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Hickey, Martin G. Wilkinson, Jiri Panek, Mark A. E. Auty, Ammasi Periasamy and Jeremiah J. Sheehan -- Diffusion of solutes inside bacterial colonies immobilized in model cheese depends on their physicochemical properties: a time-lapse microscopy study / Juliane Floury, Ilham El Mourdi, Juliana V. C. Silva, Sylvie Lortal, Anne Thierry and Sophie Jeanson.

Sommario/riassunto

Bacteria are always present in foods, whether they are indigenous or inoculated. They can be beneficial to the quality of foods, responsible for food spoilage, or even pathogens. In solid food products, bacteria are immobilized. They thus grow as colonies within the food products or on the food surfaces. The study of bacterial immobilization in colonies was begun in the 1970s by only two UK research teams. Nowadays, new approaches using non-destructive techniques allow investigation of dynamic evolution at the spatial and microscopic levels in solids. However, the literature dealing with bacterial colonies is few and far between if we exclude the literature concerning biofilms. We here consider as bacterial colonies, and not biofilms, discontinued colonies growing on food surfaces and not abiotic surfaces. Predictive models for bacterial growth are built from growth in liquid media and are not accurate for immobilized bacteria growing as colonies. Further knowledge is now needed about the potential consequences of cell immobilization. On one hand, growth and physiology of the cells growing as colonies can be influenced by the microenvironment around the colony. On the other hand, the cells within the colony can in return modify the microenvironment due to their metabolic activities (changes in pH and redox potential, proteolysis,… etc). Indeed, nutrients must diffuse within the food matrix to the colony to be available for the cells within the colony, while the metabolites must diffuse out of the colony to the food matrix to avoid accumulation. These interactions between the colony and the food matrix may lead to a micro-heterogeneity either around the colony or within the colony. Non-destructive techniques should be used to study the adaptive response to the microenvironment of immobilized cells within the colony. They are needed to investigate the spatio-temporal evolution of the colony (growth, size, shape) and its metabolic activities (micro-heterogeneity of pH, diffusion of metabolites, gene expression). The most commonly used technique is fluorescence microscopy and especially confocal laser scanner microcopy with specific probes. In addition, physical techniques such as elastic scattering or micro-calorimetry have been used to study the growth and metabolism of bacterial colonies in model foods. Furthermore, the observation of colony growth in microscopic imaging chambers dedicated to microscope examination allows the modeling of growth parameters of immobilized bacteria in colonies.