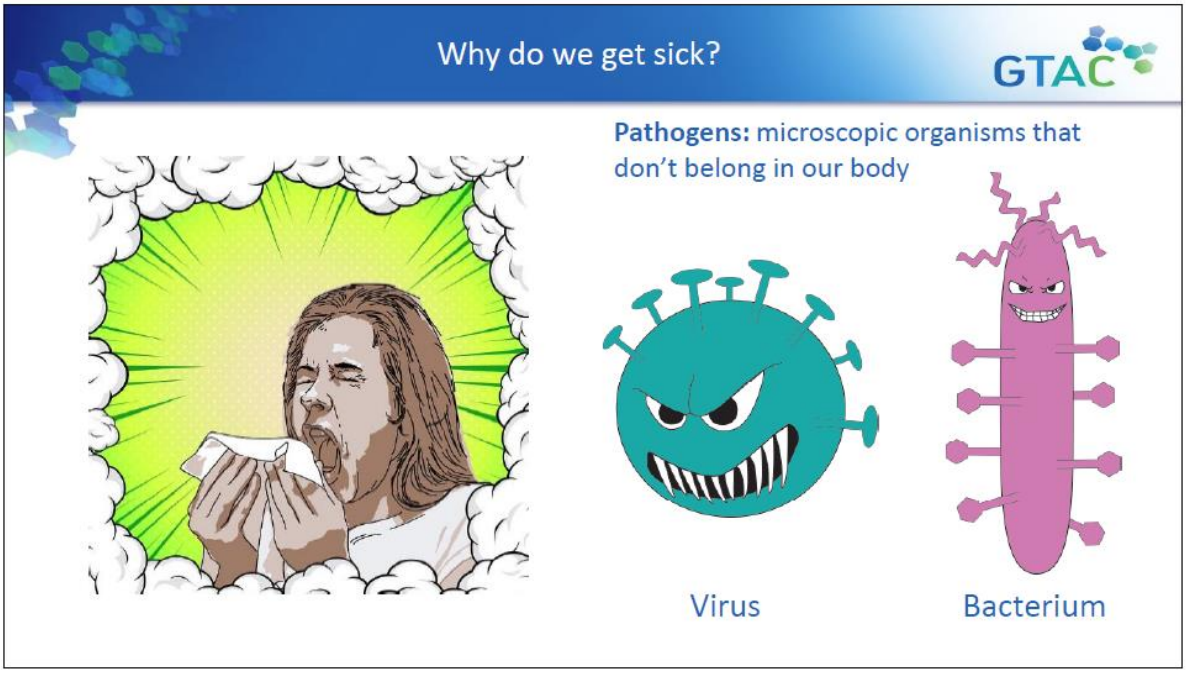
The following is a whole class game/simulation. It is recommended that students work in groups of 6 and each student in each group has a role that will contribute to the class objectives.
If tables have less than six students:

- the role assigned to student 5 can be fulfilled by student 3
- The role assigned to student 6 can be fulfilled by student 4

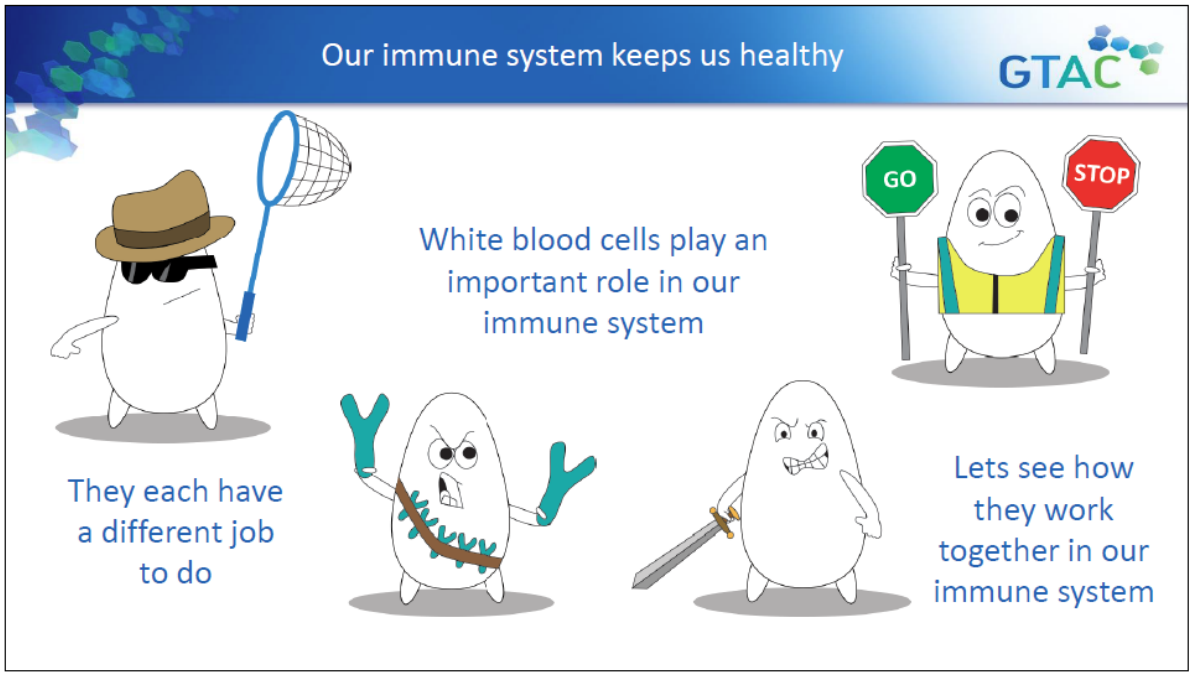
Each student will need their own dice – or if not enough, one dice per group will be enough. Each group will also need a copy of the dendritic puzzle and a set of the cell sheets and copied cell sheets.



Ask the students 'Why do we get sick?' take a few responses and then

–CLICK- to reveal that

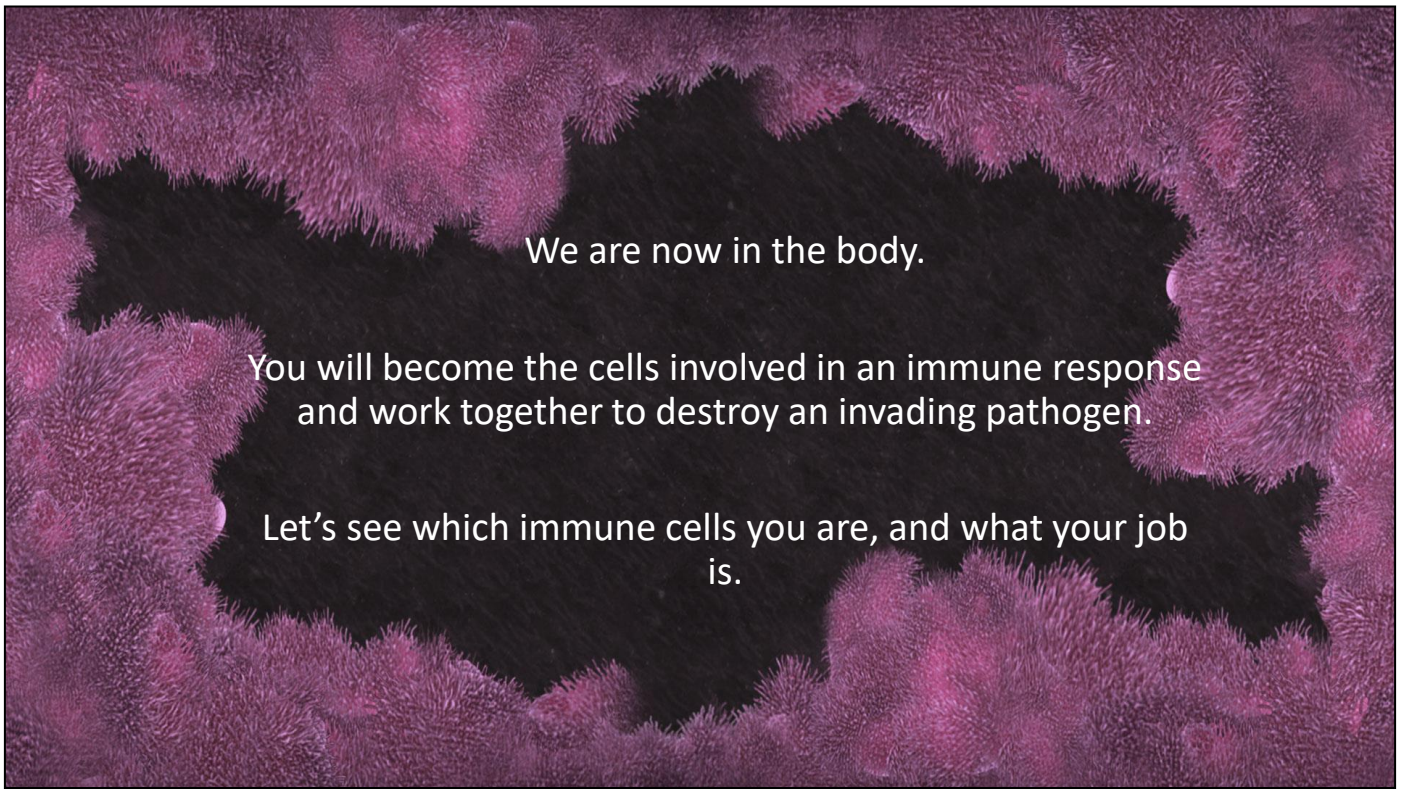
Sometimes it's because you have caught a microscopic organism that doesn't belong in your body. These organisms are known as pathogens and they can cause damage to your cells and organs. They can also cause diseases like COVID-19, whooping cough, or cold or flu.



Our immune system is made up of several different types of white blood cells with different jobs to do. –CLICK-

These white blood cells work together to remove things that don't belong in your body. –CLICK-

We are going to go through the steps involved in an immune response and see how these cells work together to fight off an invading pathogen in the body.



Have the students get into groups of 5-6, give each group a set of the resources required to run this activity

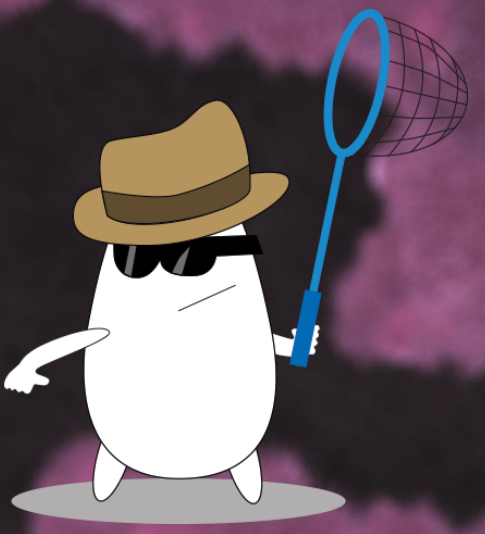
(each group will need: 1x dendritic cell puzzle pre-cut into squares and in an envelope or zip loc bag, 1 x set of cell sheets, 1 x set of copied cell sheets dice – either 1 x per student or 1 x group) instruct students not to touch anything until they have been assigned their role.

Number the students around the table – i.e. left to right Student 1, Student 2, Student 3 etc.

Dendritic Cell – The Spy

Dendritic cells capture pathogens in your body and show them to other cells in your immune system.

Student 1 – you are the Dendritic cell. Take the Dendritic cell puzzle.



Describe the role of Dendritic cells. They are like the spy of the immune system – patrolling around and gathering and sharing information about what they find with other immune cells.

Student 1 is responsible for Dendritic cell actions.

Direct Student 1 to take the Dendritic cell puzzle and keep in in front of them, but not open it yet.

Helper Cells – The Gate Keepers

Helper cells review what was captured.

If they confirm that it doesn't belong in the body, they activate other immune cells.

Student 2 – You control the Helper Cells. Take the Helper cell sheet.

Animation

Describe the role of Helper cells. Helper cells are like the gatekeepers or bouncers of the immune system – they check out things that have been captured to see if they belong in the body or not.

-CLICK-

Student 2 is responsible for Helper cell actions.

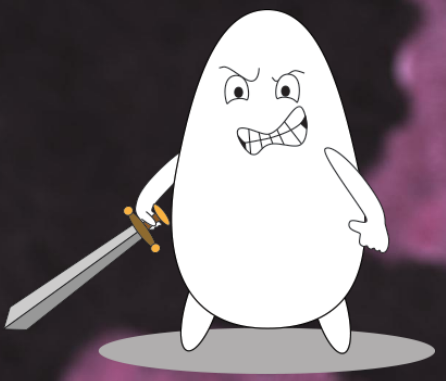
Direct Student 2 to take the Helper cell sheet and place it in front of them.

Killer Cells – The Samurai

Killer cells kill body cells that pathogens are hiding in.

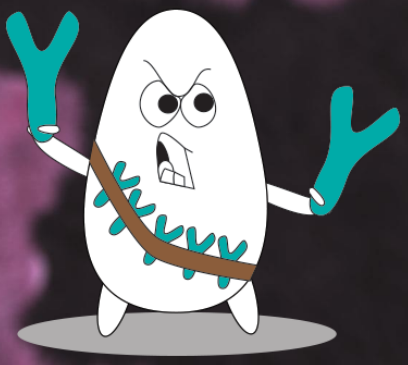
This exposes pathogens and can sometimes stop them multiplying.

Student 3 – You control the Killer cells. Take the Killer cell sheet.



Animation
Describe the role of Killer cells. Sometimes pathogens get inside our cells instead of just moving around the body, and this hides them from the rest of the immune system so they can't be removed/destroyed. They are essentially camouflaged inside one of our own cells. Killer cells kill our own body cells that have a pathogen hiding out in them.
-CLICK-
Student 3 is responsible for Killer cell actions.
Direct Student 3 to take the Killer cell sheet and place it in front of them.

B Cells – The Ninjas



B cells make molecules called antibodies.

Antibodies stick to pathogens so that they are flagged to be destroyed.

Student 4 – You control the B cells. Take the B cell sheet.

Animation

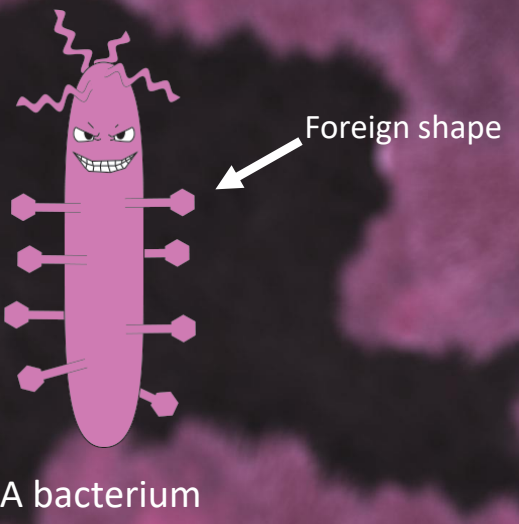
Describe the role of B cells. Ninjas throw out ninja stars, but B cells throw out antibodies . Antibodies are Y shaped proteins that stick to and stop pathogens moving about so the rest of our immune system can come along and get rid of them

-CLICK-

Student 4 is responsible for B cell actions.
Direct Student 4 to take the B cell sheet and place it in front of them.
Note that students 5 and 6 will get roles later on.

Your immune system sees molecules and things as shapes.

If a shape doesn't belong in your body, your immune system will attack it.



A bacterium

Your immune system is able to recognise different shapes. Screening and recognising these shapes as either belonging to you or not is very important to your body's ability to create an immune response and fight off an invading pathogen.

What if an immune cell recognises a shape that belongs to you?

Luckily your immune cells are screened. Any cells that recognise shapes belonging to you are removed.

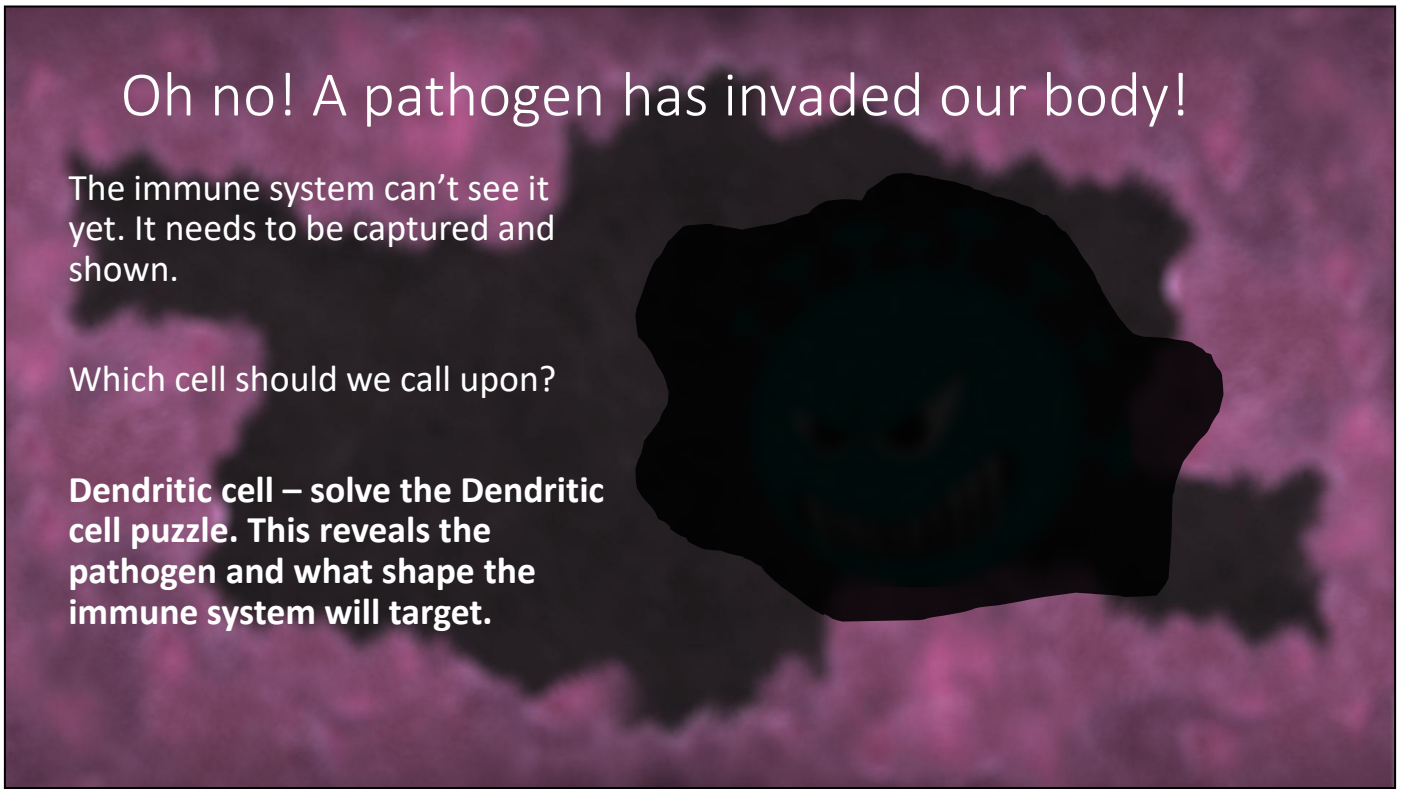
Helper cell, Killer cell and B cell students – Screen your cell sheet and cross out any cells that recognise the two shapes on the right.

Shapes belonging to our body

Direct student attention to the shapes on the right of the slide.

-CLICK-

Students 2, 3 and 4 will need to search through their cell sheets and see if any of the shapes belong to the body (the crescent and T shape on this slide). There will be one cell for each of the two shapes. When they find the two cells, they need to cross them out to remove them from the body. Congratulations you have just removed cells that could have potentially contributed to an immune response against something that belonged to our body instead of a foreign pathogen that does not belong.



Ask the students which cell should we call upon?

-CLICK-

Direct Student 1 to take the Dendritic cell puzzle and empty the pieces onto the table. They need to solve the picture puzzle to model the revealing of the pathogen. This is done in each student group. When all groups have solved the puzzle, go to the next slide. Only the dendritic cell should be the one to touch the pieces – the other cells/students on the table can offer verbal help only.

Once all groups have solved the puzzle click to the next slide.

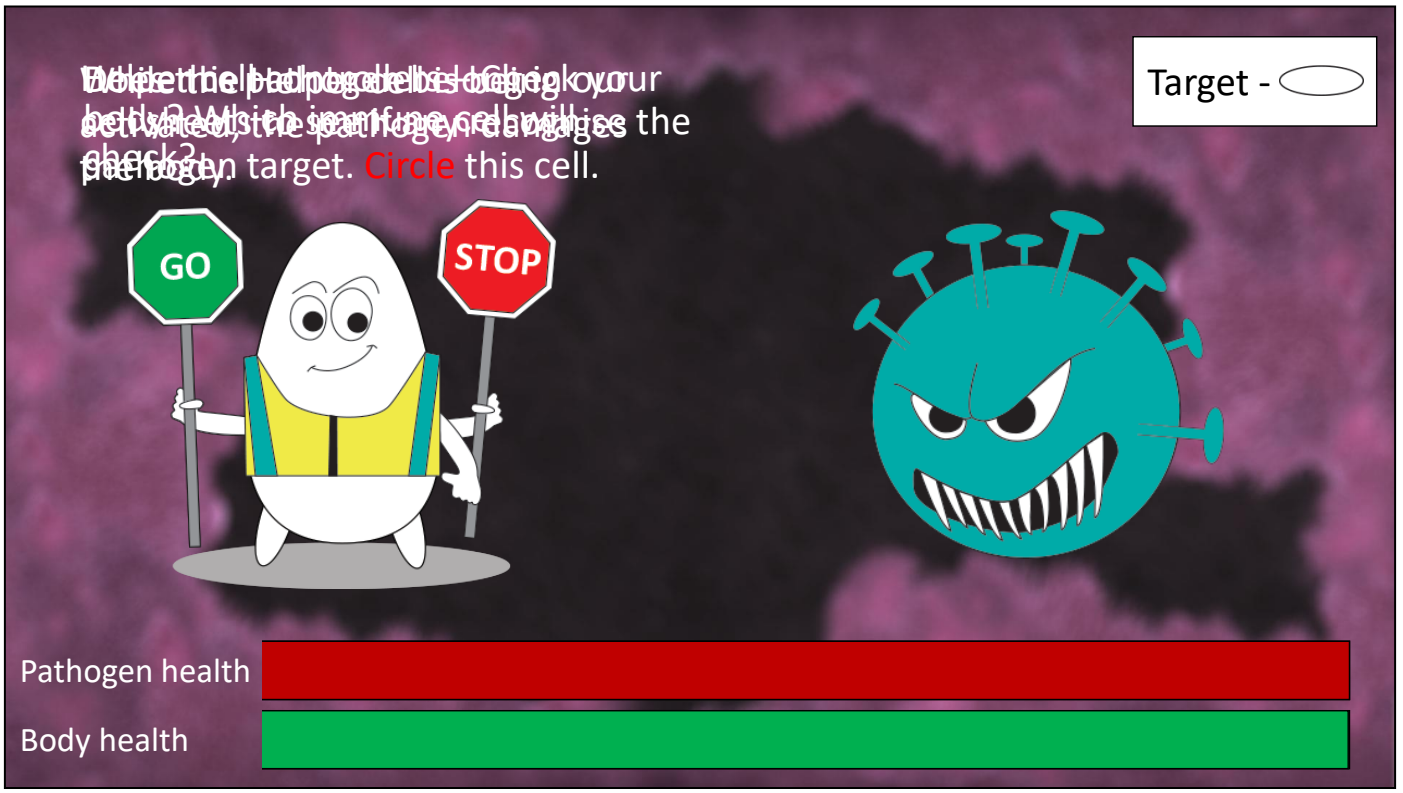
The pathogen is revealed.

-CLICK-

It is now a race: we need to destroy the pathogen before the health of the body is down to 0.

-CLICK-

Because the pathogen has been revealed, we can now see the foreign shape on the pathogen that the immune system will target.



Ask students to identify the cell that will confirm that the pathogen doesn't belong (Helper cell).

-CLICK-

Direct Helper cell students to check their cell sheet to see if any recognise the pathogen target

-CLICK-

They have a cell that recognises the target and this Helper cell is activated – have them circle this cell

-CLICK-

While the Helper cell is activated, the virus does damage

-CLICK-

Animation of the damage being done

The pathogen hides inside one of our own body cells – the immune system can't reach it to destroy it!

-CLICK-

Animation

-CLICK-

Ask which immune cell is needed to reveal it? (killer cell)

-CLICK-

Direct Killer cell students to check their cell sheet to see if one recognises the pathogen target – circle this cell

-CLICK-

Ask them to check whether the Killer cell recognises the same target as the Helper cell from before (physically compare sheets to confirm). When they see the target shape is the same – have students place a tick next to the matching cells

-CLICK-

The Killer cell copies itself. Direct Student 5 to take the copied Killer cell sheet. Ask them to compare the shape the copied killer cells recognise with the original Killer cell (circled). It's a match because they are identical.

-CLICK-

Student 3 and student 5 now control the Killer cell copies.

Killer cells kill our own body cells to expose the pathogen.

-CLICK-

Direct Students 3 and 5 to roll a die each or one per group and add the total together (if using one die per student).

-CLICK-

Have the students add the total number for each group together for the total room damage and enter this number into the box on screen. You can do this as the presentation is running. Click the Attack button.

Animation

-CLICK-

Body takes damage

-CLICK-

Animation

-CLICK-

Students 3 and 5 roll again, add the room total and enter it into the text box. Click Attack button.

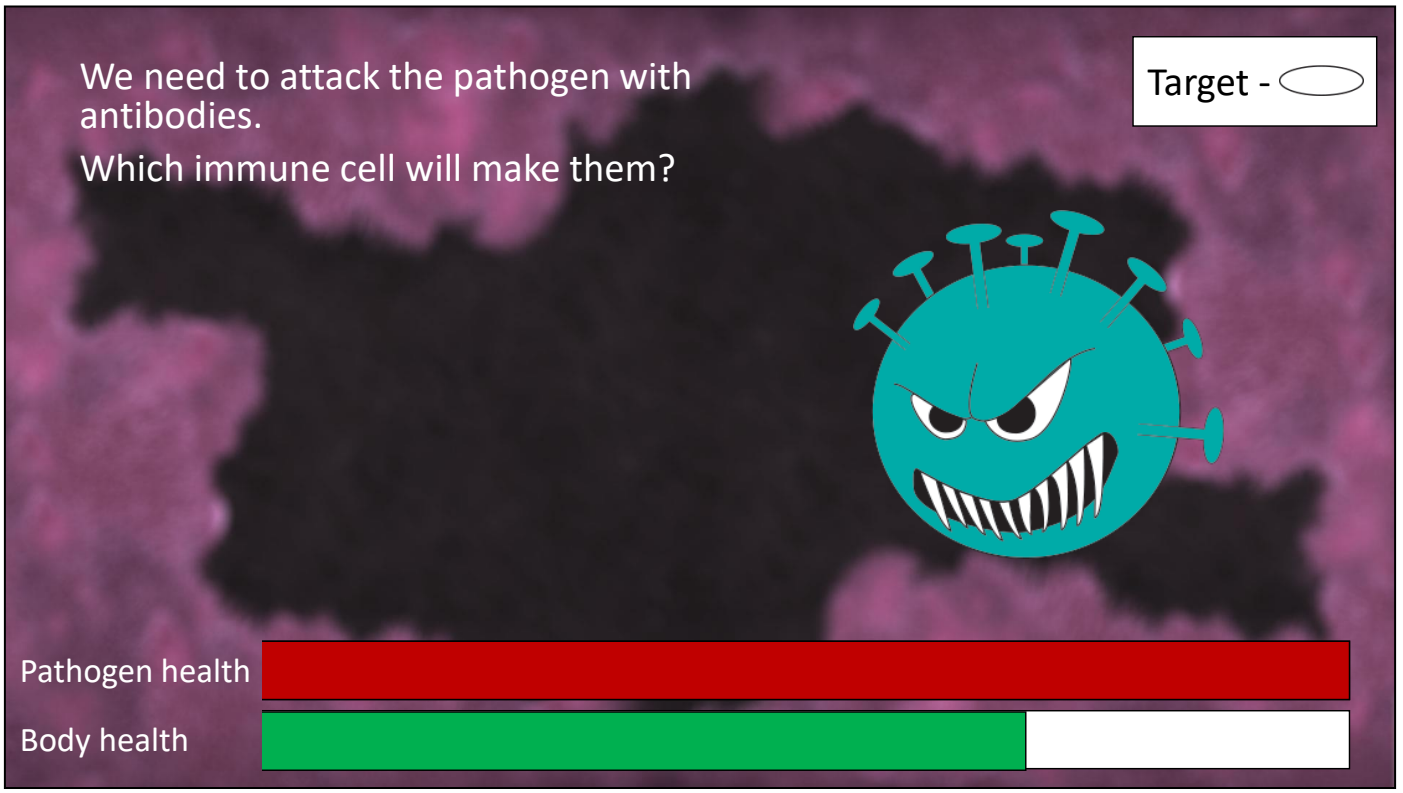
Animation

-CLICK-

Body takes damage

-CLICK-

But the pathogen is exposed



Ask the students the questions on screen. Remember B cells were the ninjas!

Animation

Direct B cell students to check their cell sheet to see if one recognises the pathogen target – have them circle this cell.

-CLICK-

Ask them to check whether the B cell recognises the same target as the Helper cell from before (physically compare sheets to confirm). Yes so place ticks next to these cells

-CLICK-

The B cell copies itself. Direct Student 6 to take the copied B cell sheet. Ask them to compare the shape it recognises with the original B cell. It's a match because they are identical.

-CLICK-

Student 4 and student 6 are now controlling the B cell copies.

We can now attack the pathogen

-CLICK-

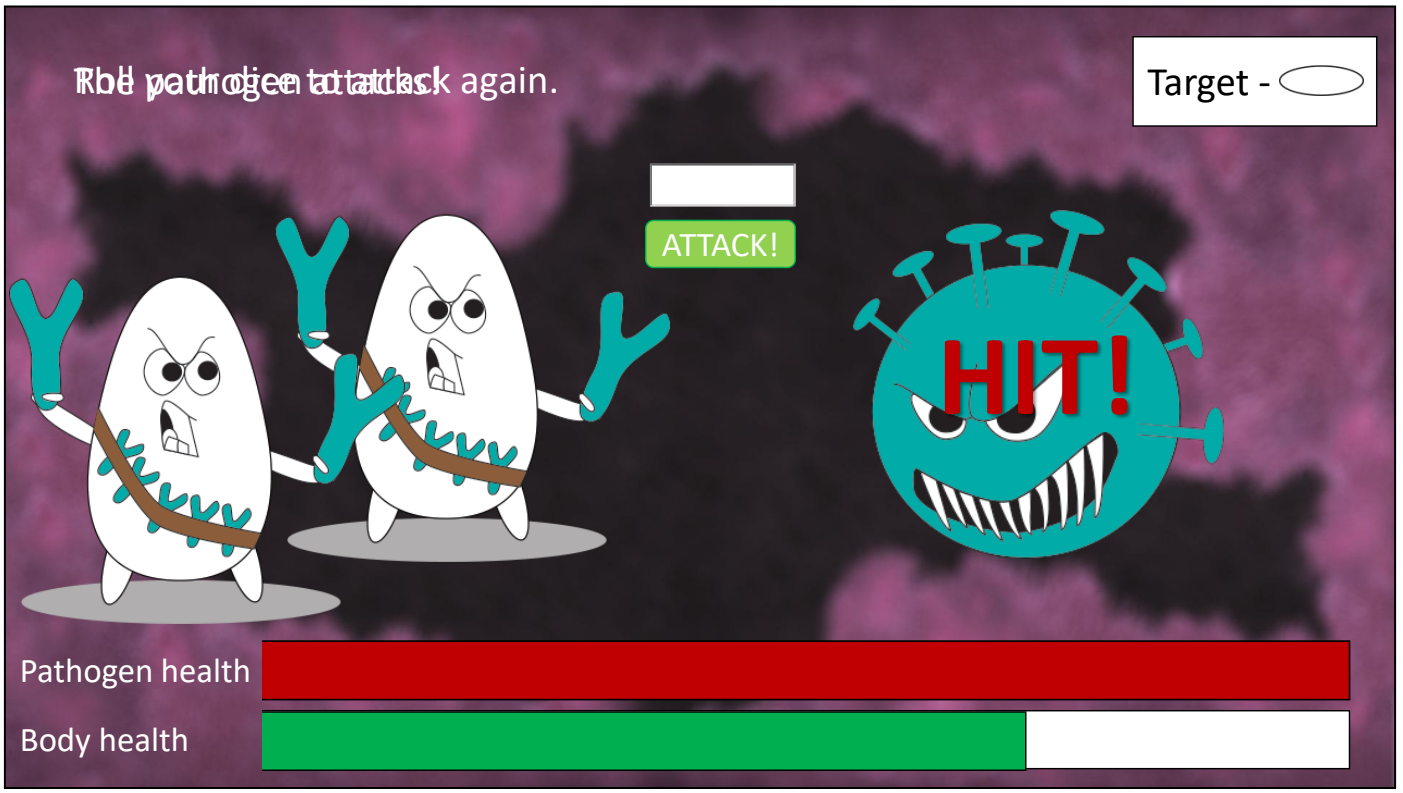
B cells release antibodies that will result in damage being done to the pathogen.

-CLICK-

Direct Students 4 and 6 to roll a dice each (or one per group) and add the total.

-CLICK-

Add the total for each group together for the room total damage and enter this number into the box on screen. You can do this as the presentation is running. Click the Attack button.



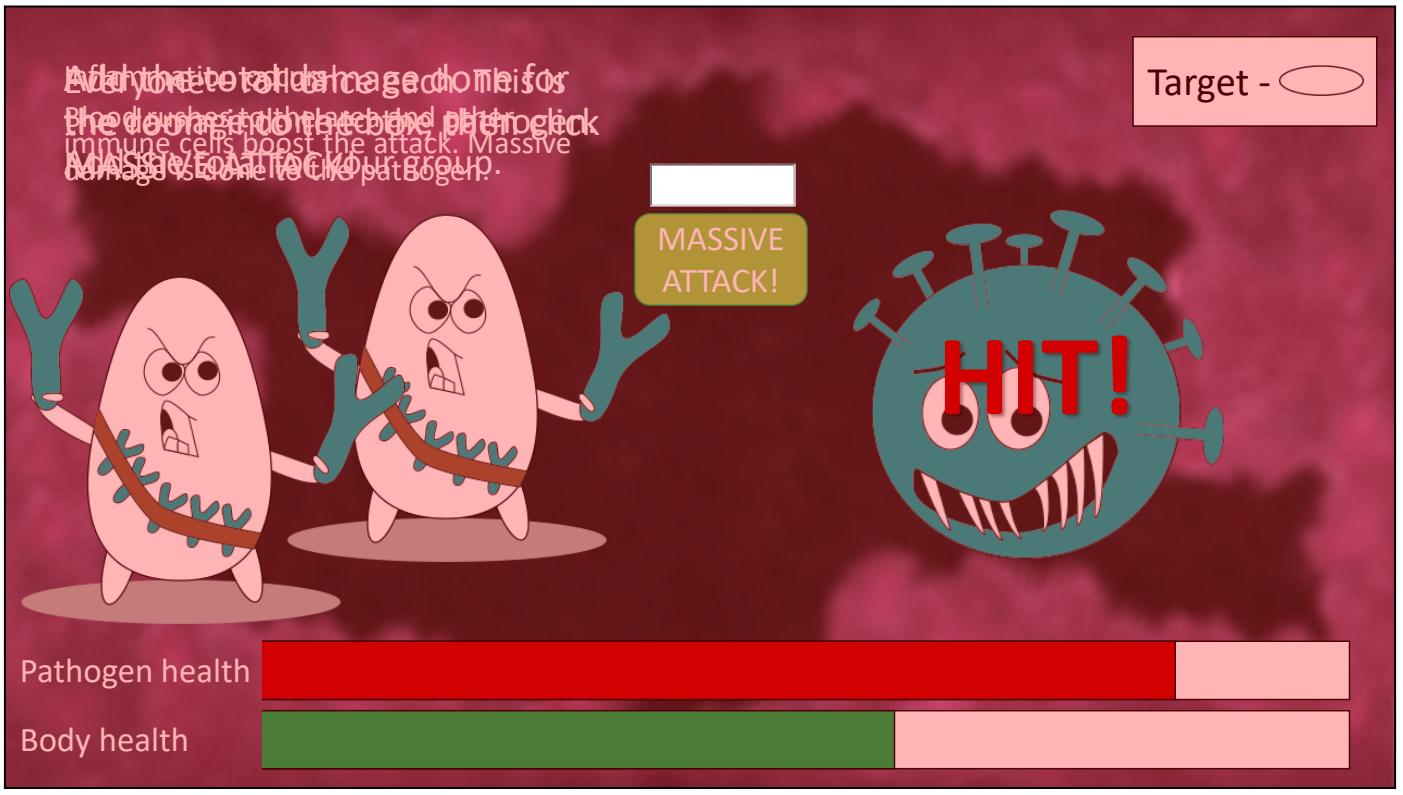
Animation.

-CLICK-

The pathogen attacks. Body health is lost.

-CLICK-

Students 4 and 6 roll again to attack. Add the total for the room and enter into the text box. Click Attack.



Animation

-CLICK-

Inflammation occurs

-CLICK-

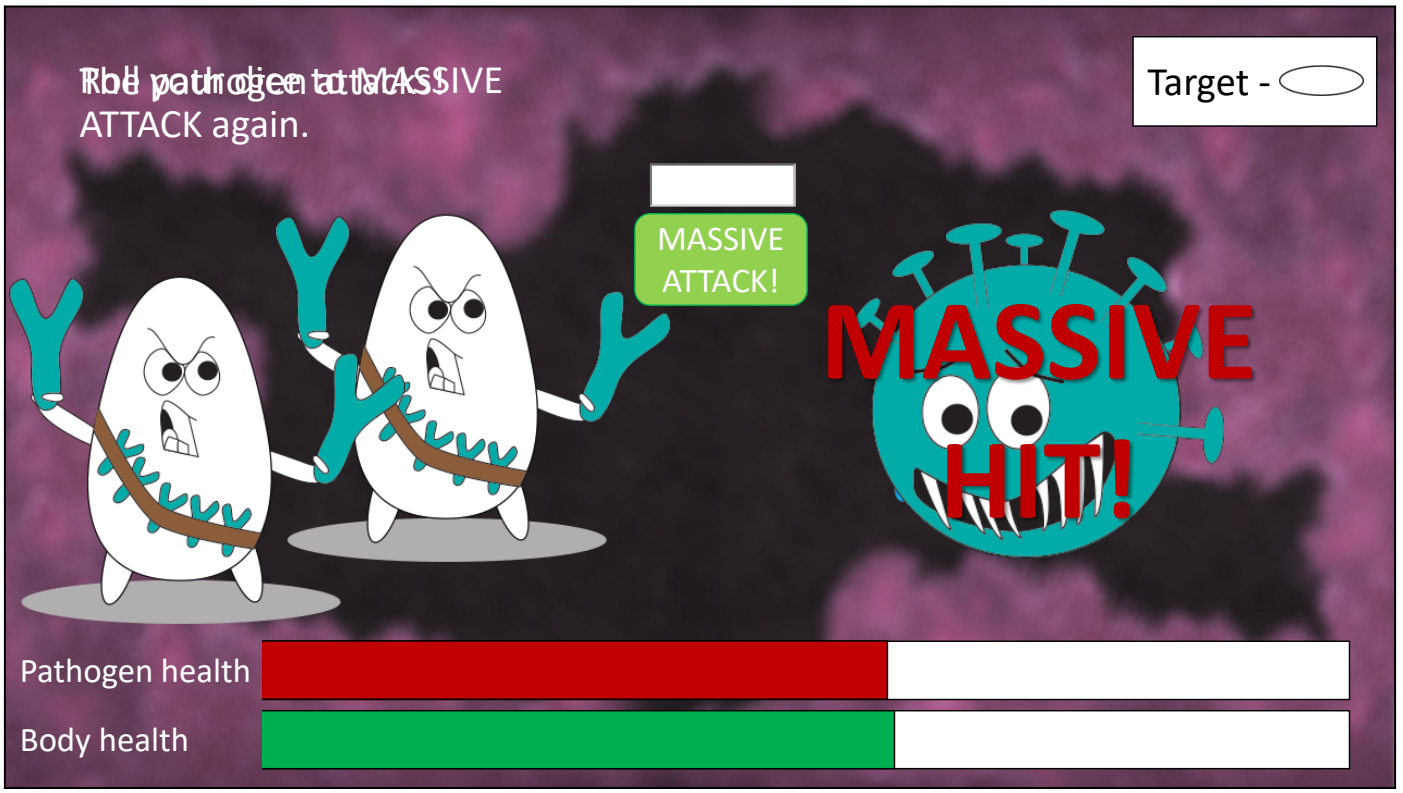
Animation. Other immune cells rush to the area and increase damage done to pathogen.

-CLICK-

Every student on the table now rolls a die, add the total for the table.

CLICK-

Add the total for the room. Enter into the text box then click Massive Attack button.



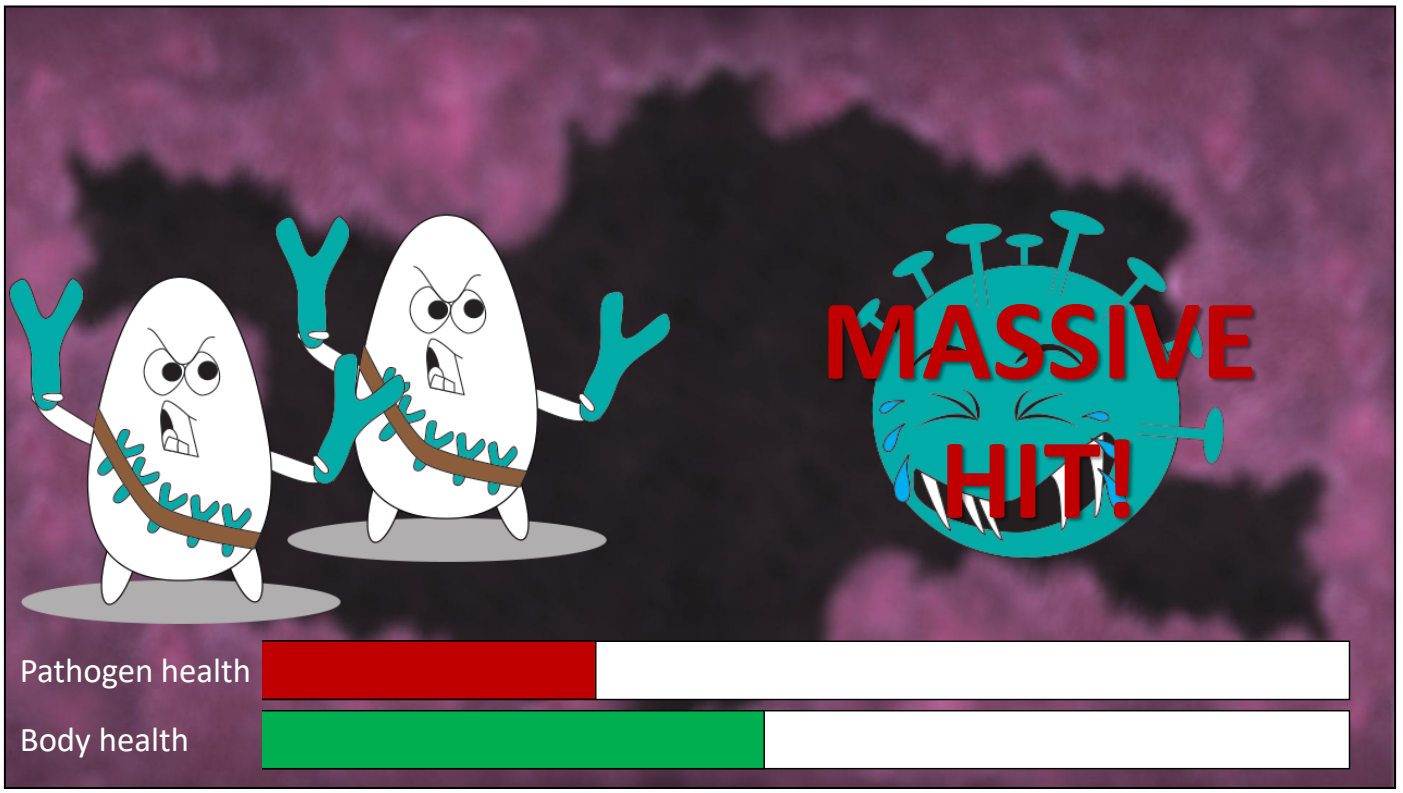
Animation

-CLICK-

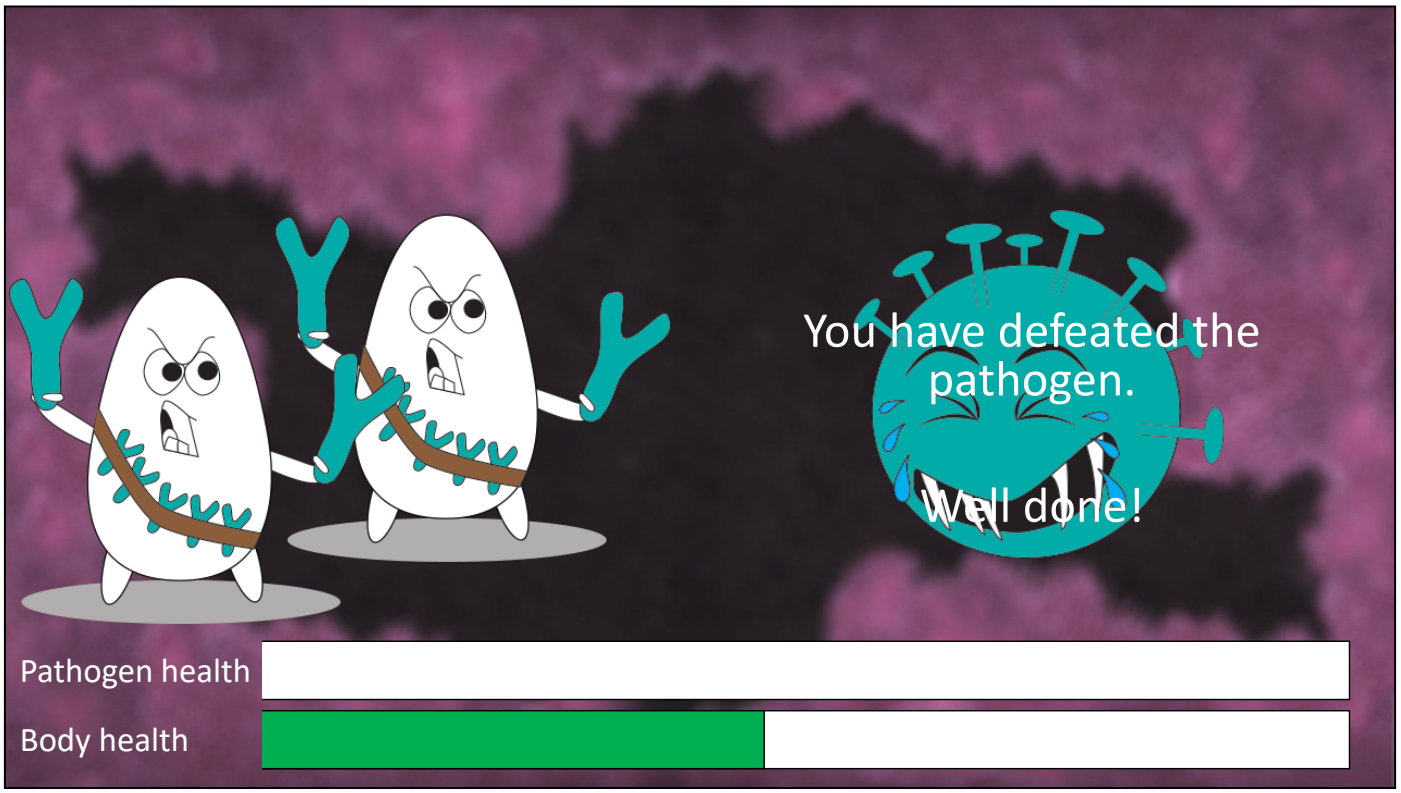
The pathogen attacks

-CLICK-

Everyone rolls again, add totals for the tables then the room, enter number into text box and click Massive Attack button.



Animation



Animation

The pathogen has been defeated, well done! Let the fanfare play

Credits

- Tech Live by Kevin MacLeod

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- Blown Away - No Percussion by Kevin MacLeod

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- Blown Away by Kevin MacLeod

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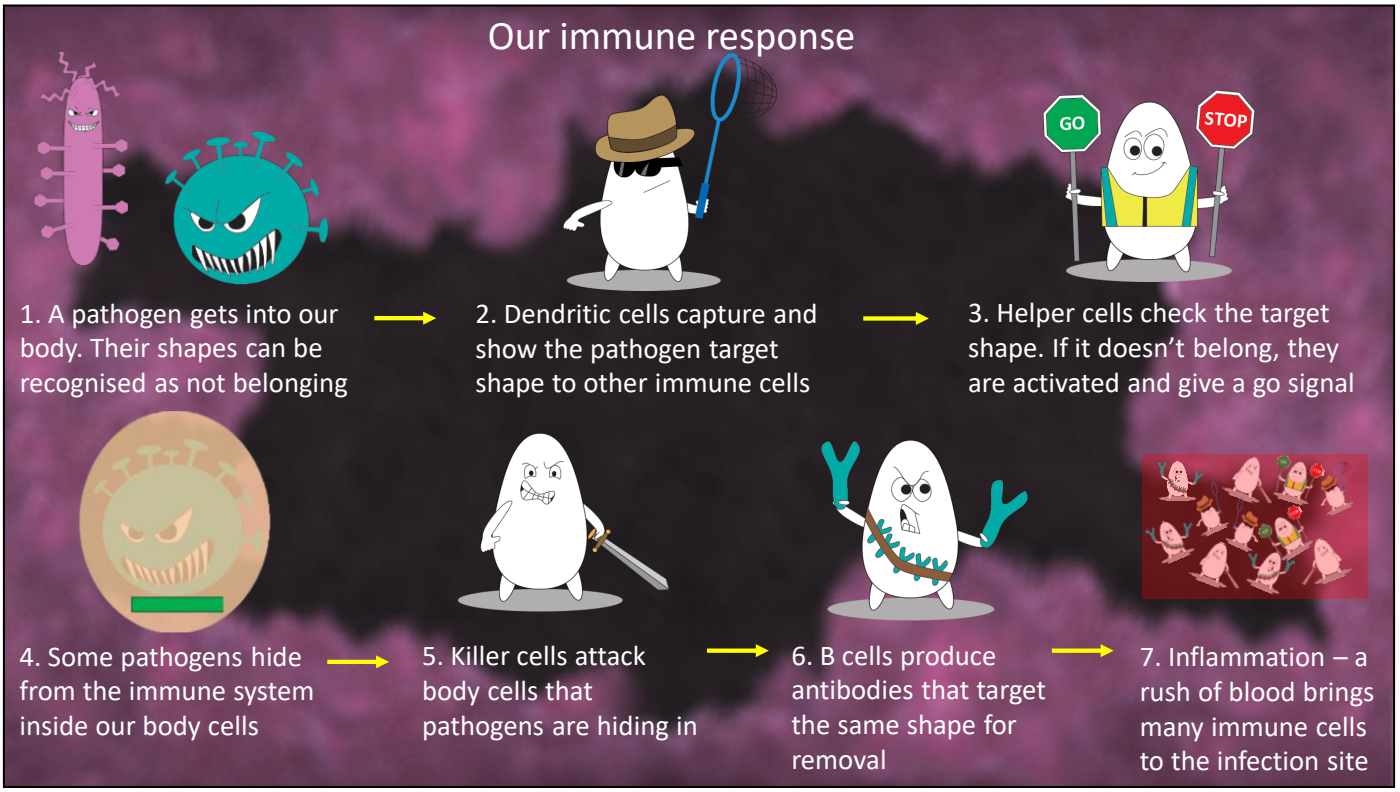

Go through the steps involved in an immune response as a overview/recap of the whole process.