

## Understanding flow cytometry with an analogy

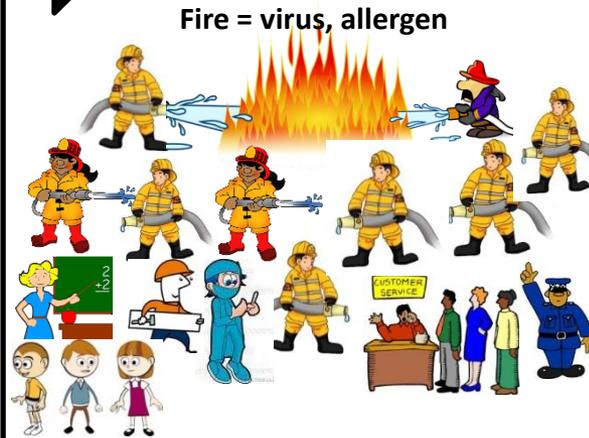
## Baseline/Healthy



- Think of your bloodstream as a town. There are many different types of cells in your bloodstream just as there are many different types of people in a town.
- In this baseline/healthy scenario, a variety of people are present in the town and things are running smoothly.
- If a fire occurs in your town, firefighters from your town and sometimes other towns help put out the fire. We can use this firefighting analogy to describe how the population of blood cells changes in LGLL.

reversible

## Immune response



- A healthy person's immune system responds to a virus or allergen with an immune/inflammatory response. Your immune system amplifies your white blood cells, such as T-cells and NK-cells to fight the infection. If a healthy person gets sick with a virus, the firefighters (immune cells) increase to fight the fire.
- After the fire is put out, the firefighters from in-town and out-of-town go back to their fire stations. In the case of an illness, the T- and/or NK-cells will die (apoptosis) and the blood cell population goes back to baseline quantities.

Permanent shift

## LGL leukemia

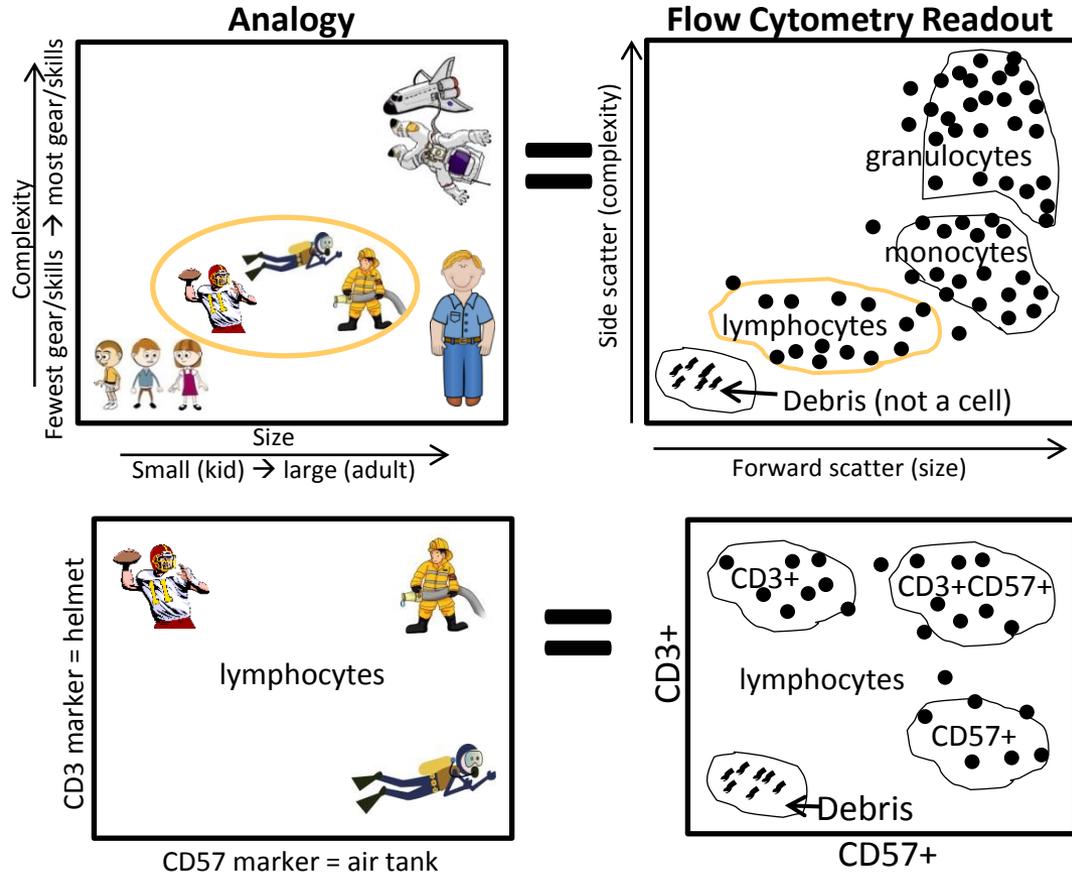
The fire may be gone or greatly weakened, but the full force of the firefighters remains.



- A person who develops LGLL starts out as baseline: an illness or antigen (viral, allergen) causes the immune response.
- For reasons we are still trying to understand, the T-cells (T-LGLL) or NK-cells (NK-LGLL) are unable to die and the expanded T- or NK-clone persists. In the case of the fire fighters, they forget how to return to the fire station and all remain to put out a non-existent or greatly diminished fire. This may or may not manifest symptoms.

**Introduction:** In the previous diagram, the analogy of a town was used to show baseline/healthy, immune response, and LGL leukemia. Firefighters can be identified by a helmet and air tank. Let's use these two qualities to determine the amount of firefighters present. We will use T-LGLL in this example. Remember that T-cells have CD3 and CD57 markers on their surface to identify themselves. So, we will say CD3 is a helmet and CD57 is an air tank.

- The horizontal axis is size: small (kid) to large (adult). The vertical axis describes the complexity; in this case we are saying further up means the more gear or skills are needed for the job performed. So, a child is small and will tend to have no skills or gear because he/she doesn't have an occupation. The astronaut is an adult and has an occupation that requires lots of gear and skills.
- We can pick out a population of people who have a helmet and air tank (yellow circle).
- This group of people is now plotted according to identifying markers. The CD3 marker (vertical axis) is a helmet, while the CD57 marker (horizontal axis) is an air tank.
- The football player in the top left has a helmet but no air tank.
- The scuba diver on the bottom right has an air tank but no helmet.
- The firefighter has both a helmet and an air tank, so he is like a T-cell displaying both CD3 and CD57 markers.



**Conclusion:** The population of firefighters/lymphocytes can be assessed compared to other townspeople/blood cells in order to learn the percentage present in the town/blood stream. If a patient persistently has more than 10-15% lymphocytes with CD3 and CD57 markers, the diagnosis could be T-LGLL. This can be confirmed by the TCR test.