

# 3D Printing of Dysphagia Appropriate Foods

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A dark blue diagonal graphic that starts from the bottom left corner and extends towards the top right corner, covering the lower half of the slide.

# Outline

- Overview of dysphagia
- New guidelines
- Current cons to dysphagia diets
- History of 3D printing
- Mechanism of how 3D printing works
- Current research

# What is Dysphagia?

- Difficulty swallowing related to lack of proper control over any muscle that takes part in the swallowing process
- Phases of swallowing
  - Food collects on the tongue
  - Tongue pushes food back towards esophagus, the larynx closes tightly to prevent food or drink from reaching the lungs
  - Food enters the esophagus
- In Dysphagia, one or more of these processes is unable to occur properly
- Severity may be present in different levels of severity therefore persons affected may require different texture modified foods
- Dysphagia may cause pain, decrease quality of life, and make it hard for a person to receive adequate nutrition

# Causes and Symptoms of Dysphagia

## Causes:

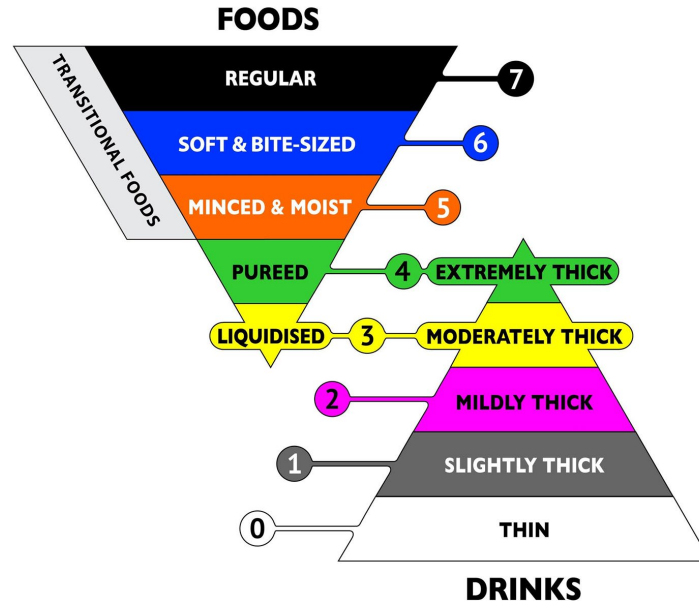
- Any disease of the nervous system that impairs swallowing ability
  - Parkinson's or cerebral palsy
- Stroke
- Cancer of the esophagus, throat, or mouth

## Symptoms:

- Pain while swallowing
- Regurgitation of food/liquid
- Drooling
- Choking or gagging
- Food or stomach acid backing up into the throat
- Unexpected weight loss

Treatment

# Mechanically Altered Foods - New IDDSI Criteria



# Cons of Dysphagia Pureed Foods

- Food can look unappetizing
- Some patients may not like the texture modification they are required to eat
- Patients can feel isolated from family at meals as they are eating something else
- Potentially limited options
- Feeling of loss of control during meal times

# Solution: 3D Print Pureed Foods

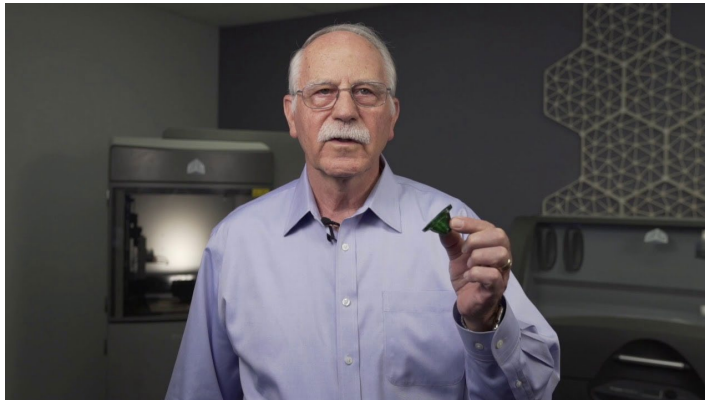
3D printed foods look more realistic, could potentially be safer for dysphagia affected patients, and give the patient some control and variety in what they are able to eat.





# History of 3D Printing

- Invented in the 1980s by Chuck Hull
  - He created stereolithography: allows users to create 3D objects by inputting digital data
- The original: a UV laser beam was directed at a liquid photopolymer which turned it into solid plastic
- 1999: first 3D printed organ was implanted in a human being (it was a bladder)
- Today: 3D printing is being used to create cars, helicopters, drones, engagement rings, and FOOD



# How does 3D printing work?

- Start with creating a 3D blueprint using something called CAD software (computer aided design)
- Prepare machine by inserting the desired materials
- Once you hit start, the machine does the rest
- With food: hypothetically the researcher would be able to decide exactly what they wanted to be in the food
  - I.e. if a patient needed more iron, the machine would be able to add more iron into the pureed food item
  - This method would allow dysphagia patients to choose from a wider variety of foods and would make sure that they got the proper nutrition

Who is Researching this?

# Dr. Aarti Tobin

- Australian researcher
- Team Leader for the Meat Science team at the Commonwealth Scientific Industrial Research Organisation
- Showed that 3D printing can be used to enhance even poor quality cuts of red meat
  - Can add protein to meet the needs of aging populations
- Believes that 3D printing could be the future of personalized nutrition
  - Still have a long way to go



# Deakin University - Australia

- Successfully printed a meal composed of tuna, pumpkin, and beetroot
  - Total printing time was only 3 minutes long to create the meal
- Renowned chefs sampled the meal to test quality
- Their research highlighted some of the potential problems with 3D printing food
- There is a large lack of knowledge on the safety of printing food which could prevent further research studies



# Summary

- 3D printing may be the future of personalized nutrition
- It can be used to make pureed food more palatable and thus more likely to be eaten
- There is still not much research out on the subject but many foods have been printed to date
- Much research is needed on the safety of these foods

# Sources

- <https://www.mayoclinic.org/diseases-conditions/dysphagia/symptoms-causes/syc-20372028>
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