Gut check: Teff grain boosts stomach microbiome health

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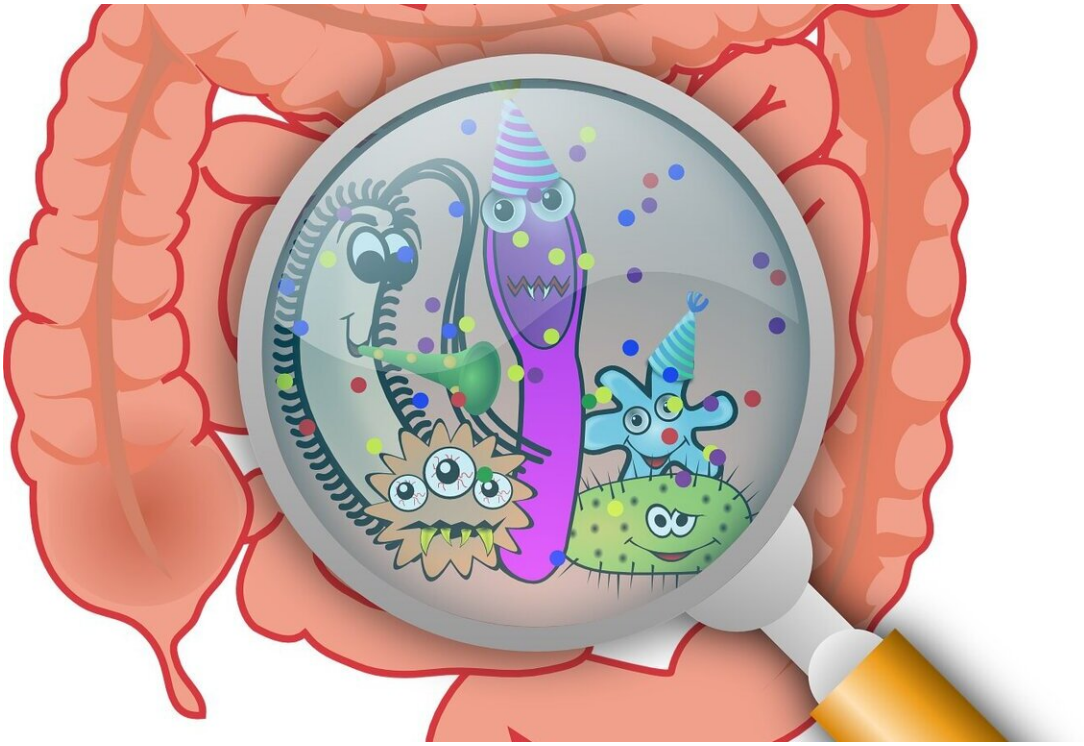

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The seeds of a teff plant—which look similar to wheat—are tiny in stature, but they pack a nutritional wallop.

Relatively new to the U.S., teff has long been a superfood in East African—specifically Ethiopia—as a staple food crop rich in fiber.

Cornell University food scientists, led by Elad Tako, associate professor of food science, now confirm this grain greatly helps the stomach and enhances the nutritional value of iron and zinc, according to a new modeling method. Their findings were reported Oct. 2 in the journal *Nutrients*.

Teff was tested in Cornell food science labs to understand how its seed extracts would affect the gastrointestinal tract and other systems in living organisms, via the utilization of a unique in vivo approach.

"The grain teff is extremely valuable," said Tako, the paper's senior author. "For the first time, we were able to associate teff-seed extracts and teff consumption with positive effects on the intestinal microbiome composition and function, potentially explaining why the prevalence of dietary iron and zinc deficiencies in Ethiopia—although still significant—are lower in comparison to other neighboring African nations."

Tako and his group conducted experiments while developing and using fertile eggs from the standard domesticated chicken (Gallus gallus). The embryonic phase of Gallus gallus lasts for 21 days, during which time the embryo is surrounded by amniotic fluid (egg whites), which is naturally and orally consumed by the embryo prior to hatch on day 21.

In the experiment, the teff seed fiber extract was injected into the fertile Gallus gallus eggs' amniotic fluid, which consists mostly of water and short peptides, on day 17 of embryonic development. The amniotic fluid and the added nutritional solution are then consumed by the embryo by day 19 of embryonic incubation.

"By utilizing this unique in vivo model and research approach, we are able to test how a candidate compound—in this case the teff grain extract—or solution affects the gastrointestinal tract, but also other

systems or other tissues," Tako said. "We were able to confirm positive effects on the intestinal microbiome and duodenal (small intestine) functionality and tissue morphology."

Several important bacterial metabolic pathways were enriched by the teff extract, likely due to the grain's high relative fiber concentration, demonstrating an important bacterial-host interaction that contributes to improvements in the physiological status of iron and zinc, and the functionality of the intestinal digestive and absorptive surface.

"We're taking advantage of the embryonic phase, as a unique in vivo model to assess the potential nutritional benefits of plant origin bioactive compounds," said Tako, who is guest editor for an upcoming special issue of *Nutrients*, "Alleviating Zinc Dietary Deficiency, and Monitoring Poor Physiological Zinc Status in Sensitive Populations."

More information: Johnathon Carboni et al, Alterations in the Intestinal Morphology, Gut Microbiota, and Trace Mineral Status Following Intra-Amniotic Administration (Gallus gallus) of Teff (Eragrostis tef) Seed Extracts, *Nutrients* (2020). DOI: 10.3390/nu12103020

Provided by Cornell University

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