Welcome to this lesson on immunotherapy. Today, we will be discussing how immunotherapy can be used in the treatment of various different types of diseases. So the main concept of immunotherapy is to use the body's own immune mechanisms and manipulate those as treatments for diseases. So immunotherapy uses two common processes called monoclonal antibodies and cytokines.

So we're going to define what each of these are and how they're used in immunotherapy to treat diseases. So we're going to start with cytokines and define what those are and how they're used. So cytokines are something that will activate B cells and T cells within the body, and they're oftentimes used to treat different types of cancers.

So interferons are a type of cytokine that virus-infected cells release. So when a cell has been infected by a virus, it will release these interferons into the body. So the normal cells will respond to the release of these interferons by producing a substance that won't allow the virus to multiply.

So it's kind of like a protection to the body by not allowing that virus to multiply any further. So the cell that's been infected by the virus produces these interferons, and then normal cells respond to those interferons by not allowing the virus to multiply. It inhibits the replication of that virus. So these are used commonly in the treatment of hepatitis C and multiple sclerosis.

Monoclonal antibodies are the other example, or the other way that immunotherapy is used. So monoclonal antibodies are antibodies that are made in a lab by cells that have been cloned from a single plasma cell or B cell. And oftentimes they're produced using bacteria. They used to actually commonly be produced using lab mice. But more often nowadays, they use bacteria to produce these monoclonal antibodies.

And actually kind of an interesting fact is that some plants can be used to produce these antibodies as well. So these monoclonal antibodies, another fact about them is that they can recognize and bind to specific antigens. So they're used commonly in home pregnancy tests. That's one example of a way that they're used, because they can detect very, very small amounts of chemicals, or bacteria cells, or other antibodies within the body. So they actually have a lot of common uses.

Another example of a way that monoclonal antibodies are used is with a certain type of breast cancer. So Herceptin is a drug that's used against this type of breast cancer. So Herceptin is a monoclonal antibody that will bind to the HER2 proteins on breast cancer cells. And then by binding to those proteins, it elicits a response from natural killer cells which are a part of your immune

system, which will then attack those cancer cells.

So it can be a very useful drug in helping with that breast cancer. But on the flip side of that, there's kind of a negative side, because some normal cells in your body, normal healthy regular cells also contain that HER2 protein. So by using this drug for that breast cancer, it will also infect or attack some of your normal healthy body cells as well.

So right now we're going to take a look at how monoclonal antibodies are produced in the lab. So as I mentioned, nowadays more commonly bacteria are used to produce these monoclonal antibodies, but we're going to use a mouse here for an example. So what will happen is that bacteria, or in this example the mouse, is injected with an antigen. So you can see here it's being injected with this antigen.

From there what will happen is that mouse will produce antibodies against that antigen. So as the mouse's natural immune response, it's going to produce antibodies against that antigen in the same way that your body produces antibodies against an antigen when you get a vaccine for the flu virus, for example. So it's going to produce antibodies against that antigen.

And then those antibody-forming cells will be isolated from the mouse. And then this here is a tumor cell. So that antibody-forming cell is going to be combined with that tumor cell to form this type of hybrid. So the antibody-forming cell and the tumor cell are combined to form a hybrid, which will then produce desired antibodies. So these antibodies will be produced for this tumor cell in this hybrid.

And then clones will be made of that hybrid. And then those antibodies will be isolated. So the antibodies that are produced on that hybrid will then be isolated, and these are what our monoclonal antibodies are. So we now have these monoclonal antibodies against this specific type of tumor cell.

So this lesson has been an overview on monoclonal antibodies and cytokines and how they are used as a form of immunotherapy.