



Bacterial resistance to antibiotics: it's our problem

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All professionals who are concerned about the health of children need to be aware of the significance of recent developments in bacterial resistance to antibiotics. This seemingly esoteric area has become a major problem that the Centers for Disease Control has labeled a public health emergency. We professionals have caused the problem.

Antibiotics became available for general use in the 1940s and revolutionized medical and dental care. They have enabled us to do procedures which previously would have been too risky. There were some recalcitrant germs, but as new antibiotics were developed and we overcame them, we became complacent, thinking science would stay permanently ahead of nature. How foolish we were. Bacteria have been here for millions of years and reproduce every 20 to 30 minutes. We have been on earth for approximately 100,000 years and reproduce at a much slower rate. How could we have had the hubris to believe that we could beat bacteria at their own genetic game.

Antibiotics are, after all, mostly products of bacteria or fungi which protect the producer from other organisms. We have done some biosynthesis and improved upon these products, but basically we have just emulated natural phenomenon. The first antibiotics altered (i.e., damaged) cell walls of bacteria, causing them to fail to develop normally. But bacteria randomly mutated and the mutations have enabled some organisms to survive this attack. Examples were penicillin-resistant staphylococci and *H. influenza* developing resistance to ampicillin, etc. These organisms became able to produce a substance which destroyed the antibiotic. Our scientists soon developed methicillin and cephalosporins which were "indestructible". The bacteria seemed hoodwinked.

But then a new resistance mechanism developed—the ability to prevent the antibiotic from attaching or penetrating the bacterial wall. And so, predictably, there now developed methicillin resistant *S. aureus* and

multiresistant pneumococci, among others.

Our next strategy was to develop newer and better antibiotics, but that wasn't as easy as we thought. It was hard to construct new antibiotics as fast as bacteria were mutating new resistance methods. Therefore, we now stand at the brink of losing the battle and returning, in some sense, to the pre-antibiotic era. We are placing our whole enterprise at risk. What's that? Why do I say *we*? What have *we* done wrong? The major factor in development of antibiotic resistance is antibiotic usage. No antibiotics, no selective pressure, no resistant organisms. If we could completely stop using antibiotics the resistant mutants would have no survival advantage and would disappear. But we have to use antibiotics to treat infection, don't we? Sure, *if* there really is an infection and if the infection is *bacterial*, not viral. Therefore, the only practical way we have to reduce the likelihood of bacteria developing resistance to antibiotics is to limit our use of antibiotics to definite or likely bacterial infections and to use the lowest effective dose for the shortest effective time. We need to take this very seriously. We have ecological catastrophe occurring and we are the polluters. We need to be selective and careful and reduce the pollution. We need to convince our colleagues to be equally discreet. We need to avoid being "which" doctors (which antibiotic do I prescribe) and become "whether" doctors (do I really need an antibiotic in this situation). If we all behave appropriately, we may be able to delay or even prevent a reversion to the bad old days. The frequency with which pediatric dentists are called upon to use antibiotics is relatively low. Pediatricians are the major polluters. But we are all in this together, and we need to convince each other, and especially our patients, that antibiotics are double-edged swords. If we want them to be effective when we need them, we must not over- or misuse them.

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