Understanding the fibration in plant proteins during high moisture extrusion

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Plant based meat-analogues have become very popular in the last few years. Using high moisture extrusion-cooking (HMEC), globular plant proteins are transformed into a fibrous structure that intends to resemble the myofibrils of an animal muscle. Understanding the mechanisms and conditions that allow the formation of the anisotropic structure could lead to an improvement in current products and innovation in the market.
The HMEC process can be decomposed into two main steps; an initial application of high shear at high temperature in a screw section of the water-rich protein mix is followed by a cooling through a long slit die. Current literature indicates that the apparition of the structure is caused by two mechanisms occurring in the cooling die. On the one hand, the deformation by elongation of the viscous mix orients the denatured proteins. On the other hand, a temperature gradient induced phase separation contributes to the oriented heterogeneous structure. A correlation between process conditions and rheological/structural properties is necessary to ascertain these mechanisms and build a predictive model. This presentation aims at reviewing the current understanding of formation of the fibrous structure in plant based meat analogs and underlining the technological and scientific gaps in this technology. Thermomechanical and structural properties of the products will be correlated to process conditions on the basis of experimental studies.

Acknowledgements: this work is performed in the frame of Tom's PhD thesis, sponsored by Nxtfood, in the frame of a Cifre convention (ANRT) with INRAE.