

## PML gene

PML nuclear body scaffold

### Normal Function

The *PML* gene provides instructions for a protein that acts as a tumor suppressor, which means it prevents cells from growing and dividing too rapidly or in an uncontrolled way. The PML protein is found in distinct structures in the nucleus of a cell called PML nuclear bodies (PML-NBs). In the PML-NBs, the PML protein interacts with other proteins that are involved in cell growth and division (proliferation) and self-destruction (apoptosis). The PML protein is able to block cell proliferation and induce apoptosis in combination with other proteins. Researchers believe that the structure of the PML-NBs is required for blocking proliferation and inducing apoptosis.

### Health Conditions Related to Genetic Changes

#### Acute promyelocytic leukemia

Gene mutations can be acquired during a person's lifetime and are present only in certain cells. These mutations are called somatic mutations, and they are not inherited. A somatic mutation involving the *PML* gene causes acute promyelocytic leukemia, a cancer of the blood forming tissue (bone marrow). Acute promyelocytic leukemia is characterized by an accumulation of immature white blood cells, called promyelocytes, in the bone marrow. A rearrangement (translocation) of genetic material between chromosomes 15 and 17, written as t(15;17), fuses part of the *PML* gene on chromosome 15 with part of another gene on chromosome 17 called *RARA*. The protein produced from this fused gene, PML-RAR $\alpha$ , functions differently than the protein products of the normal *PML* and *RARA* genes.

The PML-RAR $\alpha$  protein does not localize to the PML-NBs, and the structures do not form properly. The PML-RAR $\alpha$  protein is unable to block cell proliferation or induce apoptosis.

Additionally, the function of the RAR $\alpha$  protein, the product of the *RARA* gene, is disrupted. Normally, this protein is involved in the regulation of gene transcription, which is the first step in protein production. Specifically, this protein helps control the transcription of certain genes important in the maturation (differentiation) of white blood cells beyond the promyelocyte stage. However, the PML-RAR $\alpha$  protein blocks (represses) gene transcription.

The PML-RAR $\alpha$  protein allows abnormal cell proliferation and blocks the differentiation of white blood cells at the promyelocyte stage. As a result, excess promyelocytes accumulate in the bone marrow and normal white blood cells cannot form, leading to acute promyelocytic leukemia.

### Other Names for This Gene

- MYL
- promyelocytic leukemia protein
- promyelocytic leukemia, inducer of
- RING finger protein 71
- RNF71
- TRIM19
- tripartite motif protein TRIM19

### Additional Information & Resources

#### Tests Listed in the Genetic Testing Registry

- Tests of PML ([https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=5371\[geneid\]](https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=5371[geneid]))

#### Scientific Articles on PubMed

- PubMed (<https://pubmed.ncbi.nlm.nih.gov/?term=%28PML%5BTI%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1440+days%22%5Bdp%5D%29>)

#### Catalog of Genes and Diseases from OMIM

- ACUTE PROMYELOCYTIC LEUKEMIA, INDUCER OF; PML (<https://omim.org/entry/102578>)

#### Gene and Variant Databases

- NCBI Gene (<https://www.ncbi.nlm.nih.gov/gene/5371>)
- ClinVar ([https://www.ncbi.nlm.nih.gov/clinvar?term=PML\[gene\]](https://www.ncbi.nlm.nih.gov/clinvar?term=PML[gene]))

### References

- Collins SJ. The role of retinoids and retinoic acid receptors in normal hematopoiesis. *Leukemia*. 2002 Oct;16(10):1896-905. doi: 10.1038/sj.leu.2402718. Citation on

PubMed (<https://pubmed.ncbi.nlm.nih.gov/12357341>)

- de Thé H, Lavau C, Marchio A, Chomienne C, Degos L, Dejean A. The PML-RAR $\alpha$  fusion mRNA generated by the t(15;17) translocation in acute promyelocytic leukemia encodes a functionally altered RAR. *Cell*. 1991 Aug 23;66(4):675-84. doi:10.1016/0092-8674(91)90113-d. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/1652369>)
- Pandolfi PP. Oncogenes and tumor suppressors in the molecular pathogenesis of acute promyelocytic leukemia. *Hum Mol Genet*. 2001 Apr;10(7):769-75. doi:10.1093/hmg/10.7.769. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/11257111>)
- Salomoni P, Pandolfi PP. The role of PML in tumor suppression. *Cell*. 2002 Jan 25;108(2):165-70. doi: 10.1016/s0092-8674(02)00626-8. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/11832207>)
- Zelent A, Guidez F, Melnick A, Waxman S, Licht JD. Translocations of the RAR $\alpha$  gene in acute promyelocytic leukemia. *Oncogene*. 2001 Oct 29;20(49):7186-203. doi: 10.1038/sj.onc.1204766. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/11704847>)

## Genomic Location

The *PML* gene is found on chromosome 15 (<https://medlineplus.gov/genetics/chromosome/15/>).

**Last updated April 1, 2011**