

Fermented foods: positive effects on health

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It is now well-established that the consumption of fermented foods is associated with an improvement in health. According to a recent study, these benefits are caused by the presence in these foods of an antibacterial molecule which interacts with a receptor present on the surface of immune cells.

Fermentation is a biochemical reaction used by different microorganisms to produce energy from sugar in the absence of oxygen.

In lactic fermentation, certain types of bacteria transform the carbohydrates present in foods into lactic acid, which acidifies the culture and prevents the proliferation of microorganisms which are pathogenic or undesirable, such as molds.

This property has been used since the dawn of time to increase the shelf life of perishable foods, as has been done with milk (yogurt), certain vegetables such as cabbage (sauerkraut in Europe, kimchi in Korea) or even legumes such as soy (Japanese nattō or Indonesian tempeh).

Aside from simply conserving foods, lactic fermentation improves their digestibility, increasing their content of several essential elements (proteins, amino acids, fatty acids and vitamins derived from bacteria) and, not least, allows us to diversify our diet by generating new aromas, flavors and textures.

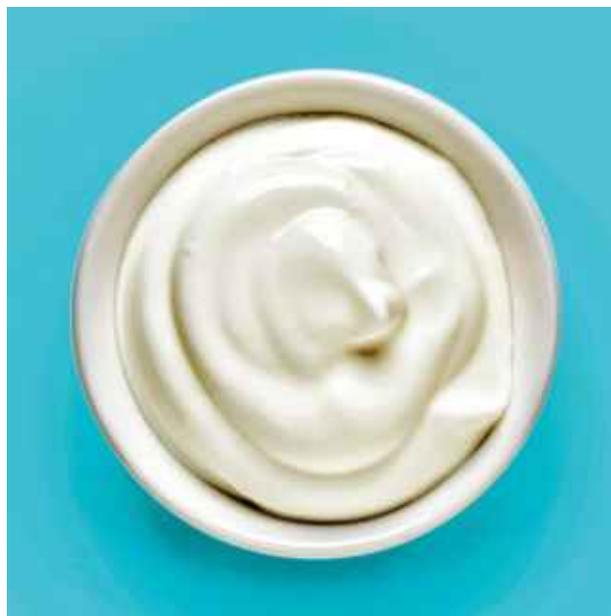
FERMENTATION AND IMMUNITY

Aside from the benefits they provide nutritionally, several studies have shown that the lactic acid bacteria present in fermented products can modulate the activity of the immune system and yield several positive effects on health.

For example, one study performed on 32,606 men recently showed that those who consumed 2 portions of yogurt per week had a risk of developing adenomas (precancerous lesions) within the colon that was diminished by 20% compared to those who never consumed yogurt¹.

A very interesting study has allowed us to better understand this interaction between fermentation and immunity: German researchers have managed to demonstrate that a metabolite produced by lactic acid bacteria during the course of fermentation, phenyllactic acid, binds specifically to a receptor called HCA3 (hydroxycarboxylic acid receptor 3)².

Similar to its close relatives HCA1 and HCA2, the HCA3 receptor is present in adipocytes where it is involved in controlling the release of fatty acids into the circulation. HCA3 is unique within the members of this protein family in that it is the only receptor which is present in very large quantities on the surface of immune cells such as monocytes (e.g. macrophages).



Researchers have observed that the addition of physiological concentrations of phenyllactic acid, easily done via the consumption of fermented foods, causes an activation of these monocytes, which then raises the interesting possibility that activation of the HCA3 receptor present on these cells could play an important role in the beneficial effects of fermented foods on immune activity.

EVOLUTIONARY ADAPTATION

The interaction of a metabolite produced by the lactic acid bacteria with the HCA3 receptor is interesting because a genetic analysis performed by these authors showed that the receptor arose relatively late during the course of evolution, about 15 million years ago, and is only present within the great apes and humans.

According to the authors, the evolutionary selection for this new gene by hominids could be due to the fact that the great apes had begun a new era by leaving the forests for a life on the ground, which increased the probability of feeding on foods which had fallen to the earth and which were therefore more likely to have begun fermenting.

The expression of a gene allowing our immune system to detect the presence of a molecule possessing antimicrobial activity, such as phenyllactic acid, in fermented foods could thus provide advantages for survival.

This type of positive selection is similar to that which has been proposed for the gene for alcohol dehydrogenase, appearing during the same era, which permitted the great apes to consume fruits altered by alcoholic fermentation. To sum up, these events show that we have been taking advantage of the benefits of fermentation for quite some time!

- (1) Zheng X et al. Yogurt consumption and risk of conventional and serrated precursors of colorectal cancer. *Gut*, published online June 17 2019.
- (2) Peters A et al. Metabolites of lactic acid bacteria present in fermented foods are highly potent agonists of human hydroxycarboxylic acid receptor 3. *PLoS Genet.* 2019; 15: e1008145.