Hyperbaric storage – a novel food preservation methodology for currently refrigerated foods with quasi no energetic costs and carbon footprintless

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Food preservation is highly dependent on refrigeration to inhibit spoilage, requiring high energy costs and causing high carbon footprints. These issues may be overcome using a new food preservation method that arose by chance about 40 years ago with the sinking of Submarine Alvin, when well-preserved food was recovered after 10 months at a depth of ≈1540 m (≈15 MPa and 4 °C).[1] This accident opened the possibility of storing food and other biomaterials under pressure (above atmospheric pressure - 0.1 MPa), representing a potential enhancement compared to presently used refrigeration.

Recent developments in our research group (Fig. 1) revealed the possibility of storing currently refrigerated foods at naturally variable (uncontrolled) room temperature under pressure (Hyperbaric Storage - HS). This preservation method is quasi energetic costless and has low carbon footprint, since it is not necessary to control the temperature, and energy is only required to reach the desired pressure (during few minutes), but not to keep it.

HS is expected to have a significant impact on food research and has potential to be applied on food industry during the next years. Additionally, it raises relevant fundamental questions, such as: How can pressure inhibit microbial growth similarly to refrigeration? What are the molecular mechanisms behind this effect? How could this knowledge be transposed to other research areas?

It is important to mention that the industrial scale high pressure equipment of University of Aveiro (Fig. 2) was used for the first and pioneer large scale experiments of HS. Our group is actively working on this subject, with the studies conducted so far clearly indicating that HS has advantages over refrigeration, namely in terms of environmental and economical sustainability. Therefore, it is expected that HS will become a disruptive evolution on food preservation in a near future.

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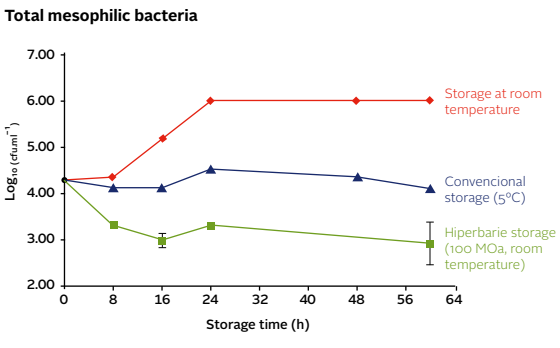

FIGURE 1
Microbial counts (total mesophiles) of watermelon juice hyperbaric stored (100 MPa, room temperature) during 60 h, compared to storage at refrigerated and room temperatures (atmospheric pressure - 0.1 MPa).

FIGURE 2
Industrial-scale high pressure equipment in Chemistry Department, University of Aveiro.