FTCD Gene

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Formimidoyltransferase cyclodeaminase

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1. Normal Function

The *FTCD* gene provides instructions for making an enzyme called formiminotransferase cyclodeaminase. This enzyme is found mainly in the liver, with smaller amounts in the kidneys. In males it is also found in the testes.

Formiminotransferase cyclodeaminase is called a bifunctional enzyme because it performs two functions. Specifically, it is involved in the last two steps in the breakdown (metabolism) of the amino acid histidine, a building block of most proteins. It also plays a role in producing one of several forms of the vitamin folate, which has many important functions in the body.

One of the enzyme's functions, called formiminotransferase, breaks down a molecule called N-formiminoglutamate in the process of histidine metabolism. Part of the N-formiminoglutamate molecule, called the formimino group, is incorporated into another molecule called formiminotetrahydrofolate. The amino acid glutamate is also produced in this reaction.

The second function of the enzyme, called cyclodeaminase, breaks down formiminotetrahydrofolate to a molecule called 5,10-methenyltetrahydrofolate and ammonia. 5,10-methenyltetrahydrofolate is one of several tetrahydrofolate molecules involved in the production (synthesis) of many important molecules in the body, such as purines and pyrimidines (the building blocks of DNA and its chemical cousin, RNA) and amino acids. The tetrahydrofolates carry small molecules called one-carbon units that are needed for the synthesis of these larger molecules.

2. Health Conditions Related to Genetic Changes

2.1 Glutamate Formiminotransferase Deficiency

At least three *FTCD* gene mutations that cause glutamate formiminotransferase deficiency have been identified. Two of these mutations change an amino acid in the formiminotransferase cyclodeaminase enzyme sequence. These mutations reduce one of the enzyme's two activities, formiminotransferase. Another mutation results in the production of a formiminotransferase cyclodeaminase enzyme that is shortened so that the part of the enzyme that takes part in the cyclodeaminase reaction is missing. Disruption of these reactions results in the excretion of a molecule called formiminoglutamate (FIGLU) in the urine of affected individuals and, in some severe cases of glutamate formiminotransferase deficiency, a buildup of certain B vitamins called folates in the blood. It is unclear how the mutations result in the specific health problems associated with glutamate formiminotransferase deficiency.

3. Other Names for This Gene

- FTCD_HUMAN
- LCHC1

References

1. Hilton JF, Christensen KE, Watkins D, Raby BA, Renaud Y, de la Luna S,Estivill X, MacKenzie RE, Hudson TJ, Rosenb latt DS. The molecular basis ofglutamate formiminotransferase deficiency. Hum Mutat. 2003 Jul;22(1):67-73.Erratum in: Hum Mutat. 2003 Nov;22(5):416.

2. Mao Y, Vyas NK, Vyas MN, Chen DH, Ludtke SJ, Chiu W, Quiocho FA. Structure of the bifunctional and Golgi-associated formiminotransferase cyclodeaminaseoctamer. EMBO J. 2004 Aug 4;23(15):2963-71.
3. Solans A, Estivill X, de la Luna S. Cloning and characterization of human FTCDon 21q22.3, a candidate gene for glutamate formiminotransferase deficiency.Cytogenet Cell Genet. 2000;88(1-2):43-9.
