

Introduction: the Germ Theory Versus My Mom's Theory

In the mid-19th century, a revolution took place in science and medicine. With the discoveries of microorganisms and their role in causing disease, the research giants Ignaz Semmelweis, Louis Pasteur, Joseph Lister, and Robert Koch defined the germ theory of disease. According to this new paradigm, microscopic living organisms could spread from person to person, invade our bodies, and cause severe illness and even death. In the ensuing 150 years, the germ theory has proven to be the single most important contribution of science to the practice of medicine.

My mother, however, didn't get the memo.

I grew up certain that illness came from being underdressed in cold weather or overdressed in warm weather. If my hair was wet when I went outdoors, guaranteed sickness. If my feet got wet in the snow or rain, sick again. Food and drink, of course, were also critical determinants of health. Hot was healing—chicken soup and oatmeal—but heaven help the poor soul who drank something too cold on a cold day or, for that matter, on a hot day. Ice was a public health menace. Hot tea with honey was curative; iced tea—are you kidding? Menthol rubs, “gogle mogels” (a concoction of hot milk, egg, and honey), six layers of blankets, and hot steam vaporizers treated the mysterious causes of most illnesses that occurred above the belt. For the illnesses below the belt, a variety of binding substances would be ingested, each of which tasted chalkier and was more nauseating than the last. Our cuts and scrapes were painted with mercurochrome, a burning antiseptic that today is banned because of the risk of mercury poisoning! If we complained that the treatment made us feel worse than the disease, we'd be reminded of what our grandparents did to our poor parents when they were sick as kids: “bankes” (a torture device using a wax candle in a glass that was applied to the chest), cod-liver oil, and schnapps. We would also be reminded that this was the price we paid for not wearing our boots in the rain. We caught a chill!

As with most diametrically opposed theories, the truth about infections rests somewhere between Mom and Pasteur. Recognizing the germs that cause infections has certainly given us powerful tools to combat them. Long before today's worries over epidemics like bird flu and SARS (severe acute respiratory syndrome) crossing onto our shores, quarantines and importation restrictions prevented the spread of yellow fever and cholera from

contaminated European ships docked in our ports. The implementation of basic community sanitation innovations, like sewage treatment and water purification systems, by the early 1930s had eliminated homegrown waterborne epidemics of cholera and typhoid fever. Coincident with these innovations, but not coincidental to them, the infant mortality rate fell from 110/1,000 live births in 1900 to 29/1,000 by 1950, and U.S. life expectancy rose from 47 years to 68 years in the same period. However, a modern-day scientific “miracle” also contributed mightily to the improved quality and duration of life in America in the first half of the 20th century. The “miracle of antibiotics” began with the discovery of penicillin in 1928. Its mass production, just in time to provide enough medicine for all our troops by D-Day in 1944, was followed by the introduction of other antibiotics, including the first to be effective against tuberculosis. Contrast the dramatic life-saving impact of penicillin on our troops in World War II with the stark statistic that two-thirds of the 360,000 Union soldiers who perished in the preantibiotic-era Civil War died not from bullets but from infectious diseases.

Our germ conquests continue. From 1950 to the present, infant mortality in the United States has decreased even further, to fewer than 7 deaths per 1,000 live births, contemporaneous with, and largely attributable to, the “miracle of vaccines.” This miracle began in 1950, when a grassroots campaign to eradicate polio emerged in Phoenix, Arizona, with the slogan, “Turn on your porch light, fight polio tonight.” In the ensuing few years, the Mother’s March of Dimes raised a fortune in door-to-door contributions from around the country, directly leading to the development and administration of effective polio vaccinations. As a result, there were no cases of polio in the United States between 1999 and 2006 (when a case of imported polio was diagnosed), compared with 21,000 U.S. cases in 1951 just before vaccines were introduced. More vaccine miracles followed: there are 200,000 fewer cases of diphtheria each year in the United States, 250,000 fewer pertussis (whooping cough) cases, and 900,000 fewer cases of measles than there were in early and mid-20th century America.

Okay, so germs are important causes of disease and fighting them with sophisticated scientific advances is effective. Does that mean that our mothers and grandmothers were snake oil saleswomen? Quite the opposite. The highly focused and skeptical lens of today’s science has proven that the simple interventions that generations of moms have embraced are also effective in protecting kids against infections—good hygiene, healthy nutrition, sleep, exercise, and yes, maybe even those rubber boots in the rain.

Neither the science nor the folklore of infectious diseases stands still. In the past 30 years, no fewer than 25 “new” germs have been identified and established as causing significant human disease; more properly, 25 “old” germs have been newly identified, since there is evidence that all of these infections have been around, albeit unnamed and unstudied, for decades or centuries. Some, such as Legionnaires’ disease and peptic ulcers, can be cured with our current armamentarium. Others, such as AIDS and hepatitis C, can be managed but not cured. Still others, like West Nile virus and Ebola

virus infections, can at best be contained. Novel mechanisms of infection have also been identified, such as the recently recognized toxin-mediated damage due to a very old and familiar bacterium, *Staphylococcus aureus*; the resulting disease is toxic shock syndrome. Another such example is the bizarrely abnormal protein molecule that defies all definitions of infection as it alters brain structure and causes mad cow disease.

If the past is at all predictive of the future, as it almost always is, new germ challenges to our health will continue to emerge with alacrity and regularity. Challenges will also continue to arise from nongerm sources—the societal, economic, and political realities we face in our war on germs. Examples are the recent trends affecting the very same infection-fighting weapons hailed just yesterday as miracles: antibiotics and vaccines. Both have now come under widespread scrutiny and criticism. Zealous marketing and excessive use of antibiotics have contributed to the emergence of supergerms that are more difficult to treat. Public amnesia about past plagues that have been controlled by successful vaccination programs has opened the door to questions about vaccine safety; such questions never surfaced in earlier eras when children were dying of infections that can now be prevented by vaccines. Predictably, immunization rates have dropped in the face of uncertainty regarding safety, and increased numbers of cases of previously controlled diseases are being observed.

For an infectious-disease specialist like me, these perpetual challenges amount to job security, but I'd happily forgo that uneasy peace of mind for a world in which infections could be prevented before they had to be cured. We can already prevent many, if not most, infections with a combination of individual common sense and societal common purpose. It sounds like a mantra for a new movement, but by coupling our cumulative scientific ingenuity with our grandparents' wisdom, your children could become the healthiest, most infection-free generation in history. This book is your first step toward joining the new movement.

Now, a word about how to read this book. I have written it in four parts, and it can be read, logically and I hope seamlessly, cover to cover. However, I suspect most of you will find yourselves frequently flipping back and forth rather than reading straight through. That's because I've also written the book as a home bookshelf reference tool that you can use to look up specific germs and diseases that you are concerned about, that you read about in the morning newspaper, or that your child's doctor has diagnosed. You can also look up specific treatments, both prescribed and home brew, as well as specific preventives, those that are recognized by the medical establishment and those that were touted by your mom and her mom before her.

"Part I: Worthy Enemies" introduces you to the germs by name and reputation, as well as to the ways in which they travel in and out of your child. This part of the book is also where you should turn when you want to know about AIDS, bird flu, the common cold, diabetes (yes, it might be caused by germs), ehrlichiosis, and the rest of the alphabet of infections through zoonoses (that's not pronounced "zoo-noses" but rather "zoa-no-sees," and

it means infections caught from animals). Rather than being presented in alphabetical order, though, the diseases are organized into those that you most hate, those that you most fear, and those that you used to hate and fear but that are now mostly gone.

“Part II: Weapons in the War” is the good news to counter all the bad news in Part I. These chapters describe your children’s natural immunity to infections, as well as the armamentarium that doctors and scientists have amassed to combat germs: antibiotics, antiviral medicines, antifungal medicines, antiparasitics, insecticides, and vaccines. In this part of the book, you’ll find answers to your questions about the safety of these life-saving weapons, as well.

“Part III: Wear Your Boots in the Rain” contains the reconciliation chapters. How do Mom’s ideas of infection prevention jive with those we have been taught by modern medicine? Is there science to support Mom’s intuition? You’ll be surprised.

Finally, “Part IV: Wisdom of the Ages” contains a single but important chapter that puts it all in perspective. How should you balance phobia with prudence in protecting your kids? How much prevention is too much? How should you interpret each new germ threat and health warning in the daily news?

Germ Proof Your Kids guides you in protecting, without overprotecting, the ones you love from the invisible enemies all around them.