STANDARD DEVIATIONS: We're not Immune from Mistakes

Greetings,

Vaccinated?

If you work in a clinical hospital setting then chances are that you have had the opportunity to receive one of the approved vaccines against SARS-CoV2. And that's great; I think.

Right now the vaccines have a strong track record, but it's a long race. The questions about efficacy against variants and the length of protection in general are questions that remain to be answered.

And vaccine hesitancy is still an issue among a significant portion of the population. That group may be large enough to keep the goal of "herd immunity" phenomenon just out of reach. The recent concerns about coagulation issues and poor efficacy in some of the vaccines being produced for coronavirus just reinforce their concerns.

A real problem we have to acknowledge about "anti-vaxxers" is that they have a point. Enough mistakes have occurred in the history of vaccines that skepticism is warranted.

Here is evidence, right from the CDC. These historical mistakes give ammunition to the critics and teach us something about safety and risk.

1955. The Cutter Incident.

Let's start with Polio. In 1955, Cutter Pharmaceutical and Wyeth Laboratories were responsible for a catastrophic vaccine mishap. Their failure to inactivate the polio virus led to 100,000 doses of live virus being administered. At least 40.000 cases of polio were caused by vaccine; hundreds of victims were paralyzed and several died.

1955-1963. Polio and simian virus.

The polio problem wasn't finished. Millions of vaccines doses administered in the US were contaminated with simian virus 40 (SV40). The virus was in the monkey kidney cell cultures used for manufacture. SV40 was found to cause tumors in rodents in 1961. Since then SV40 is known to be associated with cancer in humans; brain and bone tumors, mesothelioma, and non-Hodgkin lymphoma. Although the US stopped using the monkey cell line, the USSR, China, Japan and several African countries continued with it until 1980, exposing hundreds of millions. The pharmaceutical push to discredit research continues today.

1976. Swine Flu vaccine and Guillain-Barré Syndrome (GBS).

After 40 million people were given swine flu vaccine in 1976, it was observed that some became afflicted with the neurological disorder GBS. The low frequency (1 in 100,000) was enough for a federal decision to stop the program (officially), the lack of H1N1 transmission may have been a contributing saving grace. If a pandemic had evolved the vaccine would probably have been approved over the concerns of GBS.

Guillain-Barré syndrome (GBS) is a rare disorder where the body's immune system damages nerve cells, causing muscle weakness and sometimes paralysis. While its cause is not fully understood, the syndrome often follows infection with a virus or bacteria. Each year in the United States, an estimated 3,000 to 6,000 people develop GBS. Most people fully recover from GBS, but some have permanent nerve damage.

1998-1999. Rotavirus.

The FDA approved RotaShield vaccine in 1998, to prevent rotavirus gastroenteritis (rotavirus-caused diarrheal disease has killed millions of children and still infects hundreds of thousands yearly in under-developed countries). Immediately after it was licensed, vaccinated infants started presenting with bowel obstruction.

Investigations showed that RotaShield vaccine caused intussusception (folded bowel) 20 to 30 times over the expected risk in healthy infants younger than 12 months. It was withdrawn from market in October 1999.

Trial data demonstrated that the condition occurred more than twice as often with vaccine than placebo but the size of the trials (15,000 kids) was too small to show statistical significance.

2007. Haemophilus type b (Hib)

In 2007, Merck & Company, Inc. voluntarily recalled 1.2 million doses of Haemophilus influenzae type b (Hib) vaccines due to concerns about potential contamination with bacteria called *B. cereus*. The recall was a precaution, no evidence of *B. cereus* infection was found in recipients of recalled Hib vaccines.

No harm, no foul, right?

Bacillus cereus biovar anthracis is a variant of the *Bacillus cereus* bacterium that has acquired plasmids similar to those of *Bacillus anthracis*. *Bacillus cereus biovar anthracis* infection has caused significant mortality in numerous mammalian species; it is capable of causing anthrax. In 2016, it was added to the CDC's list of select agents and toxins.

2010. Rotavirus, again.

In 2010, it was discovered that both rotavirus vaccines licensed in the U.S.- Rotarix and RotaTeq- contained porcine circovirus (PCV) type 1. PCV1 is not known to cause disease in animals or humans. In fact, PCV is common in healthy pigs, and humans are routinely exposed to the virus by eating pork. Safety monitoring of both vaccines has not shown any reason for concern about PCV. But still ….

2013. Human papilloma virus (HPV) vaccine.

A *voluntary* recall of a batch of vaccine made by Gardasil for HPV happened in 2013. Vials of vaccine were found to contain glass particles. Luckily, no health problems were reported.

At the time of the Cutter Incident, there was no system in place to compensate people who might have been harmed by a vaccine. Today we have the National Vaccine Injury Compensation Program (VICP), which uses scientific evidence to determine whether a vaccine might be the cause of an illness or injury, and provides compensation to individuals found to have been harmed by a vaccine. Our research, testing, and development all continue to improve.

But vaccines are tricky and risky, and our risk management is suspect. Problems are often found only after they happen and we tend to put foxes in charge of the hen-house for monitoring risk. Money and politics are too often the basis of decisions about public health. Vaccine recalls are almost always disputed.

The argument is given that responsible public health leaders must be willing to take risks on behalf of the public. The problem is that sometimes that risk is conflated and we see policy made because of risk to decision makers instead of those affected by the decision.

I get it. Pandemics need action. But the thinking that it's better to overreact than underreact is a questionable way to look at risk. Good intentions don't protect people from bad decisions.

Risk assessment and risk management are separate functions. One is proactive and the other is reactive. One prevents disaster and the other cleans it up.

On the bench we use risk assessment to anticipate concern and mitigate problems before they happen. We call it a paradigm of biosafety. Mistakes happen. They are usually the result of breaches in procedure not bad policy. The drive to make public health choices with policies like vaccines needs the same paradigm of safety.

Have a great week and be safe,

Bryan