Published on *American Council on Science and Health* (https://www.acsh.org)

Newest Tourist Souvenir: Antibiotic Resistance

By Nicholas Staropoli — August 21, 2015

You d have to be living under a rock to miss the news that antibiotic resistance is a major public health problem that threatens to set us back to square one in terms of treating bacterial infections. MRSA (Methicillin Resistant *Staphylococcus aureus)* now kills as many (if not more) people than AIDS each year in the US. These superbugs are an eminent threat that needs to be dealt with in a number of ways.

The first and most obvious way is to find better ways to treat these infections. This means researching and developing new antibiotics and in particular doing this at a faster rate than we are currently doing. In 2015, the FDA has yet to approve a new antibiotic (it did approve Avycaz [1] which is a combination of cephalosporin, an existing antibiotic, and a beta-lactamase inhibitor, which targets a bacterial resistance mechanism). This is an unacceptably low approval rate. We also need to look into alternatives to antibiotics such as phage therapy, which uses viruses to selectively kill infection-causing bacteria. [2]

However, we also need to study and learn how resistance is developing and spreading so swiftly. It is basic biology that resistant bacteria were an inevitable outcome of using antibiotics; that's just what happens when you try to kill a living organism: it adapts. Resistant strains are just products of natural selection: confronted with a changing environment those better adapted (in this case those with resistance genes) are more fit and live on to propagate, while those less well adapted (susceptible to the antibiotics) are eliminated from the gene pool. However, in the current situation the rate at which resistance has developed has been alarmingly fast.

Some of the reasons for this situation are well documented. Patients who don't understand that antibiotics are for bacteria not viruses (like the common cold and the flu) and physicians kowtowing to their demands are two of the most common reasons given. A lot of emerging evidence also implicates antibiotic use as a part of animal feed as well, but here s a new one: people who travel.

In a study published [3] earlier this month in *Antimicrobial Agents and Chemotherapy,* scientists found that travelers may be contributing to the spread of resistance genes in a significant way. The researchers compared stool samples from 35 Swedish students before and after they went on an exchange program that took them to India and central Africa. During their time abroad none of the subjects was on antibiotic therapy. Upon returning the students' bacteria were found to be harboring a significantly greater number of resistance genes: a 2.6-fold increase in genes

encoding resistance to sulfonamide, a 7.7-fold increase in trimethoprim resistance genes, and a 2.6-fold increase in resistance to beta-lactams. Furthermore, prior to testing only one student was harboring any bacteria with resistance genes for beta-lactams (a class of antibiotics that includes penicillin derivatives), however after their trip 12 students were harboring these genes.

The results are not necessarily surprising as scientists have long known that human travel allows for a mixing of microbiomes [4]. However, this study points out that travel might be a more important facet of the larger issue than previously thought.
