**-Y, Y loss in leukemia**

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### Identity

#### Note

Loss of the Y chromosome from individual metaphases is common in metaphase cells from both PHA-stimulated lymphocytes and spontaneously dividing bone marrow cells. The frequency of Y loss is greater in older men, and the size of the 45,X,-Y cell population probably increases gradually with advancing age. (In females, a corollary loss of one X chromosome also occurs with advancing age.) This natural phenomenon challenges our ability to distinguish between a normal and a disease-associated 45,X,-Y clone.

### Clinics and pathology

#### Disease

-Y is frequently observed in myeloproliferative diseases (MPD), myelodysplastic syndromes (MDS), acute non lymphocytic leukemias (ANLL), and can also be seen in lymphoproliferations.

#### Epidemiology

In CML with t(9;22) and in ANLL with a t(8;21), loss of the Y chromosome tends to occurs at a younger age than in the general population.

#### Clinics

Partial or complete reappearance of the Y chromosome has been described in several cases of ANLL in remission. In most or all of these ANLL cases, the 45,X,-Y cell population represented 80-100% of pre-remission metaphases. These observations support the interpretation that the leukemia cell karyotype is 45,X,-Y.

In MDS, the proportion of -Y cells has been observed to increase, decrease, remain stable, or fluctuate up and down on follow-up studies.

In four cases of Hodgkin disease, simultaneous fluorescence immunophenotyping and FISH showed that the -Y cell population was probably independent of the Hodgkin disease in at least two of the patients. It is notable that the -Y cells represented fewer than 10-15% of the metaphase cells in all four cases.

### Cytology

No known association.

### Prognosis

In ANLL, a 45,X,-Y karyotype is believed to have an intermediate prognosis. In MDS, the prognosis appears to be neutral or favorable. There are insufficient data for MPD or lymphoproliferative disease.

### Cytogenetics

#### Cytogenetics morphological

In PHA-stimulated lymphocyte karyotype studies of males, about 2% have one or more cells with loss of the Y chromosome. Cells with -Y are observed more often in males over age 55 than in younger males. In all age groups, the proportion of -Y cells is usually under 10%. The pattern of Y loss is more striking in bone marrow aspirate karyotype studies. Here, clonal Y chromosome loss as a sole abnormality in the karyotype is a common finding. A 45,X,-Y karyotype is observed in about 6% of bone marrow karyotype studies from males, and it represents 15-20% of abnormal karyotypes.

The frequency of -Y cells increases with advancing age and is significantly greater in cases with MDS, MPD, ANLL, or lymphoproliferative disease than in subjects...
who have no evidence of disease. Subjects with no evidence of disease rarely exhibit more than 75% of cells with 45,X,-Y. Thus, if fewer than 75% of metaphase cells are -Y, the disease association is uncertain. However, if 75-100% of metaphase cells are -Y, the karyotype probably is disease-associated, even in older men.

Chromosome rearrangements involving the Y chromosome are rare in cancer and leukemia. Loss of the Y chromosome, in contrast, is a common secondary change in cancer cells and in a few leukemias (see below).

**Probes**

All available probe for the Y chromosome.

**Additional anomalies**

In association with t(9;22) in CML and with t(8;21) in FAB-M2 ANLL, loss of the Y chromosome is generally considered a secondary event of no added clinical significance.

### Genes involved and proteins

**Note**

Genes involved, if any, are unknown.

**To be noted**

**Note**

It is not known whether the Y chromosome loss is the critical mutational event. Likewise, it is not known whether the Y chromosome loss is a secondary genetic change, or if the critical (submicroscopic) genetic change simply occurs by chance in a -Y cell. Speculatively, loss of the Y could provide a proliferative advantage simply because it tends to replicate late in S-phase. Its loss might therefore shorten the cell cycle slightly.

### References


Abe S, Golomb HM, Rowley JD, Mitelman F, Sandberg AA. Chromosomes and causation of human cancer and leukemia.

XXXV. The missing Y in acute non-lymphocytic leukemia (ANLL). Cancer. 1980 Jan 1;45(1):84-90


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