CANCER: WHEN CELLS FORGET WHO THEY ARE

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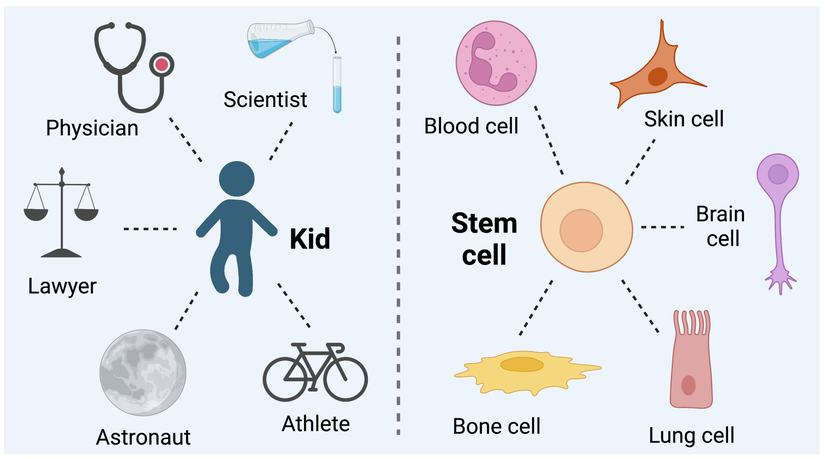
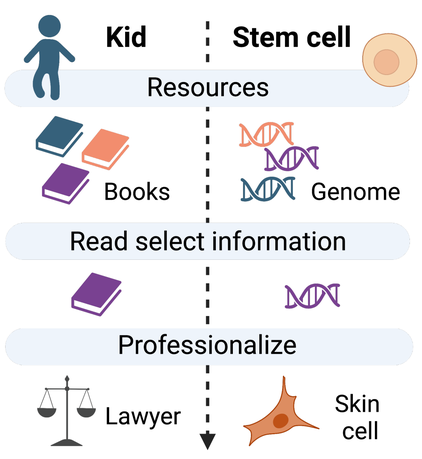
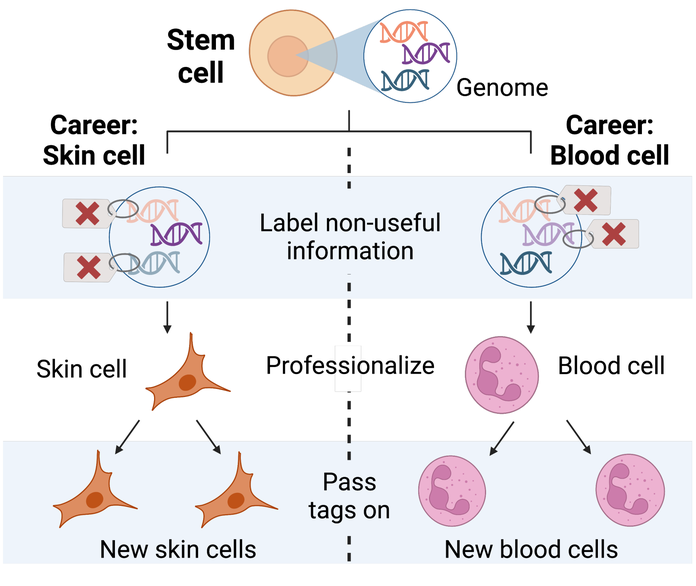
1. CELLS TAKE ON SPECIFIC CAREERS

- The human body is made up of **microscopic building blocks** known as **CELLS**. A new human body starts from a specific kind of cell called **STEM CELL**.
- Just as a kid has the potential to pursue any career they would like in the future, a **stem cell** can **specialize to perform any specific function** in the human body.
- Similar to the way we store information in books, all cells carry inside them a **GENOME**, a **complete set of information** on how to become any cell in the body.
- Stem cells professionalize by **reading ONLY useful information** in their genome for the specific function they will perform.





2. HOW DO CELLS KNOW WHAT TO READ?



- Like libraries have indexing systems to separate volumes by area of interest, cells also have a **labeling system** for their genome.
- During their professionalization, stem cells will **tag non-useful information** in their genome as **"DO NOT READ!"**
- The professional cells **MUST pass on the tags** to any new cells that will follow that same career path as them.
- However, **we (still) don't fully understand** how tags are inherited.

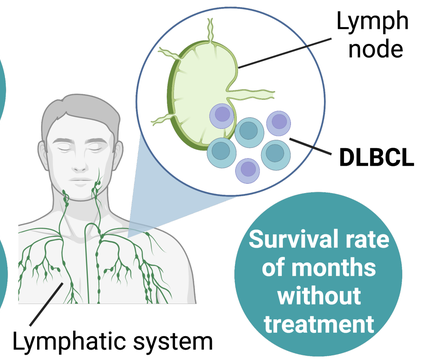
3. WHAT IF THERE IS A MISTAKE?

- Imagine if, one day, a lawyer is accidentally called to perform surgery. That wouldn't have a good outcome.
- If there is a **mistake in the tag system**, a brain cell, for example, can accidentally think it is another kind of cell and **perform the wrong function.**
- Consequently, **severe types of cancer** can arise from this mistake, such as:

Diffuse Large B-cell Lymphoma (DLBCL)

Most common cancer in the lymphatic system

More than 25,000 cases per year in the US



Survival rate of months without treatment

Childhood Diffuse Intrinsic Pontine Glioma - DIPG

Aggressive pediatric brain tumor

300 children diagnosed per year in the US

Diagnosis between the ages of 5-9

Surgery is not a treatment option

4. CAN WE MAKE CELLS REMEMBER?

Tag system

Failure: Disease

Our question: How does it work in health so we can fix disease?

- We want to understand **how professional cells pass on the correct tags** to new cells that will follow the same career path.
- If we understand how tags are inherited, we can explore ways to make sick cells remember their original functions, leading to the development of **new therapeutic options for cancers.**
- The **Ramachandran Lab** at the Anschutz Medical Campus is a **pioneer** in this research, attracting students and scientists from around the US - and the world - to Colorado.
- We also want to make Colorado a leading state in the development of **novel therapeutics for diseases with currently limited to no treatment options**.

New technologies → **How the tag system works** → **Cancer therapeutics**