T cells: killer cells that protect your body

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T cells: killer cells that protect your body

What is going on?

Main message today:

- **Cancer cells** are cells within our body, that “break the rules” and only care about themselves. Think of them as “cellular criminals”.
- **T cells** are part of our immune system that patrol the body. Think of them, as “cellular police officers”.
- T cells need to be **activated** – somebody needs to call the police - but once that happens, they can quickly and fast kill the cancer cells.
- Cancer cells and T cells can fight each other for a long time – and the T cells don’t always win. But with **new medicines** we can help them along.

What are normal cells and cancer cells?

Normal cells

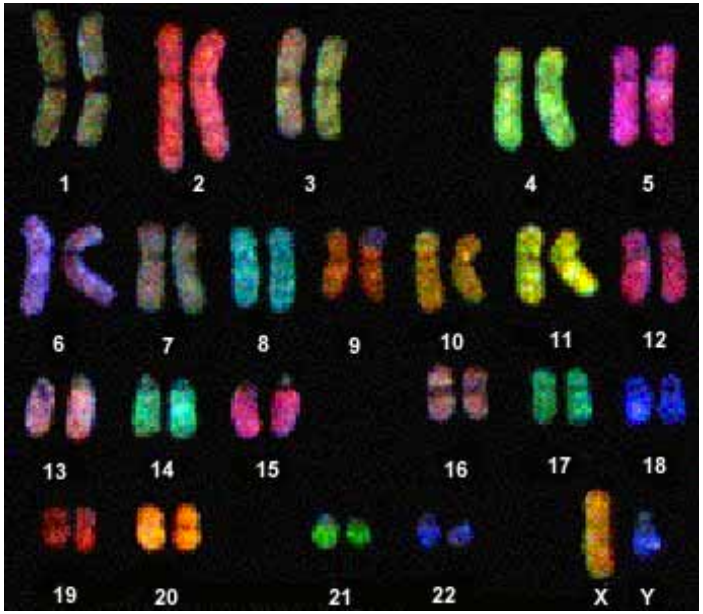
- **Respects the boundary** to other cells
- Only divide for a **set amount of time**
- Perform certain, **well-defined functions**, in collaboration with other cells (only uses the genes it's "born" with)

Cancer cells

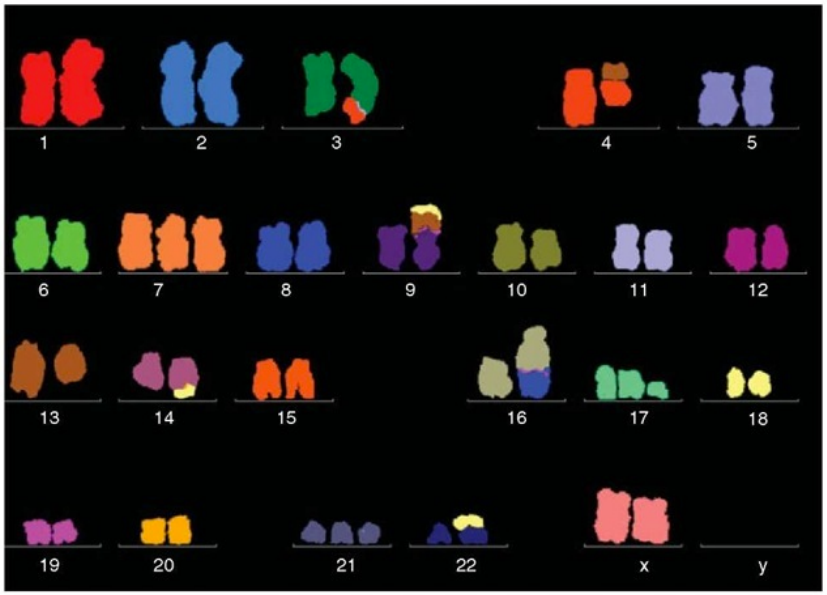
- **Grows** into areas they are not suppose to be at (invade and metastasis)
- **Keep dividing** (immortal)
- Do not perform the function they had originally
- **Learn tricks to avoid control by other cells** (mutates its genes)

What is the main difference between normal cells and cancer cells? Their **Genes**!

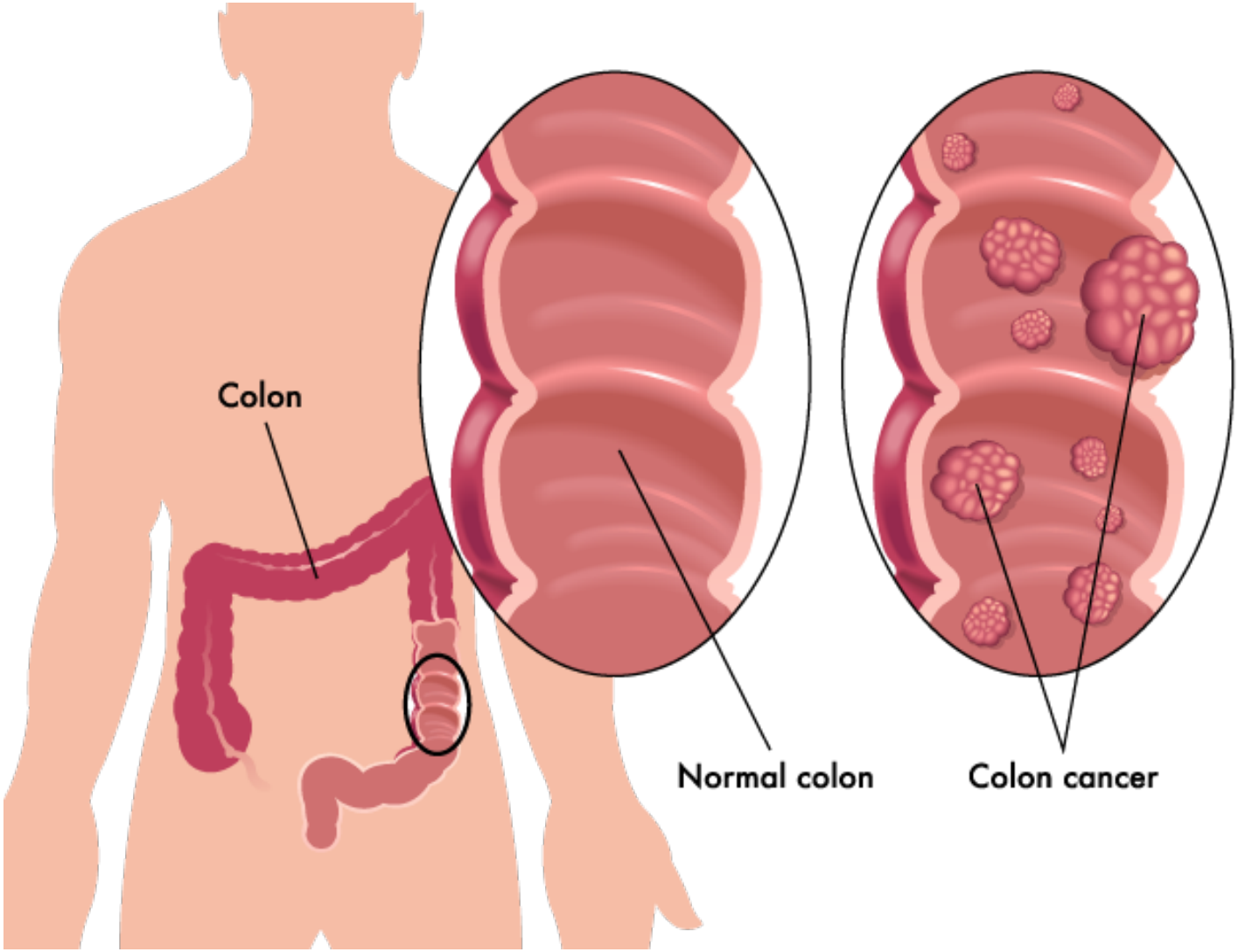
Normal cells



Cancer cells

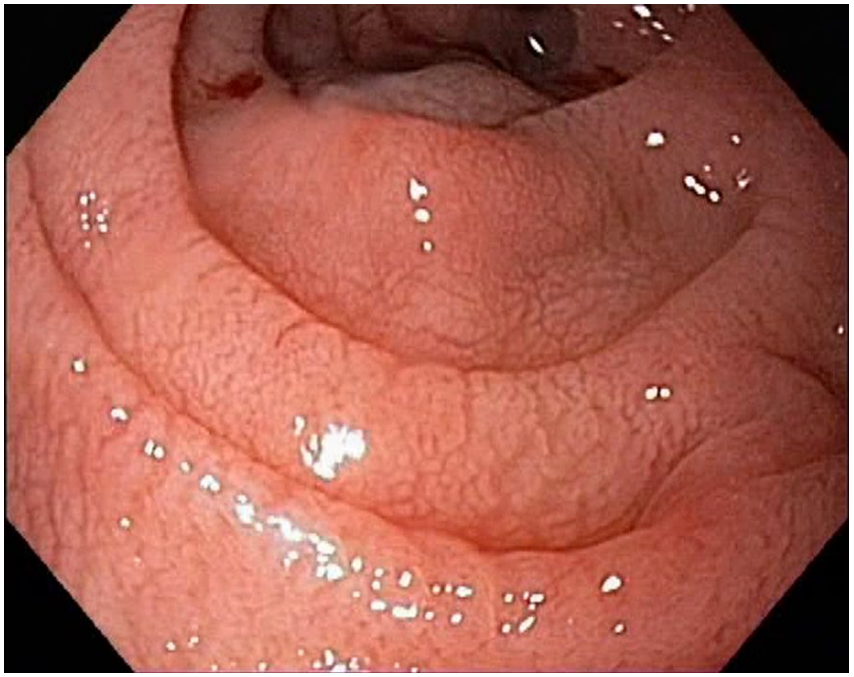


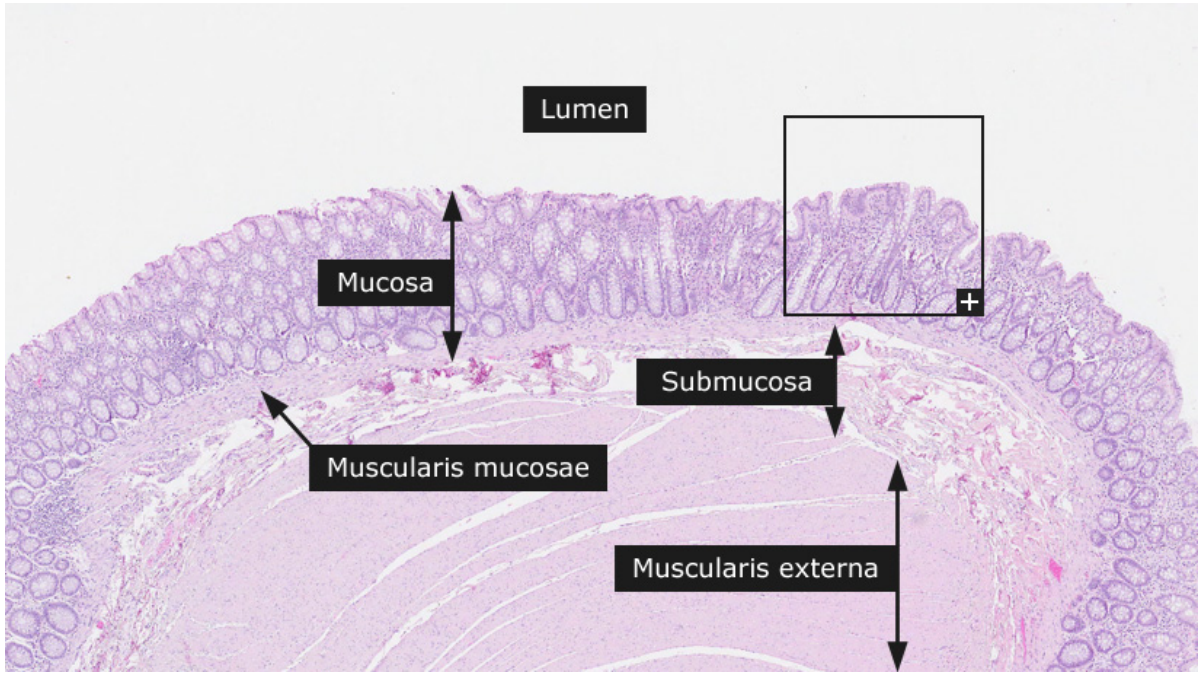
What are normal cells and cancer cells?



What are normal cells and cancer cells?

Normal cells



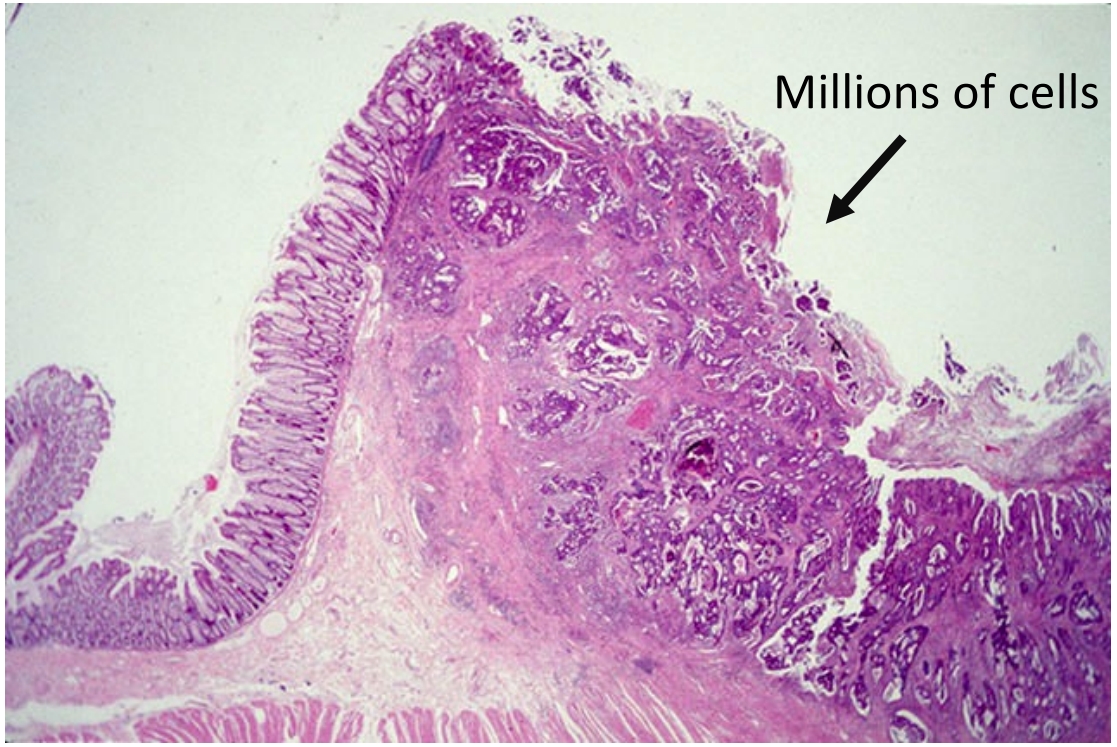


- Many different cell types
- Each cell “respects” its neighbour

- Each cell performs a function
- Once a cell stop working, it shuts down and dies

What are normal cells and cancer cells?

Cancer cells



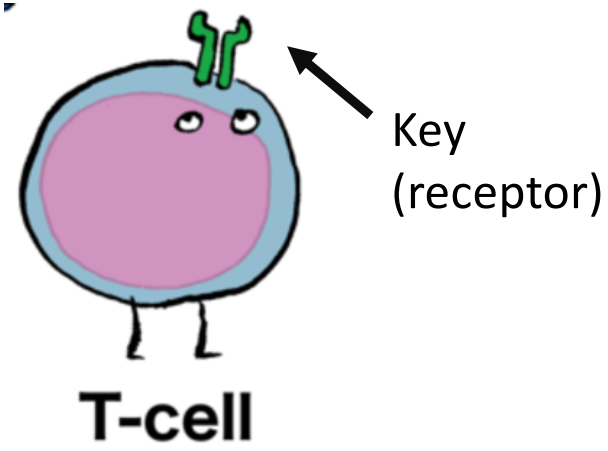
- Grow into areas they are not suppose to be at (invade and metastasis)
- Keep dividing (immortal)

- Do not perform the function they had originally
- Learn tricks to avoid control by other cells

What are T cells?

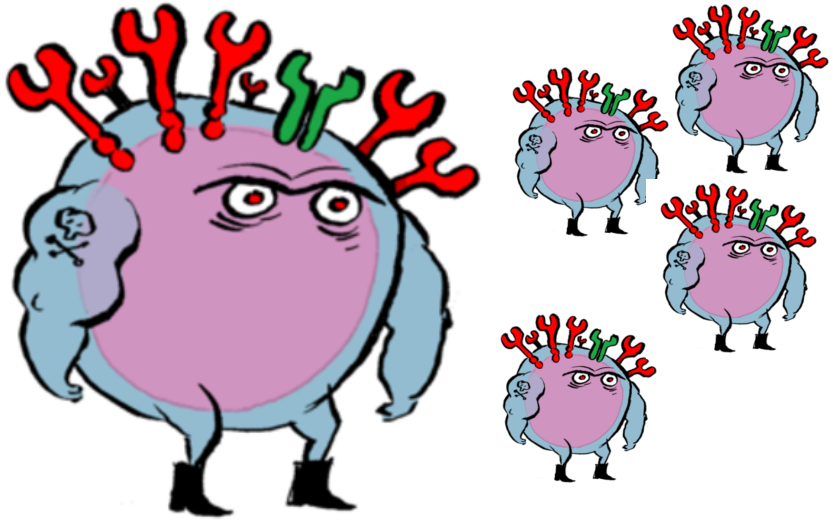
Resting T cells

- Are **normal cells**, that make up a big part of our immune system
- They **move around** in our blood and in organs on the **look-out** for trouble or danger signals
- Each T cell has a unique "**key**" on its surface



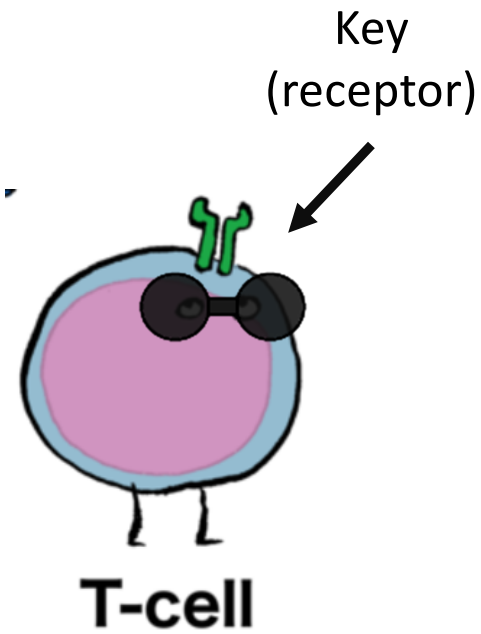
Activated T cells

- If a T cell finds another cell on which the key works, it transforms into **activated T** cells (double in size)
- It then **divides** and make millions of clones of them self, all with the same key
- They seek out their targets and **kill them**



What are T cells?

But actually: T cells are blind – so how do they move and find other cells? And only kill the right cells?

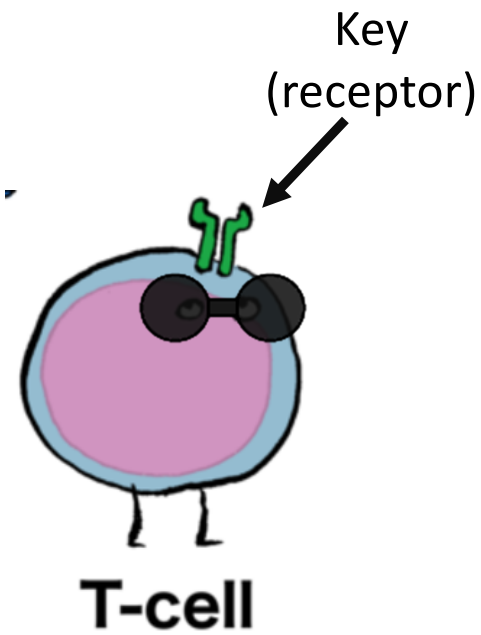


Let try an experiment
(with some dramatic music)

What are T cells?

Attracted into an area by:

- Chemical signals
- Physical signals



"**Tests**" every cell it meets:

- Does key match?
- If not, just move on
- But if… -> kill

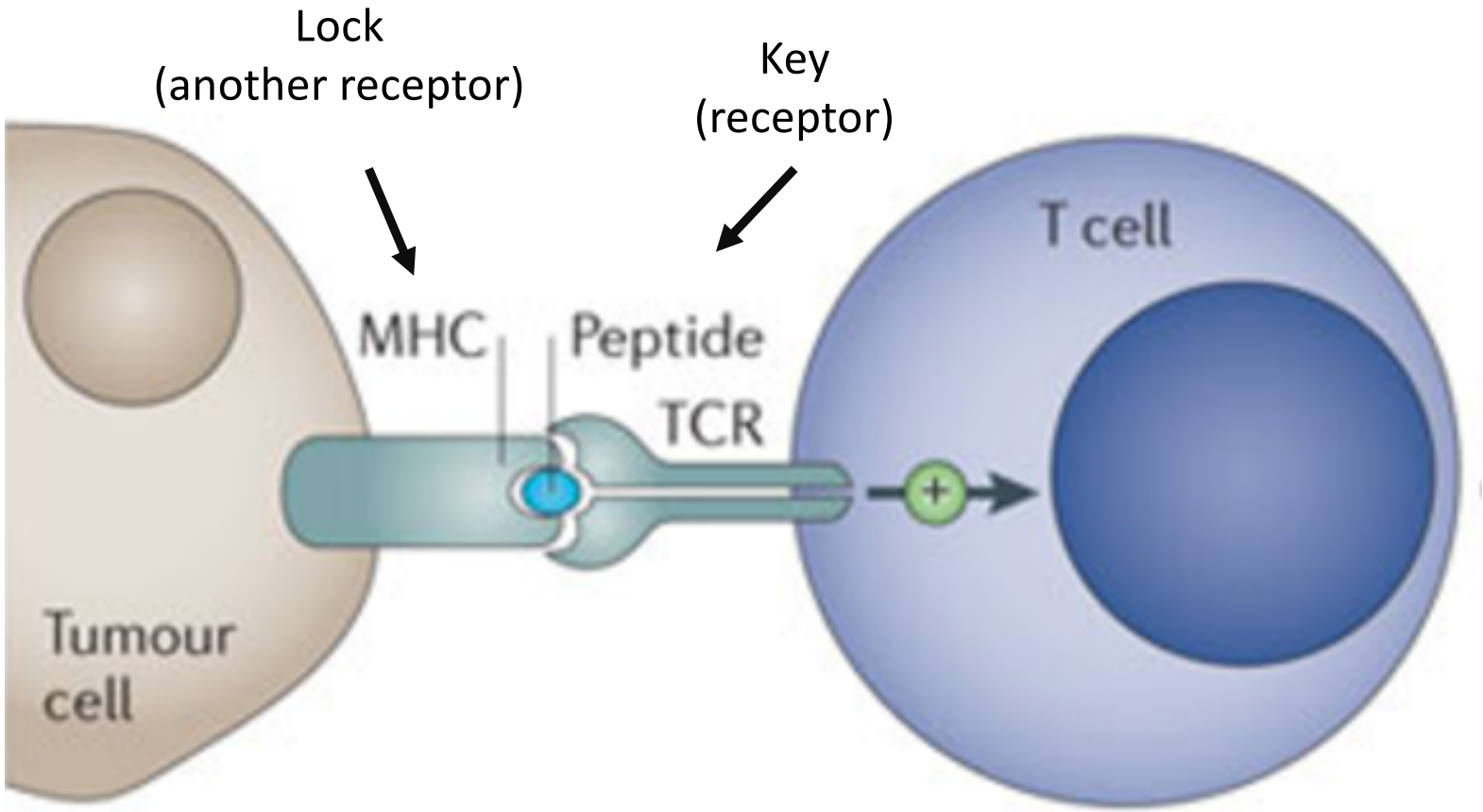
Moves:

- Very fast to cover more ground
- Optimizes it's search (almost like a shark hunting for prey)

What are T cells?

(Start at 20sec)

The key and lock: two receptors



Questions:

1) How can T cells distinguish between normal and sick cells? (Hint: whats the main difference between normal and cancer cells?).

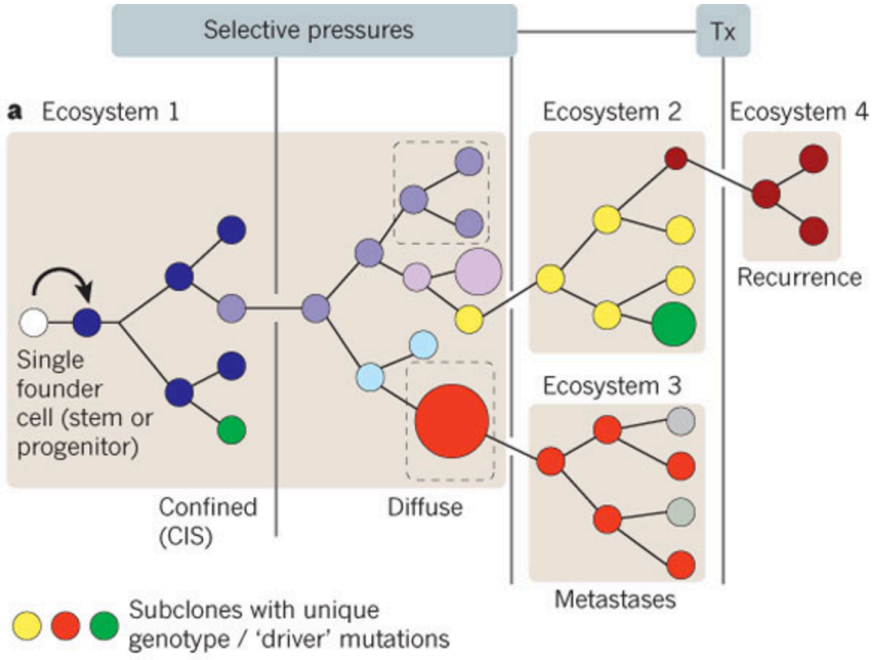
2) How can the body make sure the the T cells keys match, if it's something they have never seen before?

T cells killing cancer cells

(Start at 30sec)

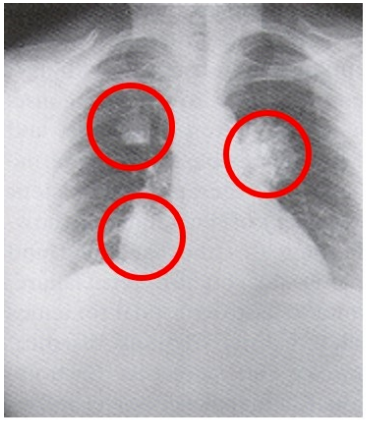
So why do we still have cancer?

Tumours “evolve” when we treat them

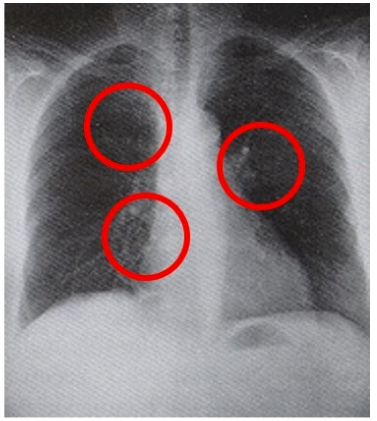


But T cells can follow this evolution because they keep generating new keys – we just need to help them a bit:

- Vaccines: makes them specific for certain locks
- Insert new “keys” into T cells
- “Release their breaks”



Pre-treatment



Post-treatment

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- **T cells** are part of our immune system that patrol the body. Think of them, as “cellular police officers”.
- T cells need to be **activated** – somebody needs to call the police - but once that happens, they can quickly and fast kill the cancer cells.
- Cancer cells and T cells can fight each other for a long time – and the T cells don’t always win. But with **new medicines** we can help them along.

Some questions:

- If T cells can killer cancer cells, why do some people still get cancer?
- How do you think cancer cells escape killing from the T cells?
- What happens if T cells make a mistake and start killing normal cells?