

# Laser based cell printing for soft tissue implants

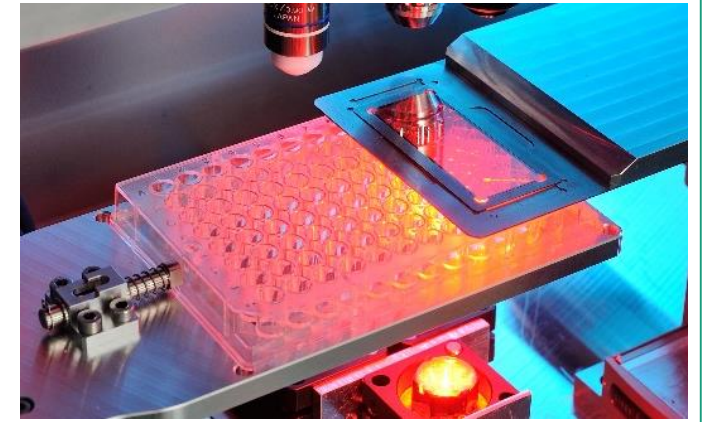
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Nadine Nottrodt, EPIC Online Technology Meeting on Laser-based Manufacturing for Implants, January 23, 2023

# Challenges in Bioprinting ...

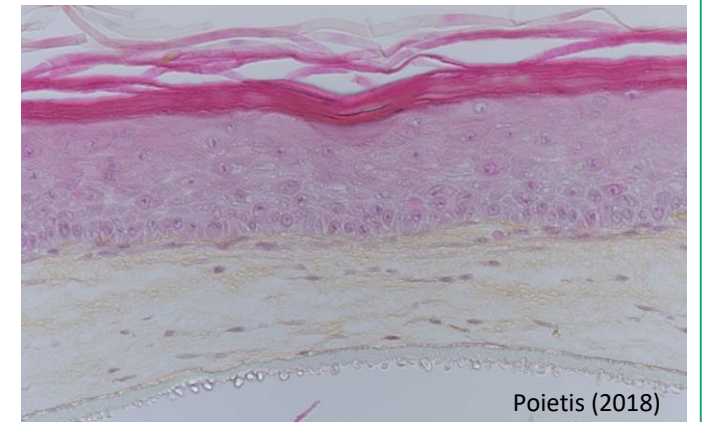
## ... for single cell technologie

- Gentle isolation of single cells while maintaining viability and functionality
- Cell accurate positioning with low deviation
- High process speeds



## ... for tissue engineering

- High cell densities
- High throughput rates for area printing of tissue
- Transfer of prefabricated structures e.g. spheroids



Poietis (2018)

# Laser Assisted Bioprinting with LIFT

## Special features of Laser Induced Forward Transfer (LIFT)

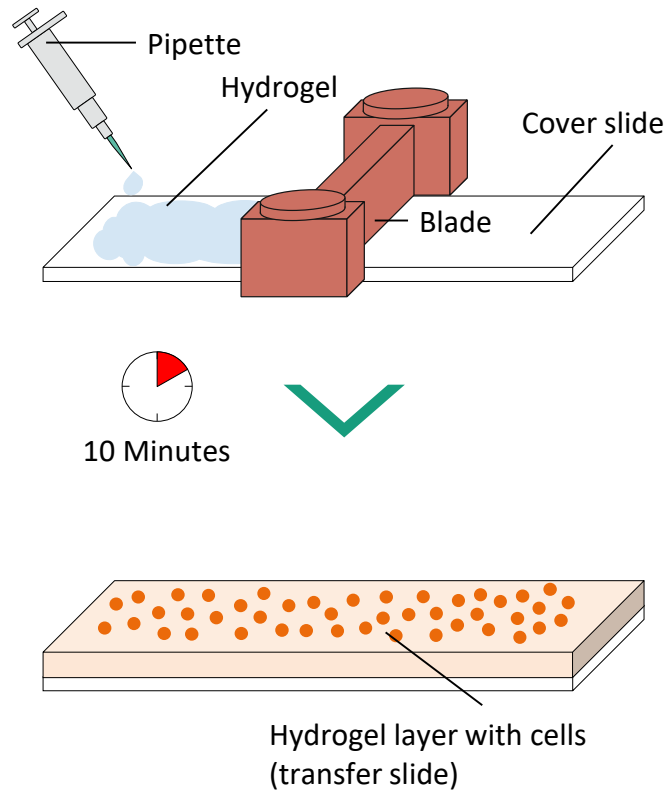
- High process speed, high throughput rates ( $< 1$  ms per transfer)
- Cell preserving with viabilities close to 100%
- High positioning accuracy ( $30\ \mu\text{m}$  for single cells,  $120\ \mu\text{m}$  for spheroids)
- Purely optical, hence combinable with microscopy and spectroscopy
- Nozzle-free, hence low shear forces and no clogging
- High tolerance to viscosity of bio-ink, enables very low to very high cell densities



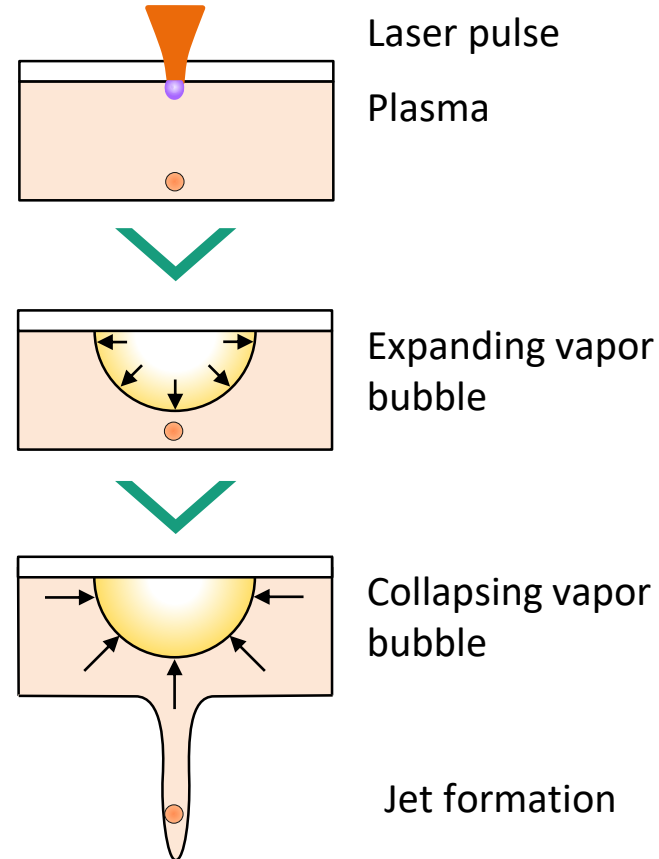
# Laser Assisted Bioprinting with LIFT

## Process description

### Sample Preparation

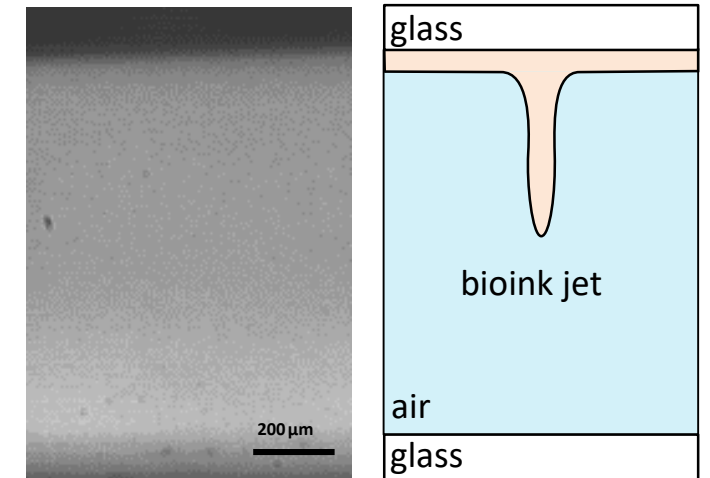


### Laser induced Forward Transfer

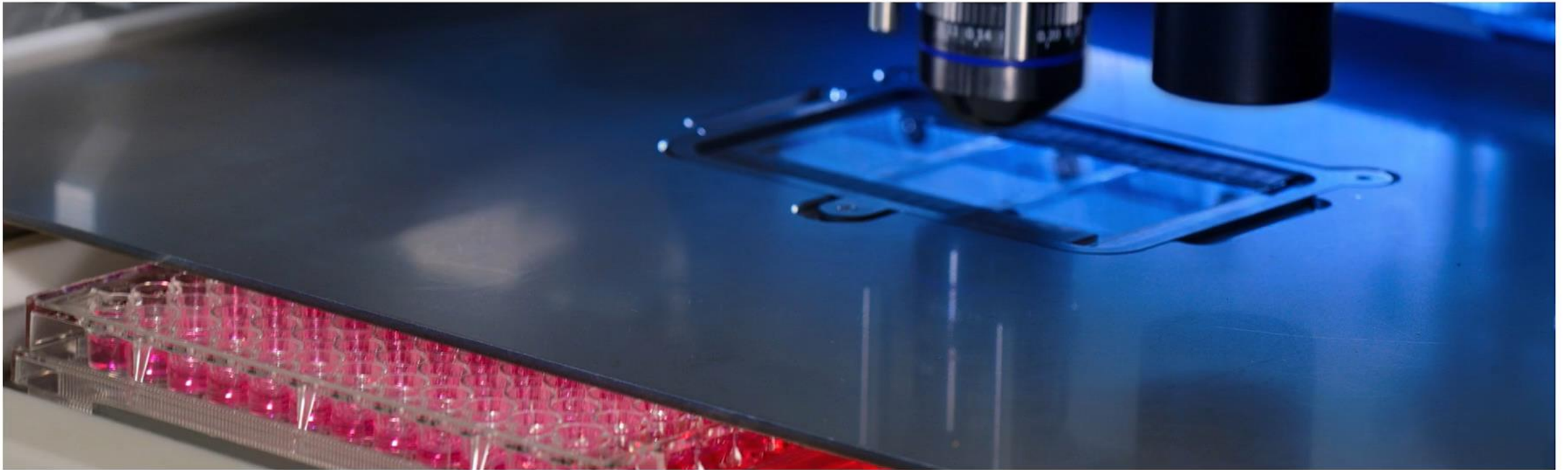


### Jetting and Transfer

- Video of bio-ink jet with 100.000 fps
- Contact on transfer slide after 210  $\mu\text{s}$
- Process completed after 1060  $\mu\text{s}$

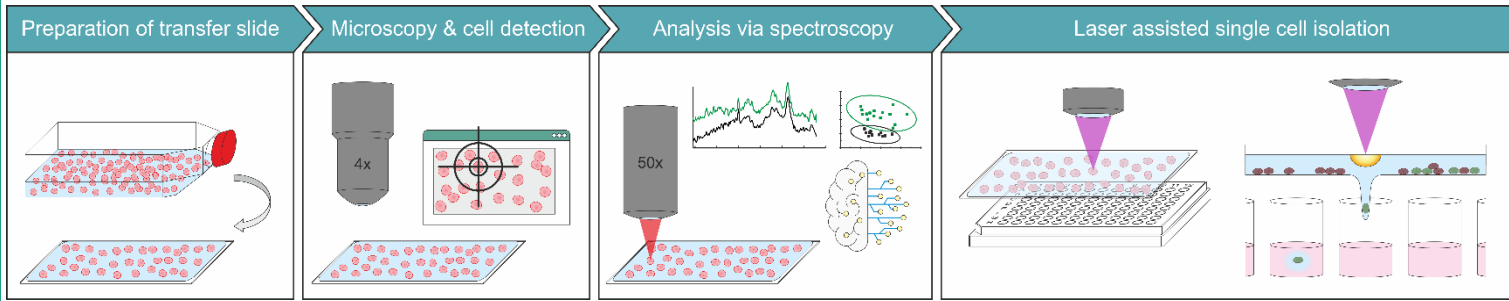


# LASER ASSISTED HANDLING OF SINGLE CELLS AND CELL SPHEROIDS

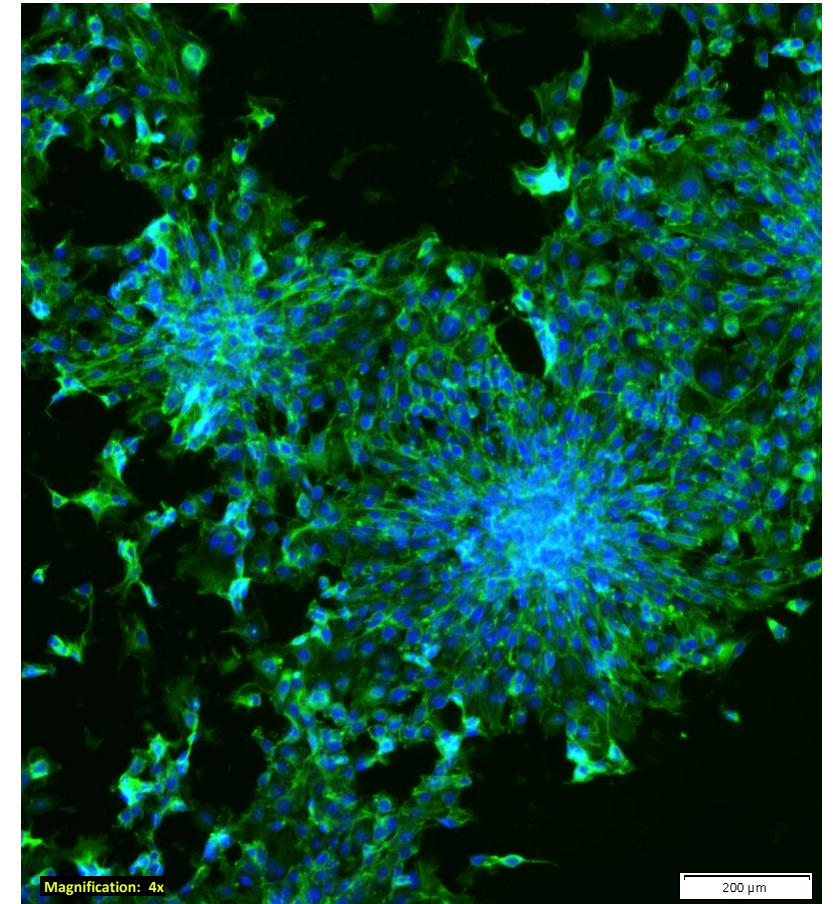
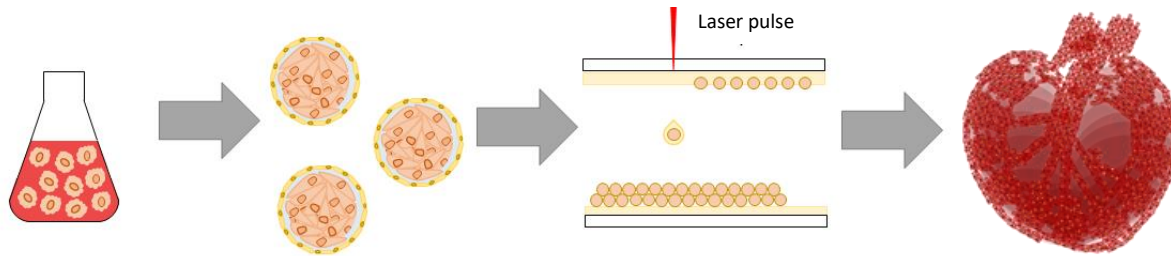


# Application Examples of Laser Assisted Bioprinting

Isolation of single cells for the generation of monoclonal high-producer cell lines in pharmaceutical research



Bioprinting of 3D tissue models for medical research or cosmetic industry



# Kontakt

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