
HOW OUR IMMUNE SYSTEM FUNCTIONS

ACTIVITY SHEET



INTRODUCTION

THIS IS ONE OF TWO ACTIVITIES THAT CAN BE USED WITH THE ANIMATIONS IMMUNECRAFT, LOOP, AND BATTLE OF BLISTER. IN EACH CASE RESEARCHERS ARE WORKING TO UNDERSTAND MORE ABOUT HOW OUR BODIES RESPOND TO INFECTION AND HOW TO FIGHT AUTOIMMUNE DISEASES SUCH AS RHEUMATOID ARTHRITIS WHERE THE BODY'S IMMUNE SYSTEM TURNS ON ITSELF.

AIMS

- TO BECOME FAMILIAR WITH THE CELL TYPES THAT ARE IMPORTANT IN THE IMMUNE SYSTEM
- TO APPLY KNOWLEDGE OF THE IMMUNE RESPONSE TO EXPLAIN WHAT IS HAPPENING AT A CELLULAR LEVEL AS THE BODY IS INVADED AND COUNTERS WITH AN ATTACK OF ITS OWN

MATERIALS

DOWNLOAD THE SET OF CARDS DEVELOPED BY MANCHESTER UNIVERSITY IMMUNOLOGY GROUP:

<http://www.mig.ls.manchester.ac.uk/documents/toptrumps.pdf>



STARTER

ASK THE FOLLOWING QUESTION AND RECORD THE ANSWERS.

"How many parts of the immune system can you name?"

A GREAT VISUAL RESOURCE CAN BE FOUND HERE:

<http://www.livescience.com/38028-how-the-human-body-s-immune-system-works-infographic.html>



METHOD

THESE CAN BE USED WITH TO PLAY CELL TOP TRUMPS USING THE INSTRUCTIONS IN THE DOWNLOAD.

The cards can also be used to reinforce students' knowledge of cell types, the chronology of the immune response and where things happen in the body.

For example, give students one of these case studies and ask them to use as many cards as possible to explain the infection scenario.

CASE 1

You get a splinter in your finger. You pull it out, but later that evening your finger becomes swollen and red. A few days later the entire hand is swollen, the pain is intense and you develop a fever. What is going on?

CASE 2

As a child you received an emergency injection of antivenom to treat a snake bite. The drug was horse serum with antibiotics. The doctor told you that this procedure could never be repeated or boosted. Why?

CASE 3

Your grandmother had a flu vaccination in November but a month later at Christmas came down with the flu. What happened?

CASE 4

You are fed up with getting colds every winter and ask the doctor for antibiotics or a vaccine but are told no you can't have either. Why?

DISCUSSION

WHAT ARE SOME WAYS THAT INFECTIOUS DISEASES ARE TRANSMITTED FROM ONE PERSON TO ANOTHER?

- Droplets in the air (e.g. cold, flu, tuberculosis)
- Via food or water (e.g. Salmonella, food poisoning)
- Via mosquitoes, ticks (e.g. malaria, West Nile virus, Denge fever)
- Physical contact (e.g. conjunctivitis, herpes, chickenpox, sexually transmitted diseases)

You can catch an infectious disease due to a virus by getting it on your hands and then touching your mouth or eyes or eating food you have touched with unwashed hands.

The AIDS virus is not spread like this but can be transmitted from one person to another in other ways such as by having vaginal or anal intercourse with a person who is infected with HIV, by sharing needles with someone who is infected with HIV, from an infected mother to her baby during pregnancy, birth or nursing or from a blood transfusion with contaminated blood.

WHAT ARE SOME WAYS YOU CAN PREVENT THE SPREAD OF AN INFECTIOUS DISEASE?

- Avoid close contact with people who are infected
- Use tissues if you have a cold or flu and throw them away
- Wash hands especially before eating, after using toilet, or after contact with someone who has an infection
- Don't touch other people's blood or body fluids (e.g. soiled tissues from someone who has a cold)
- Don't share toothbrushes, eating utensils etc
- Eat nutritious food to keep the body healthy

HOW MIGHT THE SPREAD OF AIRBORNE DISEASES DIFFER FROM THE SPREAD OF DISEASES THAT DEPEND ON PERSON-TO-PERSON CONTACT?

Airborne diseases can be spread to multiple people at the same time and can be spread to people who are nearby but not in direct contact.

IN ADDITION TO EXPOSURE TO GERMS (BACTERIA OR VIRUSES), WHAT OTHER FACTORS INFLUENCE YOUR RISK OF GETTING AN INFECTIOUS DISEASE? WHAT DEFENCES DOES YOUR BODY HAVE THAT CAN PREVENT YOU FROM GETTING SICK, EVEN WHEN YOU HAVE BEEN EXPOSED TO GERMS?

Susceptibility to infection can be reduced by good hygiene practices, such as washing your hands after possible exposure to pathogens before touching your eyes, mouth or mucous membranes where infection may occur. Susceptibility may be increased by a weak immune system due to age, previous illness, inadequate nutrition etc. Resistance to a specific infectious disease can be increased if you have had this infectious disease previously or been vaccinated against this disease. Important defences include barriers such as the skin and mucous membranes, chemicals such as acid in the stomach, inflammation and phagocytic cells.

The specific immune system also contributes to defences against infection, but more slowly.

ONCE YOU HAVE CAUGHT A COLD OR FLU, YOU DO NOT STAY SICK FOREVER. HOW DOES YOUR BODY EVENTUALLY GET RID OF THE VIRUSES THAT CAUSE A COLD OR FLU?

If a cold or flu virus gets past the first set of defences (such as the skin and mucous membranes) and infects your body, your immune system is stimulated to produce specific immune system cells (B cells and T cells) that can effectively fight the particular virus that has infected your body. This response takes time, especially the first time you are exposed to a specific virus, so you are sick with a cold or flu until the specific immune cells become effective enough to rid your body of the virus.

After an infection, your body will have memory cells which can produce a rapid defence if you are exposed to the same virus a second time, so you will be able to fight off a second infection rapidly and effectively and the level of viruses will be kept low so that you may never even feel sick. A vaccination induces the production of memory cells which can mount a rapid defence against that particular infection.

WHY IS A PERSON WITH AN HIV INFECTION UNABLE TO GET RID OF THIS INFECTION THE WAY A PERSON CAN GET RID OF AN INFECTION WITH A COLD OR FLU VIRUS?

In almost every case, a person who becomes infected with the HIV virus is infected for the rest of his or her life. With highly effective modern medical treatment, a person may survive a long time with an HIV infection. However, an untreated HIV-infected individual is very likely to eventually develop AIDS and die. There are many reasons why our bodies are unable to get rid of an HIV infection. One important reason is that HIV infects an important type of T cell, the Helper T cell, which is crucial in mobilising other immune cells to fight infection. As more and more Helper T cells are killed by HIV infection, the body becomes less and less able to fight infections, including HIV infection.

Another reason why the body cannot get rid of HIV infection is that the genetic material of the HIV virus is incorporated in the DNA of infected cells, and some of these infected cells can survive undetected by the immune system over long periods of time. Scientists are very interested in the genetic and immune system differences of the tiny number of people whose bodies appear to be able to control or eliminate HIV infection.

EXTENSION QUESTIONS

THESE CAN BE USED WITHIN THE SESSION TO STIMULATE DEBATE OR FOR HOMEWORK/INDEPENDENT STUDY TASKS.

- What are the consequences of people living for longer on the treatment of infectious diseases?
- Which genes vary the most between people, the ones that influence the way we look or the ones that shape our immune system?
- Can you think of other health areas, outside of infectious diseases, where the immune system plays a vital role?
- Severe combined immunodeficiency (SCID) mice have a mutation which stops their immune system maturing. They are routinely used to study immune diseases. How does their mutation affect the way they are kept?

OTHER RESOURCES

MANCHESTER IMMUNOLOGY GROUP
HAVE OTHER RESOURCES AT:

<http://www.mig.ls.manchester.ac.uk/resources/>

GLASGOW SCIENCE CENTRE HAS AN ONLINE GAME IN WHICH PLAYERS SEEK TO STEM THE SPREAD OF THE FLU VIRUS AT:

<http://www.glasgowsciencecentre.org/online/epidemic-emergency.html>

THE CENTRE OF THE CELL HAVE LOTS OF RESOURCES:

www.centreofthecell.org/learn-play/games/

http://www.centreofthecell.org/wp-content/uploads/New_Vaccines.pdf

THE ABPI EDUCATIONAL RESOURCE PAGES ON IMMUNITY AND VACCINATIONS CAN BE FOUND AT:

http://www.abpischools.org.uk/page/modules/infectiousdiseases_immunity/index.cfm?co-SiteNavigation_allTopic=1

A THOROUGH BUT ACCESSIBLE REVIEW OF THE IMMUNE SYSTEM AND HOW IT WORKS CAN BE DOWNLOADED HERE:

http://www.imgt.org/IMGTEducation/Tutorials/ImmuneSystem/UK/the_immune_system.pdf

SYLLABUS LINKS FOR A- LEVEL BIOLOGY

AQA

Topic 2 Cells

EDEXCEL SALTERS NUFFIELD

Topic 6 Immunity Infection and Forensics

EDEXCEL B

Topic 2 Cells, Viruses and Reproduction of living things

Topic 6 Microbiology and pathogens

OCR A

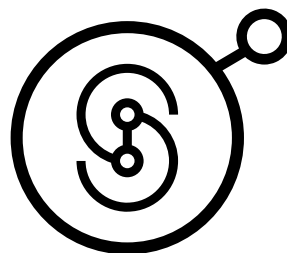
Module 4 Biodiversity, evolution and disease

OCR B

Module 3 Cell division, development and disease control

WJEC

Component 3 option Immunology and Disease



**S I L E N T
S I G N A L**
