Antibiotics and the Environment: What You Should Know

How do antibiotics enter the environment?

- Most antibiotics and other pharmaceuticals enter our natural environment after use for human and animal health purposes.
- When a person or animal is given an antibiotic, not all of the medication is used up inside the body. Some antibiotic, either in its original form or slightly changed, is released in urine and/or stool.
- Via toilets, wastewater, and runoff water
  - Unused antibiotics and antibiotic-containing waste, flushed down drains or toilets, can enter the environment.
  - Antibiotics in manure and other waste-based fertilizers enter waterways along with runoff from crop and grazing fields.
  - Antibiotics applied to fruit trees as treatment for bacterial infections can end up in field runoff destined for waterways.
- Via landfills, yards
  - Antibiotic-containing waste from our pets ends up in landfills and in neighborhood sewer runoff.
  - Unused antibiotics thrown in the trash end up in landfills.
- Via industrial discharges
  - Some industrial processes generate antibiotic-containing waste that might enter the environment.

How might environmental antibiotics contribute to resistance?

- There is much to learn about the influence of environmental antibiotics on health and the problem of antibiotic resistance.
- This is what we do know:
  - In any setting (natural, hospital, or within our bodies), bacteria in the presence of an antibiotic try to change to survive. These changes can lead to antibiotic resistance.
  - Bacteria can also transfer the ability to resist antibiotic effects by sharing antibiotic-resistance genes with other bacteria in water and soil.
  - Pharmaceutical products can have a negative impact on aquatic species.

Minnesota ONE HEALTH Antibiotic Stewardship Collaborative

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Glossary of Terms and Abbreviations

Antibiotics are medicines used to treat infections caused by bacteria

Antibiotic resistance is the ability of bacteria to withstand antibiotic effects

Antibiotic stewardship is the process of improving antibiotic use

Groundwater is used for drinking by many people, especially in rural areas

Minnesota Pollution Control Agency (MPCA) is the state agency that protects and improves the environment to enhance human health

Runoff is water that drains away from land surfaces

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Minnesotans from animal, human, and environmental health are working together to be smart about antibiotic use and preventing antibiotic resistance!

www.health.state.mn.us/onehealthabx

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- This is what we still need to learn:
  - Do antibiotics, antibiotic-resistant bacteria, and resistance genes in the environment put people and animals directly at risk for resistant infections?
  - Do environmental sources of antibiotics, resistant bacteria, and resistance genes make the overall fight against antibiotic resistance more difficult?

Antibiotics and resistance genes in Minnesota environments

- MPCA and University of Minnesota researchers have detected antibiotics used in healthcare and animal health at low levels in lakes, rivers, and streams throughout Minnesota. The U.S. Geological Survey has found antibiotics in groundwater in non-agricultural and urban areas. [1–6]
- In Minnesota, antibiotics are present in our water at levels below those considered harmful to human health.[7]
- University of Minnesota researchers have developed methods to measure antibiotic resistance genes in the environment. Work is ongoing to understand the diversity, source, and impact of these genes on health and the resistance problem.

References

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7. Minnesota Department of Health. 2015. Pharmaceutical Water Screening Values Rpt. http://www.health.state.mn.us/divs/eh/risk/guidance/dwec/pharmwaterrept.pdf
8. Minnesota Pollution Control Agency (MPCA). Managing unwanted medications. https://www.pca.state.mn.us/living-green/managing-unwanted-medications

Prevent infections, and the need for antibiotics, by hand washing, vaccination, and safe food handling.

Never pressure a doctor, dentist, or veterinarian to prescribe antibiotics.

Dispose of unused antibiotics and other pharmaceuticals properly!

- **DO** dispose medications at disposal sites or with approved mail-in disposal services.[8]
- **DON'T** put them down the drain or in the toilet.
- **DON'T** put them in the trash.

MPCA: Managing unwanted medications (www.pca.state.mn.us/living-green/managing-unwanted-medications)

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