The Sixth Extinction: Vaccine Immunity and Measles Mutants in a Virgin Soil

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For more than 25 years, I have been, as a gastroenterologist, interested in inflammatory bowel disease—Crohn's disease and ulcerative colitis—and the gut-brain connection, particularly in childhood autism. In addition, I am concerned with the environmental factors that are driving the current epidemics of both autism and inflammatory bowel disease. The issue is contentious, and one's view depends greatly on perspective. This article provides one perspective on the delicate and often misunderstood ecological balance between man and microbe, a misunderstanding fraught with assumptions and wishful thinking.

I start with an historical perspective from a time when mortality and serious morbidity from infectious disease were commonplace. In 1878 Louis Pasteur stated: "If it is a terrifying thought that life is at the mercy of the multiplication of these minute bodies, it is a consoling hope that Science will not always remain powerless before such enemies." In his perception, mankind was at war with microbes. Bacteria, viruses, and fungi were enemies.

Our current perspective is somewhat different. We now live in the era of the microbiome. We realize that we would not be here on this planet were it not for a healthy microbiome. We have to look after our gut bacteria in particular because they are exquisitely important, not only to the development of our gut and our immune system, but beyond this to our mood, our behavior, and perhaps even our brain development in the womb.

Between Pasteur and the microbiome came the antibiotic era. Sir Alexander Fleming, returning from his vacation on Sept 3, 1928, to his laboratory at St. Mary's Hospital in Paddington, London, discovered a mold growing in some of the Petri dishes containing cultures of *Staphylococcus aureus*. Pasteur said, "In the fields of observation chance favors only the prepared mind," and it was the prepared mind of Sir Alexander Fleming that made an observation that led to the antibiotic era. His "mold juice," he found, was capable of killing a wide range of harmful bacteria. Some years later Howard Florey and Ernst Boris Chain, working at Oxford University, turned this laboratory curiosity into a life-saving drug—penicillin.

The era of antibiotics began in the 1940s, and it was a turning point in what was perceived to be the war on infectious disease—a "medical miracle." And there is no doubt that the outcome from diseases like syphilis, battlefield gangrene, and scarlet fever was completely rewritten by this discovery. However, in less than a century, that dream was to turn to nightmare, the miracle to apocalypse, with the development of bacterial resistance.

From the perspective of antibiotic administration, bacterial resistance is driven by several factors, including, for example, inappropriate indication, greed, and widespread use in animal husbandry. A physician notes a pink eardrum and puts the child on amoxicillin. When the condition persists 3 weeks later, the dose or the antibiotic is changed and the cycle gets repeated, when there was no real evidence for an infection in the first place. Pharmaceutical companies introduced more and more powerful broad-spectrum antibiotics into first-line of therapy in order to get the financial benefits.

We made assumptions about our ability to control these microbes. But we overlooked or underestimated their ability to adapt rapidly under the selection pressure of antibiotics.

Selection Pressures: the End of Modern Medicine?

Antibiotic use has selected out multiply resistant, more dangerous, and more pathogenic strains of bacteria. This growing threat has led what many senior public health officials in the UK and the U.S. to describe as the "post-antibiotic apocalypse" and the "end of modern medicine." It is estimated that 50,000 annual deaths occur in Europe and the U.S. from infections that "antibiotics have lost the power to treat." So in fewer than 80 years, we have reached the point at which, for example, with prosthetic surgery, wards are being closed down, patients are being sent home, and operations are no longer possible, because once the prosthesis becomes infected with such bacteria, it is virtually impossible to get rid of them.

Are vaccines destined for a similar fate? It's a very interesting question. One answer is, why not? For vaccines, resistance equates to strains of the microbe, the virus, or the bacteria that can elude the imperfect immunity created by the vaccine.

The interaction between microorganisms such as measles and the human immune system has led to the evolution of ways of mitigating the emergence of resistant strains, such as natural herd immunity. This is a grossly misunderstood and neglected concept. As we have learned, vaccine immunity does not achieve what natural herd immunity achieves. We're already seeing the emergence of resistance in pertussis. The majority of cases of pertussis are now occurring in those who've received multiple doses of the vaccine. The authorities themselves acknowledge that with "assumptions upon assumptions" we misunderstood the immunity associated with the pertussis vaccine.[1]

We have an emerging problem in chickens, not only with avian herpesvirus, which are undergoing multiple mutations that have eluded the currently available vaccines, but with the concomitant emergence of more severe forms of Marek's disease. Since nature abhors a vacuum, newly dominant viral strains emerge where an ecological niche is opened up by the

elimination of the previous resident strain(s). This problem is emerging with vaccines against diseases such as pneumococcus and human papillomavirus (HPV), which exists as multiple virus subtypes or serotypes. If, for example, you have 20 serotypes and produce a vaccine against only four, you may create a vacuum that is then filled by other serotypes, viral strains may turn out to be more dangerous than the ones against which the vaccine is directed.

Markowitz et al. examined this issue in the setting of widespread use of human papilloma virus (HPV) vaccine. As shown in Figure 1, after the introduction of the HPV vaccine, the prevalence of vaccine-targeted HPV strains went down, and concomitantly the prevalence of other strains went up.[2] The overall prevalence of HPV in sexually active women aged 14 to 25 years was 54.4% in the pre-vaccine era (2003-2008) and 58.1% in the post-vaccine era (2009-2012). In the pre-vaccine era, the prevalence of strains in the quadrivalent vaccine (4vHPV) was 18.6% overall or about 34% of all HPV, decreasing to 10.8% overall or about 20% of all HPV in the post-vaccine era.

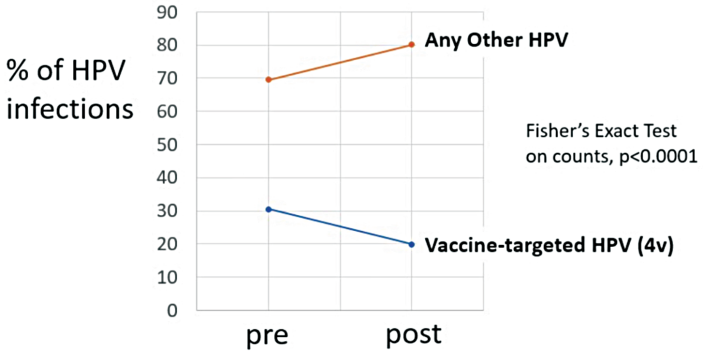

Figure 1. Prevalence of HPV Strains Pre- and Post-Vaccine[2]

Measles Virus and Herd Immunity

Authorities belabor outbreaks of measles as the reemergence of a killer disease that we had come close to eradicating until "anti-vaxxers" caused unwarranted scares around the world about the safety of the measles, mumps, rubella (MMR) vaccine. At all costs, the authorities say, we must maintain herd immunity. This is necessary, they claim, to protect the vulnerable, such as those who are immunodeficient, on steroids, or recovering from leukemia. The vulnerable now include those who have been vaccinated against measles, as the reality of vaccine failure is becoming manifest, as discussed below.

For measles, let us separate herd immunity into natural herd Immunity that operated before the vaccine era and vaccine-associated "herd immunity" in the vaccine era. What is natural herd immunity and what has it achieved? Natural herd immunity was the presence within a population of a level of immunity against measles adequate to protect those at high risk of serious infection, and by minimizing serious infection, consequently reduce serious morbidity and mortality. Natural herd immunity did not operate to prevent the infection. It did not prevent measles, but rather operated passively to permit measles in childhood at a time and in a way that it is least harmful, thus leading to improved survival, good health, and most importantly the benefit of lifelong immunity.

Measles is more severe in infants under one year of age and adults. In the pre-vaccine era the great majority of measles cases occurred in school-age children, with a peak incidence between 4 and 8 years of age, when it is a mild infection for the great majority.

Natural herd immunity operated through what I have termed "permissive constraint" (see Figure 2), so that it occurred within that time period when it was least harmful. Among the reasons for this permissive constraint were the facts that (1) a single exposure to measles in childhood led to life-long immunity and thus protection against measles in adulthood, and (2) infants were protected by passive transplacental and breast milk immunity from mothers who had themselves experienced natural measles.

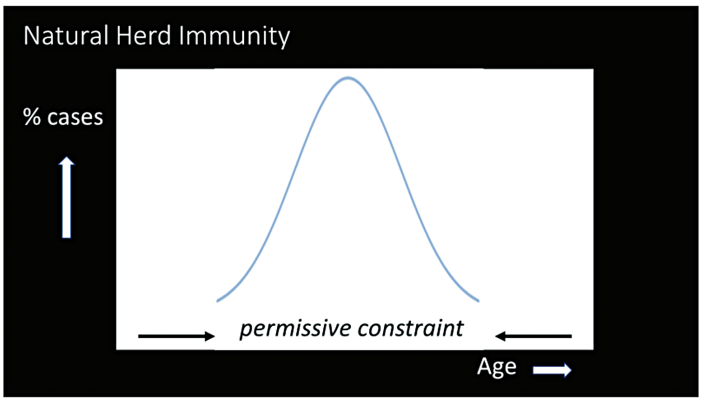

Figure 2. Natural Herd Immunity

Figure 3, prepared from data in McKeown's *Modern Rise of Population*,[3] shows the trend in measles mortality in the UK over the last 120 years or so and is applicable to any industrialized country over this period. Measles was a major killer of children in the UK until 1920, with a mortality of 1,200 per million children during biannual epidemics. Then there was a precipitous fall in case fatality rate, with at least a 95% reduction rate before the introduction of the vaccine. This decrease in case fatality rate occurred well before the introduction of antibiotics to treat secondary bacterial pneumonias, to which patients often succumbed. This trend had nothing to do with medicine or public health but was largely the result of natural herd immunity operating over 100 years as measles had rapidly become a progressively milder disease. Why measles is milder in children than at other ages, while not the subject of this paper, is due in part to the interrelatedness of factors such as age, dose of exposure, immune system maturation, and nutritional status. The fact is, that natural herd immunity achieved a dramatic improvement in the outcome from measles infection in a short space of time, and left to its own devices, may well have reduced mortality and morbidity to rarities by now. This is the benchmark against which the benefits of measles vaccines must be measured.

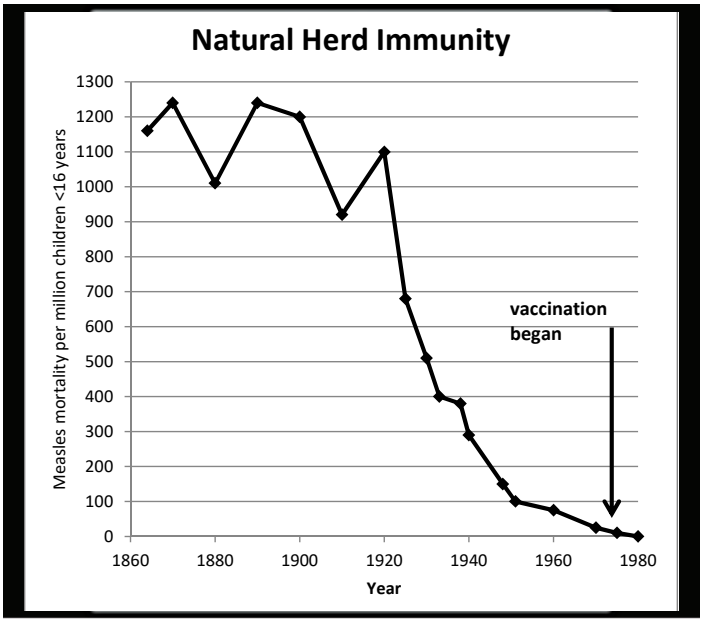

Figure 3. Fall in Measles Mortality Prior to Vaccination[3]

When measles vaccination started, President John F. Kennedy wrote a letter to a November 1961 meeting of the National Institutes of Health (NIH), describing measles as a "formidable and widespread threat." This was not a view shared by other invited experts including Sir Graham Wilson, at that time one of the world's authorities on microbial pathology. At a time when mortality from measles was one in 100,000, he described measles as one of the inevitable but rarely important maladies of childhood. This was in 1960. He suggested that the more important question was, "What is different about the child who dies?" Before rushing into universal vaccinations for every child, should we not be asking what is unique, what is different about that one child in the million, about what Claude Bernard described as the "terrain," which makes a child susceptible to this infection?

The viewpoint of the American scientists at that NIH meeting was very different, and it was driven, in part, by the perceived success of the polio vaccine campaign in this country. Kennedy's representative at that meeting, Alexander Langmuir from the Centers for Disease Control and Prevention (CDC) justified mass measles vaccination by quoting Sir Edmund Hillary, the first man to scale Mount Everest, who when asked why he did it said, "Because it was there." Langmuir went on to say that in the U.S., "measles is a disease, whose importance is not to be measured by total days of disability or number of deaths, but rather by human values and by the fact that tools are becoming available which promise effective control and early eradication."[4]

This history is extremely important because people are now hearing from the media that measles is a killer disease. That was clearly not the CDC's view then or the basis for wanting this vaccine introduced at that time. The promise made at the 1961 meeting was that tools for effective control and early eradication were becoming available. In other words, "we can and because we can we should," or rather, more honestly put, "we think we can and therefore we should take the risk." There was the sincere belief and assurance that eradication was achievable, not only in fact but within a very short time. However, Sir Graham Wilson and Dr. John F. Enders, who won the Nobel Prize for the isolation of poliovirus and who had, with his team at Harvard, isolated the measles virus, urged caution. They warned about the use of a vaccine that might not produce immunity as robust as that of natural infection, and they said with considerable prescience that vaccination should not leave people more vulnerable to measles at an age at when infection may be more dangerous—infancy and adulthood. In other words, vaccination should emulate natural herd immunity, be lifelong, not impair passive maternal immunity, and not thereby destroy the benefits of natural herd immunity. Measles vaccination, because it induces temporary and inadequate immunity and because it does impair passive immunity, has had precisely the effect anticipated by Wilson and Enders, shown in Figure 4, of reducing permissive constraint and widening the age distribution of infection.

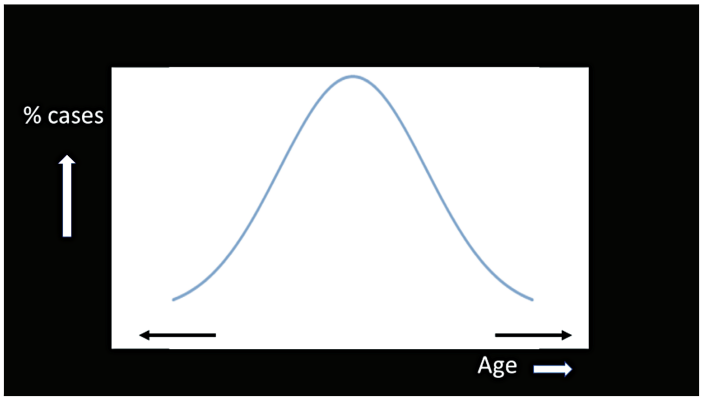

Figure 4. Age Distribution of Measles with Vaccination

The Filmmaker's Perspective: the Fatal Flaw of Certainty

In my current work, I tend to see the world with the perspective of a screenwriter. In screenwriting, you are often searching for a protagonist, someone whose story you follow from beginning to end. The arc of that story tells how your protagonist changes and deals with the fatal flaw, or doesn't. Accordingly, the story becomes an Aristotelian comedy, or tragedy. Let's explore the vaccinologist as a protagonist. The fatal flaw I was looking for emerged in a study of thimerosal, the mercury preservative that was in many of the vaccines until the mid-1990s, when it was phased out of childhood vaccines but remains in most influenza vaccines that are used in pregnant women, children older than 6 months of age, medical workers, and the elderly.

Thimerosal is a mercurial compound that never underwent any safety studies at all. It was grandfathered in when the Food and Drug Administration (FDA) was formed. At the Simpsonwood conference in 2000,[5] participants looked at the sevenfold increased risk that they'd found for neurodevelopmental injury with early thimerosal exposure compared with zero exposure, and they reanalyzed the data. They went through it at least six times, massaging it, squeezing it, jumping up and down on it,

and changing the protocol after the fact in a way that would have gotten me imprisoned had I done it, until they got rid of that significant risk.

At Simpsonwood, one vaccinologist, Dr. Richard Johnston from the University of Colorado in Denver said this: "We found a cultural difference between vaccinologists and environmental health people. Many of us in the vaccine arena had never thought about uncertainty factors before. We tend to be relatively concrete in our thinking." And here is the flaw, and that is certainty. We were certain about antibiotics. We're not so certain anymore. What gave these people the authority to be so certain? In 2004, the Institute of Medicine said, "Vaccines are among the greatest public health accomplishments of the past century."[6] Acting Surgeon General Steven K. Galson said: "Childhood immunizations are one of the greatest achievements of all time."[7] Such comments do not countenance any uncertainty.

The book *Crusade to Immunize the World's Children* by William Muraskin concerns the Gates Foundation. Muraskin used to attend all of the meetings of the Gates Foundation, which put tens of billions of dollars into vaccination campaigns worldwide. I interviewed him and asked: "At those meetings where all of the people from the industry, and the people from the World Health Organization (WHO), and UNICEF, and you are all around a table discussing vaccination policy for the developing world, did you ever discuss safety?" He said, "Not once." That is certainty in the real world.

There is no place for certainty in biological sciences. Stephen J. Gould, American evolutionary biologist wrote: "Organisms… must remain imperfect in their form and function, and to that extent unpredictable since they are not optimal machines. We cannot know their future with certainty."

There is a great deal of uncertainty in the interaction between host and infection. With vaccination we have changed virus-related factors: the virulence, the dose, the strain, the route by which they're administered, the tropism (that is the cells that viruses infect in the body, potentially changing the pathology), and adding in competing and synergistic variables such as other vaccines. There are also host-related factors or variables such as age, health, and genetics.

If I administer 10 vaccines at the same time, three of them in the same shot, and I give some with aluminum, and I give some with mercury, and these have never been tested alone or in combination, can I be certain about the safety of what I am doing? The CDC is apparently certain, despite the fact that, by their own admission, they've never done a single study of the combined schedule of these vaccines in children. Do I have the right to take healthy young people and be so certain about my position that I don't have to do safety studies? Is that good medicine or good science? If that is the new mainstream medicine, then I practiced a very, very old-fashioned form of medicine, which puts the patient first above all things, involves listening first and foremost, and first does no harm.

In physics, if you have two related phenomena such as the momentum and the position in space of a particle, Heisenberg's Uncertainty Principle states that the closer you come to knowing one variable, the further you get from knowing the other. With vaccination, we have multiple variables, each of which, when changed, could change another in ways we can't even predict, with inherent uncertainty. With a large number of variables, each of which can influence others, there is virtually infinite uncertainty. Uncertainty is the only certainty. Perhaps one certainty is that, as with antibiotics, nature will find a way; she will defy us and haunt the high ceilings of our ambition.

But in 1961, vaccinologists won the day, and certainty triumphed over caution. We were assured that there would be protection from a single shot of the attenuated vaccine; that vaccine immunity, like natural immunity, would be lifelong; that there would be no permanent injury, brain damage, or death; that measles would be quickly eradicated worldwide; and that the vaccine virus, even though it's a live virus, could not be transmitted from the vaccinee to a susceptible individual. Which of these has held true? Not a single one. And so, "The certainties of one age are the problems of the next," wrote Richard Henry Tawney in *Religion and the Rise of Capitalism*.

Vaccine Failure

A measles vaccine was licensed in the U.S. in 1963, and measles vaccination was initiated in Mexico in 1973. In both countries, morbidity and mortality had been declining long in advance of vaccine introduction. This is seen in many countries. This does not mean people were not getting measles. People were still susceptible, and the virus was still circulating. What it likely meant is that the declining severity of the disease was such that subclinical cases were not reported as measles. In other words, people were still getting infected, but it was not recorded in the statistics.

During a honeymoon period after measles vaccination in the 1970s and 1980s, measles outbreaks occurred in school-age children in the majority of reported cases. What was noted immediately is that 42% of affected children had been vaccinated against measles. Then there was suddenly a reemergence of measles in both the U.S. and Mexico in the late 1980s.[8,9] There were on the order of 170 outbreaks per year, up from the previous figure of 40 to 50 in school-age children. Approximately 80% of the affected children were appropriately vaccinated, and this increased through 1990. The majority of cases in these later outbreaks were not only in school-age children but in older, college-age children. Why? They've been vaccinated. Now they were getting measles at an older age. The vaccine had failed. Isn't that something that we've been cautioned against?

There were two outbreaks in two Texas schools despite the fact that nearly 96% of students were seropositive for vaccine-induced antibodies against measles.[8] Their protection was only apparent. The conclusion was that epidemics of measles can be sustained in school-age populations despite very high vaccination rates, and one thing that emerged very quickly is that this one shot does not confer lifelong immunity to measles. Vaccine-induced immunity is not natural immunity.

Later in that epidemic period, there was a dramatic shift in

age down to preschool children, of whom the great majority were not yet eligible for vaccination, despite which, among the affected children aged 15 months to 4 years, 44% were immunized. By 1990, measles incidence was highest for children under 1 year of age, and as was predictable, death rates were highest among these younger children. The unintended consequence of measles vaccination is a loss of the permissive constraint, with a displacement of the age distribution to young children and college-age persons, and consequently increased severity of disease.

The "answer," as it often is in medicine, was to double the dose—to give another shot of the vaccine. In interview with someone who was part of National Vaccine Advisory Committee (NVAC), I learned that NVAC had had a recent presentation by an FDA official. The presenter said that we're seeing a new outbreak of measles, and there's something different about it. It's much more severe. Maybe the virus has changed. Maybe under pressure from vaccination the virus has changed.

Even though the FDA itself noted this effect, it decided simply that more of the same was the answer.

Do two doses protect against measles? In Finland in 1989, there was an explosive outbreak in a rural Finnish municipality despite a very high vaccination rate. Those exposed at home (proximity of infection is a proxy for dose of exposure) rather than at school had a much higher infection rate, likely because of a higher dose of infectious particles, even if they had had two or three doses of vaccine. When siblings shared a bedroom with a measles case, there was a 78% risk of infection, even in two-dose vaccinees.[10] In other words, measles, particularly with high-dose exposure, is able to breach the wall of even two and three doses of the vaccine.

The initial assumptions, assurances, and certainties were wrong. There was not one shot for life, and not two shots. So, what is next? One shot every year of a failing vaccine, a product that's so successful commercially precisely because it doesn't work? While the authorities blame the outbreaks on noncompliance by "antivaxxers," this cannot be the explanation when 42% to 80% of patients contracting measles had been vaccinated.

Primary vaccine failure means that, unlike with natural infection, not all people develop immunity following exposure to the vaccine. Secondary vaccine failure occurs as a consequence of waning immunity and only a temporary state of protection.

Secondary failure is a big problem currently with mumps vaccine, because of which Merck is currently in court in Pennsylvania for allegedly falsifying the data on the efficacy of their mumps vaccine, in order to "circumvent" this failure. Outbreaks of mumps are occurring all around the world in highly vaccinated populations. Mumps is a trivial disease in children, but not in postpubertal males, so by displacing the age of susceptibility upwards, mass mumps vaccination has made a trivial disease of childhood a much more serious disease of adults.

Tertiary failure, which is not being widely discussed, is declining vaccine efficacy over time. So, tripling the dose will not solve the problem, although the National Vaccine Advisory Committee (NVAC) is currently going through the process of approving a third dose of measles vaccine.

Measles Mutants

Is measles to be feared? I believe so. A virus like measles demands our respect because, like other infectious agents, it is exquisitely versatile and geared for survival; Nature will find a way. All the vain assumptions that were made about our abilities to mutate, to exploit, and to exert dominion over this virus have been wrong—every single one—and along the way we have destroyed natural herd immunity. And measles is still with us.

Mothers who have been vaccinated give very poor passive immunity to their babies, and so babies now, unlike in the past, are susceptible to measles infection should it come back. And that's exactly what has happened in outbreaks, where we see the shift in age to under 1 year, where we are going to see a greater mortality. Is that the responsibility of those who've been cautious about measles vaccine, have tried to pay due respect to the history of measles and the evolution of Man's relationship with the organism, or those who've been accused of fraud and worse? Is it the fault of parents who are trying to deal with their vaccine-injured children? No and no.

At the other end of the spectrum, people are getting measles at an older age because the vaccine fails to induce the lifelong immunity that was promised. The quasi-herd immunity associated with mass vaccination is temporary, incomplete, and not sustained by booster doses. Mankind finds itself upon a treadmill of repeated vaccination.

The predicted situation—changing age trends in measles cases—has occurred and is illustrated in Figure 5, which shows the changing age-distribution of measles cases in Serbian measles outbreaks from 2007 through 2017-2018, based upon official data.[11,12]

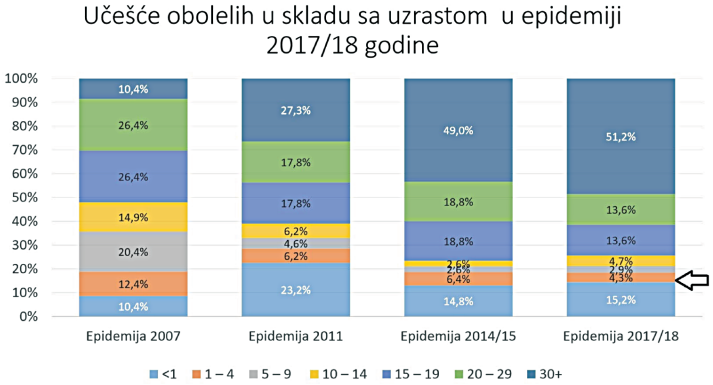

Figure 5. Age Distribution of Measles Cases in Serbian Outbreaks[12] [Graph reproduced with permission of Mladen Dakovic]

Measles morbidity in those under one year of age increased from 10.4% to 15.2% over this period. In those older than 30 it increased from 10.4% to 51.2%. Conversely, measles morbidity in children 1-4 years of age fell from 12.4% to 4.3% and in those 5-9 years of age, from 20.4% to 2.9%.

Just as with the natural infection, vaccines themselves are a swarm of quasi-species. If the environment in which that virus is operating changes, any one of those quasi-species that's better suited to survive in the new environment may emerge and become the dominant strain. The selection pressures exerted by an imperfect measles vaccine such as those in universal use may achieve the same effect. Such strains may become selection-pressure mutants that elude any immunity induced by measles vaccination. If this were to happen, a population with redundant vaccine-induced antibody might behave like a virgin-soil population, eminently susceptible once again to a measles virus of potentially altered pathogenicity.

Muñoz-Alía et al. have recently identified a variant of measles virus that escapes neutralization by monoclonal antibodies targeting the neutralizing epitope antigenic site, the main target of protective neutralizing antibodies.[13] Two measles virus genotypes emerged in their study: those with (D4.2) and those without (D4.1), the genetic variant that allowed escape from neutralization. The former had emerged in countries that have vaccinated intensively and for prolonged periods against measles (UK and France). The latter was present in isolates from East Africa. The D4.2 subgenotype viruses showed a trend toward diminished susceptibility to neutralization by human sera pooled from North American donors. In other words, a mutant has emerged against which vaccine immunity is reduced in the face of intensive, imperfect vaccination, a situation that deserves our urgent attention.

Part of the problem may be related to the way in which we produce vaccines. The immune response has broadly and simplistically two elements: the B-cell response that produces antibodies against extracellular virus—the immune response that we measure in the lab as an index of vaccine efficacy, and the cytotoxic T-cell response, which is responsible for killing intracellular virus, and which is responsible for the measles rash. In the control of and recovery from acute measles infection, and the establishment of life-long immunity both arms of the immune response are important and the TH1 response is essential. An excessive T-Helper cell Type-2 (TH2) induced a B-cell response may be associated with a suboptimal T Helper cell Type-1 (TH1) mediated cytotoxic T-cell response (see Figure 6).

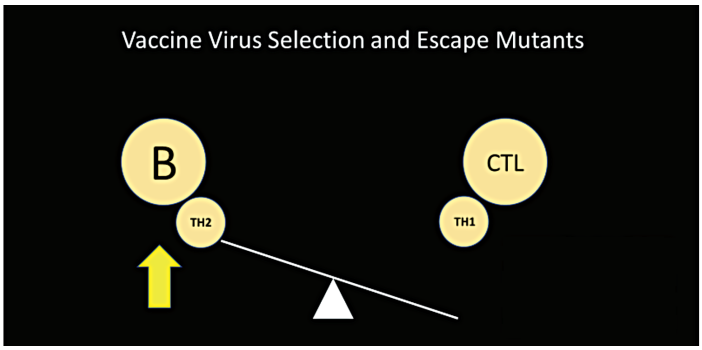

Figure 6. Two Types of Immune Response: B-cells and T-cells

When a potential vaccine candidate is injected into a susceptible individual and produces plenty of antibodies and no rash, that is considered good. But this is not necessarily the case since there may be an associated reduction in the cellular immune (TH1) response that is required for effective control of and recovery from measles virus and the generation of life-long immunity.

We know from hepatitis C virus and other viruses that an inadequate cytotoxic T-cell response may encourage the emergence of mutations. Thus, it may be that the process by which we make vaccines selects for variants that elude the immunity that's needed to protect against them.

When this has happened, as when the old-world disease measles was brought to America, the consequences were disastrous for those Native Americans who had no immunity whatsoever; mortality was huge.

The problem is not confined to populations experiencing mutants of measles virus to which indigenous measles immunity is ineffective. There is concerning evidence that measles neutralizing antibody titers have fallen to critical levels in highly vaccinated populations. Modrof et al. report a screen of plasma donors used for measles antibody replacement therapy in persons with primary immunodeficiency disorders.[14] They confirm that widespread use of childhood measles vaccination since 1963 has resulted in a decrease in average measles virus antibody titers among plasma donors, which is reflected in intravenous immunoglobulins (IVIGs). Plasma lots from these donors are failing to meet FDA potency requirements for measles virus antibody. An attempt to mitigate the decline in measles virus antibody titers in IVIGs revaccination of plasma donors was investigated as a means to boost titers, and it failed. Revaccination-induced titer increases were only about 2-fold and short-lived. Are we sitting on a time bomb? Are we creating, by suboptimal vaccination, what are essentially virgin-soil populations that have no immunity against both ancient and emergent forms of this virus?

Other Escape Mutants

As recently reported on NPR,[15] mutant strains of polio vaccine now cause more paralysis than wild polio. This is because the oral polio vaccine used in developing countries has mutated to produce highly pathogenic forms of this virus, which are likely the cause of outbreaks of flaccid paralysis around the world. The outbreak in Syria was called "a hiccup...a very regrettable hiccup for the poor children that have been paralyzed, of course." However, continued Michel Zaffran, the director of polio eradication at WHO, "With regards to the whole initiative, you know it's not something that is unexpected."

In India, after it had been declared polio-free for a year, there was a huge increase in non-polio acute flaccid paralysis (NPAFP). In 2011, there were an extra 47,500 new cases of NPAFP. Clinically indistinguishable from polio paralysis but twice as deadly, the incidence of NPAFP is directly proportional to doses of oral polio received.[16] The Indian Medical Association rejected assertions by officials of the national polio surveillance project that this rise is the result of intensified surveillance. "Nowhere in the world do we see such

numbers, and yet this has remained uninvestigated," stated Dr. Santosh Mittal, chairman of the association's consultative group on immunization.[17]

The idea that vaccines are pushing pathogens to evolve follows from the notion that natural selection removes pathogenic strains that are so "hot" that they kill their hosts and, therefore, themselves. Vaccines that "leak," which let the hosts survive but do not prevent the spread of the pathogen, relax this selection and allow the onward transmission of strains otherwise too lethal to persist. Andrew Read et al. demonstrated this effect in experiments with chickens immunized against Marek's disease.[18] Authors concluded that "the future challenge is to identify whether there are other types of vaccines used in animals and humans that might also generate these evolutionary risks."

"Just as antibiotics breed resistance in bacteria, vaccines can incite changes that enable diseases to escape their control. Researchers are working to head off the evolution of new threats," writes Melinda Wenner Moyer.[19]

The "Return" of Measles

WHO reported that 41,000 children and adults across Europe have been infected with measles in the first six months of 2018. Thirty-seven people are alleged to have died.[20] As noted above, at the 1961 NIH meeting, it was reported from Scandinavia by the world's authority that there were one in a million deaths from measles. The current WHO figure is vastly in excess of one in a million. If these numbers are to be believed, what has happened?

Blame for the "return" of measles is being ascribed to the "antivaccinationists." Gregory Poland from the Mayo Clinic writes: "Antivaccinationists tend toward complete mistrust of government and manufacturers, conspiratorial thinking, denialism, low cognitive complexity in thinking patterns, reasoning flaws, and a habit of substituting emotional anecdotes for data."[21] In fact, several papers,one from the U.S. and one from Italy, show is that the people who are rejecting vaccinations are the higher educated, the better educated, the university educated,[22,23] those who have done their research and said, "Actually, I've looked at this from both sides and I'm not so sure. I'm not sure that I believe you anymore." They've got very good reason not to believe, based upon the assurances and certainties with which they've been presented in the past that have failed to materialize. And the problem is that because the public health authorities have not been honest with people, and because the drug companies have not been honest with people, there has been attrition of trust that leaves a vacuum, and nature abhors a vacuum.

There is an apocryphal story that Pasteur recanted his germ theory on his deathbed, stating that "[Claude] Bernard was correct. I was wrong. The microbe (germ) is nothing. The terrain (milieu) is everything."[24] Whether the story is true or not, we would do well to ask, as did Sir Graham Wilson, "What is it about that child, that terrain, that makes him vulnerable?", rather than pushing universal vaccinations.

In examining the history of where the current "certainty" of public health came from I am reminded that the early studies of safety and efficacy, those upon which current beliefs are founded, started at places such as Willowbrook State School in Staten Island, N.Y. There, "feeble-minded" children, as they were described at the time, in Ward 16 were infected with hepatitis B virus, hepatitis A virus, and measles, to test vaccines. Saul Krugman would take unpurified fecal extracts from hepatitis B-infected individuals and force-feed them by mouth to children who were susceptible to see what the effects might be. The book *Against Their Will: The Secret History of Medical Experimentation on Children in Cold War America* by Allen Hornblum, Judith Newman, and Gregory Dober described such experiments. They represented the "utilitarian calculus of convenience, self-interest, and the chance of a grand scientific payoff." Where has this led us?

The Coming Plague

Is the plague coming or is it already here? The plague, in my opinion, is already here in the form of an epidemic of childhood neurodevelopmental disorders such as autism. Figure 7 shows the prevalence of autism in the U.S. as measured over time by the CDC's reporting system in standardized ways, in specific locations and centers across America. It has now reached one in 33 by some estimates. The latest increase, a doubling, is attributed by some to a change in survey questions.[25] But this timeline cannot plausibly be explained by other than a real, sustained increase. A rate as high as one in 21 has been reported for schools in Belfast in Northern Ireland.[26] We are approaching a situation in which everyone either has autism or is caring for someone with autism.

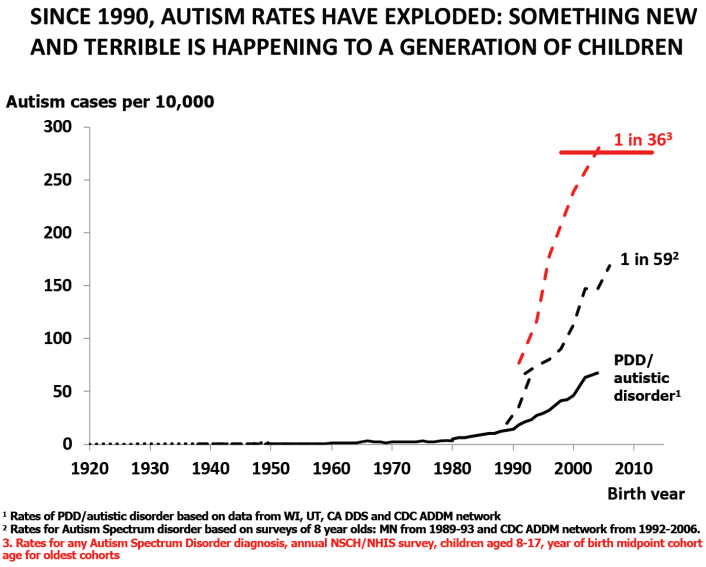

Figure 7. The Rising Prevalence of Autism in the U.S. [Figure by Mark Blaxill, based upon a lecture given in Salt Lake City, Utah, November 2018. Used with permission.]

And perhaps there is another player waiting in the wings while center stage these battles between Germ and Terrain, Caution and Certainty, Profit and Loss, Truth and Propaganda play out. In the wings we have an old adversary in the guise of an ambitious understudy—measles.

I am not the first to contemplate the idea of the final outcome, if current trends continue, not just with severe neurodevelopmental disorders, but with declining fertility[27] worldwide. There have been five major extinction events in the history of planet Earth, and I believe that if something does not change, we face a sixth extinction event as surely as eggs are eggs.

Certainty is nonetheless the official position of the U.S. A message sent to all U.S. physicians in 1984 read: "Any possible doubts, whether or not well founded, about the safety of the [polio] vaccine, cannot be allowed to exist in view of the need to assure that the vaccine will continue to be used to the maximum extent."[28] This position is still reflected in the attitude toward "antivaccinationists" expressed by government agencies, medical organizations, social-media giants, news media, and medical institutions.

As Allen Wheelis wrote, "Clearly it is not reason that has failed. What has failed—as it has always failed—is the attempt to achieve certainty, to reach an absolute, to find the course of human events to a final end.... It is not reason that has promised to eliminate risk in human undertakings; it is the emotional needs of men."[29]

Steven Erikson wrote: "He argued that every certainty is an empty throne. That those who knew but one path would come to worship it, even as it led to the cliff's edge."[30]

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This manuscript is based on a presentation given by Dr. Wakefield at the 2018 meeting of Doctors for Disaster Preparedness. Available at: https://www.youtube.com/watch?v=RWojYJpzFbk&feature=youtu.be. Accessed Jul 24, 2019.

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