

How do some immune cells become cancer ?

SFB 1335 Aberrant Immune Signals in Cancer

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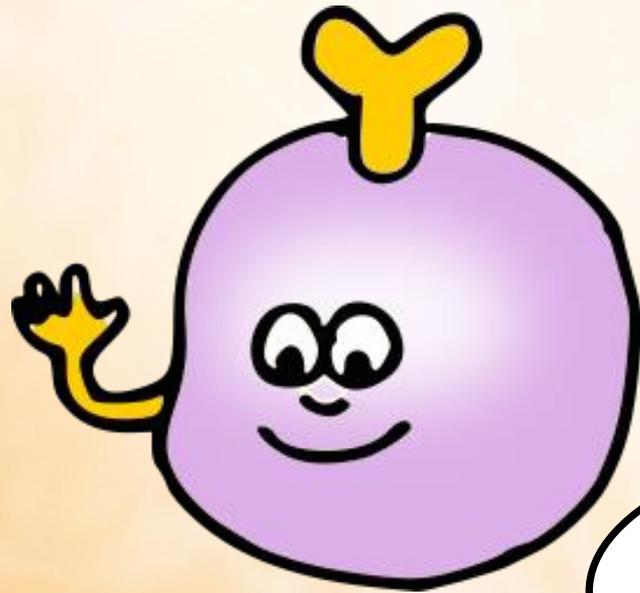
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The cells of the immune system help us fight dangerous viruses, bacteria and parasites. Without an immune system we wouldn't be able to survive! But sometimes immune cells can become cancer cells. Let's see on an example of a B cell how that happens.



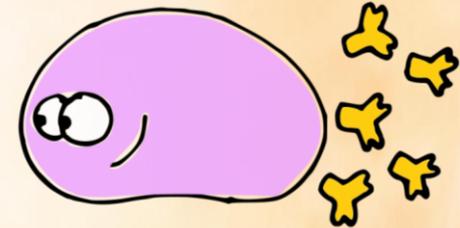
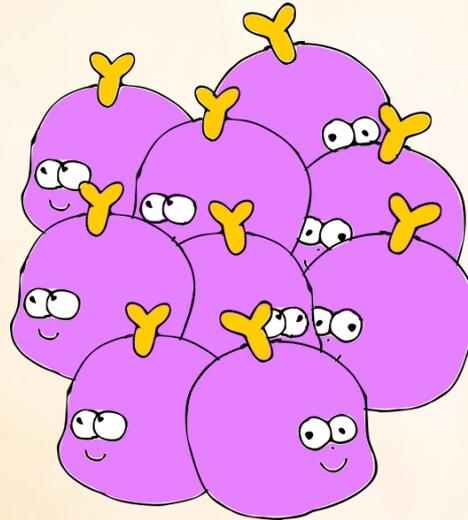
Hi! I am a B cell. I am part of the immune system.

Once a B cell recognizes a pathogen it starts dividing to make more B cells so a big army can fight the pathogen. After a while the cell needs to stop dividing so the created cells can become plasma cells and make antibodies.

A piece of a pathogen



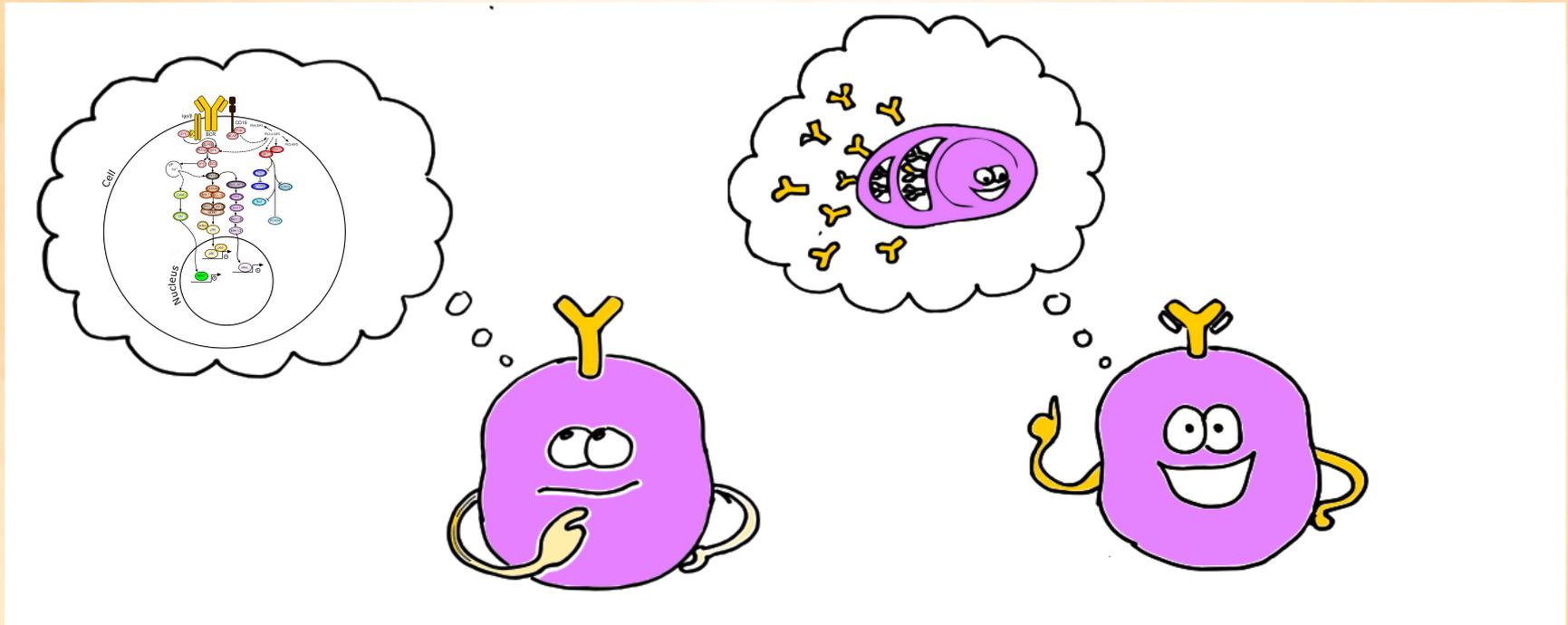
B cell



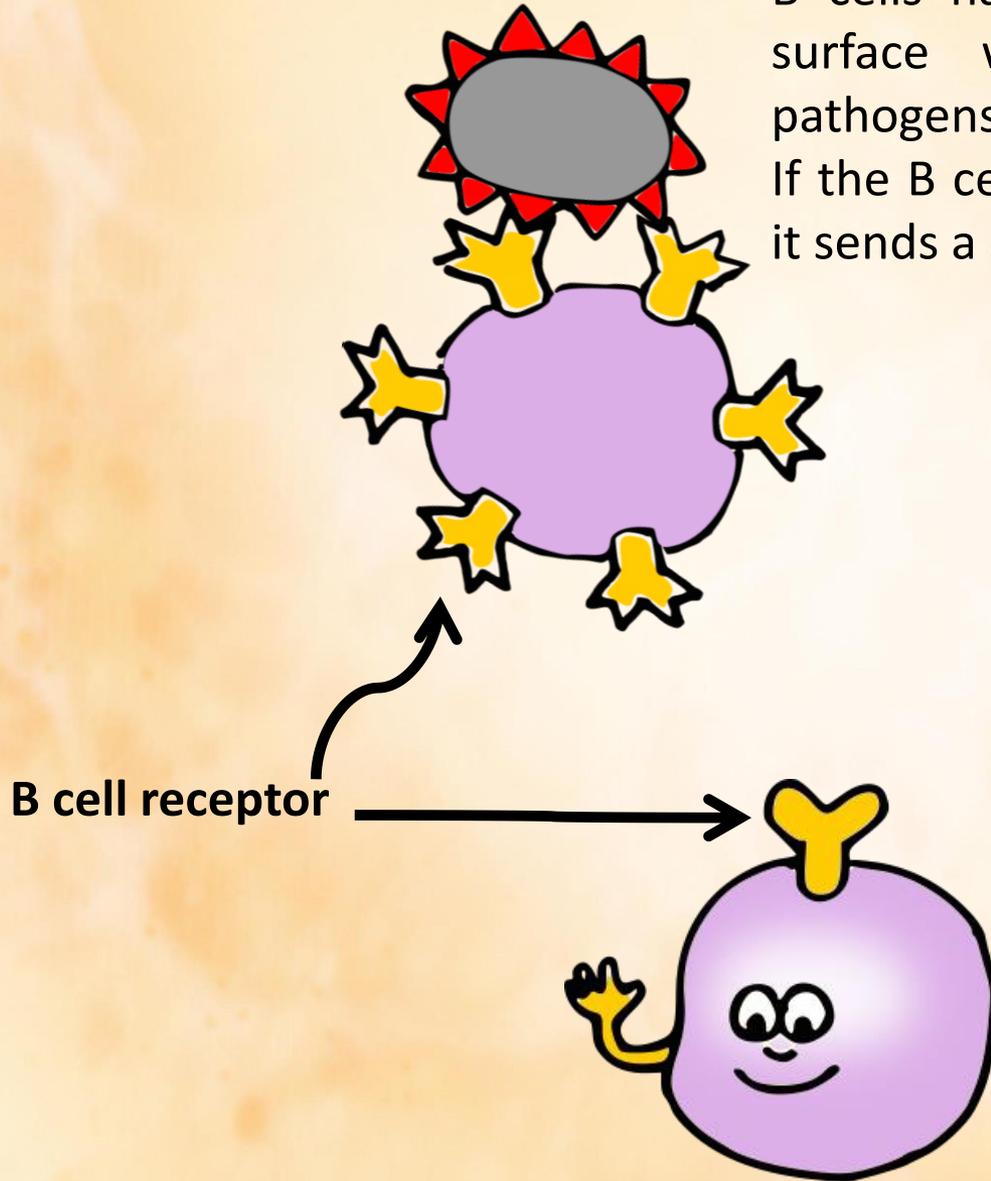
Plasma cell

A B cell needs to make a lot of decisions:

- Is something dangerous happening? For example was the body infected with a dangerous bacterium?
- Should the B cell start to divide?
- How long should it divide?
- What should it do afterwards?



B cells have the B cell receptor on their surface which they use to look for pathogens (= dangerous bacteria or viruses). If the B cell receptor recognizes a pathogen it sends a signal to the inner part of the cell.



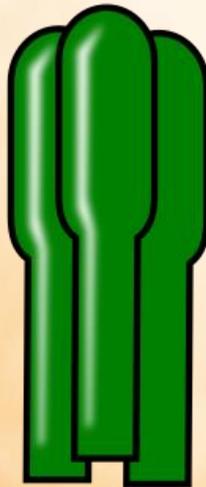
B cells also have many other receptors that help them to study what is happening around them.

Are other cells present?

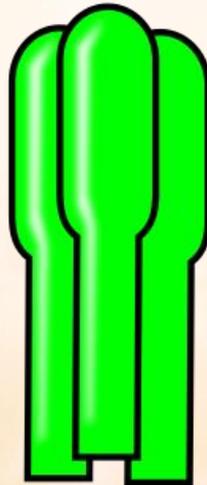
Are the other cells upset?

Are signals present that tell the cell to do something?

BAFF-receptor



Co-stimulation:
CD40



Inhibition:
CD22



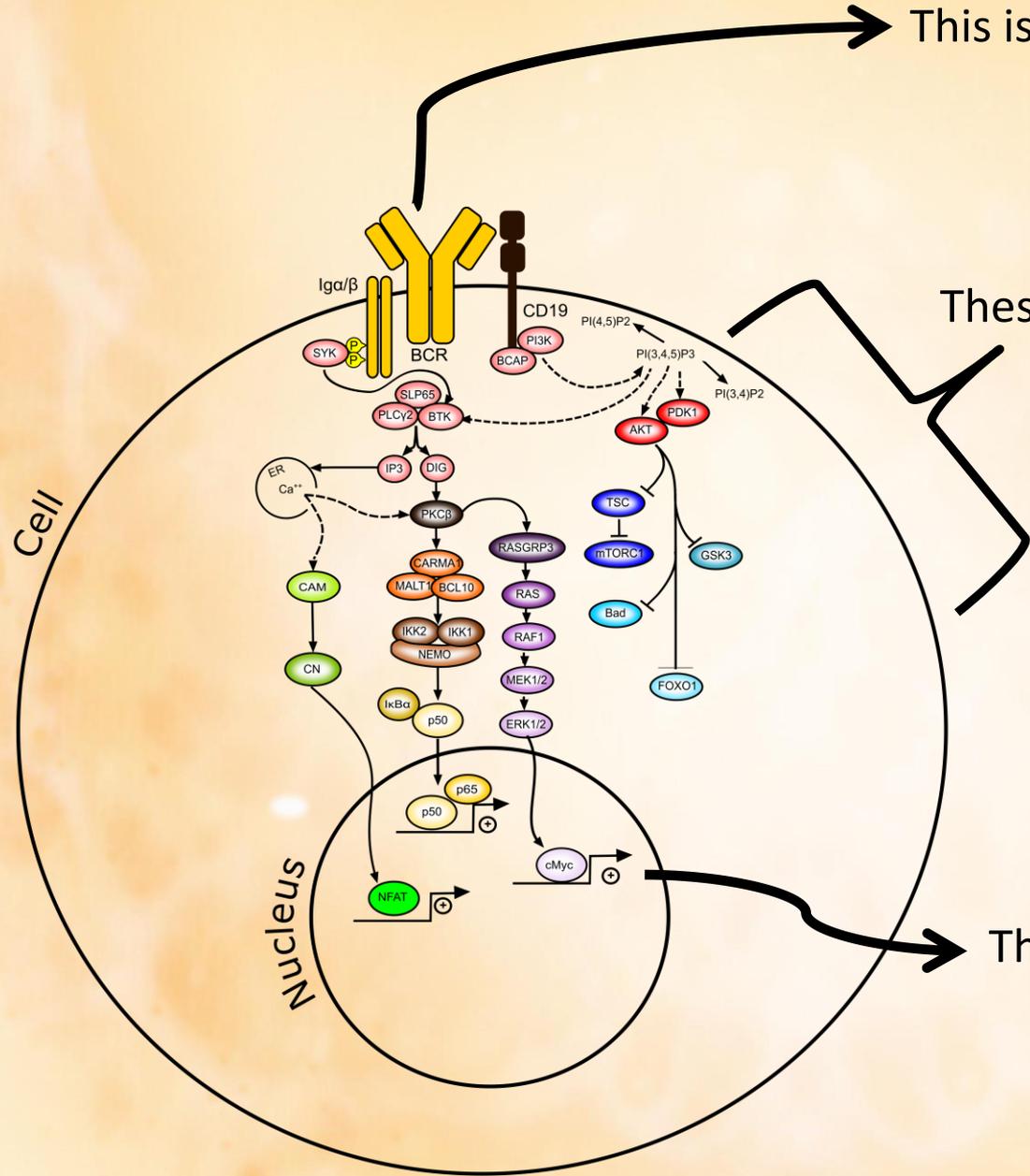
The receptors activate signaling molecules inside the cells. The signaling molecules activate transcription factors in the nucleus. The transcription factors change which part of the DNA is read, which then changes how the cell behaves.

The cell is a little bit similar to a computer. Dependent on which signaling molecules and transcription factors are activated, the cell changes its behavior. Some signaling molecules make the cell divide, some make it stop dividing.

This is the B cell receptor

These are signaling molecules

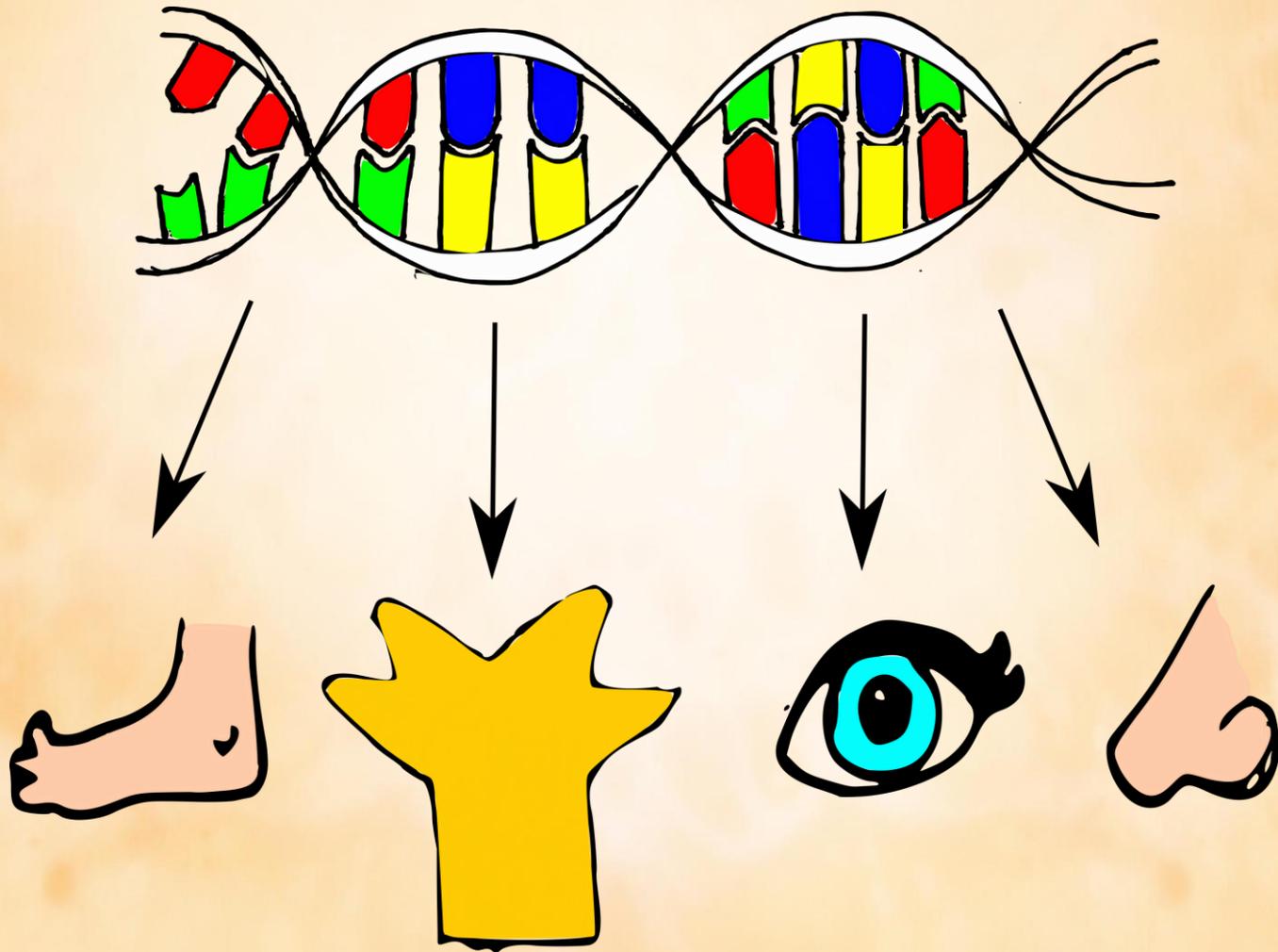
These are transcription factors



Cell

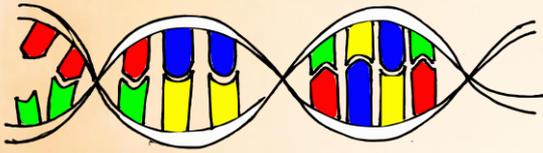
Nucleus

The DNA has all the information a cell needs. It has all information on how to make proteins, which then define how cells, organs and the whole body behave. Transcription factors decide which part of the DNA is read and when. This way the immune cells don't read information they don't need. For example they don't read information on how to make proteins needed for the eyes to see.



Sometimes mutations happen – the DNA is altered by for example UV-light or some chemicals. Mutations often don't change anything. But sometimes they result in a protein that has an altered function.

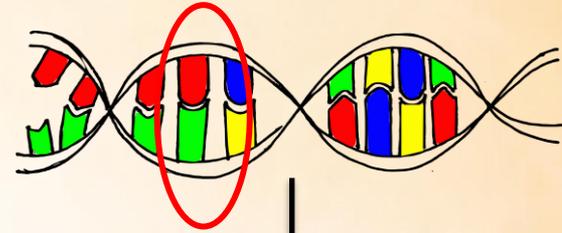
Normal DNA



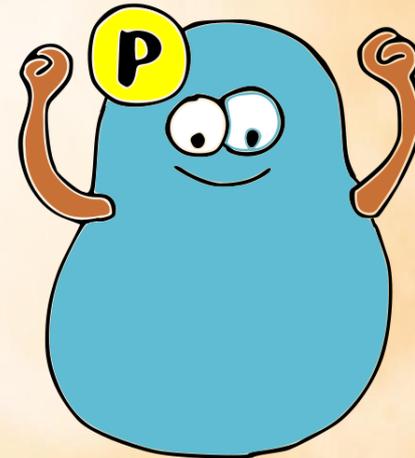
Normal protein



Mutated DNA

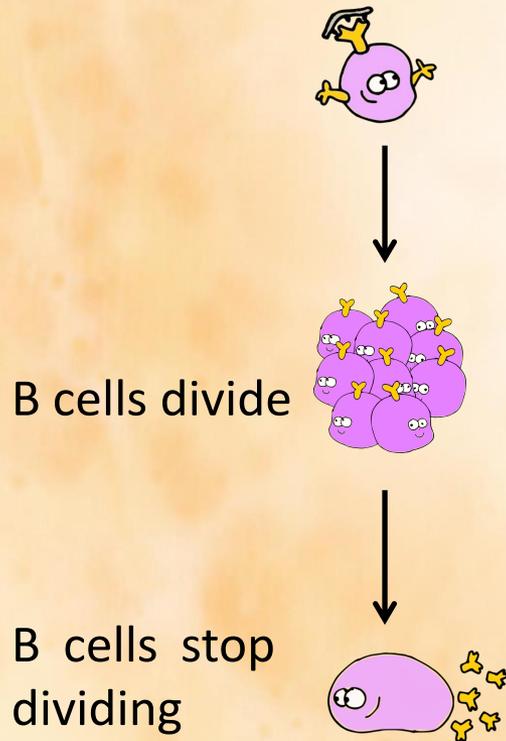


A more active protein



Some changes in how proteins behave don't do anything or kill the cell. But sometimes signaling molecules or transcription factors are changed in a way that results in the cells growing uncontrollably, surviving longer than normal or invading other tissue. This way normal cells become cancer cells.

Normal B cell behavior



Mutant B cells becoming cancer

