

## NPM1 (nucleophosmin)

### Identity

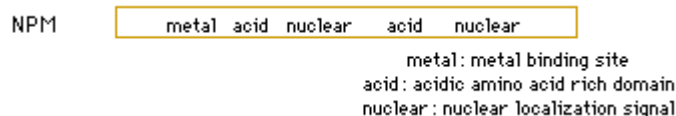
Other names	<b>NPM</b> <b>B23</b> <b>Numatrin</b> <b>NO38</b>
Hugo Location	<b><u>NPM1</u></b> 5q35

[NPM1 \(5q35\)](#) - Courtesy Mariano Rocchi, [Resources for Molecular Cytogenetics](#). Laboratories willing to validate the probes are welcome : contact [rocchi@biologia.uniba.it](mailto:rocchi@biologia.uniba.it)

### DNA/RNA

Description	11 exons on 25 kb;
Transcription	in a centromeric --> telomeric orientation; transcription is cell-cycle regulated, reaching peaks at G1/S transition and being baseline at S/G2 1.6 kb mRNA

### Protein



Description	294 amino acids, 32.5 kDa; contains in C-term an oligomerization domain (residues 1-83), a metal binding site (residues 104-115) , 2 domains rich in acidic amino acids (residues 120- 132 and 161-188) , and 2 nuclear localisation signals in C-term; forms homo-hexameres; binds to single and double strand nucleic acids
Expression	wide
Localisation	nuclear, mainly in the nucleolus
Function	RNA binding nucleolar phosphoprotein involved in preribosomal assembly; transport ribonucleoproteins between cellular compartments
Homology	with nucleoplasmin

### Implicated in

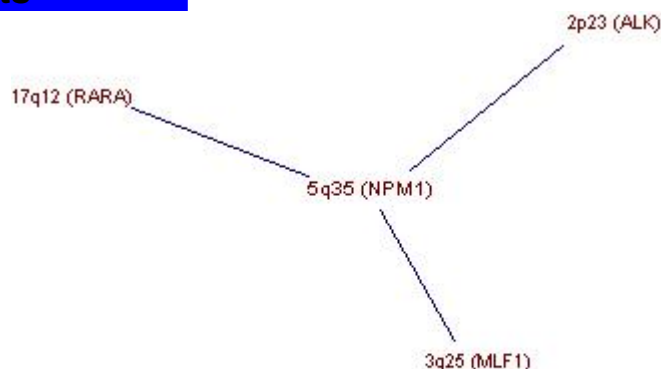
Entity	<a href="#">Anaplastic large cell lymphoma</a> (ALCL) with <a href="#">t(2;5)(p23;q35)</a> --> <a href="#">NPM1-ALK</a>
Disease	ALCL are high grade non Hodgkin lymphomas; ALK+ ALCL are ALCL where ALK is involved in a fusion gene; ALK+ ALCL represent 50 to 60 % of ALCL cases (they are CD30+, ALK+); 80% of ALK+ ALCL cases bear a t(2;5)
Prognosis	nonetheless, a 80% five yr survival may be associated with this anomaly

Cytogenetics additional anomalies are most often found  
 Hybrid/Mutated Gene 5' NPM1-3' ALK on der(5)  
 Abnormal Protein 680 amino acids, 80 kDa; N-term 116 amino acids from NPM1 fused to the 563 C-term aminoacids of ALK (i.e. composed of the oligomerization domain and the metal binding site of NPM1 ,and the entire cytoplasmic portion of ALK); no apparent expression of the ALK/NPM1 counterpart; Characteristic localisation both in the cytoplasm and in the nucleus, due to heterooligomerization of NPM-ALK and normal NPM whereas the normal NPM protein is confined to the nucleus; constitutive activation of the catalytic domain of ALK.  
 Oncogenesis via the kinase function activated by oligomerization of NPM1-ALK mediated by the NPM1 part

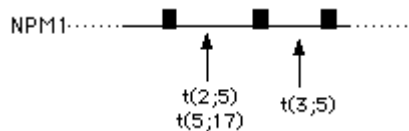
**Entity** [t\(3;5\)\(q25;q34\)](#)/in myeloid malignancies --> NPM - [MLF1](#)  
 Disease Acute non lymphocytic leukemia (ANLL), myelodysplasia (MDS), chronic myelogenous leukemia in blast crisis (BC-CML); trilineage involvement  
 Prognosis very poor  
 Cytogenetics location of breakpoints difficult to ascertain  
 Hybrid/Mutated Gene 5' NPM-3' MLF1 on der(5)  
 Abnormal Protein with the 175 N term amino acids of NPM1; nuclear protein

**Entity** [t\(5;17\)\(q34;q21\)](#)/M3-ANLL --> NPM1-[RARa](#)  
 Disease promyelocytic ANLL (M3-ANLL)  
 Cytogenetics variant translocation of the well known [t\(15;17\)](#)  
 Hybrid/Mutated Gene 5' NPM1-3' RARa on der(5)  
 Abnormal Protein with the 117 N term amino acids of NPM1

## Breakpoints



NPM1 and partners. Editor 08/2005.



Note within the 4th intron in the cases of t(2;5) or t(5;17), within the 6th intron in case of t(3;5)

## External links

	<b>Nomenclature</b>
<a href="#">Hugo</a>	<a href="#">NPM1</a>
<a href="#">GDB</a>	<a href="#">NPM1</a>
<a href="#">Entrez Gene</a>	<a href="#">NPM1 4869</a> nucleophosmin (nucleolar phosphoprotein B23, numatrin)
	<b>Cards</b>
<a href="#">Atlas</a>	<a href="#">NPM1</a>
<a href="#">GeneCards</a>	<a href="#">NPM1</a>
<a href="#">Ensembl</a>	<a href="#">NPM1</a>
<a href="#">CancerGene</a>	<a href="#">NPM1</a>
<a href="#">Genatlas</a>	<a href="#">NPM1</a>
<a href="#">GeneLynx</a>	<a href="#">NPM1</a>
<a href="#">eGenome</a>	<a href="#">NPM1</a>
<a href="#">euGene</a>	<a href="#">4869</a>
	<b>Genomic and cartography</b>
<a href="#">GoldenPath</a>	<a href="#">NPM1 - 5q35</a> <a href="#">chr5:170747462-170770492 + 5q35.1</a> (hg17-May_2004)
<a href="#">Ensembl</a>	<a href="#">NPM1 - 5q35.1 [CytoView]</a>
<a href="#">NCBI</a>	<a href="#">Genes Cyto</a> <a href="#">Gene Seq</a> [Map View - NCBI]
<a href="#">OMIM</a>	<a href="#">Disease map [OMIM]</a>
<a href="#">HomoloGene</a>	<a href="#">NPM1</a>
	<b>Gene and transcription</b>
<a href="#">Genbank</a>	<a href="#">U89309</a> [SRS] <a href="#">U89309</a> [ENTREZ]
<a href="#">Genbank</a>	<a href="#">AB042278</a> [SRS] <a href="#">AB042278</a> [ENTREZ]
<a href="#">Genbank</a>	<a href="#">AK000472</a> [SRS] <a href="#">AK000472</a> [ENTREZ]
<a href="#">Genbank</a>	<a href="#">AY347529</a> [SRS] <a href="#">AY347529</a> [ENTREZ]
<a href="#">Genbank</a>	<a href="#">BC002398</a> [SRS] <a href="#">BC002398</a> [ENTREZ]
<a href="#">RefSeq</a>	<a href="#">NM_002520</a> [SRS] <a href="#">NM_002520</a> [ENTREZ]
<a href="#">RefSeq</a>	<a href="#">NM_199185</a> [SRS] <a href="#">NM_199185</a> [ENTREZ]
<a href="#">RefSeq</a>	<a href="#">NT_086682</a> [SRS] <a href="#">NT_086682</a> [ENTREZ]
<a href="#">AceView</a>	<a href="#">NPM1</a> AceView - NCBI
<a href="#">TRASER</a>	<a href="#">NPM1</a> Traser - Stanford
<a href="#">Unigene</a>	<a href="#">Hs.519452</a> [SRS] <a href="#">Hs.519452</a> [NCBI] <a href="#">HS519452</a> [spliceNest]
	<b>Protein : pattern, domain, 3D structure</b>
	<b>Polymorphism : SNP, mutations, diseases</b>
<a href="#">OMIM</a>	<a href="#">164040</a> [map]
<a href="#">GENECLINICS</a>	<a href="#">164040</a>
<a href="#">SNP</a>	<a href="#">NPM1</a> [dbSNP-NCBI]
<a href="#">SNP</a>	<a href="#">NM_002520</a> [SNP-NCI]
<a href="#">SNP</a>	<a href="#">NM_199185</a> [SNP-NCI]
<a href="#">SNP</a>	<a href="#">NPM1</a> [GeneSNPs - Utah] <a href="#">NPM1</a> [SNP - CSHL] <a href="#">NPM1</a> [HGBASE - SRS]
	<b>General knowledge</b>

[Family Browser](#) [NPM1](#) [UCSC Family Browser]

[SOURCE](#) [NM\\_002520](#)

[SOURCE](#) [NM\\_199185](#)

[SMD](#) [Hs.519452](#)

[SAGE](#) [Hs.519452](#)

[Amigo](#) [function|NF-kappaB binding](#)

[Amigo](#) [function|RNA binding](#)

[Amigo](#) [function|Tat protein binding](#)

[Amigo](#) [process|activation of NF-kappaB transcription factor](#)

[Amigo](#) [process|cell aging](#)

[Amigo](#) [component|centrosome](#)

[Amigo](#) [process|centrosome cycle](#)

[Amigo](#) [component|cytoplasm](#)

[Amigo](#) [process|intracellular protein transport](#)

[Amigo](#) [process|negative regulation of cell proliferation](#)

[Amigo](#) [process|nucleocytoplasmic transport](#)

[Amigo](#) [component|nucleolus](#)

[Amigo](#) [function|protein heterodimerization activity](#)

[Amigo](#) [function|protein homodimerization activity](#)

[Amigo](#) [process|response to stress](#)

[Amigo](#) [process|ribosome assembly](#)

[Amigo](#) [function|transcription coactivator activity](#)

[Amigo](#) [function|unfolded protein binding](#)

[PubGene](#) [NPM1](#)

**Other databases**

**Probes**

[Probe](#) [Cancer Cytogenetics \(Bari\)](#)

[Probe](#) [NPM1 Related clones \(RZPD - Berlin\)](#)

**PubMed**

[PubMed](#) [43 Pubmed reference\(s\) in LocusLink](#)

## **Bibliography**

**Fusion of a kinase gene, ALK, to a nucleolar protein gene, NPM, in non-Hodgkin's lymphoma.**

Morris SW, Kirstein MN, Valentine MB, Dittmer KG, Shapiro DN, Saltman DL, Look AT

Science 1994 Mar 4;263(5151):1281-4

Medline [94167588](#)

**The t(3;5)(q25.1;q34) of myelodysplastic syndrome and acute myeloid leukemia produces a novel fusion gene, NPM-MLF1.**

Yoneda-Kato N, Look AT, Kirstein MN, Valentine MB, Raimondi SC, Cohen KJ, Carroll AJ, Morris SW

Oncogene 1996 Jan 18;12(2):265-75

Medline [96152893](#)

**The t(5;17) variant of acute promyelocytic leukemia expresses a nucleophosmin-retinoic acid receptor fusion.**

Redner RL, Rush EA, Faas S, Rudert WA, Corey SJ.

Blood 1996; 87: 882-886.

**The t(5;17) variant of acute promyelocytic leukemia expresses a nucleophosmin-retinoic acid receptor fusion.**

Redner RL, Rush EA, Faas S, Rudert WA, Corey SJ  
Blood 1996 Feb 1;87(3):882-6  
Medline [96151966](#)

**Isolation and characterization of the human nucleophosmin/B23 (NPM) gene: identification of the YY1 binding site at the 5' enhancer region.**

Chan PK, Chan FY, Morris SW, Xie Z  
Nucleic Acids Res 1997 Mar 15;25(6):1225-32  
Medline [97248692](#)

**Role of the nucleophosmin (NPM) portion of the non-Hodgkin's lymphoma-associated NPM-anaplastic lymphoma kinase fusion protein in oncogenesis.**

Bischof D, Pulford K, Mason DY, Morris SW  
Mol Cell Biol 1997 Apr;17(4):2312-25  
Medline [97220023](#)

**CD30+ anaplastic large cell lymphoma: a review of its histopathologic, genetic, and clinical features**

Stein H, Foss HD, Durkop H, Marafioti T, Delsol G, Pulford K, Pileri S, Falini B.  
Blood 2000; 96: 3681-3695.

**Pathobiology of NPM-ALK and variant fusion genes in anaplastic large cell lymphoma and other lymphomas.**

Drexler HG, Gignac SM, von Wasielewski R, Werner M, Dirks WG.  
Leukemia 2000; 14: 1533-1559.

**Anaplastic large cell lymphomas, Primary systemic (T/Null cell type).**

Delsol G, Ralfkiaer E, Stein H, Wright D, Jaffe E.  
World Health Organization (WHO) Classification of Tumors. Pathology and Genetics of tumours of Haematopoietic and Lymphoid Tissues . 2001 pp 230-235.

**Alk+ CD30+ lymphomas: a distinct molecular genetic subtype of non-Hodgkin's lymphoma.**

Morris SW, Xue L, Ma Z, Kinney MC.  
Br J Haematol 2001; 113: 275-295.  
Medline [21275125](#)

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URL : <http://www.infobiogen.fr/services/chromcancer/Genes/NPM1.html>

**Huret JL** . NPM1 (nucleophosmin). Atlas Genet Cytogenet Oncol Haematol. August 2001 .

URL : <http://www.infobiogen.fr/services/chromcancer/Genes/NPM1.html>

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