



# PERSONALIZED, PARTIALLY ABSORBABLE BAND-AID

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## Introduction



Injuries are a natural part of everyday life. However, some people suffer daily from open wounds — patients with diabetes.

### Limitations of traditional bandages:

- need to be changed regularly
- often stick to the wound
- and can reopen healing tissue

For chronic patients, the problem is more severe.

Additional issue:

Once a bandage is used, it becomes hazardous medical waste = cannot be reused

How can we know what is good for the wound?

How can we control the drug release from a drug loaded bandage?

## 3D Printing and Personalization

To achieve full customization, I used 3D printing technology.

3D printing allows control over:

- layer order,
- porosity,
- and drug distribution

=> fast pain relief (acute injuries)

=> slow, prolonged drug release

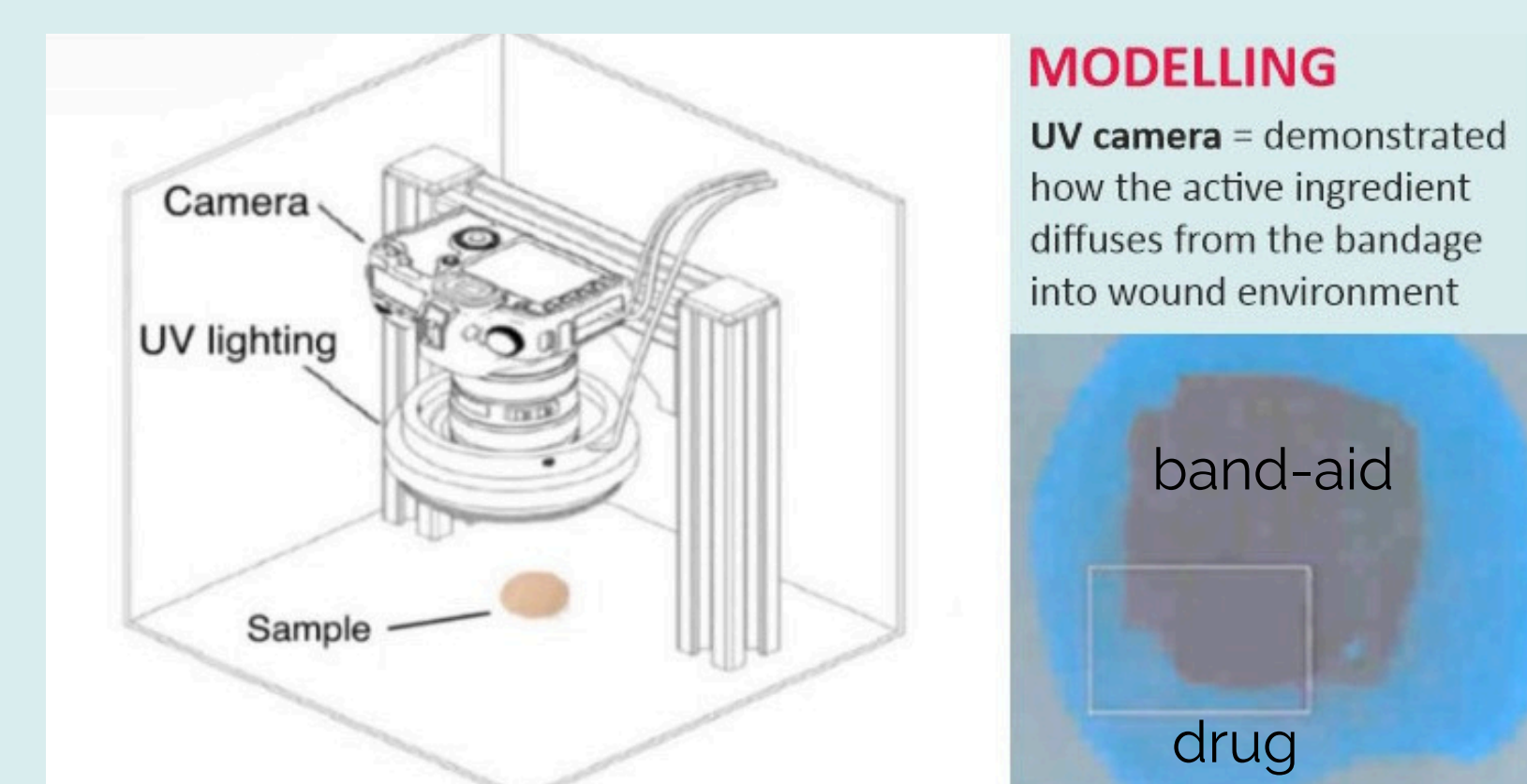
### Methods:

Experiments

- how drug release behavior is influenced by the structure and porosity of the bandage

-to compare immediate versus prolonged release

= UV camera imaging, MicroFlux experiment



**MODELLING**  
UV camera = demonstrated how the active ingredient diffuses from the bandage into wound environment

## Aims

A personalized, partially absorbable band-aid that can be adapted to different types of injuries, allowing not only adjustment of the bandage's composition (active ingredients like hemostatic, anti-inflammatory, pain-relieving, antiseptic agents), but also its size, thickness, and shape to the individual injury.

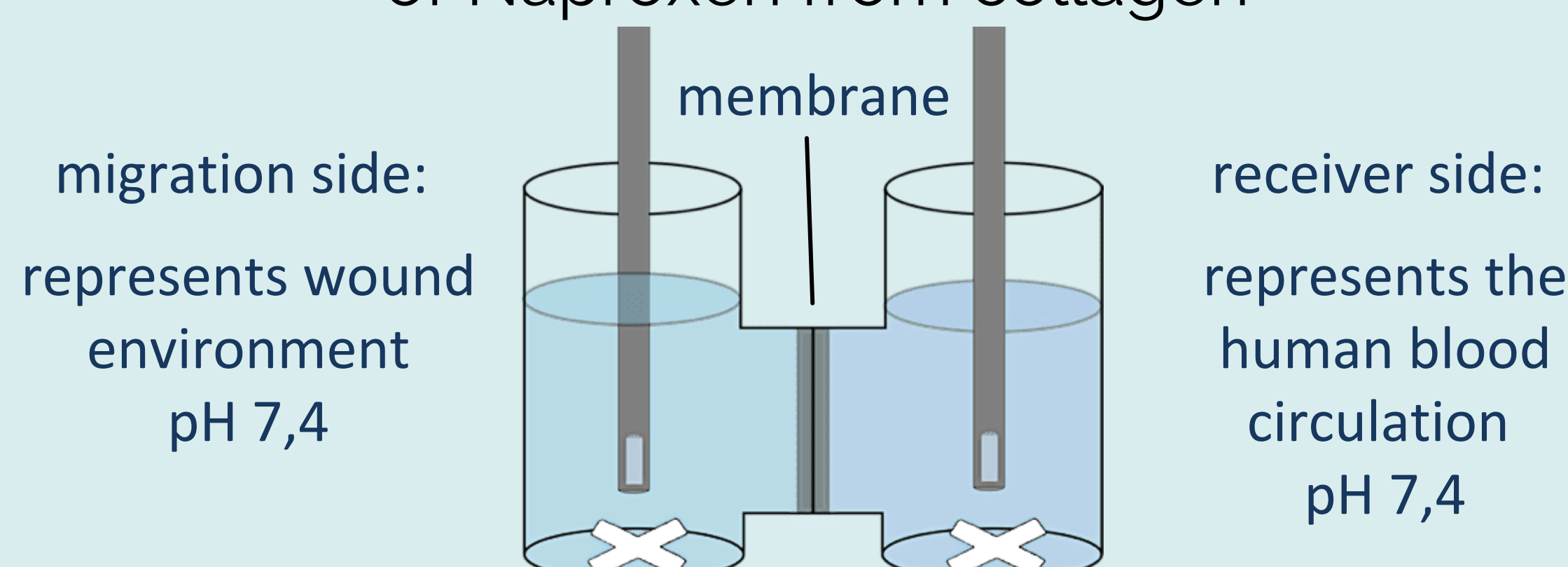
### Process

- 1.The injury is first photographed.
- 2.A mobile application determines the wound's size, shape, and depth.
- 3.The data is sent to a computer database.
- 4.A personalized bandage design is generated based on the wound parameters.
- 5.Suitable active ingredients are selected and incorporated into a collagen-based matrix.
- 6.The bandage is produced using 3D printing.
- 7.After application, the bandage gradually absorbs into the wound environment.

## MicroFLUX - Results



simultaneously testing migration and absorption of Naproxen from collagen

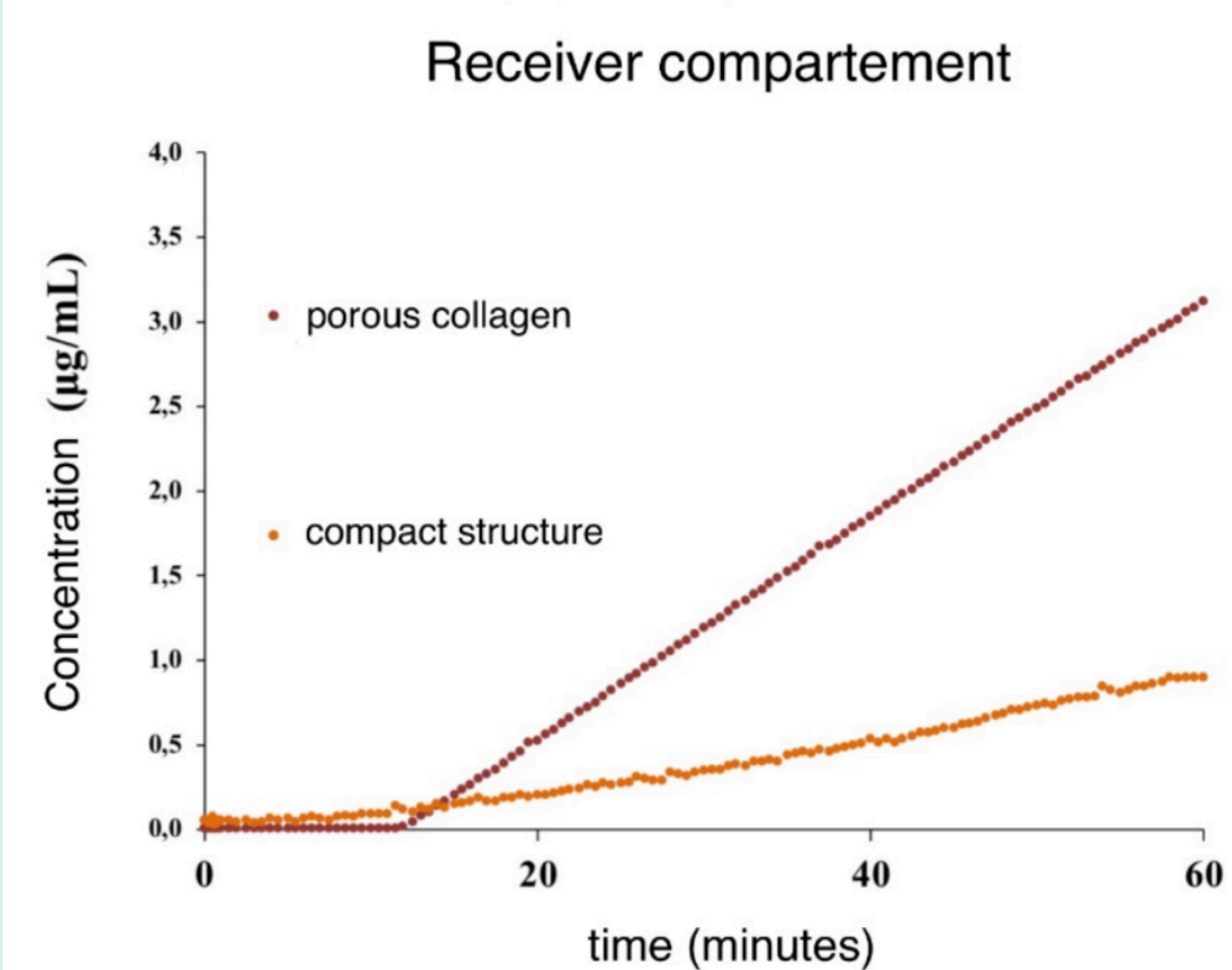
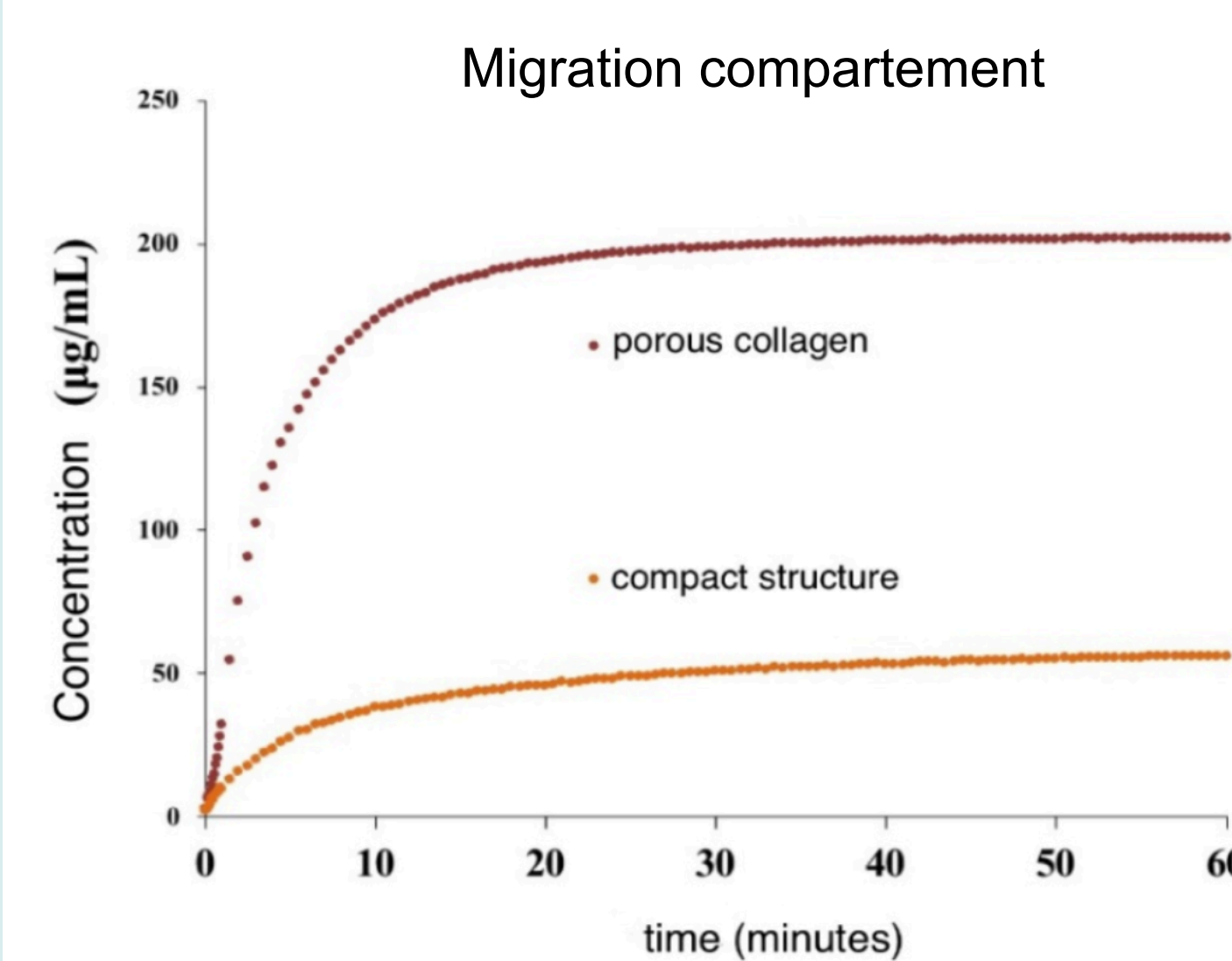


- a porous + compact collagen carrier
- in the porous structure, about 80% of the active ingredient migrated within 15 minutes = rapid
- in the compact structure, only 20% migrated within one hour = prolonged release

**This clearly demonstrates that matrix structure controls drug release.**

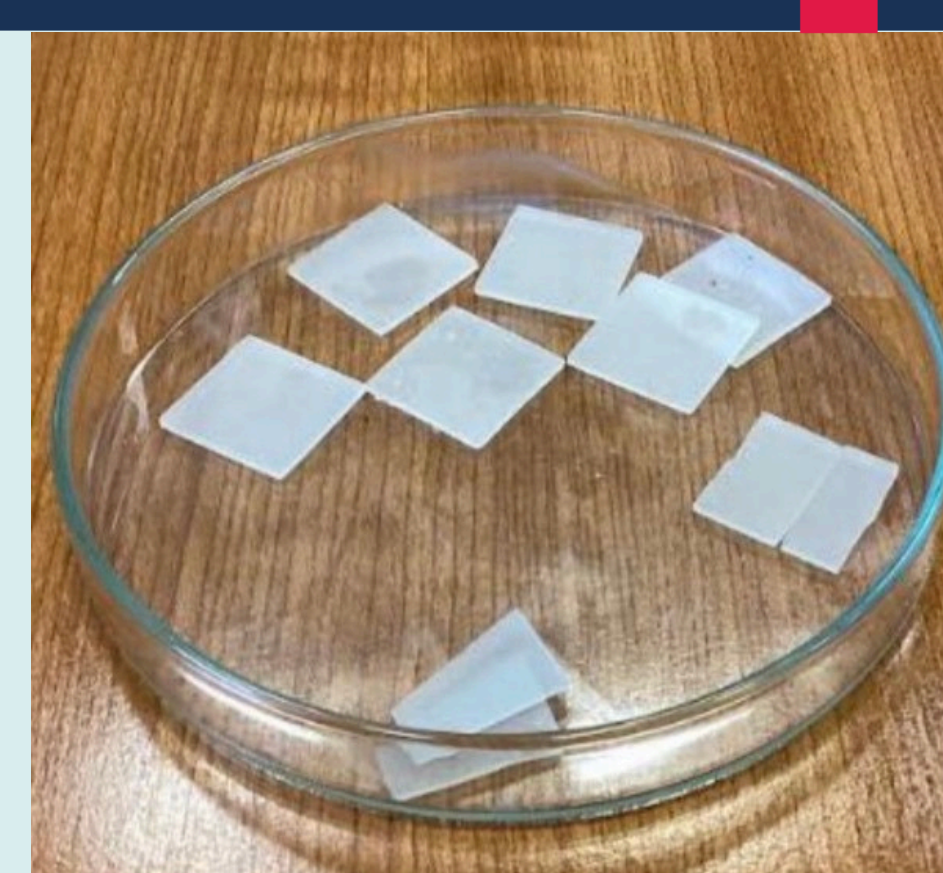
### Prototype

- film casting for simplified models,
- FDM 3D printing for layered designs
- SLS printing to create absorbable band-aid with drug



## Conclusion

- The kinetics of the collagen matrix influences the drug release rate from the band-aid.



## References

- 1) <https://doi.org/10.1002/pol.20220734>
- 2) <https://doi.org/10.1016/j.bioadv.2022.213152>
- 3) Gibson, I., Rosen, D. W., & Stucker, B. (2015). Additive Manufacturing Technologies

