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Gene Section
Mini Review

ALDH2 (aldehyde dehydrogenase 2 family (mitochondrial))

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Identity

HGNC (Hugo): ALDH2

Location: 12q24.2

Probe(s) - Courtesy Mariano Rocchi, Resources for Molecular Cytogenetics.

DNA/RNA

Description

ALDH2 gene spans 46031 base pairs (bp), consists of 13 exons and 12 introns and is located on the (+) DNA strand.

Transcription

The ALDH2 mRNA consists of 1989 base.

Protein

Description

The ALDH2 protein is 517 amino acid long, has a molecular weight of 56 Kd, and forms a homotetramer.

Expression

ALDH2 is expressed in several human tissues with the highest levels found in liver. Screening of human cDNA libraries has revealed that ALDH2 transcripts are present in human liver, kidney, heart, stomach, colon, muscle, ovary, pancreas, lung, prostate, ear, eye, marrow, gall bladder, testis, thyroid, retina, adipose, adrenal gland, blood, brain, breast, placenta, uterus, B-cells, fetal brain, tonsil, foreskin, nervous normal and also in lung tumor, bladder tumor, nervous tumor.

Localisation

Mitochondrial matrix

Function

Conversion of aldehydes to acids via the reaction: ALDEHYDE + NAD + H2O = ACID + NADH.

Homology

ALDH2 belongs to the aldehyde dehydrogenase gene superfamily.

Mutations

Germinal

One of the most studied polymorphism is a single base-pair mutation (1510 GÆA) in exon 12 of ALDH2 gene that causes an E487K substitution (ALDH2*2 allele), which results in catalytic inactivation of the enzyme. The ALDH2*2 allele is dominant negative and is responsible for acute
alcohol intoxication due to accumulation of acetaldehyde. Facial flushing, nausea, dizziness and

tachycardia characterize this alcohol intoxication. The ALDH2*2 allele is frequent in, but confined to Asian individuals, and it appears to be a determinant against alcoholism. On the other hand, alcohol-drinking individuals having the ALDH2*2 genotype are at substantially high risk of developing esophageal and upper aerodigestive tract cancers, head and neck cancers, colorectal cancer.

Implicated in

Uterine leiomyoma (uterine fibroids) --> HMGIC-ALDH2

Disease
Benign mesenchymal tumors.

Prognosis
Good

Hybrid/Mutated gene
The HMGIC-ALDH2 aberrant transcript contains complete exons 1-3 of HMGI-C and the epitopic sequence that includes complete exon 13 of the ALDH2 gene and part of the 3' untrasnlated region of this gene.

Abnormal protein
The ALDH2 contributes 10 amino acids to the fusion HMGIC-ALDH2 protein.

Oncogenesis
HMGIC-ALDH2: it has been suggested that the truncation of HMGIC, rather than fusion may be responsible for tumorigenesis. The fusion of the 3' untranslated region of the ALDH2 may contribute to the stabilization of HMGIC mRNA.

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