



Using Microarrays to Study Leukemia

Introduction

Leukemias are cancers of the white blood cells (WBCs). They occur in the bone marrow where the precursor cells for white and red blood cells (RBCs) are formed. All white and red blood cells arise from stem cells in the bone marrow. The pathway by which the different cell types are formed is shown below.

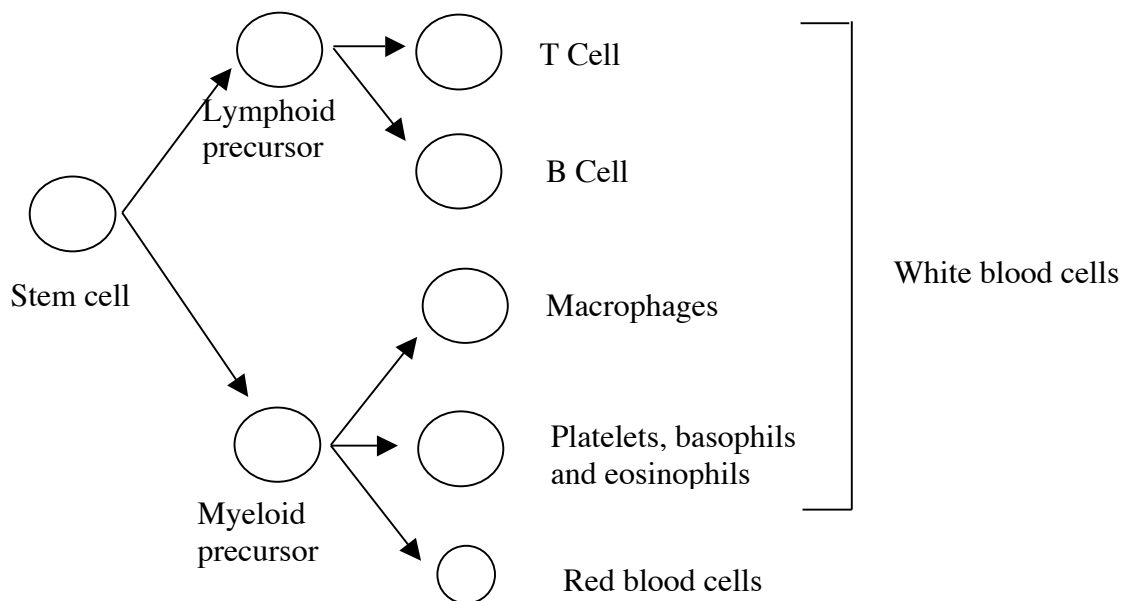


Figure 1: Development of blood cells

Leukemias cause symptoms by interfering with the normal development and function of the different types of blood cells. These symptoms include:

- Anemia – caused by alterations in the development of red blood cells that carry oxygen throughout our body.
- Susceptibility to infection – caused by alterations in the development of the white blood cells that fight infection.
- Bruising and bleeding – caused by low platelet levels.

Types of leukemia

Leukemias are classified by whether they are acute or chronic. Acute leukemias occur suddenly and are rapidly fatal if untreated whereas chronic leukemias have a slower onset and are fatal over the course of many years.

In leukemia, the WBCs proliferate in an uncontrolled fashion. In addition, the cancerous WBCs are blocked in their development so they stop maturing at some particular stage. The stage at which the WBCs stop developing varies from cancer to cancer. Lymphocytic leukemias are stopped at the lymphoid precursor stage, or as immature T or B cells (Fig 1). Myeloid leukemias affect white blood cells of the myeloid lineage (see Fig 1).

This activity will deal with two types of acute leukemia:

- Acute lymphocytic leukemia (ALL) – is commonly (but not always) seen in children and is a cancer of immature B cells (between the lymphoid precursor and the mature B cell). ALL is the most common form of cancer in children under age 15.
- Acute myeloid leukemia (AML) – is more commonly seen in adults and is a cancer of the myeloid precursors.

Since these two leukemias are treated differently it is critical to correctly diagnose patients. Microscopically, the affected cells look close to identical. Over the last 40 years we have discovered surface molecules that differ between lymphoid and myeloid cells, thus providing a way to determine whether a patient has ALL or AML.