

Gut Bugs and Health: Implications for Soyfoods

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It has been known for decades that the gut microbiota (GMB) play a critical role in the metabolism of isoflavones. Further, it was proposed nearly 20 years ago that those individuals whose large intestine host certain microbiota are more likely to benefit from soyfood consumption than those who don't.¹ New GMB-related research provides even more reason for consuming plant sources of protein, such as soy.

Research aimed at understanding the role of the GMB on health has exploded in recent years. The GMB has been referred to as our second genome because it can function as an intermediary between our diet and us. As described by Heidenreich and Mamic,² the GMB “comprises a diverse community of microbes that reside in our gut and play an important role in essential host biological processes ranging from nutrient absorption to glucose metabolism, energy homeostasis, and immune response.”

Isoflavone bioavailability and metabolism varies greatly among individuals, which results in greatly varying isoflavone and isoflavone metabolite levels in response to the intake of similar amounts of isoflavones. Much of this variation may be due to the differences among individuals in intestinal bacteria.^{3,4}

To begin with, gut microbes in the jejunum hydrolyze the glycoside form of isoflavones, which is the dominant form in soybeans and unfermented soyfoods, thereby allowing isoflavones to be absorbed. After absorption, isoflavones are conjugated in the liver and intestinal mucosa cells and are eventually excreted in the bile. Once they reach the distal part of the intestine, they are deconjugated, which allows them to be absorbed again and be part of the enterohepatic circulation.⁵ Thus, the GMB play a role in the absorption and reabsorption of isoflavones.

Furthermore, the isoflavone daidzein can be metabolized to equol by gut bacteria. However, only about 25% of Westerners host the intestinal bacteria that produce equol. In 2002, it was proposed that individuals who host equol-producing bacteria are more likely to benefit from soyfood consumption.¹ Clearly, the GMB and soy are very much interconnected.

The GMB may also at least partially play a role in determining how meat affects our health. This is because a gut microbiota-related metabolite, trimethylamine N-oxide (TMAO), has been associated with an increased risk of major adverse cardiovascular events including myocardial infarction and coronary heart disease (CHD), although it may be premature to reach definitive conclusions about a causal role for TMAO.⁶ Having said that, new research does suggest TMAO has a causal role in the etiology of CHD.⁷

The research in question is a prospective nested case-control study involving 760 healthy U.S. women at baseline that found regardless of the initial TMAO levels, 10-year increases in TMAO from the first to second blood collection were significantly associated with an increased risk of CHD. In this study by Heianza et al.,⁷ participants with elevated TMAO levels (the top tertile) at both time points showed the highest relative risk (1.79; 95% confidence interval: 1.08, 2.96) for CHD as compared with those with consistently low TMAO levels.

TMAO is synthesized in the gut from choline, phosphatidylcholine, and L-carnitine, nutrients most abundant in foods of animal origin (particularly liver, red meat, and egg yolk), by a set of gut microbial enzymes. Studies show that omnivores produce more TMAO than

vegans or vegetarians following dietary L-carnitine intake through a microbiota-dependent mechanism.^{8,9} Thus, the GMB of plant-based consumers may protect against the harmful effects of TMAO.

Two additional observations are noteworthy. One, TMAO may not be the only GMB-produced metabolite associated with CHD, at least according to research by Nemet et al.¹⁰ Two, in the study by Heianza, et al.,⁷ diet quality impacted the effect of the change in TMAO levels on CHD risk. The TMAO-CHD relationship was strengthened by unhealthy dietary patterns and was attenuated by healthy dietary patterns.

The heart-healthy attributes of soyfoods, and the emerging research on red meat and TMAO, and on plant-based diets and TMAO, present compelling reasons to add soy to the diet.

References

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