

POPULAR SCIENCE ABSTRACT

The World Health Organization has warned that the increasing incidence of antibiotic resistance is a serious threat and one of the greatest public health problems. The latest research shows that the strains included in the starter cultures may be carriers of genes encoding antibiotic resistance. Worryingly, strains that have been awarded the status of safe in the past are not regularly screened for acquired antibiotic resistance, nor are they considered as potential sources of resistance gene transmission.

High pressure processing (HPP) is one of the most promising new methods of non-thermal food preservation, as it extends the shelf life by eliminating many microorganisms, but at the same time has no effect on the organoleptic and nutritional properties of the product. However, recent reports indicate that in microorganisms that survive the effects of HPP, there may be changes in the expression of many genes, including those responsible for antibiotic resistance.

Therefore, the aim of the research proposed in the project is to analyze the impact of high-pressure processing (HPP) on the expression and transferability of antibiotic resistance genes in strains derived from commercial starter cultures. These strains had previously been characterized for their antibiotic resistance and antibiotic resistance genes. The ability of the strains to transfer genes for antibiotic resistance horizontally was also tested both *in vitro*, using membrane filters, and *in situ* in a food model. In the proposed tests, the strains will be exposed to high pressure (pressure values most commonly used in the food industry will be used). The strains will then be recovered and the Minimum Inhibitory Concentrations (MICs) of the selected antibiotics will be reassessed to see if there is a changes compared to the values before pressure treatment. The next steps will only apply to antibiotics for which a change in MICs has been observed as a result of stress factor exposure, and to genes encoding resistance to these antibiotics.

The possibility of horizontal transfer of resistance genes will be re-examined *in vitro* and *in situ*. Then, the analysis of resistance gene expression will be performed using the Real-Time PCR method.

According to the research hypothesis, high-pressure food processing may increase the expression of plasmid localized antibiotic resistance genes in microorganisms used in industrial applications in the form of starter cultures. It is also suggested that, after high pressure treatment, strains from the starter cultures will be able to carry active resistance genes.

The proposed study will provide the knowledge necessary to properly assess the risk of broadening the spectrum of antibiotic resistance among industrial strains. Assuming that the range of antibiotic resistance after the application of high pressures will increase, the obtained results will help to answer the question of whether the parameters used during food preservation should be verified in terms of their influence on the expression of antibiotic resistance genes in industrial conditions. strains. The results can therefore provide important guidance in selecting pressure parameters to be used in food preservation.