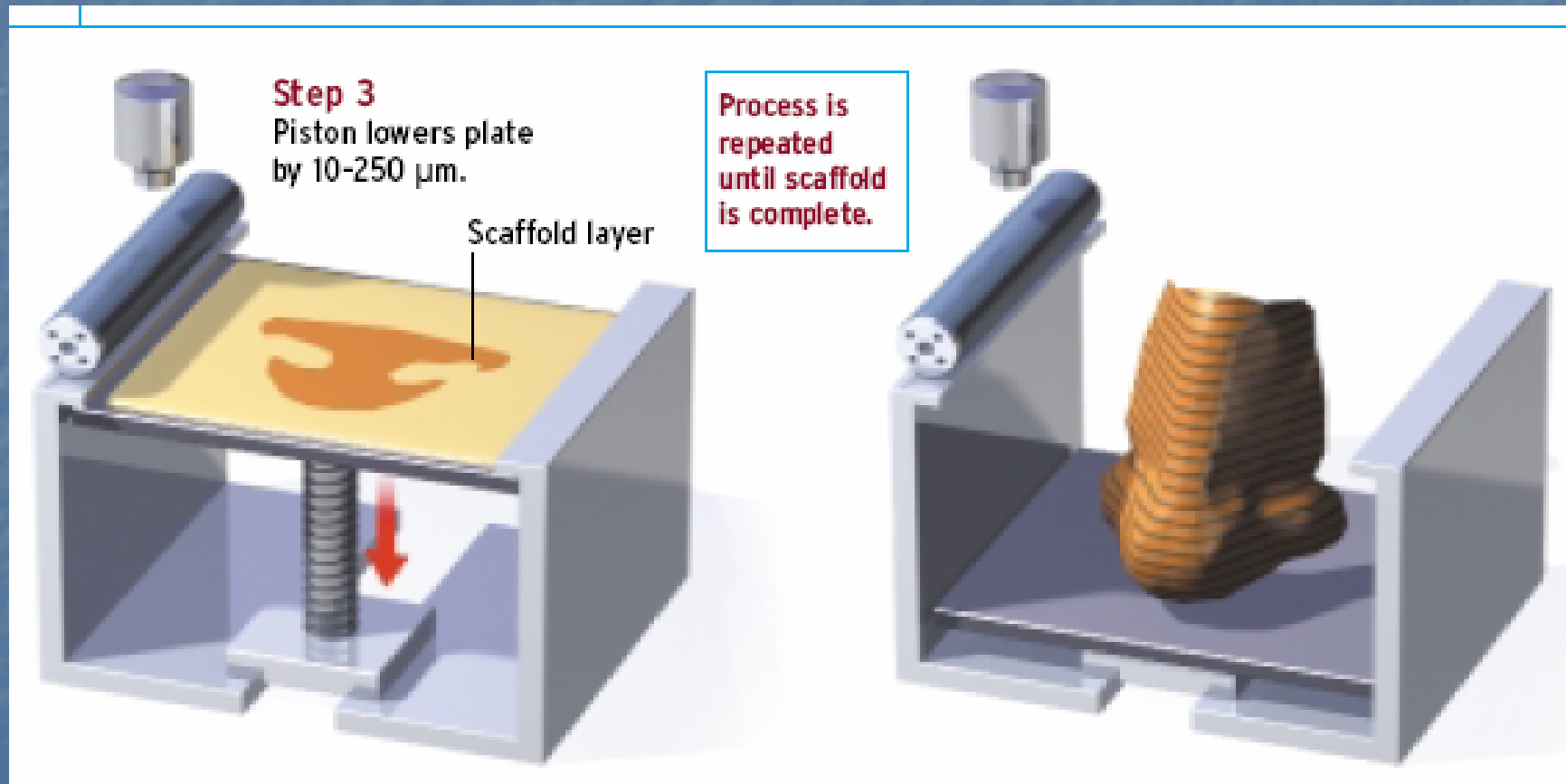
# Synthetic Bone Manufacturing process

- Unlike skin ,3D tissue design and growth is required
- automatic X-ray and resonance imaging  
Data taken
- This data is digitized into computer aided design (CAD)
- Then dimensions of slices are computed

# Synthetic Bone Manufacturing process



# Synthetic Bone Manufacturing process





# Conclusion

- What do you expect from Tissue Engineering In future?
- Many challenges slowing down the development
- Challenging Automation production , finding good resources of cells and preserving the organs after its construction

