



Vaccines are biological products and may be exposed to organic and inorganic products during their manufacture. Some people have faith, morality or safety-based concerns about the use of animal derived products, such as gelatin, calf serum, or human cells during the manufacture of vaccines.

Vaccine manufacture and composition is tightly regulated to maximise safety. The safety of individual components, and the vaccine itself, must be clearly demonstrated before a vaccine can be approved for use. Many of the products used during the manufacturing process, if still present in the finished vaccine, are only present in minute (trace) amounts.

This fact sheet summarises the animal derived products used during vaccine manufacture, identifies the New Zealand (NZ) National Immunisation Schedule vaccines involved and responds to some issues raised about the use of animal derived products.

### **Bovine and porcine products**

Bacteria and cells to grow viruses for some vaccines need a growth medium to provide optimal nutrition and moisture conditions. Some growth mediums use bovine serum albumin or fetal calf serum from cow blood to provide the nutrition the bacteria and cells need. Some components in the following vaccines have been exposed to bovine-derived materials in growth medium or milk-derived materials, such as bovine serum albumin, fetal calf serum, or casein: ADT™ Booster, Boostrix®, Hiberix®, Infanrix®-hexa, Infanrix®-IPV, IPOL®, NeisVac-C®, M-M-R® II, Priorix®, Rotarix®, Varilrix®, Varivax® and Zostavax®.

Gelatin, like the ingredient used to make jelly for a trifle or marshmallows, is used in some vaccines as a stabiliser. It may be bovine or porcine derived.

### **Bovine spongiform encephalopathy**

Theoretical concerns have been raised about the possibility of bovine products in vaccines being contaminated with bovine spongiform encephalopathy (BSE) or 'mad cow disease' and whether they could cause variant Creutzfeldt-Jakob disease (vCJD) in humans. Variant Creutzfeldt-Jakob disease is a rare but fatal brain infection. There have been no cases of a human developing vCJD after receiving a vaccine anywhere in the world. Cases of humans developing vCJD after eating animal products infected with BSE are rare.

The World Health Organization, U.S. Federal Drug Administration (FDA) and the Australian Therapeutic Goods Administration have addressed the theoretical risk of infected bovine products being used in vaccines. They estimate an exceedingly small risk of contracting vCJD from a vaccine or blood derived medical product. Very strict controls have been placed on the standards that vaccine manufacturers must adhere to.

Manufacturers may only acquire bovine products from BSE free countries, must state the type of bovine tissue used, and must provide details of their manufacturing process. Since 2000 the Center for Biologics Evaluation and Research, within the FDA, has inspected vaccine manufacturers on a routine basis to determine whether sourcing and documentation are consistent with current recommendations.

### **Perspective of major religions**

#### **Bovine-derived material**

Major religions have not expressed specific objections about the use of bovine products during vaccine manufacture.

#### **Porcine-derived material**

#### **Islam**

The transformation of the bones, skin and tendons of a judicially impure animal into gelatin with different characteristics, changes the substance that is prohibited into a substance that is judicially permissible.

#### **Judaism**

There are no problems with porcine or other animal derived ingredients in non-oral products. In non-oral products, the transformation of pork into gelatin makes them permissible. When there is no alternative available, immunisation for disease prevention and to preserve life is a necessity. Additionally, the minute quantities of trypsin residual or gelatin stabiliser in the final product become exceptions based on dilution.

### **Chicken embryos and embryonated eggs**

Chicken embryo cells are used to grow measles and mumps vaccine viruses. The cells are removed from an egg, placed in a growth medium and infected with the weakened measles or mumps virus. As the cells multiply, so does the amount of measles or mumps virus that is available to be used in M-M-R II and Priorix.

The egg white (albumin) in embryonated chicken eggs provides a perfect food for influenza viruses to grow. Although the influenza virus is taken out of the egg white once there is enough to make a vaccine, small amounts of egg white could still be attached to some of the viruses. Influenza vaccines made using eggs, such as Afluria Quad Junior® and Afluria Quad®, may contain small amounts of egg white protein in them.

### **Guinea pig embryos**

Embryonic guinea pig cells are used to grow varicella viruses in Varivax and Zostavax.

### **Monkey kidney cells**

The continuous Vero cell line started with monkey kidney cells in 1962. Descendants of the original cells are used to grow polio viruses for Infanrix-hexa, Infanrix-IPV, and IPOL and rotavirus for Rotarix. These kinds of cells never run out of energy to make more cells and the original cells are like the great, great, great, great ... grandparents of the cells being used to grow viruses for vaccines now.

### **Human cell lines**

Attitudes and practices around abortion were different in the 1960s compared with the present day, but even then, pregnancies were not terminated for the advancement of science. Pregnancies were terminated to support the well-being of women and their families. Cells were taken from what, at that time, was considered the by-product of an abortion.

No new fetal tissue has been required since the 1960s. Babies are not being aborted in order to produce vaccines. The cells used now are not the originally harvested cells, they are descendants of those cells.

Perpetual human cell lines from the 1960s are used to grow the hepatitis A, rubella and varicella (chickenpox or shingles) viruses for vaccines.

- » The WI-38 cell line is used to grow rubella virus in M-M-R II and varicella virus in Varivax and Zostavax. The original cells came from a fetus in 1961 after an abortion because the parents felt they had too many children.
- » The MRC-5 cell line is used to grow rubella virus in Priorix, varicella (chickenpox and shingles) virus in Varilrix, Varivax and Zostavax. and hepatitis A virus in Havrix® Junior and Havrix® vaccines. The original cells came from a fetus in 1966 after an abortion because the mother had psychiatric problems.
- » The original rubella virus used in the M-M-R II and Priorix vaccines came from a fetus in 1964 after an abortion because the mother had been infected with the rubella virus.

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## Human cell lines continued

### Perspective of major religions

#### Catholicism

The Vatican published moral reflections on vaccines prepared from cells derived from an aborted human fetus in June 2005. They said that, where there is no alternative vaccine, the use of vaccines derived from an aborted human fetus should not be misinterpreted as approving their production, marketing and use. They considered use of the vaccine is passive material cooperation and morally justified to avoid a serious risk, not only for one's own children but for the health of the whole population, especially pregnant women. They deemed that use of the vaccine occurs in a context of moral coercion of parents who are forced to act against their conscience.

### Human blood products

#### Human albumin

Human albumin, either engineered from yeast cells or derived from human blood, is used as a stabiliser in some vaccines.

Human albumin used in the M-M-R II vaccine is not derived from liver or blood products. It is engineered from yeast cells to imitate real human albumin.

Human albumin is no longer used in the Varilrix brand of varicella (chickenpox) vaccine.

### Perspective of major religions

#### Jehovah's Witnesses

In 1978, the Watch Tower Society declared human blood derived albumin, immunoglobulins and coagulation factors acceptable. Since then, whole blood products have been added to the list of acceptable products and Witnesses have been taught that the use of these products are not absolutely forbidden and a matter of personal choice.

### Residual DNA

Humans come into contact with external DNA daily, e.g. in the foods we eat, and microbes we breathe in or swallow. Vaccine manufacturing processes expose vaccine components to materials that contain DNA, e.g. culture cells or other animal derived ingredients.

Fragments of genetic material from the vaccine manufacturing process are expected to be found in minute amounts in the finished product. They are left over from materials used earlier in the manufacturing process and have been part of the vaccine formulation throughout all the vaccine safety trials and the time the vaccine has been used in communities around the world, and no safety concerns have been identified.

### Porcine circovirus

In March 2010 fragments of porcine circovirus (PCV) DNA were found to have been in both Rotarix and RotaTeq rotavirus vaccines since they were developed. The World Health Organization (WHO), European Medicines Agency, and U.S. Food and Drug Administration (FDA) reviewed available information and concluded that both vaccines have been shown to be safe and effective in preventing severe diarrhoea and there was no evidence of PCV disease in children who had already received the vaccines. Porcine circoviruses are also found in pork food products. They have been detected in adult faeces without any evidence of having caused harm or illness in humans.

### National Immunisation Schedule vaccines and animal derived products

Table 1 on this page and the following page shows the vaccines on the National Immunisation Schedule that have had exposure to animal derived products during manufacture. Some finished vaccines that were exposed to animal derived products during manufacture have no residuals from animal derived products, others may have an amount so small it is presumed present but cannot be measured, and others an amount that can be measured perhaps as a trace, parts per million or parts per billion.

Vaccine purification at the end of the manufacturing process ensures that the final vaccine has no harmful components and a minimal amount of any ingredient that was part of the manufacturing process but is no longer needed for the vaccine to work.

**Table 1. National Immunisation Schedule vaccines exposure to animal derived products during manufacture**

Vaccine	Disease(s)	Exposure to animal derived products
ADT Booster	Tetanus/diphtheria	» Bovine serum albumin or fetal calf serum used as a nutritional component in some growth mediums.
Afluria Quad Junior Afluria Quad	Influenza	» Embryonated chicken eggs are used to grow influenza viruses. » Egg protein.
Boostrix	Tetanus/diphtheria/ acellular pertussis	» Bovine serum albumin or fetal calf serum used as a nutritional component in some growth mediums.
Havrix Junior Havrix	Hepatitis A	» MRC-5 cell line derived from a fetus aborted in 1966 is used to propagate hepatitis A viruses.
Hiberix	<i>Haemophilus influenzae</i> type b (Hib)	» Bovine serum albumin or fetal calf serum used as a nutritional component in some growth mediums.
Infanrix-hexa	Diphtheria/tetanus/ acellular pertussis/polio/ hepatitis B/ <i>Haemophilus</i> <i>influenzae</i> type b (Hib)	» Bovine serum albumin or fetal calf serum used as a nutritional component in some growth mediums. » Medium derived from bovine casein is used to grow tetanus bacteria.
Infanrix-IPV	Diphtheria/tetanus/ acellular pertussis/polio	» Vero cells derived from monkey kidney cells in 1962 are used to grow polio viruses.

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Table 1. National Immunisation Schedule vaccines exposure to animal derived products during manufacture continued

Vaccine	Disease(s)	Exposure to animal derived products
IPOL	Polio	<ul style="list-style-type: none"> <li>» Bovine serum albumin or fetal calf serum used as a nutritional component in some growth mediums.</li> <li>» Vero cells derived from monkey kidney cells in 1962 are used to grow polio viruses.</li> </ul>
NeisVac-C	Meningococcal group C	<ul style="list-style-type: none"> <li>» Bovine serum albumin or fetal calf serum used as a nutritional component in some growth mediums.</li> </ul>
M-M-R II Priorix	Measles, mumps and rubella	<ul style="list-style-type: none"> <li>» Fetal calf serum used as a nutritional component in some growth mediums.</li> <li>» Chicken embryo cells are used to propagate measles and mumps viruses.</li> <li>» Rubella virus came from a fetus aborted in 1964.</li> <li>» WI-38 cell line derived from a fetus aborted in 1961 is used to grow rubella viruses in M-M-R II.</li> <li>» MRC-5 cell line derived from a fetus aborted in 1966 is used to grow rubella viruses in Priorix.</li> <li>» Gelatin used as a vaccine stabiliser may be bovine or porcine derived.</li> </ul>
Rotarix	Rotavirus	<ul style="list-style-type: none"> <li>» Fetal calf serum used as a nutritional component in some growth mediums.</li> <li>» Vero cells derived from monkey kidney cells in 1962 are used to grow the re-assorted rotaviruses.</li> <li>» Porcine circovirus DNA fragments.</li> </ul>
Varilrix	Varicella (chickenpox)	<ul style="list-style-type: none"> <li>» Bovine serum albumin or fetal calf serum used as a nutritional component in some growth mediums.</li> <li>» MRC-5 cell line derived from a fetus aborted in 1966 is used to propagate varicella viruses.</li> </ul>
Varivax Zostavax	Varicella (chickenpox) Herpes zoster (shingles)	<ul style="list-style-type: none"> <li>» Bovine calf serum used as a nutritional component in some growth mediums.</li> <li>» Embryonic guinea pig cells are used to grow varicella viruses.</li> <li>» WI-38 cell line derived from a fetus aborted in 1961 is used to propagate varicella viruses.</li> <li>» MRC-5 cell line derived from a fetus aborted in 1966 is used to weaken/attenuate varicella viruses.</li> <li>» Porcine derived gelatin used as a vaccine stabiliser.</li> </ul>

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