

3D Printing Skin

Videos

1-1.5 Minutes



**Initial Search
Overview Video**

3-4 Minutes



Discussion Video

1 Minute



IP Video



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STG 4 Fronts, LLC

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Search The Grid on 4 Fronts: 3D Printing Technology Knowledge and Information Guide



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TOPIC

A composite listing of 3D printing technology interest areas for possible investigation by a TyRex Investigator. Topics are sourced by interest from either TyRex Investigators, industry news, or requests from TyRex customers.

INITIAL SEARCH

A high-level overview of a topic relating to a 3D printing technology, application, or industry interest. A short summary of market activity, technical feasibility, possible advanced technology potential, current research activities and investigation entities, and intellectual property (IP) are covered areas of the initial investigation.

ADVANCED SEARCH

A more in-depth, technical report on current research efforts/advancements relating to a topic and how they correlate to specific industry interests, as well as next steps one might take in pursuing specific areas of interest. Contains most, if not all of the variables, factors, metrics, and information needed to determine if the topic should be considered for higher levels of inquiry.

PRE-RESEARCH

Outline of the research timeline including a summary of project goals, technical feasibility, challenges, and an estimate of the overall cost/duration of the project.

A pre-research investigation's goal is to create the technical information platform for potential research or market analysis. Partnership entities are provided enough information to decide whether to fund the research to advance the project into its formal research investigation.

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1-1.5 Minute
Video Example



Have an interest
or curiosity?

3-4 Minute
Video Example



Join the discussion!

1 Minute
Video Example



IP overview

10-12 Minute
Read Example



Initial search
document

3D Printing Skin

What is it?

The human body's largest organ is the skin. It encases the rest of the organs, bones, and muscles inside and acts as a protective coating. When the skin is severely damaged in one area of the body, it is not uncommon for people to get skin grafts done to help that area heal. Unfortunately, skin grafts cause secondary wounds and are not always successful.

Researchers are developing different styles of 3D printing skin in order to help patients get more successful and more comfortable procedures done.

What are the possibilities?

One possibility is 3D printing living skin, including blood vessels. This would mean that surgeons would no longer need to harvest large sections from the patient. Only small cell samples are required from the patient to mix with bioinks. Researchers believe this method could help diabetics with pressure ulcers with their care. Another possibility is using the suspended layer additive manufacturing (SLAM) method. In this method, researchers scaffold layers of cell-filled bioinks with alternating layers of pectin and collagen while taking into account where in the layers of skin the print is going to end up. The layers end up suspended in a fluid gel and can be printed into whatever shape or depth is needed.

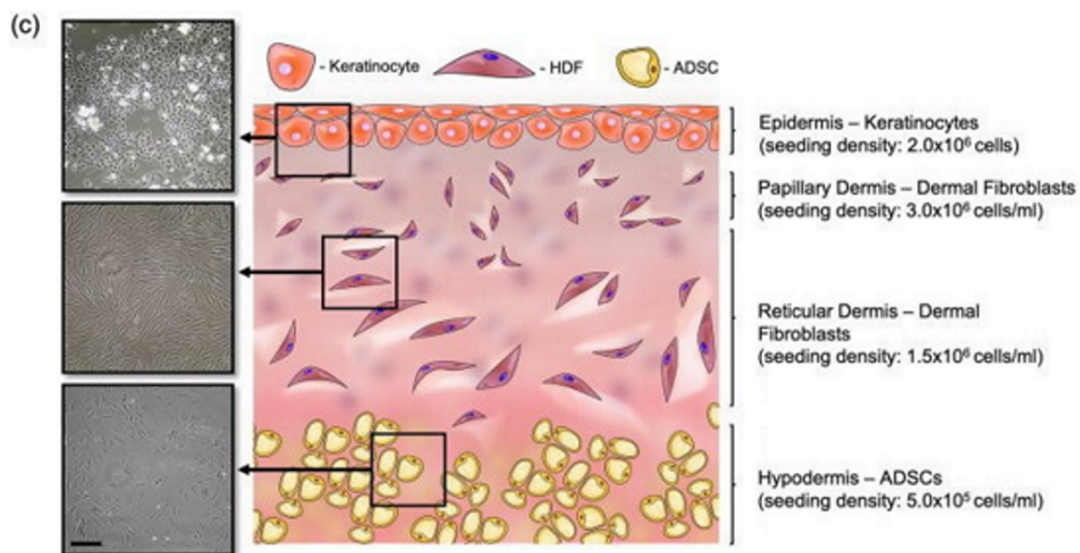


Figure 1: 3D SLAM printing of human cells.

[Note: Reproduced from "A suspended layer additive manufacturing approach to the bioprinting of tri-layered skin equivalents" by Richard J. A. Moakes, Jessica J. Senior, Thomas E. Robinson, Miruna Chipara, Aleksandar Atansov, Amy Naylor, Anthony D. Metcalfe, Alan M. Smith, and Liam M. Grover with permission of AIP Publishing.]

Applications in Additive manufacturing/3D Printing

Although these technologies are definitely more medical industry than anything else, the idea of an ink that can create a multi-layered barrier while the inner parts self-assemble and interconnect to form micro-networks could be useful across many disciplines. The idea of being able to suspend materials and have them only react for certain stimuli would also be unique to

many industries.

Current Challenges & Weaknesses

The bioinks methods is currently only testing on mice. Researchers still don't know how long the printed skin will stay alive once grafted, which is a challenge they are hoping to overcome in the next few years. By happy accident, researchers have developed a short-term graft that falls off once it no longer has nutrients, but that was not the goal of the study. Other weaknesses of 3D printing human skin are the cost of the 3D bioprinter, difficulty maintaining a healthy cell environment in the printer, and ethical concerns.

Market Overview & Technology Game Changers

Once these technologies hit the market, they will make a quality of life difference to the people who receive the prints.

Time to Technical Confirmation & Time to Market Introduction

These specific technologies should be available to human patients in the next five years.

References

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Intellectual Property Overview

Patent Possibilities (Mark with an X, bold)	Types of Patent Possibilities (Mark with an X, bold)
Extremely High High Moderate X Low None	Methods X Utility X Provisional Non-Provisional Design X None

Brief Intellectual Property Overview Surrounding the 3D Printing Subject Matter:

Since patents already exist, the future patent opportunities lie in finding a new methodology/design/utility that is non-obvious and involves a different process or breakthrough in this technology.

Y-Axis Business Industry Interests Categories

- A. All
- B. Space & Space Exploration
- C. Automotive
- D. Food
- E. Military
- F. Medicine
- G. Aerospace
- H. Housing
- I. Lighting LED
- J. Human Augmentation
- K. Consumer Products
- L. Home Medical Devices
- M. Electric Cars
- N. Solar Cars
- O. Home Products and Systems
- P. Batteries
- Q. Drones
- R. Wearables
- S. Smart Lighting
- T. Building Materials
- U. Agriculture
- V. Photography
- W. Transportation
- X. Architecture
- Y. Electronics
- Z. Communications
- AA. Environment
- BB. Pharmaceuticals
- CC. Energy
- DD. Security
- EE. Arts
- FF. Medical Research
- GG. Advertising
- HH. Dentistry
- II. Various 3DP Coins & Novelty Gift Items
- JJ. Business in Community Products
- KK. Marine
- LL. Industrial Molds
- MM. Topology
- NN. Sensors
- OO. Robotics
- PP. Veterinary
- QQ. Test & Measurement
- RR. Climate Change
- SS. Recycling
- TT. 3DP & AI
- UU. 3DP & Robotics
- VV. Cosmetics
- WW. Metaverse