A Religious Perspective on the Vaccine: Part 1, What is a Vaccine? **[1]**

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I recall clearly, aged six, going for my vaccinations. It was necessary for me to be able to go to school—the next phase of life I was eagerly anticipating. My uncle was our doctor and administered the shots. I did not cry, but put up a brave face through the pain and discomfort. In explaining the vaccines to me, I was told that I was now safe, for example, from tetanus (although my mother still cautioned me from not getting cuts from rusty nails). I knew that my body was stronger for having had those shots.

Today I am grateful for my mother taking me for my vaccinations. Back then it was uncontroversial, and taken for granted. But that was several decades ago, and with the access to increased information through the Internet since then, scepticism around vaccines have increased. This is a debate I cannot possibly hope to solve. But I do wish to offer a perspective, and let the reader decide.

WARNING: I am not a medical doctor, biologist, biochemist, or a virologist, although I do hold a master's degree in science in another field. I tried to make sure that whatever I write here is true, even if drastically simplified. If there is any doubt, please consult with a doctor or a person who specialises in a relevant field, such as biology.

This is the first in a series of articles entitled "A Religious Perspective on the Vaccine". I write at the time when several vaccines against COVID-19 are being rolled out (and regarded with suspicion) worldwide. However, I hope that what I write here will be broad enough to still be applicable during the next round of diseases and vaccine scepticism.

I am deliberately going to write as a layman, with what I understand as a non-expert. This would be how I would talk about the subject at a social gathering. It also goes to show what a layman, who knows what questions to ask, can come to know about the virus1 and its vaccines. For that reason, I have deliberately kept research to a minimum, although I did consult with people who are better acquainted with the field to make sure I am not peddling blatant lies, even if what I am saying is oversimplified.

Before we can discuss the religious perspective of the vaccine, we first need to look at what a vaccine is.

A Terse Overview of the Immune System and Vaccines

The First Vaccines: Inoculations

Modern, science-based vaccines have only been with us for around 250 years. Before microbiology, all we could do was infect certain people with a specific disease for them to become immune to that disease. These were less vaccines and more inoculations, yet they were precursors to modern vaccines. To explain how they work, think, for example, of chicken pox: it affects children only mildly, but adults more severely. Once someone has had chicken pox, they are usually immune to it for the rest of their lives. Such inoculations were dangerous, though, because the person could potentially become seriously ill, or even become a carrier of the disease and make others sick.

The first modern vaccine (there were other inoculations going back hundreds of years in other parts of the world) came about when it was observed that people who had contracted cowpox (a relatively benign diseases) where typically immune to the much more deadly smallpox. People were thus, effectively, made immune to smallpox by inoculating them with cowpox. It also eventually became known that if someone gets infected with smallpox in a certain way, it would not be deadly, but still cause immunity to develop. These are known as “live virus” vaccines.

Why are Inoculations Effective?

Inoculations introduce a foreign organism into the body. The body then reacts to the foreign organism and tries to fight it. It may raise the temperature of the body (to try and kill the organism with the higher temperature), it may cause the body to expel fluids through sneezing, coughing, or other means (in order to flush out the organism), or some other reaction, all while the body teaches itself (through white blood cells) to recognise and eliminate the threat[2]. Once the body has learned to recognise the foreign organism, it moves quickly to destroy that organism, and then allows the body to “switch off” its defensive reactions and return to normal function[3].

Roughly speaking, the immune system learns to identify the “shape” of the foreign organism. This explains the varying efficacy of vaccines. Some organisms are remarkably stable in their “shape”, such as polio. Once you have become immune to polio, you remain immune to polio[4]. In the case of cowpox and smallpox mentioned above, the two viruses which cause these different diseases are quite similar (although this was not known at the time, of course). Hence, once the body’s immune system knows how to deal with the one, it can deal with the other. Other types of diseases change their “shape” rapidly as it “jumps” between people (called mutations). Examples are the common cold and influenza: we regularly catch them, but because they undergo a high rate of change as they pass between many individuals, our bodies no longer recognise them, and need to start fighting them “from scratch” again. Other organisms defy identification by the body: this is why there are (at the time of writing) no vaccines against HIV.

The fact that the human body has the capability to defend itself in this way is, quite frankly, remarkable. The complexities and nuance around the human immune system are staggering, and scientists continue to actively study and learn about it. In the process, they gain knowledge how to help the body defend itself even better.

Are Inoculations Safe?

Returning to inoculations, a common concern is whether, when some is effectively given an actual diseases, it really is safe? As mentioned earlier, inoculations were practised outside of Europe for hundreds of years before the smallpox vaccine, but doing so (while often effective) carried significant risks. When humans started studying smallpox scientifically (even though their methods might seem strange compared to modern science), they were able to develop safe ways of inoculating people. Receiving a live virus vaccine today is—in general—safe: so much so that humanity has started chasing the goal of eradicating certain diseases through worldwide vaccination programmes.

There are people who are not able to receive such vaccines, such as immunocompromised individuals (that is, people whose immune systems don’t function well or as it should). Today, particularly in developed countries, people with such conditions are known beforehand, and doctors would not recommend vaccines if they are known to be at risk. But such individuals can still be kept safe by having a significant portion of the population around them vaccinated. The idea is that if the

bodies of most people can effectively deal with a virus and stop it from spreading, that virus cannot be carried through to the vulnerable person. This is known as “herd immunity”.

While it is still common to speak of vaccines as “giving a person the disease so that they become immune to it”, modern vaccines are developed using a variety of techniques. Live virus vaccines (such as for smallpox) are still daily given to people because they are known to be effective and safe to a high degree. But modern vaccines have progressed and are developed using more advanced techniques, not only to have less risk for humans when tested (a novel inoculation, when done wrong, could still be dangerous), but to combat more tenacious types of viruses.

More Advanced Vaccines

Even though humankind has become incredibly knowledgeable, the human body still knows best about protecting itself against foreign organisms. For this reason, vaccines still rely on making the body immune to foreign organisms by battling it itself (and thereby learning to identify its “shape”). But advancements in microbiology eventually allowed scientists to remove the reproductive capability of certain pathogens. This means that the “sterile” pathogen can be given to someone without fear that it could cause death by multiplying and running rampant within the body.

But this is not always easy to do; one certainly cannot “castrate” individual micro organisms one-by-one to vaccinate an entire human population! If there are no clever ways of making a particular pathogen sterile while still being able to replicate them, then another method must be found.

Currently, new vaccines are being developed to “fool” the body into becoming immune to a particular organism. Because the immune system targets organisms of a particular “shape”, scientists have started manipulating the “shapes” of benign viruses into those of more deadly viruses. This allows the body to learn to recognise and effectively deal with a more serious threat while not actually being in danger of harm during the process.

To avoid this article devolving further into a full-blown microbiology lecture, I won’t discuss more modern techniques in any great detail (especially as I am not qualified to). But be aware that modern techniques include attenuated and vector recombinant vaccines, and using mRNA. Such vaccines work at a DNA or smaller molecular level. For example, an mRNA vaccine (such as has been used in the development of many COVID-19 vaccines) does not trigger a full blown immune system response like an inoculation might, but teaches the body how to make certain proteins which then make the immune system respond more intelligently when confronted with the SARS-CoV-2 virus.

The Religious Perspective on the Vaccine

In this article we looked at what vaccines are. From one perspective—which I share—they are, at face value, beautiful. Understanding vaccines gives us, the laypeople, a glimpse into the incredible complexity of our immune systems. For the theist, this points towards God, and His good and thoughtful creation. Carl Sagan once said [2]:

> If you wish to make an apple pie from scratch, you must first invent the universe.
>
> Carl Sagan

Sagan, who certainly was no theist, understood that we do not “invent” new things: we look at what is already in nature, learn from it, and, essentially, imitate it5. If we play with Lego bricks, we only play with Lego bricks: materials such as wooden blocks, cement, carbon fibre, etc. are beyond our grasp. We can dream of them, but they are not part of our reality. That does not mean that we cannot build magnificent creations with Lego. It does not mean we can dissemble a Lego structure and create something more grand: but crucially, we are still using the same basic building blocks.

At face value, we are taking what is already in nature, directing it, and making it more efficient, to minimise suffering.

More than that, the development of the vaccine harnessed the combined skills, education and intellect of thousands of researchers. These people “stood on the shoulders of giants”, building on the work, discoveries and achievements of previous generations. From a Christian perspective, science [3] is our mandate to “subdue [creation]” and “have dominion” over it (Genesis 1:28). Through science, we discover the wonders of God’s creation. And along the way, we are able to improve our lives and the lives of everyone around us.

That is, as I said, at face value. Indeed, much remains to be said. What has been omitted (or not yet addressed) should not mean to minimise what I said about science as an outflow of our divine mandate. I hope everyone reading this will seriously think on that. In the next article we are going to delve into what lies beneath the face value: concerns over the vaccine.

- 1. Throughout this article I am going to be referring to viruses for simplicity’s sake. But there are, of course, vaccines which help against certain kinds of bacterial infection. I have already mentioned tetanus, which is caused by the bacteria Clostridium tetani. This bacteria releases a toxin in the body, which then causes tetanus. The vaccine allows the body to recognise this toxin (which is not a virus) and deal with it effectively.
- 2. Even though I am a computer scientist and not a biologist, there is a broad analogy between diseases and the immune system, and computer viruses and antivirus programmes. Both physical and computer viruses and unwelcome, unwanted, and potentially harmful outsiders infecting a system. Both the body’s immune system and an antivirus programme needs to be trained to recognise such external threats (and not attack something which should not be attacked). The immune system and an antivirus programme both have a “memory” which stores patterns of bad agents it had encountered before, and uses it to identify and neutralise a threat. And so I can at least speak with a little bit of knowledge on a cross-disciplinary knowledge!
- 3. Allergies happen when the body incorrectly identifies something which is foreign, but essential harmless (e.g. pollen) and tries to fight it off (possibly overreacting). An auto-immune disorder happens when the body’s immune system (obviously erroneously) starts attacking (parts of) the body.
- 4. Note that, while we are discussing live virus vaccines, the polio vaccine is not a live virus vaccine. It is an inactivated or killed vaccine: it is not able to replicate within the body. But the mention of polio here is to just discuss the efficacy of the immune system against certain kinds of viruses.
- 5. Even when the scientist Craig Venter “created synthetic life [4]”, this was not done from scratch. It was done very much by looking at existing living organisms and moving their building blocks around. Venter and his team “wrote their code”, so to speak, in a language which already existed.

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