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PRESS RELEASE (2025/08/22)

Yogurt and hot spring bathing show a promising combination for gut health

Researchers find that hot spring bathing enhanced the positive effects of yogurt on defecation status

Fukuoka, Japan— Researchers at Kyushu University have demonstrated that yogurt intake increases the diversity of gut microbiota and alters its composition. Furthermore, bathing in chloride hot springs after yogurt intake was found to improve defecation status more than yogurt alone. These findings suggest that combining two lifestyle interventions—yogurt intake and hot spring bathing—may contribute to better health, highlighting their potential application for preventive medicine. The study was published in the journal *Frontiers in Nutrition.*

Maintaining a healthy gut environment is vital for overall health, as it plays a key role in regulating digestion, immune responses, and even neurological function. Yogurt, which contains prebiotic microorganisms such as lactic acid bacteria and bifidobacteria, have been known to modulate the gut microbiota and provide a range of health benefits.

In this context, researchers at Kyushu University focused on Japanese hot springs, also known as *Onsen*. "We have previously reported the beneficial effects of onsen bathing on the gut microbiota. However, little has been known about how the combination of diet and onsen bathing influences health." says Professor Shunsuke Managi of Kyushu University's Urban Institute who led the research. "Therefore, we collaborated with Beppu City here in Kyushu, a region well known for its onsen, to investigate the effects of onsen bathing after yogurt intake."

This study enrolled 47 healthy adult men and women who had not bathed in onsens within 14 days prior to the start of the trial. The participants were then randomly assigned to one of three groups: a control group, a yogurt group and a yogurt plus onsen group.

The control group received no intervention, while the yogurt group consumed 180 g of low-sugar yogurt containing *Lactobacillus bulgaricus* and *Streptococcus thermophilus* after dinner daily. In addition to this, the yogurt plus onsen group bathed in Beppu's chloride spring for more than 15 minutes at least once every two days. Before and after the four-week intervention period, gut microbiota surveys were conducted using stool samples, and a questionnaire on defecation status containing 14 items which includes evaluating stool frequency, stool consistency, the sensation of incomplete evacuation, and the use of laxatives was administered.

The results revealed a significant increase in gut microbiota diversity in the yogurt group, accompanied by changes in the relative abundance of multiple bacterial species. Notably, these microbial changes were not observed in either the control group or the yogurt plus onsen group. However, both the yogurt group and the yogurt plus onsen group demonstrated significant improvements in defecation status scores, with the latter showing a more pronounced effect.

These findings suggest that yogurt intake may enhance gut microbial diversity, and that its combination with onsen bathing may exert an additive or synergistic effect to improve

defecation status.

"Although the sample size is small, our findings suggest that combining two accessible lifestyle interventions—yogurt intake and onsen bathing—may offer enhanced health benefits, particularly by promoting gut microbiota diversity and improving defecation status in healthy adults," explains Managi. "These results are especially relevant given the growing interest in non-pharmaceutical, lifestyle-based strategies for preventive health and wellness. Furthermore, this research may support the development of evidence-based wellness tourism, particularly in regions known for their onsen, by providing scientific validation for health-oriented travel and services."

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For more information about this research, see "Dietary and environmental modulation for the gut environment: yogurt promotes microbial diversity while chloride hot springs improve defecation status in healthy adults,"Jungmi Choi, Midori Takeda, and Shunsuke Managi" *Frontiers in Nutrition,* https://doi.org/10.3389/fnut.2025.1609102

About Kyushu University

Founded in 1911, Kyushu University is one of Japan's leading research-oriented institutes of higher education, consistently ranking as one of the top ten Japanese universities in the Times Higher Education World University Rankings and the QS World Rankings. The university is one of the seven national universities in Japan, located in Fukuoka, on the island of Kyushu—the most southwestern of Japan's four main islands with a population and land size slightly larger than Belgium. Kyushu U's multiple campuses—home to around 19,000 students and 8000 faculty and staff—are located around Fukuoka City, a coastal metropolis that is frequently ranked among the world's most livable cities and historically known as Japan's gateway to Asia. Through its VISION 2030, Kyushu U will "drive social change with integrative knowledge." By fusing the spectrum of knowledge, from the humanities and arts to engineering and medical sciences, Kyushu U will strengthen its research in the key areas of decarbonization, medicine and health, and environment and food, to tackle society's most pressing issues.

Fig. 1. The Umi Jigoku onsen in Beppu, Japan. The Umi Jigoku onsen (hot spring) is one of the stunning onsens you can see at Beppu City. While this onsen is far too hot to take a dip in, Beppu is renowned for its numerous onsens and the purported health benefits it provides. (Kyushu University)

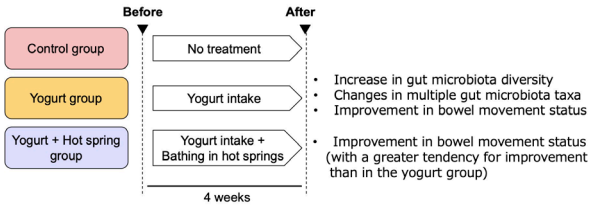

Fig. 2. Graphical abstract of the paper. In this study, volunteers were divided into three groups: control, yogurt, and yogurt and onsen. After four weeks of monitoring the team found that individuals who consumed yogurt had increased gut microbiota diversity, had changes in gut microbiota taxa, and improvements in bowel movement status. Individuals who consumed yogurt as well as regularly bathed in onsen reported improved bowel movement status with a greater tendency in that of

	the yogurt group. (Shunsuke Managi/Kyushu University)

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