The Immune Response – Descriptive Transcript

Time	Audio	Visual
0:00-0:05	B cells and T cells have different functions	"B cells and T cells"
0:06-0:18	B cells respond to free antigens, or those on the surface of organisms that circulate outside and between cells of the body. This includes most types of bacteria	A B cell is shown inside the body, with viruses and bacteria moving around
0:19-0:38	However, they cannot recognise antigens located inside cells, such as viral proteins or certain bacteria, such as meningococci and mycobacteria, which have adapted to live within cells and therefore make detection by the immune system more difficult	A large cell is shown, with a virus, a mycobacterium, and a meningococcus, inside. Each antigen turns white as they are named. B cells are passing through the body past the cell
0:40-0:42	B cells manufacture antibody	A large plasma cell is shown with rod-shaped antigens inside, each with antibodies attached. The cell is pumping out antibody molecules
0:43-0:51	However, most antigens do not stimulate B cells to produce antibody without the help of T cells	A T cell appears next to the large cell
0:51-0:56	The response to these antigens is therefore referred to as "T cell dependent"	
0:58-1:07	Unlike B cells, T cells can recognise intracellular antigens, provided they are expressed on the cell surface	The large cell with virus, mycobacterium, and meningococcus appears, with B cells passing by in the background. A T cell appears next to the cell
1:08-1:16	T cells do not manufacture antibodies, but they do secrete cytokines, which influence other cells	Cytokines secrete from the T cell into the body
1:18-1:22	The humoral, or antibody, response	"The Humoral Response"
1:23-1:30	B cells circulate with a molecule of a 3-dimensional protein, called antibody, on their surface	A B cells appears with an antibody attached
1:30-1:47	The antibodies, also known as immunoglobulins, have antigen-binding sites where the protein molecules are folded in such a way as to form a 3-dimensional cleft into which, only antigens of a corresponding shape can bind	The tips of the antibody are labelled "antigen binding sites"
1:48-1:52	There is also a binding site for macrophages and neutrophils	

1:55-2:01	When one of the antibody molecules has a surface receptor with exactly the right shape to recognise the antigen	The B cell and antibody appears next to a yellow virus which has many different-shaped surface receptors, one of which fits perfectly into the antibody
2:01-2:05	It binds to it like a lock and key	The antibody connects to the surface receptor, turning it from yellow to white
2:10-2:23	The B cells then enlarge considerably to become large plasma cells, which are antibody-manufacturing cells, capable of producing up to 100,000 antibody molecules a minute	The B cell grows to become a large plasma cell, and begins to pump out snowflake-shaped antibody molecules
2:24-2:35	The antibody molecules they produce have receptors with the same shape, that recognise the antigen in the first place. This is known as the humeral response	
2:37-2:46	The first time an infection or vaccine antigen is encountered, the antibody produced is called immunoglobulin M, or IgM	Antibody molecule labelled "Immunoglobulin M (IgM)"
2:48-2:58	IgM circulates as five molecules bound together, with a total of ten binding sites for rapid and effective binding to antigen	
3:00-3:13	When an antigen binds to an antibody, there can be three outcomes. Firstly, if the antigen is a toxin or a protein, it can be immobilised and effectively neutralised	A yellow antigen binds to a B cell by the antigen binding site and it turns grey
3:13-3:21	Or, a macrophage or neutrophil can attach and engulf the antigen-antibody complex	A macrophage engulfs a virus and the virus disappears
3:22-3:27	In addition to this, the antigen-antibody complex may activate the complement system	A B cell attached at a virus
3:28-3:35	The complement system is a cascade of proteins, some of which are capable of destroying the pathogens	Balls of protein surround the virus and the virus disappears
3:36-3:40	Cell mediated immunity	"Cell mediated immunity"
3:41-3:55	When cells contain intracellular antigens, a bit of the antigen is carried to the cell surface using molecules that are part of the major histocompatibility complex, or MHC	A large cell with antigens inside in a body with T cells passing by, a section of one antigen, labelled MHC, breaks off and moves towards the surface of the cell
3:56-4:02	T cells can recognise a combination of the MHC molecule, and the antigen	A T cell attaches to the MHC-antigen complex

4:03-4:19	When the T cell binds to the MHC-antigen complex, the activated cells enlarge, multiply, and secrete cytokines and other toxic molecules, which can then affect many immune system cells nearby	The large cell and MHC disappears, and the T cell enlarges and pumps out T cells and cytokines
4:20-4:29	There are various types of T cell. Among these, are those that can destroy an infected cell, known as cytotoxic T cells	A large cell with antigens inside in a body with T cells passing by, one T cell enters the cell and shrinks it
4:30-4:37	Another sort, known as helper T cells, can help and stimulate B cells to produce antibody	A T cell is next to a large B cell, which is pumping out antibody molecules
4:39-4:53	When an antigen binds to the antibody receptor on a B cell, a bit of the antigen is also taken up into the cell and is then presented to the B cell surface by an MHC molecule	A B cell with an antibody next to an MHC-antigen complex
4:54-5:04	This MHC-antigen complex is recognised by a T cell, usually a T helper cell, which secretes cytokines	A T cell attaches to the MHC-antigen complex and secretes cytokines
5:05-5:12	In this case, the cytokines assist the B cells to proliferate, to form identical cells, producing the same antibody	The B cell and antibody multiply