Antimicrobial Resistance in Agriculture

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Factsheet

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(replaces OMAFRA Factsheet 13-077 of the same name)

INTRODUCTION

Antimicrobial medicines such as antibiotics have played a vital role in human and animal health care for more than 50 years. In agriculture, antimicrobials are used to treat, control or prevent disease caused by micro-organisms and to improve production, growth or reproduction. Agriculture accounts for approximately 82% of all antibiotic use in Canada.

There are some concerns around this use. Antimicrobial resistance is a significant concern affecting human and animal health. When bacteria are exposed to an antimicrobial, they can become resistant to it and also to many other antimicrobials. Research has demonstrated that the agricultural use of antimicrobials can contribute to increasing antimicrobial resistance in bacteria that affect human health.

Bacteria from animal and human sources have many opportunities to mix (via water, direct contact, food and surface waste material). When this happens, resistance genes can move from agricultural bacteria to bacteria that cause diseases in people.

When someone is infected by resistant bacteria, there are fewer treatment options and recovery may take longer. In the worst case, there may be no effective treatments available.

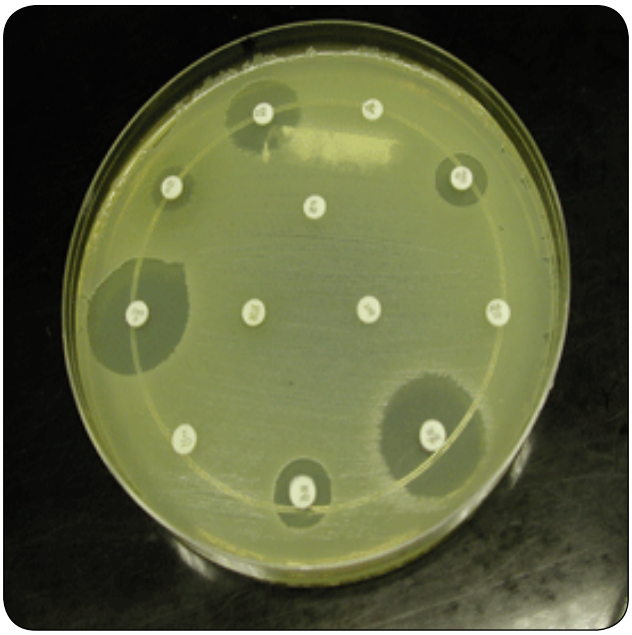

Figure 1. Bacterial growth being inhibited by certain antibiotic discs and not by others.

QUESTIONS AND ANSWERS

Q. What is an antimicrobial?

A. Antimicrobials are substances that inhibit or kill micro-organisms (microscopic life forms such as bacteria, fungi, viruses, mycoplasmas). Antimicrobials can be natural, semi-synthetic or synthetic. They include antibacterials, antifungals, antivirals and antiparasitics.

Q. What is an antibiotic?

A. The term antibiotic used to be used for natural substances produced by micro-organisms that, at low concentrations, can inhibit or kill other micro-organisms in the body, specifically substances that kill bacteria (i.e., antibacterials). Today antibiotics also include synthetic antibacterials such as fluoroquinolones. Sometimes the term is used as a synonym for all antimicrobials.

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Q. What is antimicrobial resistance?
A. Antimicrobial resistance is the ability of a micro-organism to withstand the inhibiting or killing action of an antimicrobial.

In some cases, micro-organisms may be inherently resistant to particular antimicrobials based on specific, defining characteristics of the micro-organism itself. This inherent resistance is not caused by agricultural use of medicines.

In other cases, micro-organisms may acquire resistance via mutations in their DNA, or by exchanging genetic material (genes) with resistant micro-organisms, allowing them to survive exposure to an antimicrobial to which they are normally susceptible.

Q. How is antimicrobial resistance acquired?
A. Antimicrobial resistance can be acquired in one of two ways:

- Resistance can arise spontaneously. Bacteria are constantly changing in order to survive, and some random mutations can occur in the genetic code can create antimicrobial resistance.
- Resistance can be transferred by "gene swapping" — a natural process where bacteria exchange genetic information with each other. This is the most common way that multi-drug resistance develops. Gene swapping can spread resistance relatively quickly.

Q. What is multi-drug resistance?
A. If bacteria acquire resistance to multiple antibiotics they are called multi-drug resistant. The media often refer to bacteria with resistance to a large number of antibiotics as "superbugs." When a person or animal is infected by multi-drug resistant bacteria, there are fewer treatment options and recovery may take longer. In the worst case, there may be no effective treatments available.

Q. How does antimicrobial use contribute to the development of antimicrobial resistance?
A. Any bacterial population exposed to antimicrobial drugs can develop resistance. When antimicrobials are used, susceptible micro-organisms are eliminated leaving resistant micro-organisms to survive and multiply. Within the micro-organism, the resistance gene for one drug may also be linked to resistance genes for other antimicrobials. This means that exposure to one antimicrobial can lead to a population of bacteria that are multi-drug resistant. Stopping the use of one antimicrobial may not decrease the level of antimicrobial resistance as much or as fast as it increased in the first place.

The large volumes of antimicrobials used in agricultural systems can promote resistance. This is especially true when "mass medication" antimicrobials are used in feed or water for long periods. The large number of animals involved does not dilute this effect. Mass medication for routine prevention or growth promotion reasons may need to be re-evaluated by the producer and a veterinarian.

Q. Is antimicrobial resistance linked to antimicrobial residues?
A. Antimicrobial resistance and antimicrobial residues are related but separate issues. Antimicrobial residues refer to trace amounts of antimicrobials present in food (such as meat, eggs, milk, vegetables and fruits). These residues can contribute to the development of antimicrobial resistance. However, the primary concern is that residues can cause allergic reactions in some people. With antimicrobial resistance, the risk is the development of resistant micro-organisms that cause infections in animals or humans that may be difficult to treat.

The Canadian Food Inspection Agency has rigorous inspection processes that monitor for drug residues (including antimicrobials and others), complementing the OMAFRA oversight of food safety. High levels of residues are typically caused by improper use of a drug (e.g., not adhering to proper withdrawal periods in food-producing animals). In Ontario, inspection results indicate that it is uncommon for residues to exceed acceptable safety limits.

Working Together
To Reduce Antimicrobial Resistance

What you NEED to know...

Resistant bacteria can't be treated with antibiotics.

Misuse of antibiotics can increase the spread of resistance.

18,000 patients in Canada develop antibiotic resistant infections every year.*

* Public Health Agency of Canada, (2014), Antimicrobial Resistance and Use in Canada: A Federal Framework for Action

What we ALL can do...

Wash hands regularly.

Use antibiotics only under the advice of your **doctor** or **veterinarian**.

Handle and cook foods properly.

What PRODUCERS can do...

Ask your vet how to reduce antibiotic use:

Use better herd & flock health management practices.

Improve biosecurity and vaccinations.

Use genetic selection to enhance disease resistance.

Provide quality nutrition to improve health and production.

For more information visit **ontario.ca/animalhealth**

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Q. Should the use of antimicrobials in agriculture be stopped?

A. No. Antimicrobials used in agricultural production systems help to maintain animal welfare, and control animal and crop diseases. Reducing disease helps to keep the cost of food reasonable. It can also help to prevent diseases from spreading from animals to people.

However, antimicrobials need to be used cautiously in agriculture, human medicine and public health applications. Prudent use means antimicrobials are not used excessively or indiscriminately. Many industry and professional organizations have developed or are developing guidelines for antimicrobial stewardship in animals and people.

Q. Is antimicrobial resistance only a North American issue?

A. Antimicrobial resistance is a global issue. Europe has imposed the most restrictions on the use of antimicrobials in animal agriculture. In 1986, Sweden banned using antimicrobials in feed to improve animal growth. Finland has done so as well. Denmark banned all antimicrobials for growth-promotion purposes in 2001, and in 2010 it initiated a "yellow card" system to address farms using antimicrobials above a set threshold.

In January 2017, the U.S. Food and Drug Administration implemented their guidance initiative aimed at veterinary oversight of antimicrobials used in feed and water for animals, as part of the National Action Plan for Combatting Antibiotic Resistant Bacteria (www.fda.gov/animalveterinary/guidancecomplianceenforcement/guidanceforindustry/ucm216939.htm).

Q. What is Canada doing about antimicrobial resistance in agriculture?

A. Please refer to Health Canada's website (www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/antimicrobial-resistance.html) for information on the federal government's initiatives regarding antimicrobial resistance.

Q. What can producers do on the farm?

A. There are a number of things livestock and poultry producers can do every day on their farm to help reduce antimicrobial resistance:

- Consider using antimicrobials only for treatment, when clinical signs of disease are evident in your animals and your veterinarian advises you to do so.
- Consult your veterinarian before using any antimicrobials for livestock. Medicines for use in animals are widely available, but your veterinarian is the best source of advice for responsible and effective use.
- Follow prescription or label directions for storage, use, handling and withdrawal times.
- Prevent diseases by implementing good herd or flock health, nutrition, animal comfort, hygienic and biosecurity practices.
- Periodically re-evaluate the benefit of any use of antimicrobials. Discontinue use, if there is no benefit, in consultation with your veterinarian.
- Consider the use of alternatives to antimicrobials to improve production or growth. These include alternate feeds and feeding strategies, improved genetics, probiotics, acidifiers, enzymes, nutraceuticals and oligosaccharides.

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