High pressure carbon dioxide pasteurization may become an attractive new technique

High pressure carbon dioxide (HPCD) pasteurization might well become one of the most attractive emerging technologies for bacterial inactivation. This can be concluded from a literature survey carried out by Belgian and Italian investigators, which was published in the International Journal of Food Microbiology in 2007.

The HPCD-technique is already widely used for extraction purposes and might well be attractive as a cold pasteurization treatment for foods. The advantage of this novel technique lies in the fresh-like appearance of the food combined with a prolonged shelf-life and the fact that HPCD is suitable both for batch processing of solid foods and for continuous processing of liquid foods. However, before the technique can routinely be applied to foodstuffs, consumers and industry will have to be convinced of the advantages of the HPCD-technique with regard to shelf life and sensory quality of food products. In addition, a number of economic and technical hurdles still have to be overcome.

In the HPCD technique, a foodstuff is contacted with pressurized CO_2 for a certain amount of time. Above a certain critical pressure (P_c = 7.38 MPa) and temperature (T_c = 31.1°C), CO_2 passes into the so-called supercritical phase, which implies that it possesses the unique ability to diffuse through solids like a gas, and dissolve materials like a liquid. The enhanced concentration of CO_2 in the aqueous phase of the food leads to acidification. In addition the CO_2 damages the lipid double-layer of the bacterial membrane, increasing dramatically its permeability to CO_2, which thus can rapidly diffuse into the cell. Within the bacterial cell the CO_2 causes an irreversible intracellular pH decrease and denaturation of cellular enzymes, with fast microbial death as a result.

HPCD treatment resulted in 2 – 9 $\log_{10}$ reduction of vegetative cells, depending on the pressure and temperature used. A drawback of the method is that bacterial spores are not inactivated. To achieve a substantial reduction of viable spore counts, a combination treatment is needed, for instance HPCD at ca 50 °C or HPCD + pressure cycling.

Source:

Ir. L. Garcia-Gonzalez et al., 2007. High pressure carbon dioxide inactivation of micro-organisms in foods: The past, the present and the future, Int. J. Food Microbiol. 117: 1-28

 Corresponding author Mrs. Ir. Klaske van Hoeij MSc (vanhoeij@fooddoctors.com).