

# Immunization and Public Health

Trishna Narula, '12

Memories of the summer before I matriculated at Rice would be incomplete without images of heaps and stacks of various forms waiting to be completed – one of which was a health record to be signed by my pediatrician. I decided it would be better to verify myself if I was up to date on my vaccines rather than receive an unanticipated prick at the doctor's office. Thus, like hundreds of millions of people around the globe, I turned confidently to my omniscient and omnipresent companion Google to answer my queries. I entered the word "immunizations" and precisely 0.16 second later, I was rewarded with various reliable sites such as the CDC's and the NIH's. However, preceding this obliging list was the phrase: "related searches: against immunizations" glaring at me in underlined, bold font. Curious, I clicked it. Whatever could this mean? The search engine directed me back in time...

Once upon a time, bacteria and viruses dominated the world. Actually, even today there are more microbes on your hand than there are people on the planet! However, I'm talking more pathogenic bacteria and viruses. Their lives (or "lives" in the case of viruses, which are scientifically classified in the gray area between living and nonliving) consisted of finding an innocent animal or human cell which – once they had invited themselves in through endocytosis – they established residence in and pinched food and nutrients from. If for some reason things didn't quite work out in their favor, they could easily pack up and drift to a more vulnerable host that would allow them to proliferate exponentially. These parasites were undoubtedly very happy until one fine day in 1796...

Little Miss Smallpox sat in a big ox, eating its host cells away. Along came Edward Jenner, and sat down beside her, and frightened the virus away.

Well, he had to put in a little more effort than just sitting next to her. Jenner successfully tricked the human immune system

into believing that a small amount of injected cowpox virus was actually the related but much more lethal virus smallpox, hence inciting an immune response from the person and inoculating the person against smallpox in the future.

The term "vaccination" was thus coined from *vacca*, Latin for cow, and was initially used solely for poxvirus immunogen injections. Since then, however, vaccines for hepatitis A, hepatitis B, polio, mumps, measles, rubella, diphtheria, pertussis, tetanus, haemophilus influenzae, chicken pox, rotavirus, influenza, meningococcal disease, and pneumonia have been developed, and most recently, for human papillomavirus and shingles. (Ironically, since smallpox was eradicated in 1979, there is currently no vaccine in place for it).

Not only have these immunizations been developed, but they have also been widely implemented, resulting in one of the most successful public health endeavors in the history of mankind. In 2006, approximately 77% of 19 to 35-month-olds in America received all their recommended vaccinations, a record high rate for the nation.

Nevertheless, as Benjamin Dana said, "There has been opposition to every innovation in the history of man." Microorganisms are once again gaining strength, and we the people are the ones abetting them. More and more individuals are beginning to believe that vaccines are perhaps more medically harmful than they are beneficial, and parents are indeed finding legal ways – such as religious or philosophical waivers – to opt their children out of the requirement.

Undeniably, one of the basic arguments is a fairly legitimate one: babies less than a day old, with feeble immune systems, are being infused with samples of potentially potent microorganisms. Simple reasoning seems to defy the probability of any profitable consequence of this seemingly dangerous practice. However, conducted empirical studies beg to differ. One particularly significant

experiment in Denmark published in 2005 illustrates the lack of correlation between increased vaccine exposure and a higher rate of infections. In fact, common fevers in children are a greater threat in compromising the immune system than vaccines are.

A more specific and escalatingly popular issue is the controversy created by claims that the MMR (measles-mumps-rubella) vaccine causes autism. Murmurs of this hypothetical link arose when the rate of autism diagnoses began to climb during the 1980s and 1990s, at the same time that the MMR vaccine was being introduced in Britain and its use mounting in the United States. However, the last straw was an article in *The Lancet* authored by Andrew Wakefield, M.D., in 1998, that implicitly proposed this connection.

Wakefield's research was, from the beginning, generally refuted by the scientific and medical community, including the overwhelming majority of the supporting writers of the original article. In addition, a couple of likely coincidences that would skew data must be taken into account. First, though diagnoses of autism have undoubtedly increased dramatically, the phenomenon may very well be attributed to heightened awareness of the disease, leading to better detection or even a wider definition of the same. Alternative explanations include environmental and genetic anomalies. Secondly, the mere temporal similarity of the typical onset of autism and the usual administration of the MMR may have been easily disguised as a link between the two. Indeed, later studies clearly display the absence of an association.

Nevertheless, the damage had been done to the public psyche, and the media further conditioned the concept to an immense extent. Immunizations rates already started dropping. Moreover, there was another factor fueling the pandemonium...

From the 1930s until the turn of the century, thimerosal, or sodium ethylmercurithiosalicylate, was used as a preservative in several vaccines (the MMR not being one, ironically) to thwart contamination by bacteria or fungi. Sounds all fine and dandy, right? Wrong. Take a look at that chemical name again... thimerosal is composed of nearly half mercury by weight. Excessive mercury is capable of incurring substantial brain damage, especially in children, whose actively growing and developing brains are most vulnerable. Although it was soon realized that thimerosal degrades to ethyl mercury rather than the more known and more toxic methyl mercury, the situation remained ambiguous enough for thimerosal to be removed from all required vaccines. By 2001, new vaccines were incorporating various doses in one vial. Though more expensive, these do not contain thimerosal.

Despite this metamorphosis, autism rates have still been on the rise. Indeed, a committee formed by the CDC and WHO has time and time again in the past decade concluded that there is no scientific evidence to support the link between thimerosal and autism.

Evidently, a major shortcoming in our society is the lack of accurate awareness of the above topics. Even if one goes back to a straightforward cost-to-benefit ratio, the majority of today's generations hasn't witnessed any epidemics; thus, they are not able to rationally perceive the full extent of such widespread disease. These individuals find it difficult to grasp the fact that although vaccinations have reduced so many diseases nearly to the point of extinction, diminishing the coverage can easily bring them back to life in full blast.

Unfortunately, a rather large handful of parents seem to be thinking along the lines of, "Even if my kid doesn't get vaccinated, all the other kids around him will be, so it will shield him anyway." But if the other kids' parents catch on to the same free-rider idea, the insulation bubble will quickly begin to disappear, failing to protect even those who genuinely have no other choice – for example, cancer patients with very weak immunity or individuals whose vaccinations were not 100% effective.

The take-home message here is rather transparent: vaccinations are essential. As a rule of thumb, the benefits outweigh the risks (until we can genetically screen people to predict their individual reactions to a vaccine) since a link between vaccines and autism has not been proven. To label a number on that fact, the CDC says that childhood immunizations save 33,000 lives in the U.S. alone annually. Most importantly, we must realize that everyone is on the same side – parents, doctors, policymakers – in the battle against disease and for human life.

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## References

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