Models help us **design the production** of fish-based ready-to-eat products

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Motivation & objectives

- Healthy ageing requires a healthy diet, and seafood products provide essential nutrients not always accessible to older adults.
- Designing a ready-to-eat product following a circular economy approach to facilitate consumers adopting a seafood based diet with high nutritional values.
- Design milder processes to maximize organoleptic, sensory and nutritional quality of the RTE seafood product while ensuring microbiological safety.
- Model-based design toward industrial adoption: different geometries and processes.

Methods

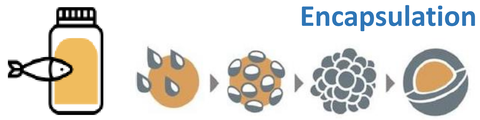
- Data: Seafood composition, temperature, CFU/g and Water Holding Capacity
- Model candidate was formulated and simulated using COMSOL Multiphysics.
- Parameters were estimated to adjust predictions to optimal predesign.
- We considered *Sporosarcina aquimarinum* and *Listeria Monocytogenes* as microorganisms of reference.

COMSOL MULTIPHYSICS®

RTE seafood production

Production of ingredients

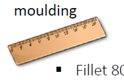
Encapsulation



Processing

- 1:1:1 GHP.
- 50%-50% gel-mince
- 0.25% KCl
- 75% moisture content
- 8% microcapsules

moulding



- Fillet 80-100 g.
- Thickness 1 cm.

Heat treatment
60°C - 40 min.

Candidate product

Modelling

HEAT TRANSEFER

$$\rho c_p \frac{\partial T}{\partial t} = k_t \nabla^2 T \qquad k_t \nabla T = h_t(T_{air} - T) + D_m \lambda \nabla C \qquad T_{t=t_0} = T_0$$

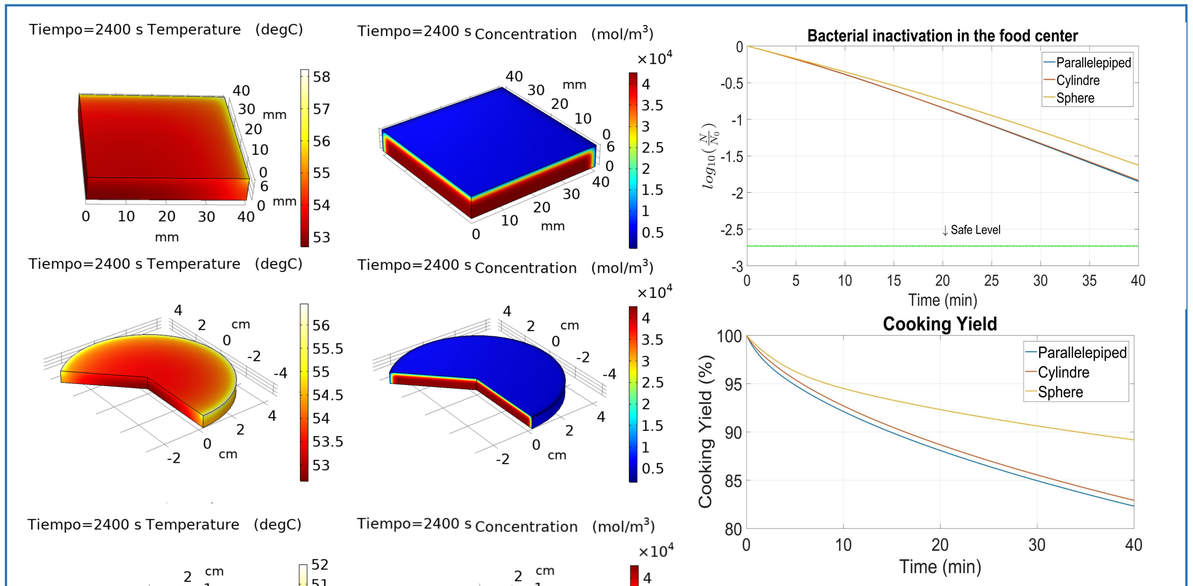
MASS TRANSEFER

$$\frac{\partial C}{\partial t} = D\nabla^2 C \qquad D\nabla C = k_c(c_b - c) \qquad C_{t=t_0} = C_0$$

MICROBIAL ACTIVITY

$$\frac{dN}{dt} = \frac{-2.303}{D_r 10^{\frac{T_r - T}{Z_{val}}}} N \qquad N_{t=t_0} = N_0$$

Simulation for different product geometries



How to process a fish ball? or a burger?

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