| Program Name: | Immunization Competencies Education Program  
Module 13 - Immunization Issues |
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<td>Adapted by:</td>
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Competency: Addresses immunization issues using an evidence-based approach.

Learning Objectives
Upon successful completion of this section the health professional will be able to perform the following:

1. Describe factors which lead to scepticism regarding immunization for both health professionals and the general public.
2. Describe the impact that misperceptions regarding immunizing agents have on immunization programs and on the population.
3. Address misperceptions regarding immunizing agents using an evidence-based approach.
4. Locate evidence-based sources of information on current issues relating to immunization.
5. Use evidence-based scientific knowledge to develop clear, concise key messages regarding true immunization benefits and risks

Test your Current Knowledge:
Based on your current knowledge, determine if the following statements are true or false.

1. The vaccination against polio is not required in this country as it has been completely eradicated from Canada.
   a. True
   b. False

2. In populations that stop immunizing the rate of infectious disease increases
   a. True
   b. False

3. Breastfeeding is an effective substitute for immunization during the first 4 months of life
   a. True
   b. False

4. Vaccines offer similar immunity to natural infections
   a. True
   b. False

5. Theoretically, a baby could receive 10,000 injections at the same time
   a. True
   b. False

6. The amount of aluminum in a vaccine is similar to the amount in breast milk
   a. True
   b. False

7. Thimerosal was removed from all routine Canadian vaccines used in children in 2001
   a. True
   b. False

8. Vaccines are not linked with asthma, MS or type 1 diabetes
   a. True
b. False

Public Perception of the Immunization Program

As clinicians we realize the importance of immunizations not only on an individual patient’s health but also the health of the entire population. Vaccines are among the greatest public health initiatives in modern medicine. They have led to the elimination of some of the most contagious and deadly diseases (e.g. small pox) from our families, our cities and the world and have undoubtedly saved millions of lives.

Some patients cite safety issues as the major reason they do not immunize their children. Many of these concerns about vaccines may occur due to the direct result of the immunization program success. As the burden of the disease falls and memory of the severity wanes, concerns shifts from the disease, to the vaccine.

The Internet has become a primary source of immunization information for many parents. Many of these websites look very professional causing parents to believe that the sites provide “unbiased” vaccine information. These sites usually contain claims that vaccines cause idiopathic illness, immunity erosion, increased incidence of adverse reactions. They often suggest that vaccine policy is motivated by institutional profit. In addition, all of the sites contain links to other anti-vaccination web sites.

With such a large number of websites on immunization, the Canadian Paediatric Society has developed a tool to judge the information on different websites. You can find this by clicking the link below:

A parent’s guide to health information on the Internet

Table 1 lists some of the websites that parents may be reading to provide them with “unbiased” vaccine information.

<table>
<thead>
<tr>
<th>Table 1 – Sample of Websites with Anti-vaccine Messages and Reputable Vaccine Websites.</th>
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</thead>
<tbody>
<tr>
<td>Sampling of internet based websites with anti-vaccine messages</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Vaccines: know the risks</td>
</tr>
<tr>
<td>Jenny McCarthy: Who’s Afraid of the Truth About Autism?</td>
</tr>
<tr>
<td>The great thimerosal cover up: Mercury, vaccines, autism and your child’s health</td>
</tr>
<tr>
<td>Ineffectiveness and Dangers of Flu Shots</td>
</tr>
<tr>
<td>Vaccine Nation – (Video Trailer on Website)</td>
</tr>
</tbody>
</table>

• [www.immunize.cpha.ca/](http://www.immunize.cpha.ca/)
• [www.cps.ca](http://www.cps.ca)
• [www.caringforkids.cps.ca](http://www.caringforkids.cps.ca)
### How some Parents Interpret the Information

If a parent was to believe only a fraction of the information published on the anti-vaccine sites in table 1 they would never immunize their child against any disease. These sites proclaim half truths regarding vaccines and encourage parents to not immunize their children. This has caused some parents tremendous concern on the safety of the immunization program.

Although some of the messages promoted by these websites have been consistent (e.g. autism, mercury risk, overwhelming the immune system), many are finding new messages to promote. During the H1N1 pandemic in 2009-2010, many of these sites proclaimed that we were poisoning our population by injecting vaccines with no testing and serious adverse effects, even though the H1N1 vaccine went through rigorous testing. The anti-vaccine lobby groups are trying an increasing number of methods to persuade more people to not immunize their children.

The media also tends to publish negative news stories when it discusses immunization. The villains of these stories are greedy vaccine manufacturers, disinterested doctors, and over-burdened regulatory agencies. The focus of the stories is that children are hurt unnecessarily by vaccines, and the tone is one of intrigue and cover-up.

### Educating Parents

#### The Role of Clinician for Educating Parents on Vaccines

Healthcare professionals are in a position of trust in our society. Many will second guess the way they educate patients on immunization, when they encounter a parent who refuses immunization. Most parents value your opinion and through the use of planned communication strategies (discussed in Module 6), up-to-date knowledge and demonstrating confidence in immunization, you can have a dramatic influence on the protection of your patients and the entire community.

#### Be Prepared and be Confident

Immunizers will be asked many questions promoted by the anti-vaccine movement. The key is to use
communicate plan messages (discussed in Module 6) and be prepared to answer their question. The following list contains answers to some of the common questions asked by patients. The question and answer content comes from two main sources that immunizers are strongly encouraged to have available in their clinical practice. These include:


**Myth 1**: The conditions we are immunizing against are not serious and the only reason we have vaccines is to support the vaccine industry.

**Key points to use when counselling patients:**

- Vaccine-preventable diseases have decreased significantly due to immunization programs.
- These conditions are rare because the immunization program has been so successful. Vaccine-preventable diseases are still prevalent in other areas in the world and can be imported here if we don’t protect our population.
- We immunize our children not for the profit of the manufacturer but for the protection of our children and the population.
- Table 2 lists morbidity and mortality data of vaccine-preventable diseases in Canada.

**Counselling Tip:**
During the 1990s there were over 140,000 cases of diphtheria and 4000 related deaths in the former Soviet Union due to suspension of vaccine programs.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Average number of cases and related deaths (per year)</th>
<th>Effects of Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before vaccine</td>
<td>After Vaccine</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>12,000 cases with 1,000 deaths</td>
<td>0-5 cases with 0 deaths</td>
</tr>
<tr>
<td>Tetanus</td>
<td>60-75 cases with 40-50 deaths</td>
<td>0-2 cases and no deaths since 1991</td>
</tr>
<tr>
<td>Pertussis</td>
<td>30,000-50,000 cases with 50-100 deaths</td>
<td>3,000 cases with 1-5 deaths</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Disease</th>
<th>Cases/Deaths</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Polio</strong></td>
<td>2,000 cases in the last epidemic in 1959</td>
<td>Muscle paralysis in 1 out of 100 persons infected with polio. Death in severe cases.</td>
</tr>
<tr>
<td><strong>Hib</strong></td>
<td>1,500 cases of meningitis and 1,500 cases of infections of blood, bone, lungs, skin, joints. About 30 cases</td>
<td>Meningitis kills 5% of cases and leads to brain damage and deafness in 10-15% of survivors.</td>
</tr>
<tr>
<td><strong>Measles</strong></td>
<td>95% of children have measles by 18 or 300,000 cases with 300 deaths and 300 children with brain damage. Less than 20 cases with 0 deaths.</td>
<td>Severe bronchitis, high fever, rash 7-14 days and deaths in 1 per 1,000 cases; encephalitis in 1 per 1,000 cases.</td>
</tr>
<tr>
<td><strong>Mumps</strong></td>
<td>30,000 cases</td>
<td>90 cases</td>
</tr>
<tr>
<td><strong>Rubella</strong></td>
<td>85% of children have rubella by age 20, 250,000 cases. About 200 cases of congenital rubella syndrome. 25 cases. 0-3 babies with congenital rubella syndrome born to unvaccinated mothers.</td>
<td>Fever, swollen glands, rash. No symptoms in about 50% of cases. Severe damage to fetus if mother infected during first trimester of pregnancy.</td>
</tr>
<tr>
<td><strong>Meningococcus</strong></td>
<td>200-400 cases with 20-40 deaths</td>
<td>Too new to see effect</td>
</tr>
<tr>
<td><strong>Pneumococcus</strong></td>
<td>3,000 cases of severe disease (meningitis, bacteremia, pneumonia) in children under age 5.</td>
<td>250 cases</td>
</tr>
<tr>
<td><strong>Varicella</strong></td>
<td>300,000 cases</td>
<td>82.5% reduction in U.S.</td>
</tr>
<tr>
<td><strong>Hepatitis B</strong></td>
<td>20,000 new cases per year with 480-</td>
<td>Less than 1,000</td>
</tr>
<tr>
<td><strong>Rotavirus</strong></td>
<td>400,000 cases per year with 2-4 deaths in children under age 2</td>
<td>Too new to see effect</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td><strong>Hepatitis A</strong></td>
<td>10-20,000 cases per year</td>
<td>Elimination of infection</td>
</tr>
<tr>
<td><strong>Human Papillomavirus</strong></td>
<td>1,350 cases of cervical cancer per year with 400 deaths and 200 deaths from other forms of cancer caused by HPV.</td>
<td>Too new to see effect</td>
</tr>
</tbody>
</table>

**Myth 2:** Diseases were disappearing long before vaccines were available due to better sanitation and drinking water.

**Key points to use when counselling patients:**

- This is not correct. Until vaccines became available there was no significant change in the number of cases of diphtheria, tetanus, pertussis, polio, measles, mumps, rubella, Hib, hepatitis B, meningococcal disease, pneumococcal disease, rotavirus and chickenpox. This was the death rate from some of these infections. People who live in poverty and are malnourished are at higher risk of death from measles and pertussis.

**Myth 3:** Breastfeeding and good nutrition prevent these childhood infections.

**Key points to use when counselling patients:**

- Breastfeeding is not an alternative to immunization and it does not enhance the response to vaccines.
- Breastfeeding provides some protection against many infections due to the transfer of maternal antibodies.
- The protection from breast milk is incomplete. This can be overcome if the baby is exposed to a large amount of a germ.
- Good nutrition will help increase your baby’s immune system and infections are more severe in malnourished children. Good nutrition will not prevent your child from developing an infection if they come in contact with the germ, including vaccine-preventable infections.
Myth 4: Vaccines do not really work.

Key points to use when counselling patients:

- Vaccines are very effective. All vaccine-preventable diseases have declined significantly in countries with successful immunization programs.\(^4\)
- Vaccines are so effective that most of the diseases they protect against are now very rare.\(^5\)
- Whenever immunization rates are high the disease rates are low. If immunization rates decline, the diseases and related deaths increase in frequency.
- Some people with the anti-vaccine message will question the efficacy of vaccines as some immunized children will develop measles if they come in contact with it.
  - Any vaccine is not 100% effective for all children.
  - Although some of the children that will get sick from a vaccine-preventable disease are immunized, the vast majority of cases will occur in unimmunized individuals.
  - The key is to have most, if not all of our population immunized so we can benefit from herd immunity. This strategy will protect the 10-15% of people not vaccinated and those whose immune system does not mount an immune response (i.e. the vaccine did not fully protect).

Myth 5: You can catch the illness from the vaccine.

Key points to use when counselling patients:

- With inactive and subunit vaccines there are no living bacteria or viruses and it is impossible for the vaccine to cause an infection.\(^4\)
- With live attenuated vaccine, the virus in the vaccine has been weakened in the lab and cannot cause major infection.\(^5\) It is this weakened form of the virus that multiplies in the body to create an immune response. Vaccine providers are very aware and vigilant in not using these live vaccines in people with weakened immune systems such as cancer patients, patients with HIV or patients on medications that suppress the immune system.\(^4\)

Myth 6: Vaccines have so many side effects that they are worse than getting the disease they are protecting against.

Key points to use when counselling patients:

- Patients should be told that serious adverse events with vaccines are extremely rare.\(^5\)
- Patients may benefit from knowing about how Canada monitors for adverse events (CAEFISS and IMPACT: Discussed in Module 9)
- The Public Health agency of Canada receives about 4000 adverse event reports each year, of which most are reports of minor events such as a fever or local injection site reactions.\(^4\)
- Anaphylaxis (a very severe allergic reaction) occurs in two per million doses of vaccines given.
- Here are some notes and tips for immunizers to provide patients:
  - Fever: Few children will develop a fever. High fever (>40°C or 104°F) is unusual with any of the current vaccines.\(^4\) Acetaminophen is the drug of choice if a child develops a fever.
  - Crying and Fussiness: Some children become momentarily very upset with the pain associated with immunization. If the fussiness persists, acetaminophen and the application of a cold compress can help with the pain. If the child is still crying or fussy after 24 hours, the patient should contact their immunization provider.
Swelling: Swelling can occur after an injection. Application of cold compresses for 15 to 20 minutes and acetaminophen can help for the swelling and pain. If the redness or tenderness is still there after 24 hours then contact the doctor or immunization provider.

Myth 7: Alternative medicine is much more effective and safer than vaccines.

Key points to use when counselling patients:

- Some alternative medicine providers (naturopaths, homeopaths, chiropractors) discourage parents from immunizing their children.
- Many within these groups state that natural infection is much better than “artificial” things like vaccines. As these groups state, natural infection with measles will offer long-term protection. Unfortunately, many children infected with measles will die or have lifelong disabilities due to this infection.
- Vaccines are truly “natural” as they are derived from either live viruses or have components extracted from these viruses or bacteria that are purified and injected into the body.

Quick Note:
The College of Chiropractors have reminded all their members that immunizations are beyond the scope of their practice and patients asking questions should be referred to clinicians who have the expertise to answer.

Myth 8: Vaccines are not as good as natural infections as they wear off over time.

Key points to use when counselling patients:

- Immunization provides a level of protection that is similar to that of natural infection without exposing the child to the risks of complications resulting from contracting the disease.
- The level of antibodies in the body will decline over time following either a natural infection or from a vaccine.
- Even with a decrease in antibodies, our body keeps memory cells that can quickly be reactivated to manufacture antibodies again if we come in contact with the natural disease.
- Most vaccines protect for a very long time, if not for life. If levels of protection start to decrease, a booster can be added to protect against the disease. This booster will quickly increase antibody levels and will have a stronger response because the body’s immune system has already been primed.
- Tetanus and diphtheria require a booster as they require antibodies to the toxin produced by the bacteria. This requires the presence of the antibodies in the blood to protect against the major effects of these conditions.

Myth 9: Vaccines overwhelm the immune system and multiple shots are too much for the child’s system to handle and can use up our immune system.

Key points to use when counselling patients:
The body’s immune system has an amazing ability to deal with a large number of germs that we come into contact every day. The air we breathe, the food we eat and the fluid we drink all contain different foreign material that our bodies manage every day.

A baby’s immune system has the ability to produce close to 1 billion antibodies. Theoretically, we could give 10,000 injections at the same time.

The vaccines today are much more purified than they were in the past. The diphtheria-pertussis-tetanus-polio vaccine in 1980 contained close to 3000 components (antigens) for the body to handle. Where giving the four vaccines against diphtheria-tetanus-acellular pertussis-polio, meningococcal C, pneumococcal and hepatitis B today contain only 34 components for the body to handle.

It is impossible to “wear out” the immune system as we are constantly making more immune system cells (B and T cells) to keep the immune system functional.

Multiple injections or combination shots only use a small portion of the body’s immune system, start to protect our children right away from multiple diseases and saves our children from needing more needles and more frequent appointments for vaccines.

**Myth 10:** Vaccines contain dangerous chemicals like formaldehyde, aluminum and antibiotics.

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**Key points to use when counselling patients:**

- This was covered in greater detail in Module 4.
- **Formaldehyde:** It is used to inactivate viruses and bacteria. The vaccines are purified and most of the formaldehyde is removed. Formaldehyde is found in the human body and is an essential for certain parts of metabolism. The amount of formaldehyde is several hundred times lower than the amount known to cause any harm to children.
- **Aluminum:** Aluminum has been used to enhance the body’s immune reaction to vaccines for over 70 years. It is the most abundant element in the earth’s crust and is found in air, food and water. The amount of aluminum in a vaccine is similar to the amount in breast milk and baby formula and is much lower than the amount absorbed from antacids.
- **Antibiotics:** Some vaccines contain trace amounts of antibiotics. These antibiotics are used in the manufacturing process and prevent contamination of the tissues where vaccines are grown. The antibiotic most commonly used (neomycin) is not linked to other antibiotics such as penicillin or “sulfa” drugs and reactions to this antibiotic are not common.

**Myth 11:** Vaccines contain human/cow tissues that can cause serious conditions like mad cow disease.

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**Key points to use when counselling patients:**

- This was covered in greater detail in Module 4.
- No vaccine contains human or animal blood, serum, cells or tissue.
- Some vaccines are grown in human or animal cells.
- During purification of the vaccine, all serum and cells are removed, but trace amounts of proteins from the cells may remain in the vaccines.
- Some vaccines use gelatin as a stabilizer. This gelatin is the same as the one used in many of the products we eat. Gelatin is derived from cows but these cows are free from mad cow disease. There has not been a single case of mad cow disease linked to immunization despite tens of millions of vaccines manufactured using bovine-based material.
Myth 12: Vaccines contain mercury and this has been linked to serious medical problems in children.

Key points to use when counselling patients:

- This was covered in greater detail in Module 4.
- Thimerosal is an organic mercury compound that has been used as a preservative in vaccines since the 1930s.\(^4\)
- Thimerosal is an ethylmercury compound. It is different than methylmercury that has been linked to neurological problems.\(^4\)
- Ethylmercury has never been shown at the levels contained in vaccines to cause any neurological problems.\(^5\)
- There has never been a link to problems with thimerosal. It was removed from all routine immunizations in children due to public concern and pressure and has not been used in routine childhood vaccines in Canada since 2001.

Myth 13: Vaccines and their ingredients can cause autism and serious illness in children.

Key points to use when counselling patients:

- At this moment, 23 studies have refuted this hypothesis that the MMR vaccine causes autism.\(^5\)
- In a Danish retrospective study involving over 530,000 children the researchers found the rate of autism spectrum disorder to be similar amongst children who had received the MMR vaccine to those children that had not.\(^5\)
- Most of the controversy around vaccines and autism surrounds a study published in 1998 in 12 children with inflammatory disease and which 8 had autism. The author of this study suggested a possible link between MMR vaccine and autism.\(^5\) In 2004, 10 of the 13 original authors retracted the results of the study and stated there was no connection between the MMR vaccine and inflammatory bowel disease and autism.\(^5\)
- Autism rates have increased in recent years and this occurred long after the MMR vaccine was introduced. In a Canadian retrospective trial of 27,749 children, they found the rate of autism increased significantly even with a decrease in the amount of MMR vaccine use.\(^5\)
- Thimerosal has not been linked to any neurological problems in children. It has been removed from all routine immunizations in children since 2001. Even with the removal of thimerosal, the rate of autism has increased in Canada. In a Canadian study, the highest rate of autism occurred in the group that had never received any thimerosal.\(^4\)

Myth 14: Vaccines have been linked to higher rates of MS, asthma and diabetes.

Key points to use when counselling patients:

- The rates of multiple sclerosis (MS) are higher today than 30 years ago.\(^4\) There is some evidence suggesting that infection in childhood might play a role in the development of the disease.\(^4\) There is no evidence that immunization causes MS or even a flare-up of MS symptoms.\(^4\)
- There is no scientific data linking immunization to an increased risk of type 1 diabetes in children.\(^4\)
- A large international study analyzed immunization rates and rates of asthma and other allergic diseases. Researchers obtained rates for 6-and 7-year olds from 91 centres in 38 countries, and for 13 and 14 year olds, from 99 centres in 41 countries. They found no correlation between immunization rates and asthma/allergy rates.\(^5\)
Putting it All Together to Provide a Clear and Concise Method on Immunization

Immunization providers have the opportunity and obligation to present evidence-based information to their patients. The key is to stay current with all immunization issues and to try to anticipate your patient’s questions so you can feel confident and have a practiced and clear message. This module and the communication Module 6 provide you with some tools so that you can counsel patients on the appropriate and evidence-based use of immunization in their health and the health of the community.

Key Learning Points

1. The anti-vaccine groups are becoming stronger and changing their messages to promote new information to encourage parents to not immunize their children.

2. Being aware of the potential questions from parents can help to educate them on the evidence-based risks and benefits of immunization.

3. Vaccines are highly effective and the questioning of the immunization program may be due to its own success.

4. Good hygiene, drinking water, breastfeeding and proper nutrition are excellent preventative measures. They are not substitutes to immunization.

5. Vaccines provide similar protection to natural infection without the risk of death and morbidity associated with the “natural” disease.

6. Most side effects are minimal and can be managed with some simple steps at home.

7. Vaccine ingredients have been thoroughly tested and are safe.

8. There is no link between immunization and autism.

9. There is no link between immunization and multiple sclerosis, asthma, allergies and type 1 diabetes.

Discussion Forum

1. What is the most common immunization issue in your practice and how do you address it?
2. Do you have any tips to help clinicians deliver clear and concise evidence-based information to their patients?
3. What is the most outrageous claim that you have heard regarding vaccines and the immunization program?
4. What myth from this module did you find most useful for discussing with your patients in your practice?
Quiz

Barbara N. is in with her son Jeremy. You notice that she insisted upon deferral of the 2 month immunizations and when you approached her again she mentions that she is concerned with the use of vaccines in her son. She pulls out a stack of information that she downloaded from the Internet and is worried that she is placing her son at risk of harm. She states that:

- Vaccines contain mercury that causes brain damage
- Vaccines are no longer needed and we only use them to support the vaccine industry
- Vaccines have been linked to autism
- Severe reactions from vaccines are very common
- She read that some children have contracted hepatitis from some of the vaccines as they are grown in human cells

You anticipated that she was a cautious patient regarding immunization and you were prepared for her appointment. You decide to handle one issue at a time.

1. Which of the following statements regarding thimerosal would NOT be appropriate to use when counselling Barbara?
   a. Barbara, I understand your concern and so did the government so they removed mercury from all vaccines because the high risk to our children
   b. Barbara, I can understand your concern. I can tell you with confidence that thimerosal has not been linked to any major neurological conditions
   c. Barbara, the thimerosal that is in some of the vaccines is very different from the mercury that was linked to brain damage
   d. Barbara, I understand your concern and I can tell you that there is no link to thimerosal and autism

2. Which of the following statements regarding the need for immunization is the MOST appropriate to use when counselling Barbara?
   a. Barbara I can appreciate your concern. With the amount of international travel any of these diseases are just a plane flight away and that is why we need to protect your son and the community
   b. Barbara, trust me I know what is good for your son. Give him the vaccine.
   c. Barbara, I can tell you that some of these diseases are very rare but we immunize our children because that is what the experts tell us to do
   d. Barbara, you are somewhat right, we immunize our kids against some of these conditions as the vaccine manufacturers only make certain formats of vaccines.

3. Which of the following points is NOT appropriate to include when discussing the risk of autism and vaccines?
   a. Barbara, there is no link to vaccines and autism
   b. Barbara, one huge study with over a half a million children showed no link between autism and vaccines
c. Barbara, the study that raised most of the concern between autism and vaccines was retracted recently due to the lack of a link
d. Barbara, they still think there are a small number of children that get autism from vaccines but the risk to Jeremy is minimal

4. When discussing adverse effects with Barbara which of the following statements is the MOST appropriate to include?
   a. Barbara, most side effects with vaccines are minor and can include some soreness at the injection site and a mild fever
   b. Barbara, some vaccines have a higher risk of serious adverse effects than other so we can avoid them if you would like
   c. Barbara, Jeremy will probably have one vaccine that he is allergic to. Don’t worry I can manage it here, by him just staying for 15-30 minutes after the injection
   d. Barbara, simply put you are wrong. Vaccines are not linked to any side effects

5. When discussing Barbara’s comment regarding vaccines containing human and animal tissues which of the following statements is the MOST appropriate to include?
   a. Barbara, there are some cells and tissues in these products but don’t worry they are safe
   b. Barbara, although there are some vaccines grown in human and animal cells there are no vaccines containing human blood, serum, cells and tissues
   c. Barbara, gelatin is used in some vaccines but the risk of mad cow disease with this is low
   d. Barbara, human cells are in some vaccines but only in the live vaccines

References