

Chronic Myelogenous Leukemia

II Semester Zoology

Genetics

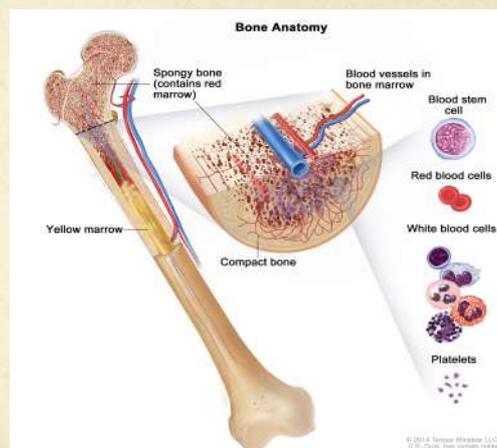
ZOO-CC-202

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(Study materials are collected from books and internet for classroom teaching purpose only)

Chronic Myelogenous Leukemia

- Chronic myeloid leukemia (CML), also known as *chronic myelogenous leukemia*, or *chronic granulocytic leukemia* is a type of cancer that starts in certain blood-forming cells of the bone marrow.
- Chronic myelogenous leukemia (CML) is a disease in which the bone marrow makes too many white blood cells.
- It accounts for 20% of all leukemias affecting adults.



CML - Affect Blood Cells

The bone marrow makes blood stem cells (immature cells) that become mature blood cells over time.

A blood stem cell may become a myeloid stem cell or lymphoid stem cell.

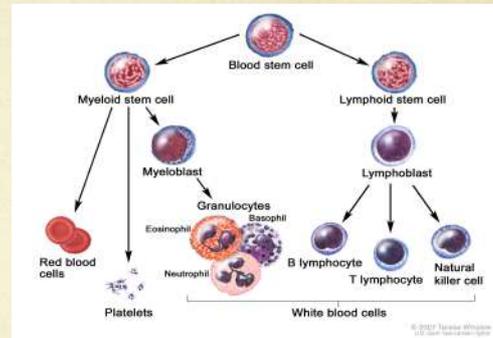
A lymphoid stem cell becomes a white blood cell.

A myeloid stem cell becomes one of three types of mature blood cells:

Red blood cells that carry oxygen and other substances to all tissues of the body.

Platelets that form blood clots to stop bleeding.

Granulocytes (white blood cells) that fight infection and disease.

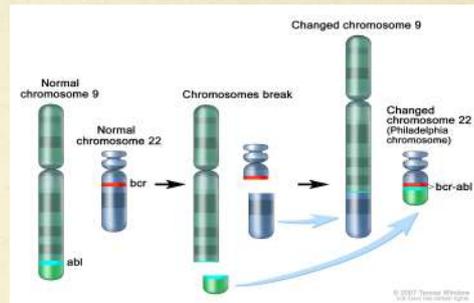


Chronic Myelogenous Leukemia

- Chronic myelogenous leukemia (CML) is a myeloproliferative disorder resulting from the clonal expansion of a transformed multipotent hematopoietic stem cell.
- CML is a biphasic disease with an initial **chronic phase** characterized by a massive expansion of myeloid precursors and mature cells that leave the bone marrow (BM) prematurely but retain their capacity to differentiate normally.
- This is invariably followed by progression to a fatal **acute phase** termed 'blast crisis', which resembles acute leukemia.

Most people with CML have the Philadelphia chromosome

- Leukemic white blood cells from patients with chronic myelogenous leukemia bear a specific translocation, in which the C-ABL gene on chromosome 9 is translocated into the BCR gene on chromosome 22.
- This translocation creates a structure known as the **Philadelphia Chromosome**.
- The Philadelphia chromosome is not passed from parent to child.



BCR-ABL Genes

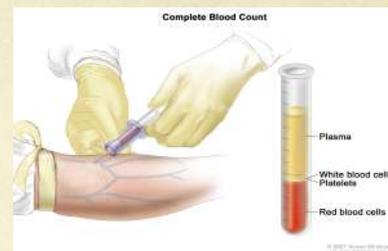
- The swapping of DNA between the chromosomes leads to the formation of a new gene (an oncogene) called *BCR-ABL*.
- This gene then produces the BCR-ABL protein, which is the type of protein called a *tyrosine kinase*.
- The BCR-ABL protein is an abnormal signal transduction molecule in CML cells, which stimulates these cells to proliferate even in the absence of external growth signals.

CML- Risk Factors

- The only risk factors for CML are:
- **Radiation exposure:** Being exposed to high-dose radiation (such as being a survivor of an atomic bomb blast or nuclear reactor accident) increases the risk of getting CML
- **Age:** The risk of getting CML increases with age
- **Gender:** This disease is slightly more common in males than females, but it's not known why
- There are no other proven risk factors for CML. The risk of getting CML does not seem to be affected by smoking, diet, exposure to chemicals, or infections. And CML does not run in families.

Detect and diagnose CML

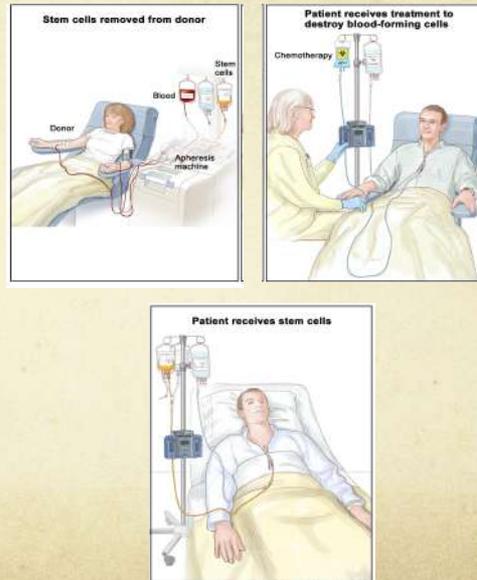
- Physical exam and history :
- Blood chemistry studies :
- Complete blood count (CBC) with differential :
- Bone marrow aspiration and biopsy :
- Cytogenetic analysis:
- FISH (fluorescence in situ hybridization):
- Reverse transcription-polymerase chain reaction:



CML - Therapy

Six types of standard treatment are used:

- Targeted therapy
- Chemotherapy
- Biologic therapy
- High-dose chemotherapy with stem cell transplant
- Donor lymphocyte infusion (DLI)
- Surgery



Thank you