

Antibiotic resistant bacteria proliferate in agricultural soils

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Infectious diseases kill roughly 13 million people worldwide, annually, a toll that continues to rise, aided and abetted by resistance genes. Now a study, published in the March *Antimicrobial Agents and Chemotherapy* finds reservoirs of resistance in agricultural soils. These contained more diverse populations of drug resistant bacteria, with greater levels of resistance, than composted and forest soils. Vegetable garden soil alone harbored multi-drug resistant bacteria, and also had the highest level of resistance to three major antibiotic classes.

"The observations of this study point to the widespread presence of high level antibiotic-resistant bacteria in [agricultural soils](#)," says first author Magdalena Popowska of the University of Warsaw, Poland.

Antibiotics, and [resistance genes](#) thereto, occur naturally in soil due to the arms race between microbial species competing for territory. "Almost 50 percent of Actinomycetes isolated from soil are capable of synthesizing antibiotics, which provide a natural antibiotic residue in soils," says Popowska. But the use of antibiotics to promote livestock growth boosts the resistance to a whole new level, as demonstrated by the differences in resistance level in agricultural and forested soils, she says. Manure from antibiotic-fed animals exacerbates the resistance spread, as demonstrated by the high levels in the manure-amended vegetable garden soils.

The spread of resistance and multi-resistant strains of pathogens and opportunistic bacteria that can infect humans and animals is aided and abetted by the fact that they are frequently carried on mobile genetic elements, notably plasmids and transposons, that can be transferred not only among bacteria of the same species, but among different species, says Popowska.

The results of this study "should assist in the

development of regulations regarding the use of antibiotics in the broader environment e.g. in plant protection products fish farming, and industry," says Popowska. "We think they will also help optimize methods allowing the combating of emerging bacterial infections, as well as in the development and application of new chemotherapeutic agents."

The use of antibiotics "should be restricted to dangerous bacterial infections, and to strict medical supervision," says Popowska. "This cannot be emphasized strongly enough."

More information: M. Popowska, M. Rzczycka, A. Miernik, A. Krawczyk-Balska, F. Walsh, and B. Duffy, 2012. Influence of soil use on prevalence of tetracycline, streptomycin, and erythromycin resistance and associated resistance genes. *Antimicrobial Agents and Chemotherapy* 56:1434-1443.

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