CANCER AND VIRUSES

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This lesson will introduce the topic of vaccination, using the cervical cancer vaccine as an example. In doing so, it will highlight the fact that a small proportion of cancers are linked to certain viruses.

Through role-play and group discussion, students will become familiar with the controversy surrounding the cervical cancer vaccine. In this way, the lesson will help students consider how science impacts on society and help students think about other people’s points of view.

This lesson plan has strong links with the GCSE Science, Citizenship and PSHE curricula.
CANCER AND VIRUSES

AIMS
• This lesson plan introduces the key concepts of vaccination and aims to generate discussion about controversial scientific issues that affect society
• It builds on the “What is cancer?” lesson plan, expanding on the concept that some forms of cancer can be caused by viruses (but only specific types and these are relatively few)

SUCCESS CRITERIA
After this lesson, students will be able to:
• Describe how vaccines work
• Name a type of cancer caused by a virus and understand that cancer itself is NOT an infectious disease
• Explain the pros and cons that introducing the HPV vaccine would have for society

PREREQUISITE
The class will already be familiar with the causes of cancer; through the “What is cancer?” lesson plan.

CURRICULUM LINKS AND AIMS

GCSE SCIENCE
Keeping healthy
• Why are we encouraged to have vaccinations

How science works
• Societal aspects of scientific evidence

GCSE CITIZENSHIP - 2A, 2B, 2C, 3A
GCSE PSHE - 2E, 4G

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BACKGROUND INFORMATION FOR TEACHERS

CANCER AND VIRUSES

About one in ten cases of cancer in the UK and one in four cases in the developing world are linked to infection. This is because certain infectious agents (for example viruses and bacteria) can damage the DNA in cells, making them more likely to multiply out of control. These infectious agents are known as pathogens.

The most common type of cancer caused by infection is cervical cancer. Cervical cancer is linked to infection with the human papillomavirus (HPV).

Not everyone infected with HPV will go on to develop cancer. In fact most will not. This is because the road to cancer is a complicated, multi-step process. Many other steps are required in addition to infection with the virus before cancer develops.

About viruses

Viruses are very simple forms of life, consisting of a piece of genetic information (either DNA or RNA) wrapped in a protective coat of proteins.

When viruses infect an animal or a human (which we call the host), they invade living cells, usually turning them into ‘factories’ that copy the virus’s genetic material and produce new virus particles.

These particles are released by the destruction of the cell and can then either invade more cells in the host or spread the infection to a new individual.

HPV and cervical cancer

HPV is a virus that is passed on from one person to another through sexual contact. It’s a sexually transmitted virus.

Many women will be infected with the HPV virus at some time during their lifetime. Often the virus causes no harm and goes away without treatment. The vast majority of women infected with these viruses don’t go on to develop cervical cancer.

But for some women, infection with HPV can go on to cause

• Genital warts (HPV can also cause genital warts in men)
• Changes in the cervix, which may develop into a cancer

There are many types of HPV. HPV 16 and HPV 18 cause the vast majority of cases of cervical cancer — that is about 7 out of 10 cases (70 per cent). The remaining 30 per cent are linked to other HPV types. We also know that HPV 6 and HPV 11 cause genital warts but are less likely to cause cancer.

An HPV vaccine (sometimes referred to as a cervical cancer vaccine) has been developed which will protect against HPV 16 and 18. You can read more about the new vaccine in press releases featured on our News and Resources website (using the useful links for this lesson plan).

Because HPV is a sexually transmitted virus, the vaccine needs to be given to girls at an early age, before they become sexually active. This means it would protect them from becoming infected with HPV once they do start having sex.
How do vaccines work?

When you are given a vaccination, a very small amount of the virus you are being vaccinated against is injected into your body. Your immune system recognises this virus as a foreign body and white blood cells produce antibodies. These attack and destroy the virus and stop you from getting ill.

In future, if you become infected again, you will be protected against the virus. This is because your body will have been “primed” to react against that particular virus.

Your immune system contains white blood cells, which “remember” how to respond to certain infections. In effect, giving someone a vaccination is a way of “teaching” the immune system how to react if faced with a full-blown infection. It will recognise the virus and respond by rapidly making the correct antibody against that virus.

The future of cervical screening

If HPV vaccination is introduced, there would still be a need to carry on with the existing cervical screening programme for a number of years because a large number of older women in the population would not have been vaccinated.

Also, the current vaccines do not protect against all the strains of HPV that are associated with the development of cervical cancer. So not all cases of cervical cancer will be prevented.

FURTHER RESOURCES

Read more about cancer and viruses, HPV and the HPV vaccine on our website:
www.cancerlessonplans.org.uk
EXERCISE 1
CANCER AND VIRUSES – WHAT’S THE SOLUTION?

Use the information in the “Background” session to explain about the link between some cancers and viruses to the class.

Key concept: Cancer is not in any way an infectious disease. But a small number of infections, especially certain viruses, seem to play a key role in causing particular types of cancer. This is because certain viruses can damage cells, making them more susceptible to multiplying out of control.

Nearly all cases of cervical cancer are linked to infection with the HPV virus. Currently, women are asked to go for regular smear tests from their early twenties to spot early signs of cervical cancer (as explained in exercise 2 of the “What is cancer?” lesson plan).

How do you think you could reduce cases of cervical cancer?

Remember, the disease is linked to a virus. Split the class into groups and give each group a list of infectious diseases - either A, B or C - from page 10. The lists to give out are:

A
- Measles
- Tetanus
- Flu

B
- Tuberculosis
- Polio
- Mumps

C
- Rubella
- Chicken Pox
- Hepatitis

Ask the groups of students to think how we stop people from getting these diseases. There should be at least one disease in each list that the students recognise and that they know they have been vaccinated against. This should prompt them to come up with the answer of vaccination.
EXERCISE 2
A VACCINE AGAINST CERVICAL CANCER

Has anyone in the class had a vaccination? Ask them what happened.

Use the information in the “Background” section to explain to the class how vaccines work.

Key concept: Vaccines stimulate white blood cells to produce antibodies that destroy foreign bodies, known as pathogens.

Your students may have heard in the news that a new vaccine has been developed against the virus that causes cervical cancer. Ask them to read the “newspaper” article on page 11 and answer the questions.

Comprehension questions
1. Explain how infection with HPV can cause cervical cancer.
2. Why does the vaccine work best if given to children aged 12–13?
3. Will the vaccine stop the need for the current cervical screening programme?

Answers
The answers to all these questions can be found in the background information for teachers.
**EXERCISE 3**

**DEBATE**

Split the class into groups of four or five and ask each member of the group to take on one of the roles below:

1. Dr Thornton – doctor in favour of vaccination
2. Jenny Summers – 12-year old who wants the injection
3. Mr Edwards – concerned parent
4. Mrs Patel – parent who welcomes the jab
5. Mrs Smith – concerned parent

They will need the worksheet on page 12. After the smaller groups have debated the issue, get them to feed back to the rest of the class.

**Possible questions for class discussion:**

- Do you think the HPV vaccine is a good idea?
- What would be the advantages and disadvantages of the vaccine?
- Who should get the vaccine? Should it just be for girls? Or should boys get it too? And at what age?
- How do you think a vaccine against cervical cancer might change how people behave?
- If we have a vaccine, does that mean we can stop the cervical screening programme?
- Would you want to have the jab?
- How would you feel if the injection was only available in private clinics and not as part of a national vaccination programme?

**EXTENSION WORK**

Ask students to write a short essay answering this question:

**What do you think the government will need to consider when introducing a nationwide vaccination scheme for cervical cancer?**

When researching this topic, students should think about:

- Who the interested parties may be, as shown in the role-play activity (e.g. parents, children, doctors, nurses, schools etc.), and what their different points of view may be
- The practical aspects of getting a system up and running, e.g. finance – who will pay for it?
- How to persuade the public to take part in the programme, e.g. through a health awareness campaign.
EXERCISE 1
Cut out these lists and give a different one to each group.

A
MEASLES
TETANUS
FLU

B
TUBERCULOSIS
POLIO
MUMPS

C
RUBELLA
CHICKEN POX
HEPATITIS B
EXERCISE 2

Read the article carefully, then answer the questions below.

Cancer Jab Plan For Schoolgirls

In 2006, Hollie Anderson, 13, became the first British girl to be vaccinated with a new vaccine that could prevent cervical cancer. Hollie's grandmother died of cervical cancer and so Hollie was keen to have the vaccine when she heard about it.

Human papillomavirus (HPV) is one of the key causes of cervical cancer, which kills around 1,000 women in the UK every year.

The virus is sexually transmitted. The HPV vaccine would be most effective if given before women are exposed to the virus, that is, before they start having sex. This is why it is being recommended for children around the age of 12 or 13.

There are many types of HPV. The vaccines will protect against HPV 16 and HPV 18, which cause 7 out of 10 cases of cervical cancer.

In some states in America, injections against HPV are already being given to schoolchildren as a matter of routine.

In the UK, the vaccine is not widely available, but the government is considering introducing a nationwide vaccination scheme. A handful of British parents have begun buying the £450 injection for their daughters through private clinics.

QUESTIONS

1. Explain how infection with HPV can cause cervical cancer.

2. Why does the vaccine work best if given to children aged 12–13?

3. Will the vaccine stop the need for the current cervical screening programme?
**CANCER AND VIRUSES**

**DR THORNTON**
“This vaccine is a blessing. It is a fantastic example of how medical science is making progress in the fight against cancer. It would be wrong not to vaccinate schoolchildren.”

**STUDENT WORKSHEETS**
These resources can be photocopied for classroom use.

**JENNY SUMMERS, AGED 12**
“I think the vaccine is a great idea. I’ve had my BCG to prevent me getting TB, and this is the same kind of thing. It’s all about staying healthy.”

**MRS SMITH**
“It’s confusing to give a vaccine against a sexually transmitted infection to children who are just starting puberty. It may encourage them to have unprotected sex, and I wouldn’t want that.”

**MR EDWARDS**
“Children have so many vaccinations before they are teenagers. I’m worried that yet another vaccine would be too much for my child’s immune system.”

**MRS PATEL**
“My mother died of cervical cancer. I have seen first-hand how distressing this disease can be. I wouldn’t want my daughter to go through the same thing.”

**EXERCISE 3**
**ROLE-PLAY AND DEBATE**