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Doomsday scenario from bacteria? Maybe.

By ACSH Staff — December 4, 2014

At ACSH, we probably spend more time debunking phony or overblown fears than anything else. Between bad science, hidden agendas, and terrible press coverage we never run out of things to do.

Although most scares vaccines, minute traces of chemicals in the environment, or GM foods, for example are baseless, this does not mean that all of them are.

Something *really* scary can be found on the front page of today s [1] *New York Times*. Gardiner Harris s article, Superbugs Kill India s Babies and Pose an Overseas Threat, **may sound a bit hyperbolic like many scare stories do but this time there is substance to the hype. Harris** discusses a global health threat that, although not new, poses a far greater threat to us than more newsworthy diseases, such as ebola. **This story involves** the very rapid increase in a particularly deadly mechanism of bacterial resistance known as NDM1, which is short for New Delhi metallo-beta lactamase 1.

ACSH s Dr. Josh Bloom, **himself** a former infectious disease researcher, explains, Bacteria have evolved a number of mechanisms to protect themselves from antibiotics. Sometimes they learn how to pump the antibiotic out of the cell. They can also mutate in such a way that the original binding site of the antibiotic changes its structure so that the drug no longer binds where it formerly did. And perhaps the most important mechanism of resistance is when the bacteria evolve to destroy the antibiotic before it has a chance to work. This is how NDM1 works.

Resistance is all but guaranteed when a pathogen is treated with a drug designed to kill it. This is the quintessential example of evolution selective pressure. Bacteria have a built in sloppiness in their replication process, which gives rise to huge numbers of mutant species. Usually they are unimportant, and have no bearing on the disease.

But when this mixture of strains is treated with a drug that kills most of them, some strains will, by chance, be immune to the drug, and they will then flourish in the absence of the formerly-dominant strain. This is the genesis of antibiotic resistant bacteria.

Dr. Bloom adds, Resistance is unavoidable, but the rate at which it occurs is determined by a number of factors, such as overuse or improper use of antibiotics, both of which accelerate the process.

This is one of the driving forces behind the growing crisis in India, where people, especially young children, are becoming infected with and dying from bacterial infections that do not respond to any antibiotic.

But in India, other factors are huge contributors to the problem. The lack of proper sanitation is a double whammy it forces doctors to administer antibiotics to newborns because areas where people defecate outdoors become breeding grounds for more bacteria, which in turn necessitates the use of more antibiotics.

ACSH advisor Dr. David Shlaes, the former head of infectious disease research at Wyeth, and the author of the Antibiotics-the Perfect Storm [2] blog, discusses how the interplay of multiple factors all negative has created this nightmarish scenario. He says, We need new antibiotics - but we also need societies to use these valuable assets in a reasonable way - something that has been lacking in developed countries. But India is perhaps the best example of a complete lack of control of antibiotic use. They are also a society plagued by a lack of basic facilities like toilets and safe fresh water and they seem to rely on antibiotics to get them through.

And, there are other factors at play economic and regulatory that make matters even worse. Dr. Shlaes explains, At the same time, India, like China, is home to generic manufacturers who wantonly ignore quality requirements which has resulted in at least two of their large manufacturers being banned in the US and Europe. So Indian citizens are caught between a rock and a hard place - and resistance breeds quickly and spreads rapidly. This will affect the rest of the world as is already occurring with highly resistant infections especially strains that operate via the NDM1 mechanism being exported from India to Europe and even to North America.

And, this is developing on top of an already critical public health problem in the US, says Dr. Bloom, whose 2012 New York Post op-ed [3], The Coming Gonorrhea Epidemic described how a formerly easily curable sexually transmitted disease is now susceptible (and just barely) to one single antibiotic.

As Dr. Shlaes blog title suggests, there is really a perfect storm raging in the infectious disease world the lack of a robust pipeline of new antibiotics, as well as the growing resistance problem, which is magnified by poverty in the developing world. If this sounds scary, it really is.

(Note: Today the FDA is holding hearings to consider streamlined pathways for antibiotic development targeting resistant infections. Dr. Shlaes will be reporting on this in coming days).

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[2] http://antibiotics-theperfectstorm.blogspot.com/
[3] http://nypost.com/2012/09/05/the-coming-gonorrhea-epidemic/