Leukemia

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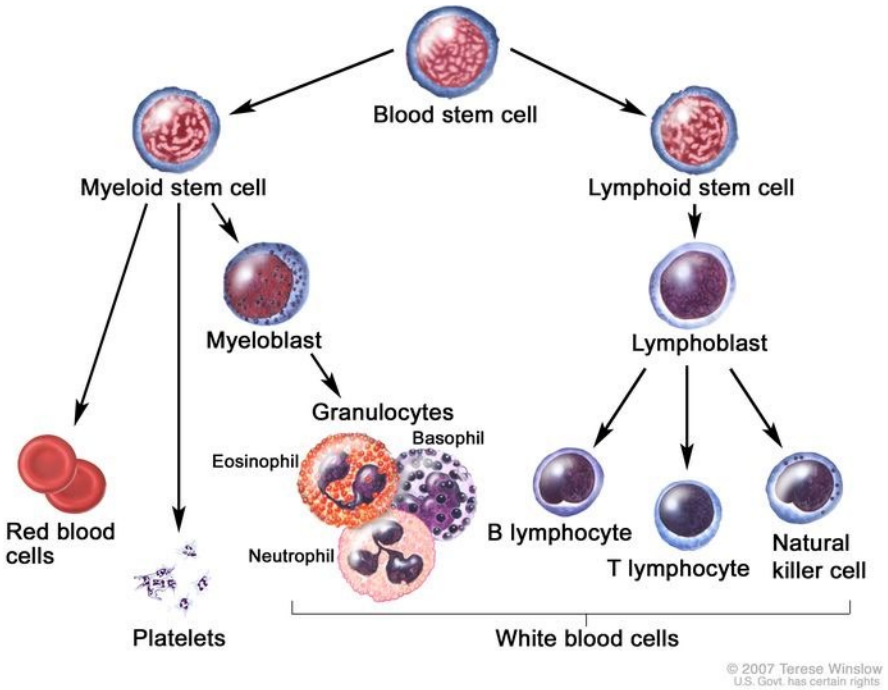
Though childhood leukemia is rare, the incidence has increased steadily since 1975[1] and remains the most common cancer diagnosed in children less than 15 years of age[2]. Leukemia occurs when a genetic mutation or alteration affects the formation of blood components, also known as hematopoiesis. There are three main components of blood: red blood cells, platelets, and white blood cells. When a blood stem cell divides it becomes either a myeloid or lymphoid stem cell. Myeloid stem cells go on to make red blood cells, platelets and a few white blood cells known as granulocytes. Granulocytes are considered the front line of the immune system, responsible for treating early infections. Lymphoid stem cells make the white blood cells responsible for acquired immunity. These cells are known as B- and T-cells.



The most common form of leukemia is acute lymphoblastic leukemia (ALL). This means the genetic mutation or alteration is affecting the lymphoid stem cell line. Each year in the United States approximately 3,100 children and adolescents less than 20 years of age are diagnosed with ALL[3]. Thankfully, survival rates for these patients have increased as well. The 5-year survival rate increased from approximately 60% to 90% in children less than 15 years of age and from 28% to 75% in adolescents aged 15 to 19 years[4-6].

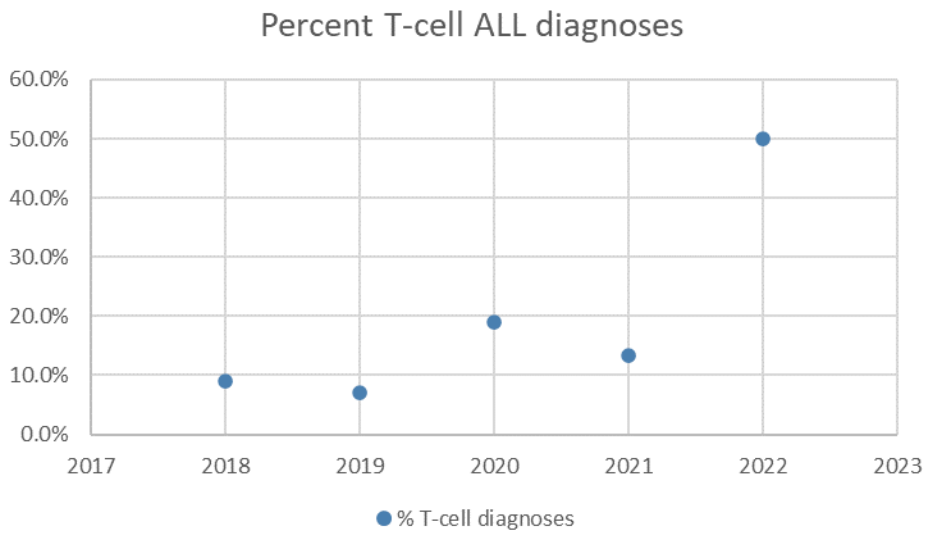
ALL is further classified as either B-cell ALL or T-cell ALL, depending on which type of lymphocyte is affected. About 85% of all ALLs are due to mutations in the B-cell population while the remaining 15% are due to alterations in the T-cell population[7]. Treatment is aimed at targeting either the B-cell or T-cell population specifically. Treatment is then adjusted according to the patient's risk stratification (i.e. high risk, standard risk, etc.), which is based on factors such as age, white blood cell count at diagnosis, steroid pretreatment, and initial response to treatment.

Treatment consists of chemotherapy lasting 2.5 to 3.5 years in duration. The first 6-8 months is the most intensive with dosages aimed at killing all cancer cells. The remaining therapy is geared toward keeping those cancer cells away. In recent years the medications used for chemotherapy have shifted from targeting and killing any rapidly dividing cell to specifically cancer cells. This new type of chemotherapy is called immunochemotherapy.

Despite these targeted agents, survival rates for T-cell ALL are still 5-10% worse than B-cell ALL. This is thought secondary to poor patient tolerance of chemotherapy, increased risk of relapse, lack of favorable genetic subtypes, and resistance to conventional chemotherapy[8].

Patients diagnosed at Akron Children's Hospital over a 5-year period, from 2018-2022, were evaluated. On average there were 96 new diagnoses per year with 21.7% of those patients having ALL. Over the 5-year period 22.8% of patients with ALL had T-cell ALL. However, when each year was evaluated individually there was an exponential increase in the number of T-cell ALL cases per year in 2022 (Figure 1). This leads to wonder if this phenomenon is a coincidence or will be a nationwide trend. Further analyses will be needed to further monitor this finding.

Figure 1: Percent T-cell ALL diagnoses by year



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