Immunisations
Questions and Answers

These questions were asked in 2005 and the answers were prepared for Healthtalkonline by the Health Experiences Research Group with help from the advisory panel on the Immunisations research project. The opinions are not necessarily those of all members of the panel.

1. How long do childhood immunisations last for?

In general, the live childhood vaccines (as in MMR) are expected to give life-long immunity. The degree of protection from other vaccines (e.g. DTaP/IPV/Hib and Men C) declines with time unless the immunity is boosted. The immunity can be boosted by re-immunisation, in which case protection is gained quickly instead of being delayed by 2 - 3 weeks as would happen if the person had not been previously immunised. This is why re-immunisation is offered to someone who has the type of injury which could cause tetanus. If the natural infection continues to be common in a community, children's immunity gets boosted by exposure to the natural infection. Once a disease comes under control, booster immunisations will extend immunity.

2. Why do I need to immunise my child if the diseases that we immunise against were on the decline anyway?

Immunisations have played a major part in reducing infectious diseases, although other factors like better standards of living and health care are also important. However, until an infectious disease has been eradicated from the world, there is always a chance that the infection can be brought into a well-immunised community from abroad. This has happened with diphtheria in the UK, poliomyelitis (polio) in the Netherlands and measles in the USA. When immunisation levels fall, the disease recurs causing fatal infections, as happened with whooping cough in the UK in 1976-79, with diphtheria in Russia in the 1990s, and measles in Dublin in 2000. As has been recently found with mumps in the UK, immunisation levels need to be maintained at a high level to prevent outbreaks of such diseases. Investigations into outbreaks of vaccine-preventable diseases consistently find that most of the cases occur in people who have not been fully immunised and that immunisation has protected many people against the serious forms of the infections.

3. Do the immunisations always give sufficient cover to prevent a child contracting the disease?

A child who is fully immunised with the vaccines used in the UK, including 2 doses of MMR and the pre-school booster of DTP, gets 98-99% protection against the diseases targeted by the vaccines. In other words, immunised children stand a small chance, of between 1 in 50 and 1 in 100, of getting the disease like measles if they come into contact with another infected person. The risk of this happening becomes very small if immunity of the population keeps the disease under control. The risks of getting the disease if a child is not immunised depend on how common the disease is: without vaccine, children were almost certain to catch measles and rubella sometime in their lives.

4. What research has been done on the long-term side-effects of the immunisations?

There has been a lot of research on the long-term side effects of MMR and whooping cough vaccines. The research has been done in two main ways: firstly, there have been studies which follow children throughout their childhood, to see what health problems, if any, occur and to compare those who were immunised with those who were not. These cohort studies (to use the technical term) have been easiest to do in Scandinavian countries where the medical records are
kept in a carefully co-ordinated way. As Scandinavian countries started using MMR vaccine before the UK, their studies of vaccine safety have been very useful. These studies are summarised in the section on Medical Research on MMR. The second method is used when a health problem, for example autism or bowel disease, is suspected as being caused by a vaccine. What is done is to study a group of children with the health problem (“cases”) and compare their immunisation records with children who do not have the condition (“controls”). These “case-control” studies can give answers relatively quickly, and are particularly useful when the health problem in question is relatively uncommon. Consistency of results across several studies gives reassurance of reliability. However, research findings are always limited to the questions that are asked, so that conditions that have not been foreseen as side-effects of vaccines may not be identified.

Monitoring for vaccine effectiveness and safety is an integral part of the immunisation programme to measure the impact of the uptake of immunisation on the incidence of disease and to pick up any rare adverse events which may not have been observed in clinical trials. It was this process that picked up the small risk of aseptic meningitis in MMR vaccines manufactured using the Urabe strain of mumps vaccine virus, which led to the immediate withdrawal of two brands of MMR in 1992.

The World Health Organisation monitors adverse events associated with immunisation, as described on their website.

5. Do doctors get paid for immunisations?

In the NHS, childhood immunisations have been part of the service that GPs are contracted to provide, and they do not get paid extra for each child who is immunised. There is a scheme to give general practices small additional payments if they meet certain targets set by the Department of Health, and the targets include childhood immunisations. The money from these bonuses goes into the practice account and is not given to an individual doctor or nurse. Childhood vaccines are bought from pharmaceutical companies by the Department of Health and distributed at no cost to the general practices. The arrangements for adult vaccines, for example the annual influenza campaign, and for travel immunisations are different, and there is a more direct link between the number of immunisations given and the money earned by the practice. Doctors are paid for immunisations given privately outside the NHS.

6. What are vaccines preserved in?

The steps taken to preserve vaccines are to make them in a sterile way, to put them in leak-proof single-dose ampoules, to store them in a refrigerator, and to discard any vaccines that have not been stored properly. Preservatives are used to ensure that the vaccine stays safe and effective when stored. Formaldehyde (which is a preservative, common name “formalin”) is used to make diphtheria and tetanus vaccines. The formaldehyde converts the bacterial toxins into “toxoids” which are harmless but give immunity against the dangerous toxins. This is a safe and effective procedure. Another preservative was thiomersal, a chemical that contains mercury. While no harm has been detected from using thiomersal as a preservative in vaccines, it is no longer used in childhood vaccines in the UK following the precautionary principle. Every batch of vaccine is tested to make sure that it has been made safely, and that the preservatives in the vaccines are at very low doses.

7. What about mercury in vaccines?
Thiomersal, a compound containing ethyl mercury, is a preservative to prevent bacterial and fungal contamination. It was used in the DTP (“triple”) vaccine until recently. The amount of ethyl mercury was 50 micrograms per dose, which was within the safety limits advised for babies by the World Health Organisation. However, following the precautionary principle, manufacturers have stopped using thiomersal, and the new DTaP/IPV/Hib vaccine does not contain thiomersal or any mercury compound. MMR vaccines do not and never have contained mercury. None of the vaccines used in the routine childhood immunisation programme in the UK contain thiomersal or other form of mercury.

8. What steps are taken to ensure vaccines are safe?

Safety is a primary factor in designing a vaccine, and is the first thing that is tested when a new vaccine is going through clinical trials. As far as possible, all potential problems are investigated and excluded before clinical trials are started on children. Side-effects are studied in the clinical trials, often by parents keeping diaries of their children's symptoms after immunisation. By the time that a vaccine is ready to be introduced into routine use in children, there will be evidence from studies involving tens of thousands of children, and this evidence will be scrutinised by national and international drug safety committees. It is appreciated that the clinical trials are not likely to be large enough to pick up a rare side-effect - something that might occur in one in 100,000 or one in a million. So once a vaccine is in routine use, “post-marketing surveillance” is applied, whereby doctors and nurses report illnesses or symptoms that might be side-effects to a national body that can investigate drug safety. With international co-operation between ministries of health and the pharmaceutical companies, the evidence on safety accumulates quickly after the introduction of a vaccine into routine use. Post-marketing surveillance is not a perfect system, as it depends on people recognising adverse events as side-effects. But if it does raise questions about a new vaccine, the investigation into possible side-effects needs to be an active process. Sometimes vaccines have been withdrawn or changed because post-marketing surveillance picks up a problem.

9. Should a premature baby start immunisations later?

No. Babies who were born prematurely are more at risk of infection than babies born at term. Mothers normally pass protective antibodies to their babies across the placenta in the last three months of pregnancy, so premature babies need the protection from immunisation. Research has shown that the immune system of premature babies develops sufficiently quickly for them to benefit from starting the immunisations at the normal time, 2 months after their actual birth date. Parents of babies who are born very prematurely and/or spend a long time in neonatal special care units should ask the specialist for individual advice.

10. Should babies with serious illnesses in infancy (e.g. cystic fibrosis or congenital heart disease) start immunisations later?

Not as a general rule. Babies with serious illnesses are at greater risk from developing complications if they catch a vaccine preventable disease like whooping cough or measles. If an immunisation is missed or temporarily delayed because the child is unwell with the underlying condition, it is important that the immunisation is given as soon as the child is recovering. This can sometimes be arranged while the child is still in hospital. Advice should be sought appropriate to the individual child's illness.

11. Does lactose intolerance put a child at any greater risk of a reaction from immunisations?
No. Lactose intolerance affects the bowel, when foods containing lactose are eaten. All current childhood vaccines are given by injection. Oral vaccines, where used, do not contain lactose.

12. Do breastfed babies still need immunisations?

Yes. Although breast feeding does protect babies against gastro-enteritis and some other infections, it does not protect against the vaccine preventable diseases.

13. How does the risk of the natural disease compare with the risk of being immunised?

The risks of death, disability or serious complications if a child gets the natural infection are much greater than the risks of the vaccines. As said in the answer to question 2, although the vaccine preventable diseases have become less common, the risk of the natural disease does not cease until the disease has been eradicated. The health and risks for the individual child is paramount in the decision to have or not have a vaccine.

14. If my child has a strong immune system through a good diet and lifestyle, does he or she still need the childhood vaccines?

Yes. Whilst being healthy helps to reduce the severity of infections, the risks of death or complications if a person catches a vaccine preventable disease, from polio and tetanus to measles and mumps, are still much greater than the risks of immunisation.

15. What is herd immunity?

Herd immunity is the benefit to the whole population when sufficient children have been immunised. Herd immunity stops the infection from spreading in the population and protects children who are too young to be immunised. The proportion of immunised children (vaccine coverage) required to produce herd immunity varies from disease to disease, but is estimated to be about 95% for measles.

16. Why has the 3 in 1 vaccine been changed to the 5 in 1 vaccine?

The change from the 3 in 1 “triple” DTP (Diphtheria, Tetanus, Pertussis (whooping cough)) vaccine to the current 5 in 1 (DTaP/IPV/Hib) vaccine has occurred in stages over the last 10 years. When Hib vaccine was first introduced it was given separately from DTP. When it was found that the Hib vaccine could be safely and effectively made and given as one injection, the 4 in 1 DTP/Hib was preferred because it is a single injection. Polio vaccine was given as drops in the mouth until September 2004, when it was decided to use an injected “inactivated” polio vaccine (IPV). IPV has been chosen as it is not a “live” vaccine and is even safer than oral polio vaccine. In 2001, whooping cough vaccine became part of the pre-school booster together with diphtheria, tetanus and polio vaccines. The whooping cough vaccine chosen was the acellular pertussis (aP) vaccine, which is a more refined product and has fewer active components (“antigens”) than the former vaccine made from the whole killed bacterium (used to be denoted as P, but now sometimes called wP to show it is whole-cell pertussis). The 5 in 1 vaccine, given at 2, 3 and 4 months old, combines DTaP/IPV/Hib in a single injection. Men C is still given as a second injection usually in the opposite leg to the 5 in 1 injection.

17. What are the ingredients of the DTaP immunisations?
In DTaP vaccine are diphtheria toxoid, tetanus toxoid, and five antigens from the outer coat of the bacteria that cause pertussis (whooping cough). These are adsorbed onto a mineral, aluminium hydroxide that does two things: it controls the rate at which the body reacts with the toxoids and antigens, so there is less inflammation, and secondly it improves the immunity to the other parts of the vaccine. The toxoids are the toxins produced by tetanus and diphtheria bacteria made non-toxic by formaldehyde. A mercury compound, thiomersal, used to be a preservative in DTP vaccine, but is no longer used.

18. Can you give paracetamol (Calpol) to a two-month-old baby before they have an immunisation?

Yes, you can, but it probably will not have any effect on whether the baby gets a slight fever after the immunisation. This is because the effect of paracetamol will have worn off before there is any reaction to the immunisation. Many children have so little reaction that it is not necessary to give paracetamol, so it is better to wait and see how things go.

19. My daughter had a swelling on her leg following her DTaP (or DTaP/IPV/Hib) immunisation. Is this normal and what should I do about it?

A swelling at the place where a vaccine is injected is fairly common (about 1 in 4 children have some noticeable inflammation). It is normal, and settles within a few days. The swelling is not a reason to avoid the later doses. A swelling after one injection does not mean that there will be a swelling after the next injection.

20. What reactions should I expect after my daughter’s DTaP/IPV/Hib immunisations? What steps should I take if these reactions occur?

The reactions can be grouped as mild (common), intermediate (uncommon) and severe (rare). Mild reactions occur 1 to 3 days after the injection and are redness, swelling and tenderness where the injection was given (one in ten children, fever, irritability, tiredness, poor feeding or vomiting, or a small lump at the injection site which disappears after a few weeks). The local reaction of swelling and redness is more common after the booster doses than after the first three doses given at ages 2, 3 and 4 months. These mild reactions pass within a day or two and do not need any treatment, unless the child looks uncomfortable in which case paracetamol or ibuprofen syrup will help. They are not a reason to avoid further immunisations.

Intermediate reactions which occur infrequently are: non-stop crying for 3 hours or longer (1 child in 1000), a period of staring and twitchiness (1 child in 14,000), and high fever (1 child in 16,000). These intermediate reactions usually settle within a day or two, but ask your doctor for advice and for the reaction to be reported. If in doubt, ask for a follow up assessment.

Severe problems: a serious allergic reaction (less than one in a million doses); this would occur within a few hours of the immunisation, and the signs would be wheezing or difficulty with breathing, a rash (like a nettle sting), paleness, being floppy, and/or a fast heart beat. Seek medical advice immediately. There used to be concern about pertussis (whooping cough) vaccine causing brain damage, but careful research has shown this to be very rare.
Adverse events following immunisation must be reported by the doctor or nurse to the Committee on Safety of Medicines.

21. How important is it to have each set of the DTaP/IPV/Hib immunisations at two, three and four months old?

The greatest risk of serious illness with whooping cough and Hib is in the first few months of life, and it is good to start immunisations as soon as the baby’s immune system is ready to respond, and this is at 2 months of age. Even babies who are born prematurely can, and should, start their immunisations when they are two months old. The second and third immunisations should be given at intervals of a month or more (in some countries the interval is 2 months), because immunisations repeated at less than a month do not give the best long-term protection. There is an advantage in following the regular schedule, because it makes appointments easier to plan and for the clinic to notice a missed appointment, but it does not matter if a immunisation is delayed a little because the child is unwell on the day that the immunisation is due.

22. Do more vaccines in one go, such as the new 5 in 1 immunisation, lead to a greater chance of having a reaction?

The risk of a reaction from a combination 5 in 1 vaccine is less than the risk of reactions if the five vaccines were given separately. This is because each vaccine would have to be given three times and a child would be more likely to react in a course of 15 injections than in a course of three. The new 5 in 1 vaccine has less chance of causing a moderate reaction (see answer to question 13) than the old triple vaccine(DTP) because it has the acellular pertussis (whooping cough) vaccine instead of the whole cell pertussis vaccine.

23. Some parents believe that small babies should not be overloaded (challenged) by too many different antigens and that they will therefore not be able to benefit from the five in one immunisation?

The question about whether the immune system could be overloaded by combination vaccines (e.g. the 5 in 1 DTaP/IPV/Hib vaccine, or the MMR vaccine) is often asked. As part of the development of new vaccines, the combinations used in the new vaccines were compared with tried and tested triple (DTP) vaccine, and the immune system responded well to the new combinations. In early life, a baby will encounter many bacteria and viruses from members of the family and from the environment and the immune system has evolved to protect against several different microorganisms at the same time. It has been estimated that even if 11 vaccines were given to a baby at any one time, only about 0.1 % of the immune system would be used.

24. Do vaccines prevent the immune system from working naturally?

No. There have been scientific studies that found immunised children to be generally healthier than un-immunised children. A mistaken belief may have arisen because there are a few infections that are worse in adulthood than in children. The clearest example of this is rubella (German measles) which is generally a mild disease but causes congenital abnormalities if the mother has rubella in early pregnancy. The immunity gained by natural infection with rubella lasts longer that immunity from a single immunisation. Before the rubella immunisation programme started in the UK in 1970, 5 % of women reached their child-bearing years being immune. In some years before 1970, there were 70 babies born with birth defects due to rubella in pregnancy and without having the natural
infection, and thus being immune, and an estimated 700 women had their pregnancies terminated because they had rubella. Now there are 5 or less infections in pregnancy a year.

25. What are the possible side-effects from the MMR immunisation? What steps should I take if these reactions occur?

The reactions to MMR vaccine can be grouped as mild, intermediate and severe (very rare). Mild reactions occur about a week after the injection and are: fever (1 in 6 children), a mild rash (1 in 20 children). A rare mild reaction is swelling of the glands in the cheek or neck after 2 - 3 weeks. These reactions are less common (a tenth as common) after the second dose of MMR. No treatment is needed for these mild reactions.

Intermediate reactions are infrequent:
- a febrile convulsion (a fit) within a week or so of immunisation (1 in 3000 doses). A febrile fit can happen with a fever from any cause and is treated by keeping the child cool.
- temporary stiffness or pain in the joints, more likely in teenagers or adults than in young children.
- temporary low platelet count which can cause a bleeding disorder (about 1 in 30000 doses), seek hospital specialist advice.
- Aseptic (viral) meningitis can be caused by the mumps part of MMR vaccine. It is very rare with the type of MMR vaccine used in the UK, and is a complication of natural infection with mumps.

Severe problems: a serious allergic reaction (less than one in a million doses); this would occur within a few hours of the immunisation, and the signs would be wheezing or difficulty with breathing, a rash (like a nettle sting), paleness, being floppy, and/or a fast heart beat. Seek medical advice immediately. Several other problems have been reported to occur after a child gets the MMR vaccine. However, as these problems can happen for other causes and also occur in non-immunised children, it is rarely possible to know if the vaccine caused the problem in an individual child. One way in which experts find out whether a vaccine causes a problem is to carry out studies of whole populations to see if the risk of severe problems is commoner in children who have or have not been immunised. See Information section Medical Research on MMR, autism and bowel disease and other safety issues.

26. What is the latest research on MMR and what are the findings?

There have been large population studies in the UK, USA, Finland and Denmark in the last 5 years which have looked for evidence that autism and/or bowel disease were caused by MMR vaccine. These epidemiological studies concluded that MMR vaccine did not cause autism or bowel disease. See Information Section Medical Research on MMR, autism and bowel disease and other safety issues.

27. What are the ingredients of the MMR vaccine? What has been added or taken away in the last four years?

The MMR vaccine has three vaccine viruses which have been grown on cell cultures. The cell cultures for measles and mumps vaccines are derived from hens’ eggs, and rubella vaccine is grown on human foetal cells. The human foetal cell cultures were started 35 years ago, and no new foetal tissue is used for making the vaccines. The vaccine does not contain any foetal tissue, and is accepted by the faith communities in the UK. Thiomersal is not used as a preservative in MMR. Apart
from the vaccine viruses, there is some albumen, gelatine, calf serum (all checked for sterility), sucrose and neomycin (an antibiotic) in very small amounts.

28. Are boys more likely to develop autistic disorders than girls and at what age do children start showing signs of autism?

Between 3 and 6 children per 1000 are diagnosed with autism by the age of 6 years. The average age at which autism is diagnosed is 3 years. Autism is 3-4 times more common in boys than girls (for reasons that are not known). Autism is more common and is diagnosed at an earlier age than 30 years ago, this is partly because the condition is better known and so more likely to be recognised than was previously the case. The increase in the number of cases started well before MMR vaccine was introduced in the UK. Although autism increased in the last 30 years, the rise in the condition has slowed. The reasons for the increase are not understood, but may be due to better diagnosis.

29. What has caused the rise in the numbers of children with autism, asthma and allergy in recent years?

The reasons for a rise in autism are not clear but, as said in the answer to question 28 and the paper on MMR vaccine research, MMR vaccine is not the cause. Allergy and asthma may have become more common in developed countries because children live in cleaner environments, so their immune systems have had fewer of the common infections to respond to than in previous times. Vaccines may actually help to reduce the chances of a child developing asthma or hayfever, by stimulating the immune system to be protective rather than re-active in the first two years of life.

30. Are live vaccines, such as those used in MMR vaccine, too much for a child's body to cope with?

No. The immune system has a very large capacity and has evolved to respond to more than one virus or bacterium at a time. Viruses are circulating in the population all the time, especially amongst young children and in winter time. The live viruses used in viruses are selected (“attenuated”) to give immunity with no, or very mild, symptoms.

31. Is my child less likely to have complications of measles or mumps if the immune system is strong, through a healthy diet and lifestyle?

The protection against measles, mumps and the other vaccine-preventable diseases comes from have antibodies (immunity) which is specific for each disease. This specific protection can be produced only if the immune system is stimulated by the vaccine or the natural infection. General measures to strengthen the immune system do not give the protection against the disease and its complications.

32. Why is it recommended that girls are given rubella vaccine at age 1 instead of in the teens, as used to be the case?

Rubella immunisation for teenage girls was started to protect them in their child-bearing years, because the main risk is the congenital rubella syndrome. Once it became clear that immunisation at an early age would protect for many years, it was decided to immunise both girls and boys in order to stop the spread of rubella in children, and so gain herd immunity (see Question 15).
33. I had measles and mumps as a child and don’t remember them as serious, so why does the Department of Health now say that these diseases are serious?

Fortunately, most people had measles and mumps without serious complications. However, one in fifteen children with measles had complications including earache, pneumonia and fits. One on 5000 had inflammation of the brain (encephalitis). When these rates are applied to the whole population, the complications of measles and mumps caused a serious number of hospital admissions and long-term disability.

34. How can I get access to the single measles, mumps and rubella vaccine?

Single measles, mumps and rubella vaccines are not available in the NHS, and GPs do not have access to them through the normal channels of licensed drugs. There is not a central list or register of private clinics that provide single vaccines, and there is no simple way for GPs to find out where their nearest such clinic is. A parent support group, JABS, has a list of clinics which have single vaccines, and will send the list on request (more information on the website www.jabs.org.uk). Some of the private clinics have been based in private (independent) hospitals, and others have been part of private general practice. The single measles, mumps and rubella vaccines are imported without being licensed in the UK, on what is known as a “named patient basis”.

35. Why is there not a choice on the NHS for children to be immunised with single vaccines?

The NHS has a duty to provide the best affordable treatment, and MMR is considered to be better than single vaccines. This is a policy decision taken to offer children the protection at the earliest age possible. When single vaccines have been used, the interval between the different injections has meant that some children got the disease, and some immunisations were missed. No country has a policy of using MMR and offering single measles mumps and rubella vaccines as an alternative. As described in more detail in the paper on MMR research, expert groups (including the World Health Organization) support the use of MMR, and none support the use of single vaccines. The report of a Scottish expert group gives a good explanation for this conclusion www.scotland.gov.uk/library5/health/rmmr.pdf

36. My son is allergic to eggs, should he have the MMR immunisation?

Your son should have MMR immunisation. The measles and mumps part of the vaccine are made using cells derived from hens’ eggs, so there was a theoretical question about safety and egg allergy. However studies have shown that MMR vaccine can be given safely to children even when they have previously had an anaphylactic reaction (urticaria on the face and body, a swollen mouth and throat, breathing problems and shock) following food containing egg. Sometimes, the GP and parents will wish to have specialist advice from a hospital paediatrician before deciding when and where to give the MMR vaccine and to consider the alternatives. The advice may be to have the immunisation given in a hospital clinic.

37. The nurse said that she always had adrenalin ready in case a child had an allergic reaction to a immunisation. What would be the reason that a child would have an allergic reaction to a immunisation?

An allergic reaction is possible with any drug or food, although it would be unusual to experience an adverse reaction to vaccines. The risk of a severe allergic reaction to routine childhood vaccines is less than 1 in a million, but if it happens, treatment with adrenaline makes a difference.
38. Can the MMR jab exacerbate childhood eczema?

MMR does not exacerbate childhood eczema and, as a general rule, eczema is not a reason to either delay or not have MMR. As with any serious illness (see Question 10), specialist advice may be sought for a child who has severe eczema.

39. Why does my daughter need to have a second dose of MMR? Can a blood test be done to establish her immunity?

The reasons for the second dose is that some children do not get immunity from the first dose of MMR to all three infections: 5-10% will not be immune to measles, 2% to rubella, and up to 30% susceptible to mumps. The percentage not immune after the second dose is less than 1%. The other reason is that the second dose of MMR ensures that the immunity lasts a long time. The second dose of MMR causes less reaction than the first, and is less distressing than a blood test.

There is no blood test available to establish with sufficient accuracy if an individual child is immune to all three infections and how long the immunity will last. Blood and saliva tests are used to diagnose acute or recent infection, or for research into the immune levels of groups of people, but they are not suitable to decide whether or not your child needs the second MMR immunisation.

40. Who takes responsibility for vaccine damage, i.e. illness caused by MMR and other vaccines?

The responsibility lies at several levels. Firstly, the doctors and nurses giving advice and immunisations are responsible for giving vaccines in a competent manner, on which they would be judged by their professional bodies if it were alleged that they made a mistake. In the UK, the departments of health (the individual countries have their own health ministries) are responsible for the immunisation programme which includes the decision on which vaccines to buy, the immunisation schedule and the monitoring of vaccine safety. The government provides payment for children damaged by vaccines, by a scheme run by the Department of Work and Pensions. Finally, the pharmaceutical companies are responsible for the quality and safety of the vaccines that they make.

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