

Teacher Notes

Question: Should children be required to have all their vaccinations before they can go to school?

This is not a debate on whether vaccines are safe or a good idea. Plenty of resources on that topic exist already, and the science comes down heavily on the side of vaccines being safer than catching communicable diseases. This debate is about what the best public health policy is, to protect the public, balancing individual freedoms against public health. This leads to a more finely-balanced debate.

Lesson plan

The different rounds of the debate help students think through the issues and reconsider their opinions. The structure also shows them how to build a discussion and back up their opinions with facts.

Starter: 5 minutes.

Do your students know what vaccinations are? What vaccinations do children usually have and at what ages? What vaccinations have the students in the class had or not had? Do they know how vaccines work?

Do students already have an opinion on whether having your vaccines up-to-date should be compulsory to go to school? Ask their opinion and fill in the first question on the online survey (debate.imascientist.org.uk/vaccinations/)



Designed for 11 years and up

Main Activity: 35 minutes.

- 1) Split students into as many groups as characters you want to cover.
- 2) Give them their character cards – one per group, and give them a few minutes to read them over.
- 3) Get one student in each group to read out their first section to the rest of the class.

What are the class's initial thoughts? Is there one position they identify with or reject?

- 4) Take it in turns to read out their fact. Does it change the way they think?
- 5) Read the issue. Any different feelings?
- 6) Each group asks their question to the character of their choice.

Plenary: 10 minutes

Now that students have had the debate and heard many different opinions on the topic of vaccines, what is their own opinion? Have they changed their minds? Why?

Vote for which position they agree with most (if there is one). Fill in the third question of the online survey.

Background notes

Current policy

In the UK and Ireland, no vaccines are required for children to attend school. In other countries (eg. USA and Canada) a full set of vaccines is required for children to attend school. Despite this, the vaccination rates in these countries are comparable. For example, the numbers of children who had the MMR vaccine in 2013 are similar in the UK and USA – 92.3% vs. 91.9% respectively.

USA and one in Russia. Although a forgotten ampoule of smallpox virus was recently found in a laboratory fridge in Maryland. Experts think it's possible there are also other stocks elsewhere.

Back in 1855, when smallpox was rife, vaccination was made compulsory by the Vaccination Act. Even though at that time smallpox killed up to 80% of infected infants, there was opposition to the compulsory vaccine. People worried about the safety of the vaccine and they were suspicious of having to do things to their bodies because of the law. There were riots in Ipswich, Henley, Milford and other towns. This anti-vaccination movement still exists in some places today.

The influence of the media on vaccination rates

The MMR scare began in the UK in 1998 with a paper (now-discredited and retracted) in The Lancet by Andrew Wakefield. The paper suggested there were side effects with the vaccine causing an unusual gut syndrome that could be linked to autism. The findings of this very small (and, as we now know, flawed) study were trumpeted by much of the press, without giving time for scientists to investigate or respond.

MMR vaccination rates plummeted, leading to outbreaks of measles, which have continued in young adults. Since then every piece of evidence supports the idea that the MMR vaccine is completely safe, and increasingly, the public have realised this. Following much more favourable press coverage and campaigns to increase vaccination, MMR vaccination rates are now at a historic high (92.7% of infants in 2014 had it by age 2, the lowest recorded figure was 79.9% in 2003-4). You may have pupils who were not vaccinated due to the controversy, and who have never caught up.

Vaccines are biological preparations that induce immunity to a particular infection. Infectious agents can be viruses, bacteria or parasites. Vaccines are the product, and immunisation is the result.

If you recover from a natural infection your body has learned to recognise the pathogen and fight it. You have made antibodies that recognise part of the pathogen (called an **antigen**). Once you recover from the infection, you will usually have small numbers of the antibody in your body forever, as well as immune system cells that are programmed to fight the infection. If you encounter the same infection again, your body can quickly mount an immune response, without you having to get ill first. This is called **naturally acquired immunity**.

Vaccination is a way of giving you that antibody and immunity WITHOUT you having a full blown infection. There are different ways of doing this:

Live, attenuated vaccines – the patient is given a weaker version of the pathogen. They still get an infection, but this is very mild or not noticed at all, and their body will mount an immune response, e.g. MMR and rotavirus vaccines.

Inactivated/killed vaccines – the patient receives a pathogen which has been killed, but still has the antigen bits, e.g. polio (IPV), pertussis/whooping cough and hepatitis A vaccines.

Toxoid vaccines – contain an inactivated toxin, for bacterial infections where a toxin produced by the bacteria is the main cause of the illness, e.g. diphtheria, tetanus.

Subunit/conjugate vaccines – contain only broken up bits of the pathogen (i.e. antigens), which scientists have found our bodies are good at responding to. They may contain between 1 and 20 different antigens, e.g. influenza (the flu jab) and pneumococcal vaccines.

Vectored vaccines – sometimes we use one virus that is safe to deliver fragments of another virus to the immune system. This is useful if the target virus is dangerous and difficult to work with. The vaccines being tested for controlling the Ebola outbreak in West Africa are like this.

History of vaccines

Most people say the first vaccine was given by Jenner using cowpox to inoculate against smallpox. In fact, dairy farmers had long noticed that people who'd had cowpox didn't get smallpox. Benjamin Jesty, a Dorset farmer, successfully vaccinated his wife and children against smallpox using cowpox pus in 1774!

But even these weren't the earliest inoculations against smallpox. Various forms of 'variolation' were used in China and the Middle East, centuries earlier. These included blowing powdered smallpox scabs up people's noses, or rubbing material from smallpox patients into cuts in people's arms.

Variolation was common in China, the Middle East and Africa by the 17th Century, although it was regarded as 'superstitious folklore' by many European doctors. Yet it was the most effective way of protecting against smallpox. Eventually vaccinations were introduced in Europe in the early 18th Century.

Later, in 1796, Jenner used pus from cowpox blisters to inoculate a young boy. He then demonstrated the boy and other people he had inoculated were immune to smallpox. He wrote up his findings in a scientific paper. By 1807 the Royal College of Physicians had confirmed that vaccination worked.

By 1980 smallpox had been eradicated from the world by widespread vaccination. The only known remaining smallpox viruses in the world are held in two laboratories – one in the

Catch-up vaccinations

It is straightforward to get catch-up vaccinations at any age from your GP. Usually young people would be accompanied by a parent. But if their parents disagree and a young person wants to be vaccinated, then they can be treated without parental consent, if the doctor or nurse judges them to be 'Gillick competent'. I.e., in their opinion, the young person understands the treatment they are asking for and can give informed consent. This would almost certainly be the case for a 13 year old or older, asking for catch-up vaccinations.



All the facts in this kit have been researched. References can be found online at: (debate.imascientist.org.uk/vaccinations/)

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