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Gene Section
Short Communication

HMGN5 (High Mobility Group Nucleosome binding domain 5)

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Abstract

HMGN5 is a member of the high mobility group nucleosome binding domain (HMGN) protein family. HMGN proteins are ubiquitously expressed in vertebrate cells. They are nuclear proteins that bind specifically to nucleosomes without specificity for the DNA sequence and affect the structure and function of chromatin. HMGN5 sequences have been detected in all vertebrate tissues examines. HMGN5 differs from the other members of the HMGN family in that it is significantly larger and its amino acid sequence varies significantly between different vertebrate species.

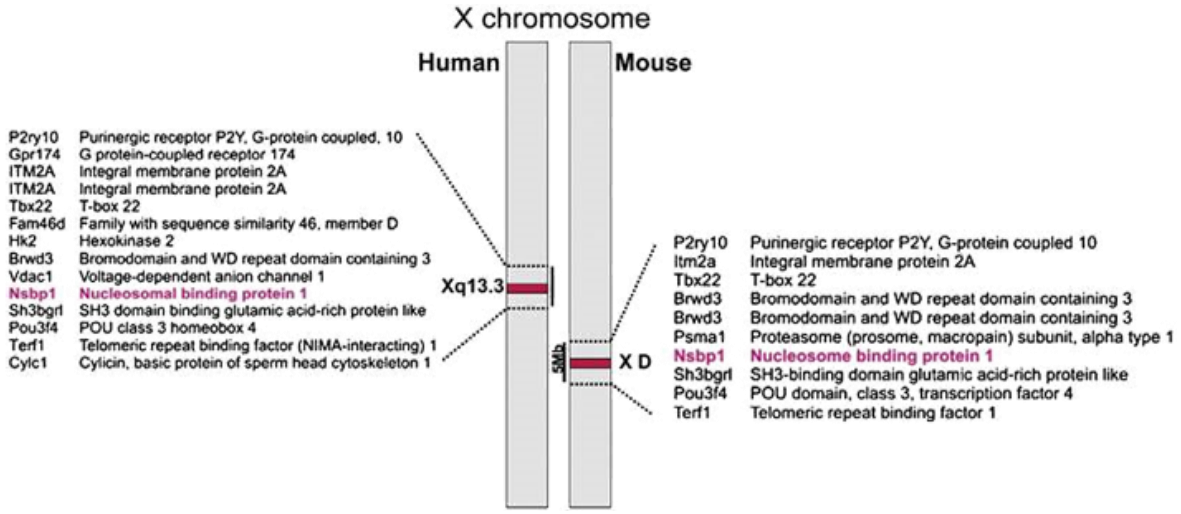
Keywords: HMGN5, NSBP1, Chromatin

Identity

Other names: NSBP1, NBP-45

HGNC (Hugo): HMGN5

Location (base pair): Starts at 81113701 and ends at 81201942 bp from pter (according to NCBI 11-Apr_2016)



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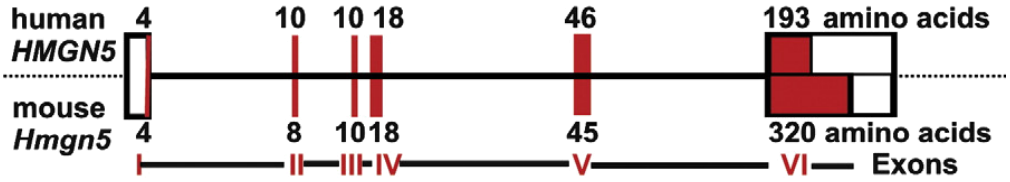


Organization of the human HMGN5 and mouse Hmgn5 gene. Exons are marked by red blocks and untranslated regions are marked by white boxes. The number of amino acids encoded by each exon is indicated. Reproduced from: HMGN5/NSBP1: a new member of the HMGN protein family that affects chromatin structure and function. Rochman M, Malicet C, Bustin M. Biochim Biophys Acta. 2010 Jan-Feb;1799(1-2):86-92. doi: 0.1016/j.bbagrm.2009.09.012. Review. PMID: 20123071

DNA/RNA

Description

NCBI Reference Sequence: NC_000023.11; Coding positions from 81,113,701 to 81,201,942 (length: 88,242 bp). Both human and mouse Hmgn5 genes are composed of 6 exons and 5 introns.

Transcription

849 bp cDNA for Human HMGN5. No splicing isoforms are reported as of April 2016.

Protein

Description

Reference sequence for HMGN5 protein: NP_110390.1. HMGN5 contains 282 amino acid residues with a molecular weight of 31525 Da. HMGN5 belongs to the HMGN protein family. HMGN5 contains a Nucleosome Bingding Domain (residue 12-36) for chromatin interaction.

Expression

Expressed at low levels in most vertebrate cells.

Localisation

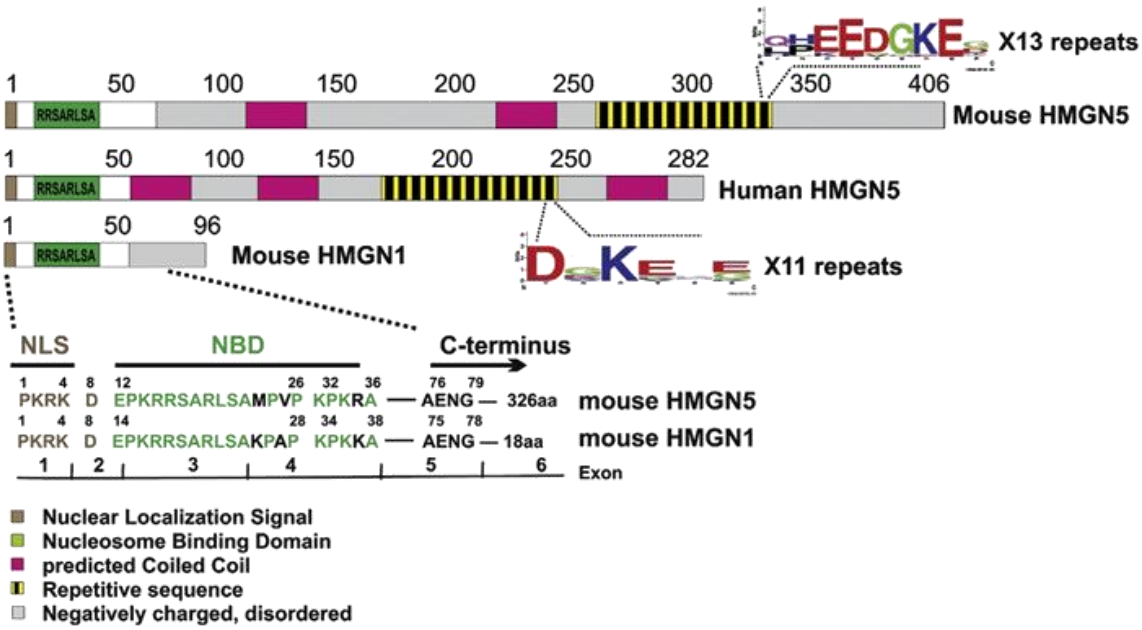
Nucleus.

Function

Modulates chromatin structure.

Homology

HomoloGene (NCBI) Genes identified as putative homologs: NP_110390.1 HMGN5, Homo sapiens; XP_001144951.2 Hmgn5, Pan troglodytes; XP_001103630 Hmgn5 Macaca mulatta; XP_002699982.3 Hmgn5, Bos taurus.



Schematic representation of structural domains of mouse and human HMGN5 proteins. Localization of each domain is related to the amino acid sequences of the proteins numbered on top of each scheme. Reproduced from: HMGN5/NSBP1: a new member of the HMGN protein family that affects chromatin structure and function. Rochman M, Malicet C, Bustin M. Biochim Biophys Acta. 2010 Jan-Feb;1799(1-2):86-92. doi: 0.1016/j.bbagrm.2009.09.012. Review. PMID: 20123071

Implicated in

Clear cell renal cell carcinoma (ccRCC)

HMGN5 expression is detected in renal tissues from clear cell renal cell carcinoma (ccRCC) patients and in ccRCC cell lines, and its expression level is associated with tumor grade.
Knockdown of HMGN5 induced cell cycle arrest and apoptosis, and inhibited invasion in ccRCC cell line 786-O. (Ji et al, 2012).

Prostate Cancer

Knock down of HMGN5 inhibits the in vitro and in vivo growth of the human prostate cancer cell line DU145 by inducing cell cycle arrest and apoptosis (Jiang et al, 2010). Similar effect is also observed in the LNCaP prostate cancer cell line, too (Zhang et al, 2012).
HMGN5 knockdown exhibit increased apoptosis rate in response to ionizing radiation (Su et al, 2015).
The normal prostate epithelial cells which are induced Ectopic HMGN5 expression results in oncogenic phenotype such as colony formation and invasion (Guo et al, 2015).
Tumorigenic activity of the cells which overexpress HMGN5 is suppressed by MIR340 (microRNA-340) (Wei et al, 2015).

Gliomas

HMGN5 is highly expressed in both low-grade and high-grade glioma tissue samples than normal brain tissues.
The down regulation of HMGN5 expression in human glioma cell line (U251 and U87) caused cell cycle arrest and apoptosis. (Qu et al, 2011).

Bladder cancer

The protein level of HMGN5 in surgically removed bladder cancer specimens and human bladder cell lines is correlated with the increased tumor grade and pathologic stage.
Knock down of HMGN5 reduced cell viability and cell cycle promotion (Wahafu et al, 2010; Gan et al, 2015).
The expression level of HMGN5 is suppressed by MIR186 in human bladder cancer cells (Yao et al, 2015).

Lung cancer

HMGN5 is highly expressed in lung cancer cell lines A549 and H1299. Downregulation of HMGN5 inhibits cell proliferation and colony formation (Chen et al, 2012).
MIR326 downregulated HMGN5 expression in the non-small cell lung cancer (NSCLC) cell and inhibited cell proliferation and invasion of NSCLC (Li et al, 2016).

Osteosarcoma

Both HMGN5 RNA and HMGN5 protein are highly expressed in human osteosarcoma tumor. The expression level is also upregulated in osteosarcoma cell lines SaO2 and HOS while other cell lines U-2OS and MG63 showed lower expression level. HMGN5 expression is induced by anticancer agents in these cell lines. Overexpression of HMGN5 in U-2OS and MG63 cells increased drug resistance by upregulating autophagy (Yang et al, 2014).

Breast cancer

HMGN5 is highly expressed in breast cancer tissues when compared with the adjacent non-cancerous tissues. Clinical and histopathologic analysis revealed that HMGN5 expression level is correlated to the tumor grade and staging. Using the human breast cancer cell line MCA-MB-213 as a model, HMGN5 knockdown resulted in inhibition of migration and invasion, and induced cell death (Weng et al, 2015).

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