

## Modification of Cell Behaviour on Edible Scaffolds Used for Cultivated Meat

Master Thesis

### Motivation

Producing enough food for a growing world population while reducing environmental damage is a huge challenge. The cultivation of meat has excellent potential to significantly reduce the use of energy, water, and land. Currently, only the production of thin layers of cultivated meat is possible, which limits the offering to minced or processed meat. To cultivate more desirable and natural whole-cut meat, the development of novel 3D cell scaffolds is essential. sallea's indirect additive manufacturing technology enables the manufacturing of such scaffolds, addressing the limitations of current systems by providing open, hierarchical porosity and free choice of material to enable significantly enhanced nutrient transport during the cultivation of meat.

### Project Aim

The aim of the master's thesis is to modify sallea's scaffolds for supporting relevant cells to produce cultivated meat. The scaffold needs to support cell adhesion, proliferation and differentiation of muscle cells into muscle tissue and enable sufficient formation of biomass. These properties may be adjusted by modification of various stages in the production process, such as the scaffold material and potential additives, post-processing alterations, coatings and the cell culture protocol itself. In the framework of this project, the focus will be on adjusting the post-processing of the scaffolds to improve cell growth on the scaffolds. This development will include both an optimisation of the scaffold production process and cell testing of the prepared scaffolds. The work will be conducted at sallea (ETH H nggerberg), a start-up of ETH Z rich in the research group Complex Materials, Department of Materials Science.

### Project Tasks:

1. Literature Research
  - a. Screen the literature for both the ideal physical and chemical environment for muscle cells to thrive.
  - b. Select the most promising strategies to obtain these properties within the constraints of sallea's scaffolding process.
2. Modification of Scaffolds
  - a. Prepare scaffolds with at adjusted processing conditions. This specifically includes adjustments to the freeze-drying process to alter the scaffold microstructure
  - b. Analyse the effect of the adjustments on the scaffold properties, including mechanical properties, swelling ratio and stability in cell culture medium.
3. Cell Culture
  - a. Culture the scaffolds with a model cell line to assess the influence of the adjusted properties on the cell behaviour
  - b. Analyse the cell growth by MTT staining and potentially histology.

*Characterisation:* To characterise the materials and scaffolds described above, characterisation techniques, including mechanical testing, SEM analysis, microscopic tissue analysis, and histology.

The tasks may change due to changes in the project progression and/ or because of the varying interests of the student. Ideas/ Interests etc. from the student are highly appreciated.

### Contact

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