

The circularity of brewer's spent yeast – from beer to food ingredients and biomedical applications

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It is a common practice of brewing industry to reuse the yeasts in serial fermentations. *Saccharomyces pastorianus*, used to produce Lager beer, is widely reused without affecting its fermentation performance. However, *S. cerevisiae*, used to produce Ale beer, is usually not reused due to its poor performance upon recycling. When yeast recycling is not able to keep the quality of the beer, these are discarded as brewer's spent yeast (BSY). Therefore, all breweries are also yeast biomass producers. During fermentation, yeasts modulate their glycogen and cellulosic-like polysaccharide structures in different ways¹, resulting in materials with distinct structural characteristics for food and biomedical applications². For example, as an emulsifying ingredient for a vegan mayonnaise formulation³, and an oral delivery system⁴ able to be recognized by the human Dectin-1 immune receptor even after digestion. After digestion, their spherical shape was preserved and the released material was able to interact with the immune receptors Dectin-1, DC-SIGN, and Dectin-2, important to develop tailored applications. The immunomodulatory activities of yeast β -glucans have been gathering increasing attention as therapeutic agents or immune adjuvants. Because they can be specifically recognized by immune cells, yeast β -glucans are a promising option as carriers for the targeted delivery of immunotherapies. Some of the most recent biomedical applications for yeast polysaccharides include their use as anti-tumoral agents, bone implants and tissue repair, vaccine adjuvants, and drug delivery systems². Also, BSY polysaccharides possess thickening and emulsifying properties able to replace egg yolk and modified starch in a mayonnaise formulation. β -Glucans and O-linked mannoproteins were found to contribute to emulsion stability by preventing Ostwald ripening³. BSY polysaccharide modifications that arise from the brewing process can potentiate their food and biomedical applications, namely, as emulsifying ingredients and oral delivery systems recognized by human immune receptors.

References

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FIGURE 1

Overview of brewer's spent yeast derived microcapsules as targeted oral carriers and its innate immune response.

FIGURE 2

Proposed emulsion stabilization model of brewer's spent yeast cell wall polysaccharides in a mayonnaise formulation.

