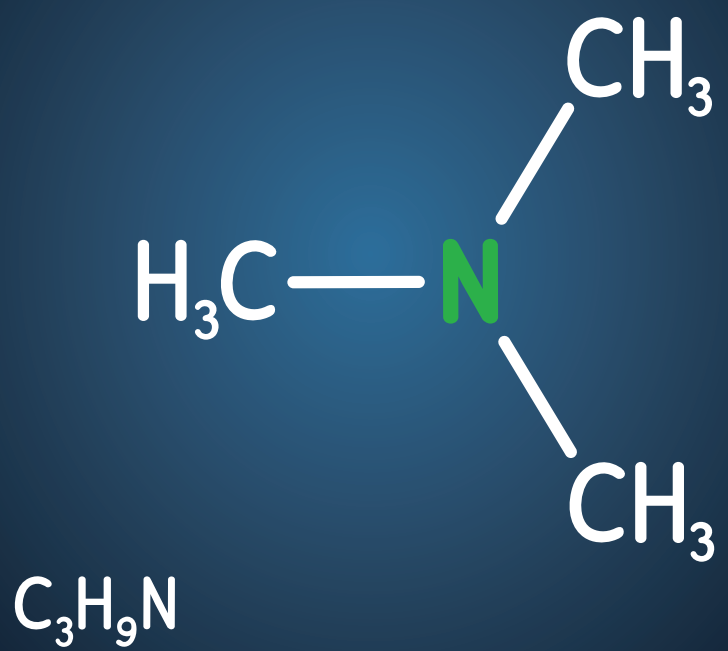




Trimethylamine



Is there something “fishy” about betaine?

Some of your colleagues have asked us why we are using betaine in our dietary supplements as it may result, in some patients, in a fishy smell of body odor?

Is it true that betaine consumption could result in “fishy” body odor in susceptible individuals?

Yes. In very rare situations consumption of betaine has been reported to trigger an increase of a compound called trimethylamine (TMA), which has a very specific odor described as “rotten fish”

For susceptible individuals, are there any other foods or dietary supplements that can trigger this unique body odor?

Yes. Consumption of seafood or high amounts of dietary choline or carnitine can trigger an increase in production of TMA.

Where does TMA come from in the body of susceptible individuals?

TMA can come from food. Marine fish are naturally rich in Trimethylamine N-Oxide (TMAO), which is transformed into TMA by gut bacteria; furthermore, as fish freshness decreases, TMA content of fish flesh increases.

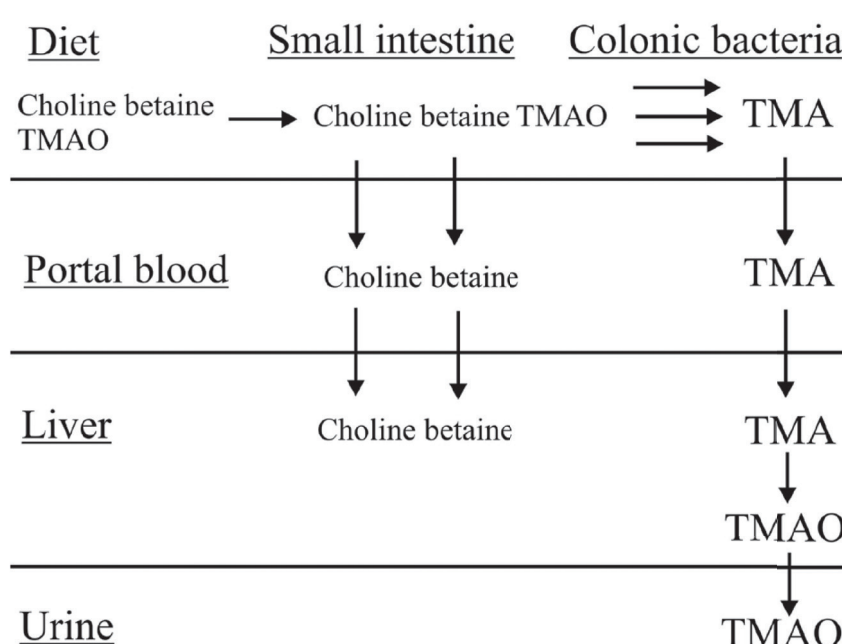


Figure 1: Interrelation of diet sources of precursor compounds and normal TMAO metabolism. Adapted from Mackay et al.

TMA is also produced by certain bacteria present in the mouth, colon, and vagina.

TMA is normally absorbed by the GI tract and is further metabolized in the liver into TMAO which is odorless and is eliminated in urine. (Figure 1)

Some people (current estimation: 1% of the US population) carry a genetic mutation (known as primary trimethylaminuria) that makes it impossible for them to convert smelly TMA into TMAO in the liver. Other individuals (those with secondary trimethylaminuria) can only partially metabolize TMA into TMAO, and are therefore susceptible to developing a fishy body odor if their liver is overloaded with TMA. Possible reasons for this overload are: liver insufficiency, TMA-producing bacterial overgrowth in the mouth, or gut, or vagina, increased ingestion of choline or carnitine.

For these susceptible individuals, is it safe to take betaine, carnitine and, or choline?

Other than the unpleasant odor that can be socially difficult to live with, increased levels of TMA seem to be innocuous.

For susceptible individuals, how can you reduce this unpleasant body odor?

Other than usual methods used to decrease body odors (deodorants, maintaining proper hygiene, changing clothes daily), it seems that limiting seafood and choline consumption can mitigate unpleasant body odor. A few publications suggest that supplementing the diet with riboflavin may help, as well as maintaining healthy mouth, gut and vaginal microflora.

At Protocol For Life Balance®, we believe in offering ingredients that are safe for all your patients. So, when you express concerns about one ingredient, we want to communicate transparently about it to address the questions you have so you can give your patients the best possible advice. Betaine is a safe ingredient, even in the rare cases of individuals susceptible to develop a fishy body odor when exposed to TMAO or TMA.

For more information about this subject rarely discussed in medical books:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3052392/>

<https://www.sciencedirect.com/science/article/pii/S1359644620302543?via%3Dihub>

<https://www.sciencedirect.com/science/article/pii/S0002822304015743>

<https://www.mdpi.com/2073-4344/9/12/1028>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3509925/>

<https://dmd.aspetjournals.org/content/44/11/1839>

<https://academic.oup.com/jn/article/133/5/1302/4558590>