This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 101035813

Impact of potentially protective agents on lactic acid bacteria in probiotic formulations

Natalia Burlaga, Amanda Pacholak, Ewa Kaczorek

Institute of Chemical Technology and Engineering, Poznan University of Technology, ul. Berdychowo 4, 60-965 Poznan, Poland

Probiotic formulations are commonly produced through freeze-drying and spray-drying processes. However, these methods significantly reduce the viability of microorganisms, thereby decreasing the therapeutic effectiveness of the probiotics. The survival rate of bacterial cells during drying can be improved by incorporating protective agents such as proteins, sugars, and carbohydrates. These additives help stabilize the cell structure and shield the bacteria from the stresses associated with drying. Unfortunately, some of these substances, regarded as potentially protective agents (PPAs), can negatively impact both the viability and other functional properties of the bacterial cells. Recent research underscores the need for further investigation into the effects of PPAs used in probiotic production methods.

Moreover, the interactions between PPAs and bacterial cells are complex and can vary depending on the specific strain of bacteria and the type of protective agent used. This variability necessitates a tailored approach to selecting appropriate protective agents for different probiotic strains. Recent research underscores the need for further investigation into the effects of PPAs used in probiotic production methods. Understanding these interactions at a molecular level could lead to the development of more effective probiotic formulations with enhanced therapeutic benefits. Additionally, optimizing the concentration and combination of PPAs could help mitigate their negative effects, ensuring that the beneficial properties of probiotics are preserved during processing and storage.

The objective of this study was to examine the response of lactic acid bacteria to the presence of PPAs in probiotic formulations. Among others, trehalose, vitamin C, arabic gum, and monosodium glutamate were selected for testing. The study analyzed modifications in cell membrane permeability, surface hydrophobicity, and surface roughness of the bacteria. Additionally, the potential occurrence of oxidative stress in bacterial cells was assessed. The findings revealed that the addition of the selected PPAs significantly altered the functional properties of the analyzed strains compared to control cells. Furthermore, the direction of these changes was highly dependent on the specific probiotic bacterial strains used in the research.

This work was supported by National Science Centre, Poland, grant number 2023/49/N/NZ9/02128.