



TMAO: A Toxic Substance Formed When You Eat Meat Can Make You ... Dead Meat

By Robert Ostfeld, MD, MSc
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We can add another reason to the list of why we should not eat meat. If the saturated fat and cholesterol in meat were not enough, there is a newly identified toxic kid on the block: trimethylamineoxide (TMAO).^{1,2}

When we eat red meat, its carnitine interacts with our gut bacteria, forming trimethylamine, which is then metabolized by the liver into TMAO. And it appears that TMAO is not our friend.^{1,2}

TMAO promotes the formation of cholesterol plaques in our blood vessels, which make them less healthy and may lead to heart attack, stroke, and death. TMAO reduces our body's ability to excrete cholesterol.^{1,2} And, if that is not bad enough, TMAO may be linked to death from prostate cancer.³

The good news is that people who eat an exclusively plant-based diet appear to form little TMAO. In fact, when researchers fed steak to a vegan, virtually no TMAO was made.² Why is that? Vegans, it seems, do not select for the specific gut bacteria that lead to the formation of TMAO, whereas meat eaters do. Hence, it's as if plants create a coat of armor in our stomachs, protecting us when they are not even there.

So if we're protected by plants, is it okay for us to eat steak for just a few days? Are we protected from TMAO? It appears that we may not be. The trillions of bacteria in our gut change very quickly. In fact, they may meaningfully shift even within one to two days!⁴ So aside from the many other deleterious effects of meat, even one day of steak could cut a chink in the natural armor afforded us by eating plants.

Notably, red meat is not the only source of TMAO. Choline, which is found in chicken, fish, dairy — and even plants — is another. Choline is structurally similar to the carnitine in red meat, and with the help of the same gut bacteria, also forms TMAO. Accordingly, when investigators fed omnivores an egg, they made TMAO.¹

Although we have no dietary need for carnitine, we do require dietary choline. So how can we get the choline we require without the unwanted company of toxic TMAO? The answer appears to be in the armor. Eating a plant-based diet selects for gut bacteria that do not lead to the formation of TMAO.² So even though we are eating choline in plants, our stomach's plant-derived protection is in place, practically freeing us from concern about TMAO.

Science's understanding of the interaction of our diet and gut bacteria and their influence on our health is at an early stage. However, evidence is mounting that a plant-based diet may be beneficial for this interaction in many ways. Yet another reason to go (or stay) plant based!