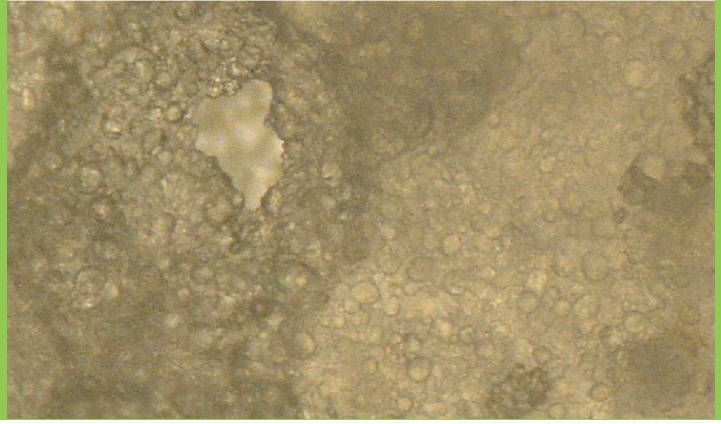

©Kossigan Bernard Dedey - Continuous mesoscopic observation of a film of dough as it swells into a bubble in a laboratory-designed cell that controls temperature and gas composition; shown here after the film has broken.

# Can controlled functionalisation of flour mixtures with fewer additives be achieved?

## Read more


Grenier D. *et al.*

Gas cell opening in bread dough during baking

Trends in Food Science and Technology 2021

https://doi.org/10.1016/j.tifs.2021.01.032


## Partnerships

- UMR IATE, Montpellier for the analysis accompanying the bibliographic review in TIFS and for the mechanical characterisation of gluten during baking (post-doc, Heliciane Clément 2021–2023)
- UR BIA, Nantes and UMR PAnTher, Nantes for the multi-scale characterisation of starch grain softening in bread dough (Marie Skłodowska-Curie Postdoctoral Fellowship, Nanci Castanha da Silva 2021–2023)
- The European PRIMA-FBM project (2021–2025) coordinated by INRAE (UR BIA, Nantes).

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## Context

Bread is a staple food in many cultures. Its honeycomb structure and soft and crisp textures are all valued qualities (contributing to 20 % of the overall appreciation). Controlling expansion in baking has relied mainly on the viscoelastic properties of the gluten network (8–12 % of wheat bread flour), while the variability between flour batches is smoothed with technological aids or additives. The approach is to better understand the role of flour constituents other than gluten, such as starch, in order to attempt a functionalisation using flour blends to achieve the desired expansion. The baking stage can no longer be neglected as previously, as it determines fundamental changes in the properties of the starch.

## Results

Analytical work revisited the stabilising/destabilising functions of the dough walls by the different components in a flour, in particular the starch grains, during rising and baking. Two candidate mechanisms for dough wall stabilisation by starch were investigated: the release of material into the extragranular phase and the softening of starch grains. None of these have been studied under the conditions of moderate hydration of the bread dough. The approach developed for this research combines micromechanical modelling, which is still underdeveloped in the food industry, and original measurement methods, which make it possible to follow the migration of matter at the scale of starch grains (nuclear magnetic resonance – NMR) or to observe the deformation of a film of dough forming a bubble under a microscope. We drew inspiration from the Alveolab®, which many laboratories in the bread- and pastry-making industry are equipped with, but this time with an atmosphere that recreates the rise in temperature and the gaseous composition of the dough.

## Future outlook

The researchers want to play with the successive arrangement of the stabilising actions of the different ingredients of the dough (glutinous network, then liquid lamella, then granular phase consisting of starch). The objective will be to find combinations of flour blends that allow this series of actions to be obtained for a given gluten quality. This could make it possible to work with flours with a lower gluten content than those currently used and to better control the baking process by adjusting the pressure level in the oven (European PRIMA FLAT-BREAD-MINE project).