CONQUER OR BE CONQUERED

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ACUTE MYELOID LEUKEMIA **(AML)**

- Also known as **acute nonlymphocytic leukemia** (**ANLL**).
- Cancer of the myeloid line of blood cells, characterized by the rapid growth of abnormal white blood cells that accumulate in the bone marrow and interfere with the production of normal blood cells.

Normal blood counts

Red blood cell count	**Male:** 4.32-5.72 trillion cells/ℓ (4.32-5.72 million cells/microliter) **Female:** 3.90-5.03 trillion cells/ℓ (3.90-5.03 million cells/microliter)
Hemoglobin	**Male:** 13.5-17.5 grams/deciliter (135-175 grams/ℓ) **Female:** 12.0-15.5 grams/deciliter (120-155 grams/ℓ)
Hematocrit	**Male:** 38.8-50.0 percent **Female:** 34.9-44.5 percent
White blood cell count	3.5-10.5 billion cells/ℓ (3,500 to 10,500 cells/microliter)
Platelet count	150-450 billion/ℓ (150,000 to 450,000/microliter)

Treatment protocol

- **General treatment approach for acute myeloid leukemia**
- Fit patients (< 60-65 years, select patients up to age 75 y) receive intensive therapy. Treatment includes induction therapy and post remission therapy (consolidation). High risk patients are evaluated for stem cell transplantation in first remission.
- **Treatment recommendations for patients < 60y or for select patients ≤ 75y (good performance status, minimal or no co-morbidities)**
- *Induction therapy:*
- Combination of cytarabine and anthracycline or anthracenedione is recommended
- Cytarabine 100-200 mg/m ^{2} continuous IV infusion for 7d **plus** idarubicin12 mg/m ^{2}/day for 3d **or** daunorubicin 60-90 mg/m ^{2}/day for 3d
- Follow-up bone marrow to assess remission is typically done 7-14d after completion of induction chemotherapy, except for patients with acute promyelocytic leukemia (APL).

Treatment protocol cont…

- High-dose cytarabine plus anthracycline/anthracenedione (various regimens, such as idarubicin + high-dose cytarabine)
- Cytarabine 2-3 g/m ^{2} q12h for 3d **plus** idarubicin 12 mg/m ^{2}/day for 3d for 1 cycle **or**
- Cytarabine 2-3 g/m ^{2} q12h for 3d **plus** daunorubicin 45-60 mg/m ^{2} day for 3d for 1 cycle [6]
- Cladribine-based therapy:
- Cytarabine 200 mg/m ^{2} continuous infusion for 7d plus daunorubicin 60 mg/m ^{2} for 3d plus cladribine 5 mg/m ^{2} for 5d [9]

Treatment protocol cont…

- *Postremission therapy (consolidation)*
- All patients should be assessed for risk of relapse. Specific drug regimens are recommended based on a patient's risk of relapse.
- ***Better-risk patients:***
- Cytogenetics [inv(16) or t(16;16), t(8;21)] and molecular abnormalities (normal cytogenetics: with NPM 1 mutation or isolated CEBPA mutation in the absence of FLT3-ITD):
- High-dose cytarabine 3 g/m ^{2} IV over 3h every 12h on days 1, 3, and 5 for 4 cycles [6]
  or
- High-dose cytarabine 3 g/m ^{2} IV over 3h every 12h on days 1, 3, and 5 for 2 cycles **plus** autologous stem cell transplantation [6]
- ***Intermediate-risk patients:***
- Cytogenetics [normal cytogenetics, +8, t(9;11), other nondefined] and molecular abnormalities [normal cytogenetics: t(8;21), inv(16), t(16;16): with c-KIT mutation]:
- High-dose cytarabine 3 g/m ^{2} IV over 3h every 12h on days 1, 3, and 5 for 4 cycles or allogeneic stem cell transplantation

Treatment protocol cont…

- ***High-risk patients:***
- Cytogenetics [complex (≥ 3 clonal chromosomal abnormalities), -5, 5q-, -7, 7q-, 11q23 - non t(9;11), inv(3), t(3;3), t(6;9), t(9;22)] and molecular abnormalities (normal cytogenetics: FLT3-ITD mutation), prior antecedent hematologic disorder (AHD):
- Allogeneic stem cell transplantation **or**
- Clinical trial **or**
- High-dose cytarabine 3 g/m ^{2} IV over 3h every 12h on days 1, 3, and 5; if clinical trial not available

Cytogenetics

- Cytogenetics is an exciting, dynamic field of study which analyzes the number and structure of human and animal chromosomes.
- Changes that affect the number and/or structure of the chromosomes can cause problems with growth, development, and how the body functions.
- Chromosomal abnormalities can happen when egg and sperm cells are being made, during early fetal development, or after birth in any cell in the body.
- Changes to chromosome structure can disrupt genes, causing the proteins made from disrupted genes to be missing or faulty.
- Depending on size, location, and timing, structural changes in chromosomes can lead to birth defects, syndromes or even cancer.

Screening for a match

- HLA matching : Human Leukocyte Antigen
- Protein – or marker – found on most cells in the human body.
- The immune system utilises HLA markers to know which cells belong in the body and which don't.
- The best transplant outcome happens when a patient's HLA and the donor's HLA closely match.

Screening for a match cont…

- Half of our HLA markers are inherited from our mother and half from our father.
- Each brother and sister has a 25 %, or 1 in 4, chance of matching you. It is highly unlikely that other family members will match you.
- About 70 % patients requiring a transplant do not have a suitable donor in the family.

Stem cell / bone marrow transplant

- Before the transplant, chemotherapy, radiation, or both may be given. This may be done in two ways:
- **Ablative (myeloablative) treatment:** High-dose chemotherapy, radiation, or both are given to kill any cancer cells. This also kills all healthy bone marrow that remains, and allows new stem cells to grow in the bone marrow.
- **Reduced intensity treatment, also called a mini transplant:** People receive lower doses of chemotherapy and radiation before a transplant. This allows older people, and those with other health problems to have a transplant.

Stem cell / bone marrow transplant cont…

- There are 3 kinds of bone marrow transplants:
- **Autologous bone marrow transplant:** The term auto means self. Stem cells are removed from you before you receive high-dose chemotherapy or radiation treatment. The stem cells are stored in a freezer. After high-dose chemotherapy or radiation treatments, your stems cells are put back in your body to make normal blood cells. This is called a rescue transplant.
- **Allogeneic bone marrow transplant:** The term allo means other. Stem cells are removed from another person, called a donor. Most times, the donor's genes must at least partly match your genes. Special tests are done to see if a donor is a good match for you. A brother or sister is most likely to be a good match. Sometimes parents, children, and other relatives are good matches. Donors who are not related to you, yet still match, may be found through national bone marrow registries.
- **Umbilical cord blood transplant:** This is a type of allogeneic transplant. Stem cells are removed from a newborn baby's umbilical cord right after birth. The stem cells are frozen and stored until they are needed for a transplant. Umbilical cord blood cells are very immature so there is less of a need for perfect matching. Due to the smaller number of stem cells, blood counts take much longer to recover.

Stem cell / bone marrow transplant

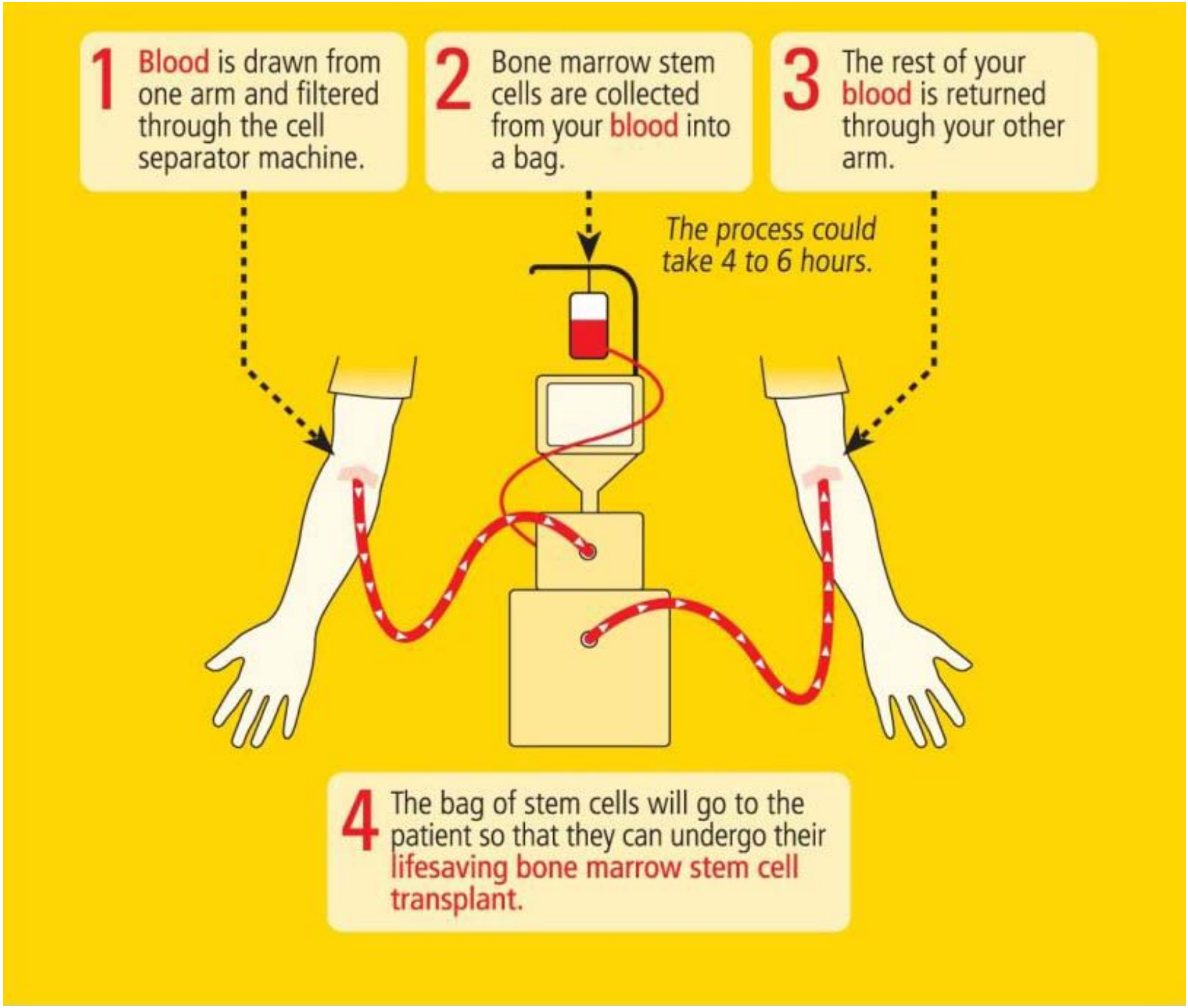
cont…

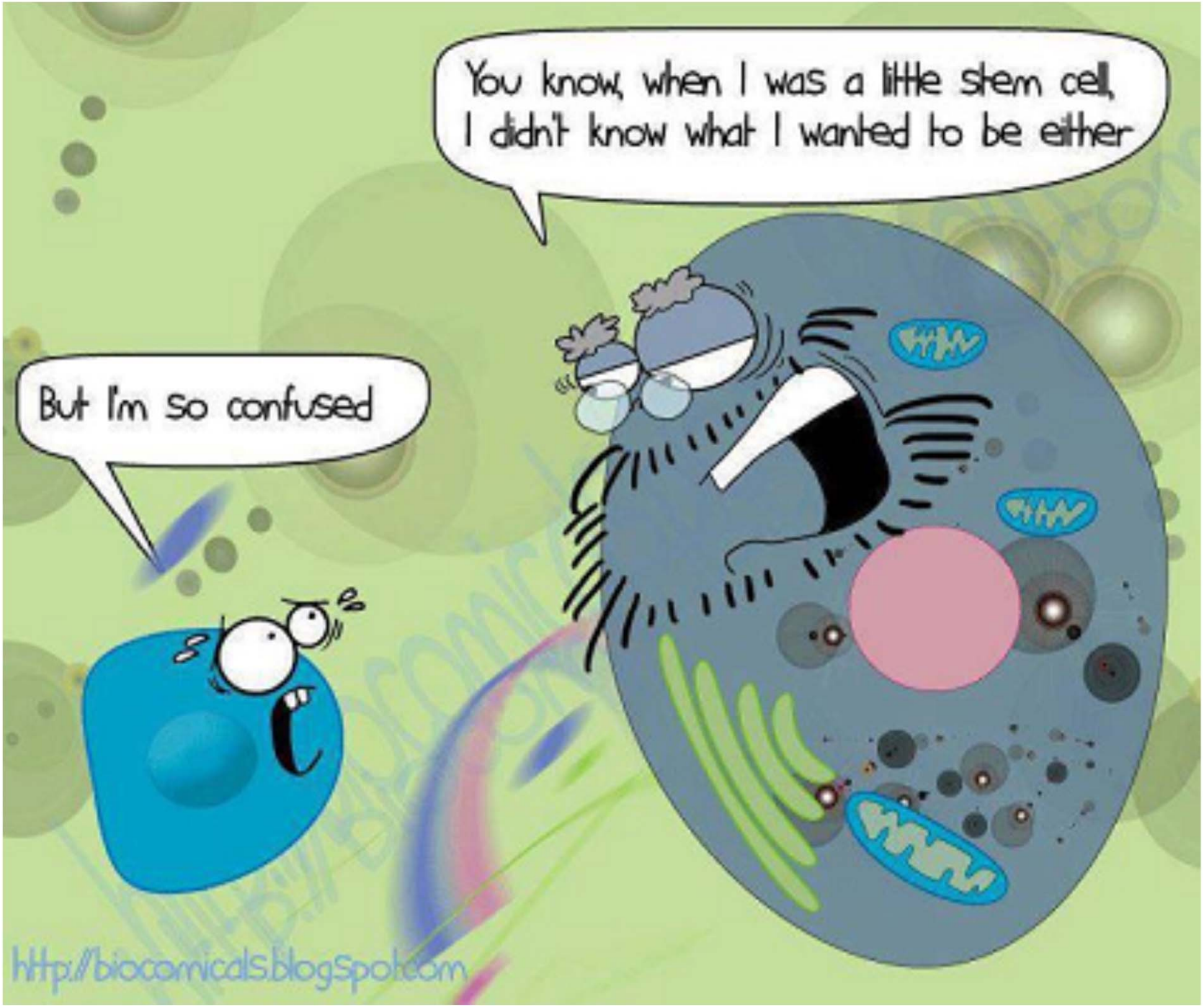
- Donor stem cells can be collected in two ways:
- **Bone marrow harvest:** This minor surgery is done under general anaesthesia. This means the donor will be asleep and pain-free during the procedure. The bone marrow is removed from the back of both hip bones. The amount of marrow removed depends on the weight of the person who is receiving it.

Stem cell / bone marrow transplant

cont…

- **Peripheral blood stem cells.** Peripheral blood stem cells (PBSCs) are collected by apheresis, a process in which the donor is connected to a special cell separation machine via a needle inserted in arm veins. Blood is taken from one vein and is circulated though the machine which removes the stem cells and returns the remaining blood and plasma back to the donor through another needle inserted into the opposite arm. Several sessions may be required to collect enough stem cells to ensure a chance of successful engraftment in the recipient.
- Neupogen injection may be given to the donor for about one week prior to apheresis that will stimulate the bone marrow to increase production of new stem cells. These new stem cells will be released from the marrow and into the circulating or peripheral blood system; from there they can be collected during apheresis.


1 Blood is drawn from one arm and filtered through the cell separator machine.
2 Bone marrow stem cells are collected from your blood into a bag.
3 The rest of your blood is returned through your other arm.
The process could take 4 to 6 hours.
4 The bag of stem cells will go to the patient so that they can undergo their lifesaving bone marrow stem cell transplant.


You know, when I was a little stem cell, I didn't know what I wanted to be either
But I'm so confused
http://biocomicals.blogspot.com

Some statistics

- **What are the key statistics about acute myeloid leukemia?**
- The American Cancer Society's estimates for leukemia in the United States (population ± 320 million) for 2015 were:
- About 54,270 new cases of leukemia (all kinds) and 24,450 deaths from leukemia (all kinds)
- **About 20,830 new cases of acute myeloid leukemia (AML). Most will be in adults.**
- About 10,460 deaths from AML. Almost all will be in adults.
- Acute myeloid leukemia is generally a disease of older people and is uncommon before the age of 45. The average age of a patient with AML is about 67 years.
- AML is slightly more common among men than among women, but the average lifetime risk in both sexes is less than ½ of 1%.

References

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Thank you


See No Leukemia
Speak No Leukemia
Hear No Leukemia
Believe
and it will be