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Local artisanal dairy fermented products as reservoir of beneficial microorganisms

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Beneficial microorganisms provide added value to food products or hosts and correspond to what is often referred to as "positive flora". These microorganisms exhibit diverse biological activities and produce metabolites of interest, which can positively impact food preservation, flavor development, and host health. Beneficial microorganisms can generally be classified into two main categories: antagonistic microorganisms and probiotic microorganisms.

Antagonistic microorganisms are those that inhibit undesirable microorganisms, by either active or passive competition. Active antagonism involves the production of bioactive molecules, such as bacteriocins, organic acids, or antifungal compounds, which directly suppress harmful organisms. Passive competition, on the other hand, relates to microorganisms occupying ecological niches or competing for nutrients without necessarily producing active molecules. These mechanisms have been extensively studied in bacteria; however, research on yeasts exhibiting similar antagonistic properties remains relatively limited and is a growing area of interest.

Probiotic microorganisms, in contrast, must demonstrate a beneficial biological activity *in vivo* within a host. These microorganisms, including certain bacterial and yeast strains, are capable of promoting gut health, improving immunity, and supporting overall host well-being.

Fermented foods, such as artisanal cheeses, are excellent examples of how beneficial microorganisms can enhance food preservation while simultaneously providing health and sensory benefits. During the ripening process of traditional cheeses, complex microbial ecosystems develop, consisting of bacteria, yeasts and molds. These organisms play a crucial role in flavor development, texture formation and the inhibition of spoilage flora or pathogens.

For example, in the Hauts-de-France region of the north of France, the artisanal cheese Tomme d'Orchies was studied using metagenetic analysis during its ripening process. This analysis revealed the microbial diversity present in both the rind and core of the cheese and highlighted the evolution of bacterial and yeast microbiota over time. Notably, two strains of *Kluyveromyces* isolated from this cheese demonstrated interesting antagonistic activities.

Further studies on other regional cheeses, such as Carré du Vinage and Bourle Roncquoise, identified and isolated antimicrobial strains of yeasts and bacteria. Two specific yeast strains were tested in a curd model, where they demonstrated significant biopreservation potential by inhibiting spoilage microorganisms. These results suggest that such yeasts could be valuable for extending the shelf life and safety of cheeses.

Fermented foods represent a significant reservoir of beneficial microorganisms with wide-ranging applications. Beyond food biopreservation, these microorganisms have potential uses in improving animal health, human gut health, and even reducing food

waste by preventing spoilage. Artisanal cheeses, therefore, serve as both cultural heritage and a valuable platform for exploring microbial diversity and its positive impacts on food systems and health.

References

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