Study and realization of a 3D dual printhead for meat-based food products

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STUDY AND REALIZATION OF A 3D DUAL PRINT HEAD FOR MEAT-BASED FOOD PRODUCTS

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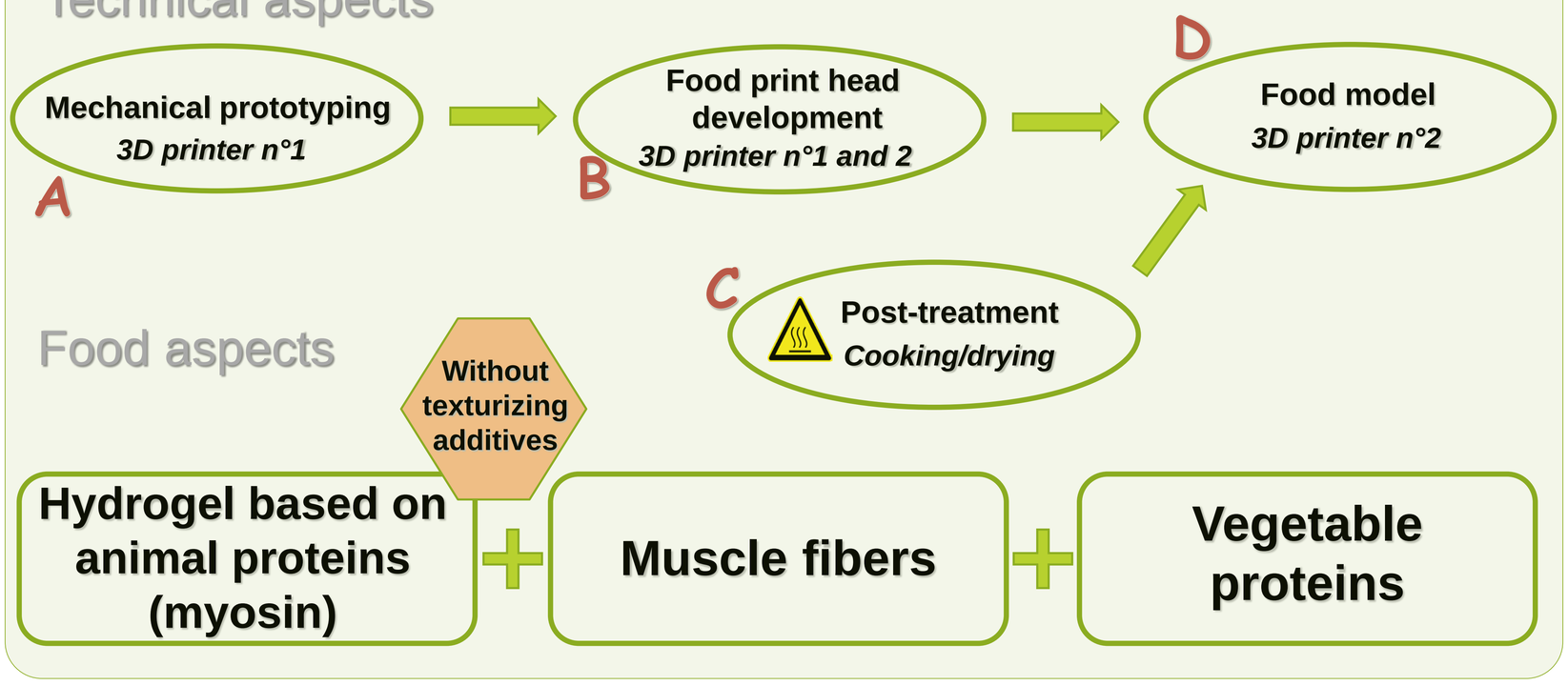
INTRODUCTION

3D printing or additive manufacturing (AM) now provides enormous freedom to design, manufacture and innovate in mechanical and biochemical engineering, design science, pharmaceutical industry, biotechnology, and even food. The literature on 3D printing technologies is booming, and with the immense potential applications unlocked by AM, a number of authors are even talking about a new industrial revolution. Even if uptake of AM in the food industry is far from obvious, there are nevertheless signs of an emerging trend for culinary applications tied to the 'food design' movement.

Our goal is to design foods with targeted functionalities by taking into account the main technology lock: Texturizing of meat products.

CONCEPTS



METHODS & RESULTS

Technical aspects

A — Volumic Stream30 Pro MK2

B

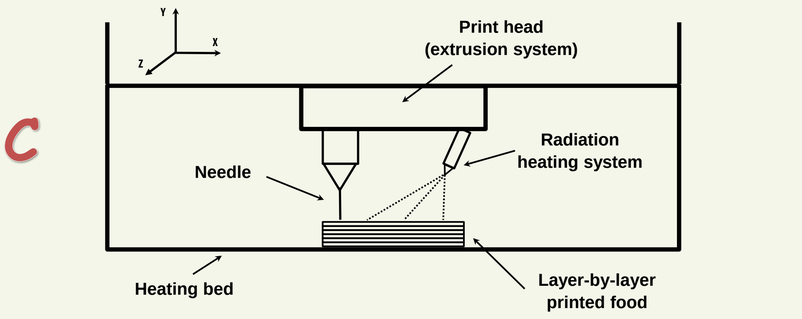
Prusa i3: original printer and our new device

The new parts of the print head were designed using Autodesk® Inventor Pro 2018 software.
The production of the parts was carried out using a commercial 3D printer type « Volumic Stream30 Pro MK2 ».

The Prusa i3 (Marlin) driver software was modified, using a text editor, to integrate the 2 extruders of the new head as well as the new displacement, temperature and extraction speed parameters of products.

The different printed parts are in PLA except the screws and gears which are in ABS-Kevlar. Two commercial syringes are used (content: 10mL).

Food aspects



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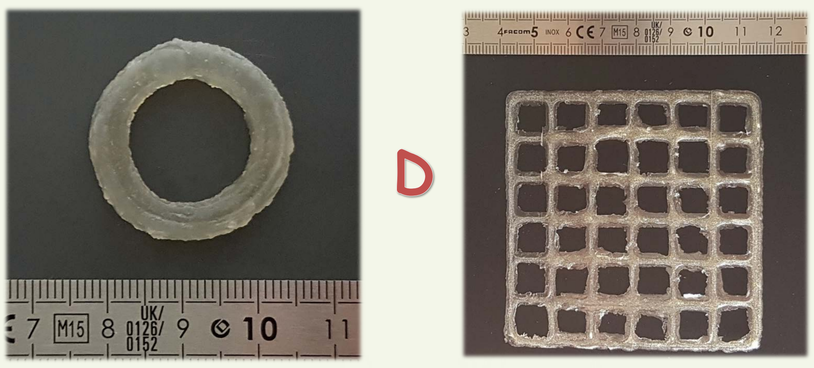

D

Bed temperature: 50 °C – Gel temperature: 60 °C
Needle diameter: 0.8 mm
Layer thickness: 0.2 mm

Original post-processing system

Layer-by-layer heating with controlled depth according to a radiative process or using a laser beam.
This system makes it possible to cook, dry, decontaminate the surface of the layers while preserving the thermosensitive nutrients.

The model food of our study is a gel based on animal proteins with known thermogelling properties.
These proteins come from animal tissues little or poorly valued by the sectors.

CONCLUSION

The results obtained during the first tests on animal protein-based gels suggest wide possibilities of printing meat products for targeted populations of consumers (seniors, athletes, children and young adults). These foods of the future may be therapeutic or adapted to the consumption patterns of future generations of consumers.

Portanguen, S., Tournayre, P., Sicard, J., Astruc, T., & Mirade, P. S. (2018). Vers la conception d'aliments à fonctionnalités ciblées et de bioproduits par impression 3D. *Science et technologie des aliments, 1*(Numéro 1).

Portanguen, S., Tournayre, P., Sicard, J., Astruc, T., & Mirade, P. S. Toward the design of functional foods and biobased products by 3D printing: A review. Submited in *Trends in Food Science and Technology*.

Acknowledgments:
Thanks to Createur 3D for technical support.
e-mail: contact@createur3d.fr

32nd EFFoST International Conference, 6-8 November 2018, Nantes, France.

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