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Gene Section
Mini Review

TAL2 (T-cell acute lymphoblastic leukemia 2)

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Identity

HGNC (Hugo): TAL2

Location: 9q31

Local order: from centromere to telomere: CSDUFD1, MGC45564, FCMD, TAL2, C9ort87, ZNF462

DNA/RNA

Description

Exons 1a, 2, 3, and 1b located 5-8 kb upstream of exon 4; coding region in exon 4 (326 bp).

Transcription

Various mRNA isoforms were found in SUP-T3 and in the mouse, which also encompass upstream exons; gene products, however, always corresponded to the TAL2 protein encoded by exon 4.

Protein

Description

108 amino acids; basic Helix Loop Helix motif for protein dimerization and DNA-binding.

Expression

In adult testes; in developing midbrain, dorsal diencephalon, rostroventral diencaphalic/ telencephalic boundary, and anterior pons; pivotal role in the development of the mature central nervous system; not expressed during normal hematopoietic development.

Function

Transcription factor; TAL2 dimerizes with members of the class A subgroup of bHLH proteins (ie E47, E12, E2-2, HEB), as well as LIM-only proteins LMO1 and LMO2; heterodimers are formed intracellularly through stable interaction between bHLH domains of TAL2 and E47; TAL2/E47 heterodimers bind DNA in a sequence-specific manner that is dependent on the E-box element; TAL2/E12 heterodimers also have DNA-binding activity; TAL2 does not bind DNA in absence of E2A proteins; a significant fraction (60%) of TAL2 polypeptides from SUP-T3 exist in phosphorylated form, the rest is unphosphorylated; serine residue 100 of TAL2 is the potential site of phosphorylation by MAP kinases.

Homology

TAL1 at 1p31, LYL1 at 19p13; TAL2, TAL1, and LYL1 share more than 85% amino acid identity in the bHLH domain and are thus more related to one other than to other bHLH proteins, for instance c-myc.

Implicated in

t(7;9)(q34;q32) -->TAL2-TCRB

Disease

T cell acute lymphoblastic leukemia found in < 1% of ALL, in 1-2% of T-ALL, rare but recurrent.

Hybrid/Mutated gene

Translocation of part of TCRB locus to a breakpoint 33 kb downstream of TAL2 mediated by the V(D)J recombinase via a fortuitous recombination signal sequence (YRSS) on chromosome 9; the translocation results in a signal joint fusion of TAL2 YRSS with the Db1 23-RSS; this gene product was detected in 6 of 10 thymus samples of healthy children with an estimated frequency of 1 in 10 million thymic cells; only upon secondary rearrangement of the TAL2/Db signal joint to the Jb2.6 segment, and deletion of the intervening sequence, the typical TAL2/Jb2.6 T-ALL junctions could be observed which presumably lead to overexpression of TAL2 and development of leukemia.

Abnormal protein

TAL2 placed under control of TCRB enhancer leading to overexpression of TAL2 in T-cells and development of leukemia.

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