

Gene Section

Mini Review

LMO1 (LIM domain only 1 (rhombotin 1))

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Identity

Other names: rhombotin 1, RBTN1, RHOM1, TTG1

HGNC (Hugo): LMO1

Location: 11p15.4

Local order: Telomeric to STK33 gene; centromeric to RIC3 gene.

DNA/RNA

Description

4,4 kb (from the beginning of the 1st exon to the end of the 5th exon) consisting of 5 exons.

Transcription

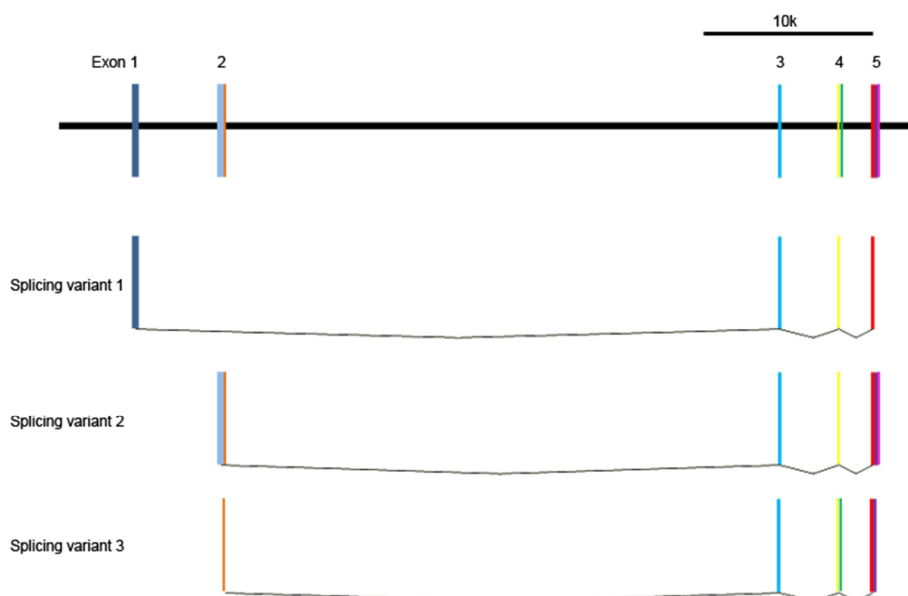
mRNA of approximately 700 - 1000 bp, depending on the splicing variants.

Pseudogene

Not reported.



LMO1 gene is located between RIC3 and STK33 genes in Chromosome 11p15. The arrow indicates the orientation of the genes.



Structure of LMO1 gene. The gene consists of 5 exons and several splicing variants were reported.

Protein

Description

The protein contains two highly conserved, cysteine-rich motifs known as LIM domains, which interact with other proteins. As LMO1 has no DNA-binding domain, its DNA binding ability is dependent on the other proteins with which it interacts. The proteins known for binding to LMO1 include TAL1/SCL and LDB1, and the molecules have an oncogenic function in T cell acute leukemia with the chromosomal translocation t(11;14)(p15;q11).

Expression

LMO1 expression is prominent in the central nervous system in both human and mouse. In mice it was observed by an in situ hybridization technique in the cerebral cortex, diencephalon, mesencephalon, cerebellum, myeloencephalon and spinal cord. Northern blot analysis revealed its expression in the thymus, kidney and placenta of adult mice.

Localisation

Nucleus.

Function

Transcription factor.

Mutations

Note

Not reported.

Implicated in

Neuroblastoma

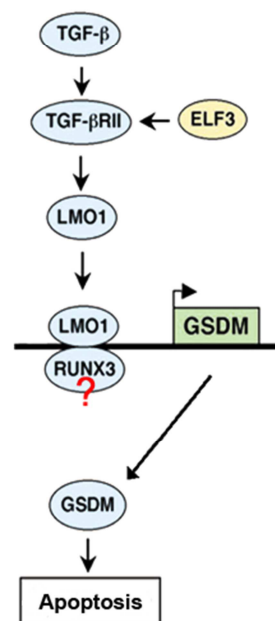
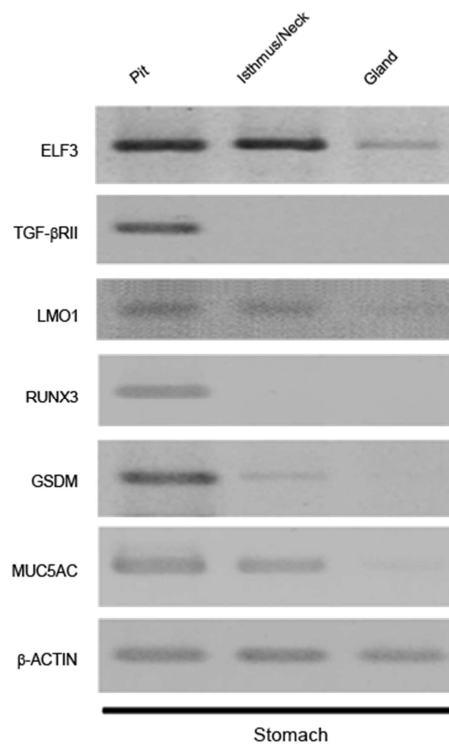
Disease

Genome-wide association studies revealed a correlation between neuroblastoma and a single nucleotide polymorphism in LMO1 gene, rs110419 (A/G), of which the A allele was shown to promote LMO1 expression and to correlate the cases. The DNA copy number gain of the LMO1 locus due to duplication was also demonstrated to associate with the cases. These findings suggest that the gene has a role in the development and/or progression of neuroblastoma. It was also reported that LMO3 is a neuroblastoma oncogene.

Apoptosis of the gastric epithelial cells

Note

In some gastric-cancer derived cell lines, LMO1 is upregulated by TGFbeta signalling and induces their apoptosis through enhancing GSDMA expression. This TGFbeta-LMO1-GSDMA cascade is considered a mechanism for apoptosis induction in the gastric epithelial cells, and has a role in maintaining their homeostasis.



LMO1 induces apoptosis of the pit cells in TGFbeta signalling. This function is assumed to have a role in homeostasis of the gastric epithelium.

T-cell acute lymphoblastic leukemia (T-ALL)

Disease

Originally, the LMO1 gene was identified at a break point of the translocation t(11;14)(p15;q11), which was frequently observed in T-ALL. Using LMO1 as a probe, LMO2 and LMO3 were identified. LMO1 is expressed in immature T cells but suppressed in the mature cells, and overexpression of the gene in

thymocytes, hematopoietic progenitor cells located in the thymus, resulted in developing T-ALL in mice. LMO1 acts cooperatively with SCL (Stem cell leukemia) as a transcriptional activator or repressor, dependent on the genes and the cells, and enforced expression of LMO1 and SCL in the thymocytes inhibits T-cell differentiation and causes T-ALL. It is known that the LMO1-SCL complex regulates several genes, including suppression of NFkB1 (nuclear factor of kappa light polypeptide gene enhancer in B-cells 1) and PTCRA (pre T-cell antigen receptor alpha), activation of NKX3.1 (NK3 homeobox 1).

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