Atlas of Genetics and Cytogenetics in Oncology and Haematology

OPEN ACCESS JOURNAL AT INIST-CNRS

# Gene Section

## Mini Review

# LGALS3 (lectin, galactoside-binding, soluble, 3)

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Published in Atlas Database: October 2010

Online updated version : http://AtlasGeneticsOncology.org/Genes/LGALS3ID44396ch14q22.html
DOI: 10.4267/2042/45035



## Identity

**Other names**: CBP35, GAL3, GALBP, GALIG, L31, LGALS2, MAC2

**HGNC (Hugo):** LGALS3

**Location:** 14q22.3

## DNA/RNA

### Description

Size 16277 bases.
Consists of at least 6 exons.

### Transcription

Two transcription initiation sites were identified in human LGALS3. These transcripts arise from an internal gene embedded within LGALS3, named galig (galectin-3 internal gene) (Barondes et al., 1994; Hirayabashi and Kasai, 1998).

### Pseudogene

None.

## Protein

### Description

250 amino acids; 26152 Da; The initial 12 amino acid N-terminal peptide sequence also called small N-terminal, precede the proline/glycin-rich repetitive domain consisting of about 100 amino acids. C-terminal consists of about 130 amino acids encoding carbohydrate-binding domain. Galectin-3 is the only chimeric protein among a family of 15 galectins known so far (Hirayabashi and Kasai, 1998).

### Localisation

In adults, galectin-3 is ubiquitously expressed and localizes to the extracellular matrix, the cytoplasm and the nucleus (Hirayabashi and Kasai, 1998; Krzeslak and Lipinska, 2004).

### Function

Galectin-3 is a carbohydrate-binding protein: a characteristic that it shares with other members of galectin family. The collagen alpha like N terminal sequence can be cleaved by Matrix metalloproteinases and the cleavage results in an enhanced binding efficiency to carbohydrates (Ochieng et al., 1994; Shekhar et al., 2004). Intra-cellularly it functions as an anti-apototic protein because of the presence of Asp-Trp-Gly-Arg (NWGR) motif at the C terminal (Akahani et al., 1997; Nakahara et al., 2005; Yang et al., 1996). NWGR is designated as the anti-death motif characteristic of the BCL2 family. Extra-cellular protein however, functions as a pro-apoptotic entity on T cells (Fukumori et al., 2003). Galectin-3 has also exhibited pro-angiogenic properties (Nangia-Makker et al., 2000).

### Homology

N-terminal domain has 33.5% identity with collagen alpha1 (II) chain of bovine cartilage, so it is also designated as a collagen-like N-terminal domain. The C-terminal domain of galectin-3, forming a globular structure, accommodates whole carbohydrate-binding site, and is very similar to CRD of other lectins.

## Mutations

### Germinal

P64H (rs4644), T98P (rs4652), R183K (rs10148371).
Functional germline mutation in the galectin-3 gene at position 191 (rs4644) substituting proline with histidine (P64H), which results in susceptibility to matrix metalloproteinase cleavage and acquisition of resistance to drug-induced apoptosis. This substitution

correlates with incidence of breast cancer and racial disparity (Balan et al., 2008). Rs10148371 is localized in the anti-apoptotic motif NWGR.

### Somatic

None.

## Implicated in

### Various cancers

**Disease**

Over-expression of galectin-3 was reported in the metastatic cell lines compared to their non-metastatic counterparts. Galectin-3 concentrations were significantly higher in the serum of patients with melanoma and breast cancer compared to the normal controls. In the tumor tissues, upregulation and/or redistribution of galectin-3 was shown in thyroid, colon, breast, gastric, prostate, melanoma and head and neck cancers, however, the data in some cases are not consistent (Dumic et al., 2006; Yang et al., 2008). Recently, it was reported in breast and prostate cancer that after cleavage by Matrix metalloproteases galectin-3 is not recognized by the commonly used monoclonal antibody TIB166 (Nangia-Makker et al., 2007; Wang et al., 2009), which could explain some of the discrepancy in the earlier reports.

### Autoimmune disease

**Disease**

Galectin-3 plays a role in pathogenesis of autoimmune disease. Endogenous protein promotes inflammatory response in asthma, pharmacological application of galectin-3 might suppress it (del Pozo et al., 2002; Zuberi et al., 2004), thus opening a new approach for future treatment of the disease. In Crohn's disease and systemic lupus, erythematosus and polymyositis/dermatomyositis anti-galectin-3 auto-antibodies were identified (Jensen-Jarolim et al., 2001; Lim et al., 2002). In sera and synovial fluid from rheumatoid arthritis (RA) patients, galectin-3 level was found to be elevated (Ohshima et al., 2003).

**Prognosis**

Galectin-3 is differentially expressed in thyroid carcinoma compared with benign and normal thyroid specimens, suggesting that Galectin-3 is a good diagnostic marker for thyroid cancer (Chiu et al., 2010).

**Oncogenesis**

Galectin-3 is not an oncogene, but helps in cancer progression once it is initiated.

## To be noted

**Note**

Acknowledgements: Supported by the National Institutes of Health (R37CA46120-19 to A.R).

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*This article should be referenced as such:*

Nangia-Makker P, Balan V, Raz A. LGALS3 (lectin, galactoside-binding, soluble, 3). Atlas Genet Cytogenet Oncol Haematol. 2011; 15(6):499-501.