Leukemia - Acute Myeloid - AML - Subtypes

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Subtypes

ON THIS PAGE: You will learn about how doctors describe AML. This is called the subtype. To see other pages, use the menu on the side of your screen.

There are different subtypes of AML. Although all subtypes cause decreases in normal blood cell levels, different types of AML are associated with specific symptoms and problems and can behave differently after treatment.

Morphology

AML is first described by its morphology (what the cancerous cells look like under the microscope). AML is classified by the type of normal, immature white blood cell it most closely resembles.

Most patients with AML have a subtype called myeloblastic leukemia, which means the cancer is in the cells that normally produce neutrophils. Other patients have a type of AML called monoblastic or monocytic leukemia. In monocytic leukemia, the cells look like white blood cells called monocytes. Leukemia cells can also be a mixture of myeloblastic and monocytic cells.

Sometimes AML seems to come from cells that produce red blood cells (called erythroid) or platelets (called megakaryocytic). Acute promyelocytic leukemia (APL) is a unique subtype of AML where the cancer cell stops maturing when the cell is at a stage called the promyelocyte or progranulocyte stage.

Flow cytometry is a blood test that can identify particular proteins on the surface of abnormal cells and is sometimes used to find the difference among these subtypes.

The classification system from the World Health Organization (WHO) includes these major groups:

- AML with recurrent genetic abnormalities (meaning with specific chromosomal changes)
- AML with multilineage dysplasia (abnormalities in how the blood cells look)
- AML, related to therapy that is damaging to cells (also called therapy-related myeloid neoplasm)
- AML that is not otherwise categorized

The French-American-British (FAB) classification is an older system for describing AML, but it is still commonly used and is listed below for reference.

M0: Myeloblastic without differentiation
M1: Myeloblastic without maturation
M2: Myeloblastic with maturation
M3: Promyelocytic
M4: Myelomonocytic
M5a: Monocytic without differentiation (monoblastic)
M5b: Monocytic with differentiation
M6: Erythroleukemic
M7: Megakaryocytic

Cytogenetics

AML is also classified by the cytogenetic (chromosome) changes found in the leukemia cells. Sometimes the doctor can find these changes by looking at the chromosomes in dividing cells under the microscope, while other changes can be found only with molecular tests that can recognize very small changes in the DNA.

Certain chromosomal changes are closely matched with the morphology of the AML cells. More importantly, the chromosomal changes help doctors determine the best treatment options because these changes can sometimes predict how well treatment will work. Chromosomal changes are commonly grouped according to the likelihood that treatment will work against the subtype of AML. (Note: all chromosomes are numbered from one to 22; sex chromosomes are called ?X? or ?Y.? The letters ?p? and ?q? refer to the ?arms? or specific areas of the chromosome.)

Some of the most common chromosomal changes are grouped as follows:

Favorable. Chromosomal changes associated with more successful treatment include abnormalities of chromosome 16 at bands p13 and q22

[inv(16)(p13q22)], a translocation (exchange of genetic material) between chromosomes 8 and 21 [t(8;21)], and a translocation between chromosomes 15 and 17 [t(15;17)] (found in promyelocytic leukemia).

Intermediate. Changes associated with a less favorable prognosis include normal chromosomes (no changes are found) and a translocation between chromosomes 9 and 11 [t(9;11)]. Many other subtypes are considered part of this group, particularly those with one or more specific molecular changes.

Unfavorable. Examples of chromosomal changes that are associated with less successful treatment or with a low chance of curing the AML include extra copies of chromosomes 8 or 13 [for example, trisomy 8 (+8)], deletion of all or part of chromosomes 5 or 7, complex change on many chromosomes, and changes to chromosome 3 at band q26.

In general, the favorable changes occur more commonly in younger patients, while the unfavorable changes are more common in patients older than 60. How well treatment works still varies widely in each of these groups. Treatment is successful in the long term for 50% to 60% of patients with AML that is classified as favorable and for less than 10% of patients with AML that is classified as unfavorable. How well treatment works also depends on other factors, including the patient?s age and the number of white blood cells. It is not possible to predict exactly the likelihood of successful treatment for a person with AML.

Molecular Genetics

Mutations in genes that are too small to be seen with a microscope and cannot be found with cytogenetic tests have been found using tests called molecular assays. For example, patients with changes in the *NPM1* or *CEBPalpha* genes have a better long-term outcome, while chemotherapy (see the Treatment Options [2] section) does not work as well for patients with changes in the *FLT3* gene. Therefore, testing for these changes at diagnosis helps determine a patient?s treatment options.

Recurrent AML

Recurrent or relapsed AML is cancer that has come back after treatment. If there is a recurrence, the cancer may need to be subtyped again using the system above.

Information about the cancer?s subtype will help the doctor recommend a treatment plan. The next section helps explain the treatment options for this type of cancer. Use the menu on the side of your screen to select Treatment Options, or you can select another section, to continue reading this guide.

Links:
[1] http://www.cancer.net/about-us
[2] http://www.cancer.net/node/19072