**Modification of resistant starch nanoparticles using High Pressure Homogenization treatment**

Eftychios Apostolidis1, Panagiotis Chaloulos1, Ioanna Mandala1

*1Department of Food Science and Human Nutrition, Agricultural University of Athens, Iera Odos 75, Athens 11855, Greece*

Starch is an abundant natural biodegradable biopolymer, which can be modified into various products widely used in the food industry1. Among the different types of starches, resistant starch (RS) is considered to be of great value, due to its properties and its beneficial effect on human health. In particular, recent studies highlight the impact of RS on the prevention and control of chronic health conditions, including diabetes, colon cancer and cardiovascular diseases2. High pressure homogenization technology (HPH), invokes great interest in the scientific community as a novel physical method for the modification of starches3. The aim of this study is the physical modification of resistant starch granules’ size subjected to high pressure homogenization treatment at 140 MPa, 200 MPa and 250 MPa, in order to produce nanoparticles with a potential application in the food industry (e.g. pickering emulsions4). In particular, we investigated the properties and structural changes of starch granules, including size, structure, crystallinity, solubility and degree of swelling following high pressure homogenization. Dynamic Light Scattering measurements of particle size demonstrated a statistically significant decrease in starch granule size, with increasing HPH pressure and cycles. Electron microscopy studies showed that the size of starch granules decreased with increasing HPH pressure and homogenization cycles, while the morphology of the grains was also affected. X-ray diffraction patterns showed that there was an evident decrease in crystallinity after an increase in HPH pressure and cycles. Furthermore, an increase in solubility and degree of swelling was observed after an increased homogenization pressure. Our results provide basic information for further understanding the properties of modified resistant starch treated at different pressures and indicate the potential applications of physically modified starch nanoparticles in food production.

**References:**

1. Angellier, H., Choisnard, L., Molina-Boisseau, S., Ozil, P., & Dufresne, A. (2004). Optimization of the preparation of aqueous suspensions of waxy maize starch nanocrystals using a response surface methodology. *Biomacromolecules*, *5*(4), 1545-1551.
2. Zhong, Y., Zhu, H., Liang, W., Li, X., Liu, L., Zhang, X., ... & Guo, D. (2018). High-amylose starch as a new ingredient to balance nutrition and texture of food. *Journal of Cereal Science*, *81*, 8-14.
3. Wei, B., Cai, C., Xu, B., Jin, Z., & Tian, Y. (2018). Disruption and molecule degradation of waxy maize starch granules during high pressure homogenization process. *Food chemistry*, *240*, 165-173.
4. Ge, S., Xiong, L., Li, M., Liu, J., Yang, J., Chang, R., ... & Sun, Q. (2017). Characterizations of Pickering emulsions stabilized by starch nanoparticles: Influence of starch variety and particle size. *Food chemistry*, *234*, 339-347.