

In food form, some probiotics have a better chance to promote health

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Functional foods containing bacteria with beneficial health effects, or probiotics, have long been consumed in Northern Europe and are becoming increasingly popular elsewhere. To be of benefit, however, the bacteria have to survive in the very hostile environment of the digestive tract. A group of scientists from the Norwegian University of Life Sciences in Ås, Norway have developed a "model gastric system" for evaluating the survival of bacteria strains in the human digestive system, and determined that some bacteria strains survive better when consumed as fermented milks. Their results are published in the February issue of the *Journal of Dairy Science*.

"Most of the bacterial strains we tested have interesting functional properties related to food products. We wanted to evaluate whether these strains could contribute with beneficial health functions, or even have the potential as [probiotics](#) for human consumption," explains lead investigator Professor Siv Skeie of the Department of Chemistry, Biotechnology, and Food Sciences.

Researchers tested 5 *Lactococcus* bacteria strains, including 4 *Lc. lactis ssp. cremoris* strains, which are found in ropy milks, traditional Nordic fermented milk products reported to have beneficial effects on consumer health, as well as 3 *Lactobacillus* strains, and one strain of *Enterococcus hirae*. The study tested whether the strains could survive exposure to acidic conditions and bile salts, the traditional method of evaluating the potential of probiotic bacteria. The bacteria were also subjected to a process that mimicked the human digestive system, incubating the bacteria in human gastric and duodenal juices at body temperature. The bacterial strains were tested both as pure cells from cultured media and in the form of fermented milk.

The initial in vitro testing in acid and bile salts found that *Lactobacillus* strains had a significantly higher acid tolerance than the lactococci strains

and *E. hirae*. The model digestion experiments allowed researchers to simulate with more precision the multiple stress factors that might ultimately affect the survival and subsequent performance of bacteria in the gut. The lactobacilli strains showed the highest survival rate in the model digestive system, whereas the cocci, with some exceptions, performed similarly in both systems. Interestingly, while none of the lactococcal stains and the *E. hirae* strain survived in significant numbers after exposure to the gastric juices, their numbers increased in the subsequent duodenal phase.

"This could mean that lactococci and enterococci are able to resurrect their viability if they are exposed to more suitable conditions like those in the small intestine. This is very interesting because it is in the intestine that functional or probiotic bacteria confer their health benefit to the host," suggests Dr. Skeie.

In testing whether fermented milk gave protection to the bacteria through the [digestive tract](#), the results were mixed. The *Lactococcus* strains Af-1 and ML-8 and *Lb. paracasei* INF448 showed lower numbers of viable cells compared with the digestion of pure bacterial cells. The other strains showed higher numbers of viable cells in comparison. In particular, the fermented milk improved the viability of the *Lactococcus* [strains](#) Ar-1, Bf-2, the active bacteria in ropy milk, and *E. hirae* INF E1 during incubation under gastric conditions.

"These results seem to confirm that foods, such as fermented milks, could be a protective matrix enhancing survival of some [bacteria](#)," Dr. Skeie concludes.

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