PLXNB1 (plexin B1)
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Identity
Other names: KIAA0407; MGC149167; OTTHUMP00000164806; PLEXIN-B1; PLXN5; SEP
HGNC (Hugo): PLXNB1
Location: 3p21.31
Local order: The Plexin B1 gene is located between FBXW12 and CCDC51 genes.

Note
Size: 26,200 bases.
Orientation: minus strand.

DNA/RNA
Description
Functioning gene. 21.00 kb; 37 Exons.
Transcription
7097.00 bp; Number of transcripts: 1; Type: Messenger.
Two alternatively truncated spliced variant, coding secreted proteins (lacking the part of the extracellular domains).

Pseudogene
No.

Protein
Description
2135 Amino acids (AA). Plexins are receptors for axon molecular guidance molecules semaphorins. Plexin signalling is important in pathfinding and patterning of both neurons and developing blood vessels. Plexin-B1 is a surface cell receptor. When it binds to its ligand SEMA4D it activates several pathways by binding of cytoplasmic ligands, like RHOA activation and subsequent changes of the actin cytoskeleton, axon guidance, invasive growth and cell migration.
It monomers and heterodimers with PLXNB2 after proteolytic processing. Binds RAC1 that has been activated by GTP binding.
It binds PLXNA1 and by similarity ARHGEF11, ARHGEF12, ERBB2, MET, MST1R, RND1, NRP1 and NRP2.
This family features the C-terminal regions of various plexins. The cytoplasmic region, which has been called a SEX domain in some members of this family is involved in downstream signalling pathways, by interaction with proteins such as Rac1, RhoD, Rnd1 and other plexins.
Three copies of a cysteine rich repeat are found in Plexin. The function of the repeat is unknown.

Expression
It is highly expressed in fetal kidney, digestive system (from esophagus to colon), thyroid, prostate and trachea and at slightly lower levels in fetal brain, lung, female reproductive system (breast, uterus and ovary) and liver.
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Localisation
Three isoforms have been identified: The isoform 1 is located in cell membrane and the isoforms 2 and 3 are secreted proteins.

Function
Plexin B1 has several molecular functions, like a receptor activity, transmembrane receptor activity, protein binding, semaphorin receptor and semaphorin receptor binding. It is implicated in the next biological processes: Signal transduction, intracellular signalling cascade, multicellular organismal development, cell migration and positive regulation of axonogenesis.

Homology
It belongs to the plexin family and it contains 3 IPT/TIG domains and one Sema domain.

Mutations
Somatic
Wong et al. (2007) identified 13 different somatic mutations in the cytoplasmic domain of the PLXNB1 gene in prostate cancer tissue. Mutations were found in 8 (89%) of 9 prostate cancer bone metastases, in 7 (41%) of 17 lymph node metastases, and in 41 (46%) of 89 primary cancers. Forty percent of prostate cancers contained the same mutation, and the majority of the primary tumors showed overexpression of the plexin-B1 protein. In vitro functional expression studies of the 3 most common mutations showed that the mutant proteins resulted in increased cell motility, invasion, adhesion, and lamellipodia extension compared to wildtype. The mutations acted by hindering RAC1 and RRAS binding and GTP activity.

Implicated in
Breast cancer
Prognosis
Loss of protein Plexin B1 expression is associated with poor outcome in breast cancer ER (estrogen positive) patients.
Renal cell carcinoma

Note
By reverse transcription-polymerase chain reaction plexin B1 is expressed in nonneoplastic renal tissue, and it is severely downregulated in clear cell renal carcinomas. By immunohistochemistry on tissue microarrays it was shown that plexin B1 protein is absent in more than 80% of renal cell carcinomas. Otherwise, all kinds of renal tubules showed strong membrane reactivity. When plexin B1 expression is induced with an expression vector in the renal adenocarcinoma cell line ACHN, a marked reduction in proliferation rate is found.

Prostate carcinoma

Note
13 somatic missense mutations in the cytoplasmic domain of the Plexin-B1 gene have been reported. Mutations were found in cancer bone metastases, lymph node metastases, and in primary cancers. Forty percent of prostate cancers contained the same mutation. Overexpression of the Plexin-B1 protein was found in the majority of primary tumors. The mutations hinder Rac and R-Ras binding and R-RasGAP activity, resulting in an increase in cell motility, invasion, adhesion, and lamellipodia.
Plexin B1 loss of expression in three cases of renal cell carcinoma (clear cell upper right and left), and papillary (bottom right). One case of renal clear cell carcinoma with PlexinB1 expression (bottom left).

**Osteoarthritis**

**Note**

Using semi-quantitative reverse transcription polymerase chain reaction (RT-PCR) analysis, plexin B1 (PLXNB1) was confirmed to be consistently expressed at lower levels in osteoarthritis.

**Disease**

Degenerative bone disease.

**References**


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