FMO3 gene

flavin containing dimethylaniline monoxygenase 3

Normal Function

The *FMO3* gene provides instructions for making an enzyme that is part of a larger enzyme family called flavin-containing dimethylaniline monooxygenases (FMOs). These enzymes break down compounds that contain nitrogen, sulfur, or phosphorus. The FMO3 enzyme, which is made chiefly in the liver, is responsible for breaking down nitrogen-containing compounds derived from the diet.

One of these compounds is trimethylamine, which is the molecule that gives fish their fishy smell. Trimethylamine is produced as bacteria in the intestine help digest certain proteins obtained from eggs, liver, legumes (such as soybeans and peas), certain kinds of fish, and other foods. The FMO3 enzyme normally converts fishy-smelling trimethylamine into another compound, trimethylamine-N-oxide, which has no odor. Trimethylamine-N-oxide is then excreted from the body in urine.

Researchers believe that the FMO3 enzyme also plays a role in processing some types of drugs. For example, this enzyme is likely needed to break down the anticancer drug tamoxifen, the anti-inflammatory medication benzydamine, the antifungal drug ketoconazole, and certain medications used to treat depression (antidepressants).

The FMO3 enzyme may also be involved in processing nicotine, an addictive chemical found in tobacco. Normal variations (polymorphisms) in the *FMO3* gene may affect the enzyme's ability to break down these substances. Researchers are working to determine whether *FMO3* polymorphisms can help explain why people respond differently to certain drugs.

Health Conditions Related to Genetic Changes

Trimethylaminuria

More than 40 variants (also known as mutations) in the *FMO3* gene have been identified in people with trimethylaminuria. Some of these variants lead to the production of a small, nonfunctional version of the FMO3 enzyme. Other variants change single building blocks (amino acids) used to build the enzyme, which alters its shape and disrupts its function. Without enough functional FMO3 enzyme, the body is unable to convert trimethylamine into trimethylamine-N-oxide effectively. As a result,

trimethylamine builds up in the body and is released in an affected person's sweat, urine, and breath. The excretion of this compound is responsible for the strong body odor characteristic of trimethylaminuria. Studies suggest that diet and stress also play a role in determining the intensity of the fish-like odor.

Other Names for This Gene

- Dimethylaniline monooxygenase [N-oxide-forming] 3
- Dimethylaniline oxidase 3
- FMO3_HUMAN
- FMOII

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of FMO3 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=2328[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28FMO3%5BTIAB%5D%29+OR+%28flavin+containing+monooxygenase+3%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- FLAVIN-CONTAINING DIMETHYLANILINE MONOOXYGENASE 3; FMO3 (https://omim.org/entry/136132)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/2328)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=FMO3[gene])

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Genomic Location

The *FMO3* gene is found on chromosome 1 (https://medlineplus.gov/genetics/chromoso

me/1/).

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