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PARTNERS FOR HEALTH | PARTENAIRES POUR LA SANTÉ

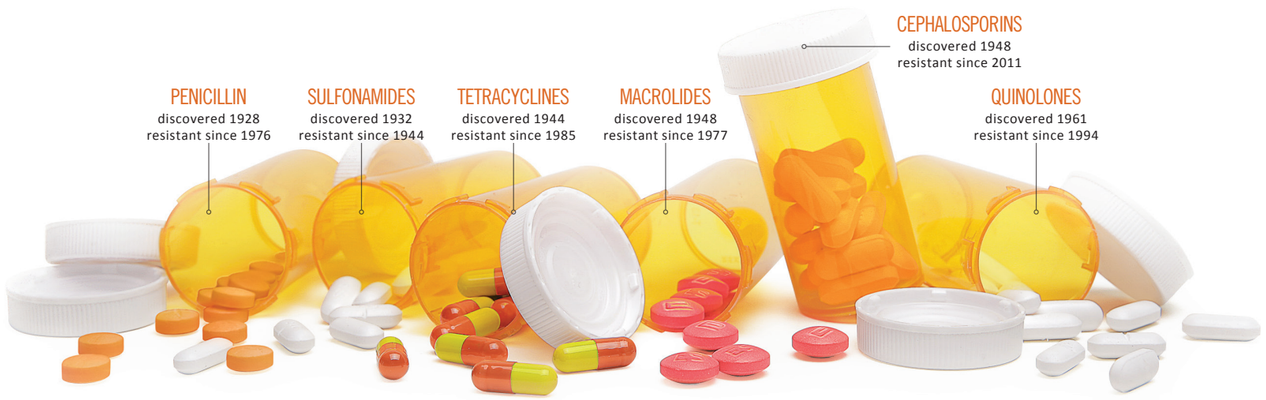
ANTIMICROBIAL RESISTANCE

A PUBLIC HEALTH THREAT

Antimicrobial resistance is an increasingly serious health issue in Ontario and worldwide. As more antimicrobial drugs become ineffective and fail to treat a growing number of infections, those infections persist and increase the risk of disease, poor health and death. Action is required to ensure the use of antimicrobials only when necessary to safeguard the availability of future treatments for both common and serious infections.

History of antimicrobial resistance: example of *Neisseria gonorrhoeae*

Continuing and growing antimicrobial resistance in *Neisseria gonorrhoeae*, the organism that causes gonorrhea, means that gonorrhea may soon become untreatable as no new drugs are in development. Of the many drugs used for decades to fight gonorrhea, only cephalosporins continue to be effective, and their efficacy has begun to wane.[1] While over 20 antibiotic classes were marketed between 1930 and 1962, only two new classes have been approved for sale since that time. This example shows the history of antibiotics used to treat gonorrhea, and reflects increased resistance of many drugs to an increasing number of infections:

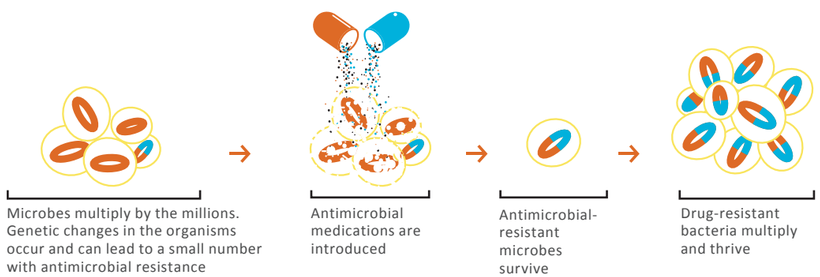


THE ISSUE AT A GLANCE

- Misuse and overuse of antimicrobials have increased the pathogen spread and rates of resistance.[2]
- Patients with routine infections, such as urinary tract infections (UTIs), are at higher risk for serious complications when the microbe is drug resistant.[3]
- The need to preserve the effectiveness of established antibiotics is critical, as antibiotic discovery is costly, slow and ultimately uncertain.[4]

HOW ANTIMICROBIAL RESISTANCE OCCURS

Resistance can exist naturally, happen through mutation, or happen by picking up resistant genes from other microbes. Microbes not killed by antimicrobials survive and multiply, leading to the emergence of strains that are partially or fully resistant to antimicrobial treatment.[5]



Microbes multiply by the millions. Genetic changes in the organisms occur and can lead to a small number with antimicrobial resistance

Antimicrobial medications are introduced

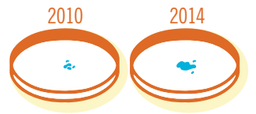
Antimicrobial-resistant microbes survive

Drug-resistant bacteria multiply and thrive

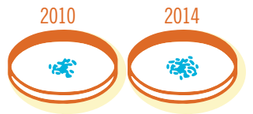
ORGANISMS OF CONCERN

Laboratory testing for resistance and whether or not it is increasing over time provides a warning that treatment may lose effectiveness. Many organisms, primarily acquired in community settings, are showing concerning levels of resistance to the antimicrobials routinely used to treat infection. Examples of these include:[6]

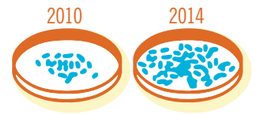
Rate of resistance to recommended antibiotics: [6]



***Shigella* species**
(ceftriaxone resistance)



Invasive *Candida glabrata*
(fluconazole resistance)

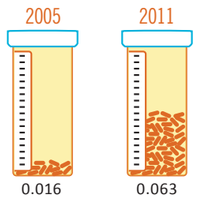


***Klebsiella pneumoniae* from UTIs**
(trimethoprim/sulfamethoxazole resistance)

IMPLICATIONS OF ANTIMICROBIAL RESISTANCE

As antimicrobial resistance increases, more currently treatable diseases will become untreatable, leading to increased infection, complications and death.[3]

Cefixime dosage (ug/ml) required to kill 50% of *Neisseria gonorrhoeae* isolates[7]



- Increase in the incidence of diseases
- Increased mortality
- Increased recovery times
- Emergence of multidrug-resistant organisms
- Increased treatment failure
- Use of alternative antimicrobials that are less effective and more toxic

STOPPING ANTIMICROBIAL RESISTANCE

Addressing the growing threat of antimicrobial resistance will require shared and coordinated action.[8]

Public Health
- Focus on the prevention of infections
- Surveillance to detect emergence of resistance

Clinicians
- Antimicrobial stewardship – prescribe antimicrobials only when required
- Use the right drug, at the right dose, for the right duration

Researchers
- Explore new antimicrobials and combination therapies
- Study ways to mitigate the development of resistance

Public
- Take antimicrobials as prescribed and only when necessary

Industry
- Minimize the use of antimicrobials for agricultural use

1. Unemo M, Shafer WM. Antibiotic resistance in Neisseria gonorrhoeae: origin, evolution, and lessons learned for the future. Ann N Y Acad Sci. 2011 Aug;1230:E19-28. **2.** Public Health Agency of Canada. Canadian antimicrobial resistance surveillance system - report 2015. Ottawa, ON: Her Majesty in Right of Canada: March 2015. Available from: http://healthycanadians.gc.ca/alt/pdf/publications/drugs-products-medicaments-produits/antibiotic-resistance-antibiotique/antimicrobial-surveillance-antimicrobioresistance-eng.pdf **3.** World Health Organization. Antimicrobial resistance: Global report on surveillance [Internet]. Geneva, Switzerland: World Health Organization; 2014. Available from: http://www.who.int/drugresistance/documents/surveillancereport/en/ **4.** Silver LL. Challenges of antibacterial discovery. Clin Microbiol Rev, 2011, 24(1):71-109. **5.** Centers for Disease Control and Prevention. About antimicrobial resistance [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; 2015 Sep 8. Available from: http://www.cdc.gov/drugresistance/about.html **6.** Labware Public Health Ontario Laboratory Information Management System. Public Health Ontario, extracted 2015 Sep 29. **7.** Laboratory Information Management System. Streptococcus and STI Unit, National Microbiology Laboratory, extracted 2016 Jan 07. **8.** Public Health Agency of Canada. The Chief Public Health Officer's report on the state of public health in Canada, 2013: Infectious disease — The never-ending threat. Ottawa, ON: Her Majesty in Right of Canada: March 2015. Available from: http://www.phac-aspc.gc.ca/cphorsphc-respcacsp/2013/index-eng.php

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