

BUBBLEGUM AND BAND-AIDS

By David A. Watson, Ph.D.

Each year at the beginning of the holiday season, I take a few minutes to reflect on what I am most thankful for. As you know by now if you peruse this space regularly, my wife and I have four healthy and happy young children. Although in many ways raising children has never been easy, much of the anxiety and uncertainty related to their health has disappeared in just this century thanks to the miracle of modern medicine. The widespread availability of antibiotics and vaccines have all but defeated serious infectious diseases of childhood—in the developed world, at least. No longer do we lose large numbers of children to measles, diphtheria, rubella, or a host of other vaccine-preventable diseases. Of course, better nutrition and clean water matter a great deal as well, but within just the past 50 years (certainly within the lifespan of many individuals still alive today) antimicrobial usage has become common and vaccination of children is nearly universal.

A world free from serious infections of childhood is a wonderful utopian vision; the reality, however, is that any declaration of victory over them is almost certainly premature. I say this since somewhere along the way to being eradicated from the planet, the microbes rebelled. They started becoming resistant to the miracle antibiotics discovered not so very long ago. How did this happen, and what can be done? First, some information, then some bad and good news.

Microbes, or germs if you prefer, are actually a very heterogeneous group of living organisms, really sharing little more than small size. Viruses are generally the most common causes of infection, and while such infections may lead to considerable misery, they are often self-limited (although not always, as in the case of e.g. the Human

Immunodeficiency Virus-HIV). They are usually extremely small, so tiny in fact that most cannot be seen using a light microscope, and are parasites that carry miniscule amounts of genetic information. Viruses are very different from bacteria, the other major culprit in infectious disease processes. Bacteria are much larger, and can be visualized using most microscopes. The great majority of antibiotic compounds have been developed for use against bacteria (although a small number of antiviral drugs are now available).

Resistance to antibiotics by microbes, mostly bacteria (but also by HIV against antiviral drugs), has resulted simply because bacteria follow the dictates of nature. That is, the appearance of large concentrations of antibiotics in the environment has presented what biologists call “selection pressure.” The microbes either adapt or die. Overwhelmingly, they die. A few survive, not because they choose to, but simply due to the randomness of mutations (changes) in their genetic information. These mutant forms proliferate and are no longer vulnerable to the drug. This is not the only mechanism of development of resistance, but it serves to illustrate the resilience of bacteria. Where have the antibiotics come from and why has there been such an increase in resistance over the past decade? The blame is ours. Antibiotic usage has climbed steadily for two decades. Very often antibiotics are prescribed for what are in reality viral infections, against which antibiotics are not effective. The bad news is that superbugs are beginning to show up that defy treatment with almost every available antibiotic. We may see a time when we are again no better off than the pre-antibiotic era with regard to certain types of bacteria. The good news is that when antibiotics are used with greater restraint, there is apparently a return to lower levels of resistance.

So...I'm thankful: for liquid antibiotics that taste like bubblegum because it made convincing our 12 year old to take her medicine when she was small almost as easy as giving candy to a baby; that our nine year old set up a howl that filled the doctor's office one day over an inoculation, because it means vaccination is a part of his young life that my wife and I take for granted; that our five year old underwent surgery, because it meant his inflamed ear canals could properly drain a chronic infection; and, that our two year old had to wear band-aids on both of his chubby little thighs for a day following a round of vaccination, because it means he won't be one of the thousands of kids who used to fall victim to acquired mental retardation resulting from complications of bacterial meningitis. Have a happy and safe holiday season!