MANAGEMENT OF ANTIMICROBIAL-RESISTANT ORGANISMS CoP MEETING – RVH IPAC HUB

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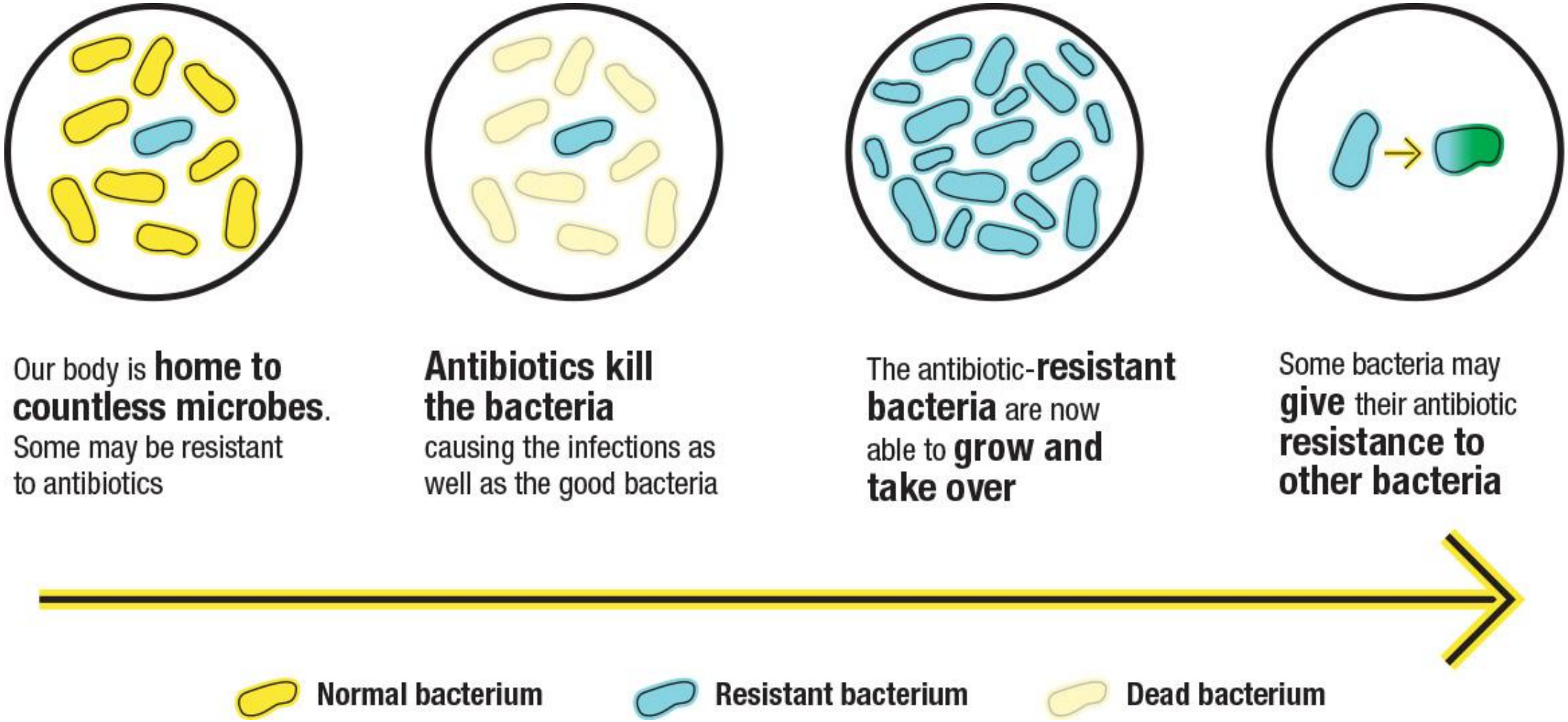
WHAT IS ANTIMICROBIAL RESISTANCE?

- Occurs when germs like bacteria and fungi develop the ability to defeat the drugs designed to kill them.
- Causes significant level of infections and deaths worldwide.
- Drug resistance to even one antimicrobial can be serious.
- Presence of antibiotics and antifungals can cause bacteria and fungi to adapt, accelerating antimicrobial resistance.
- Misuse and overuse of antibiotics promotes antimicrobial resistance.

Source: www.canada.ca



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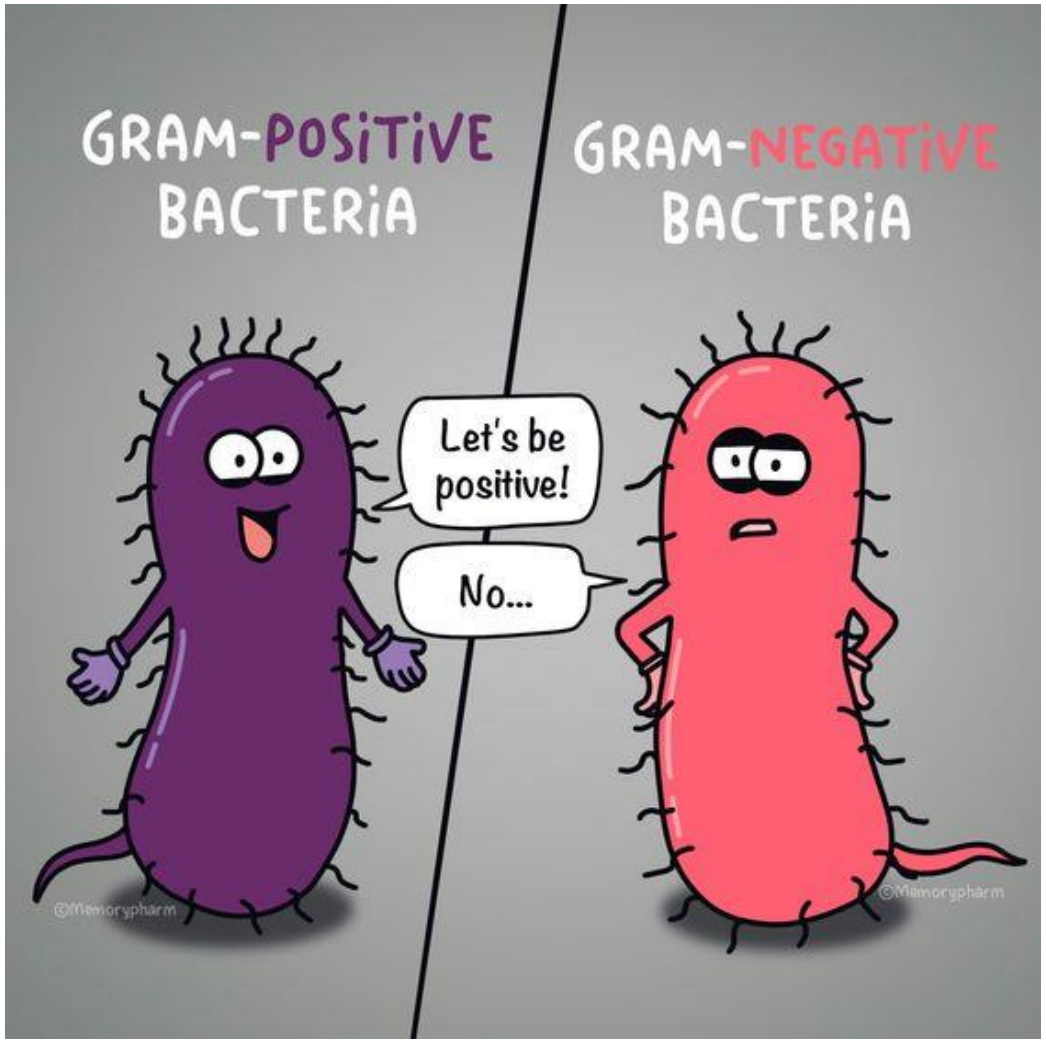

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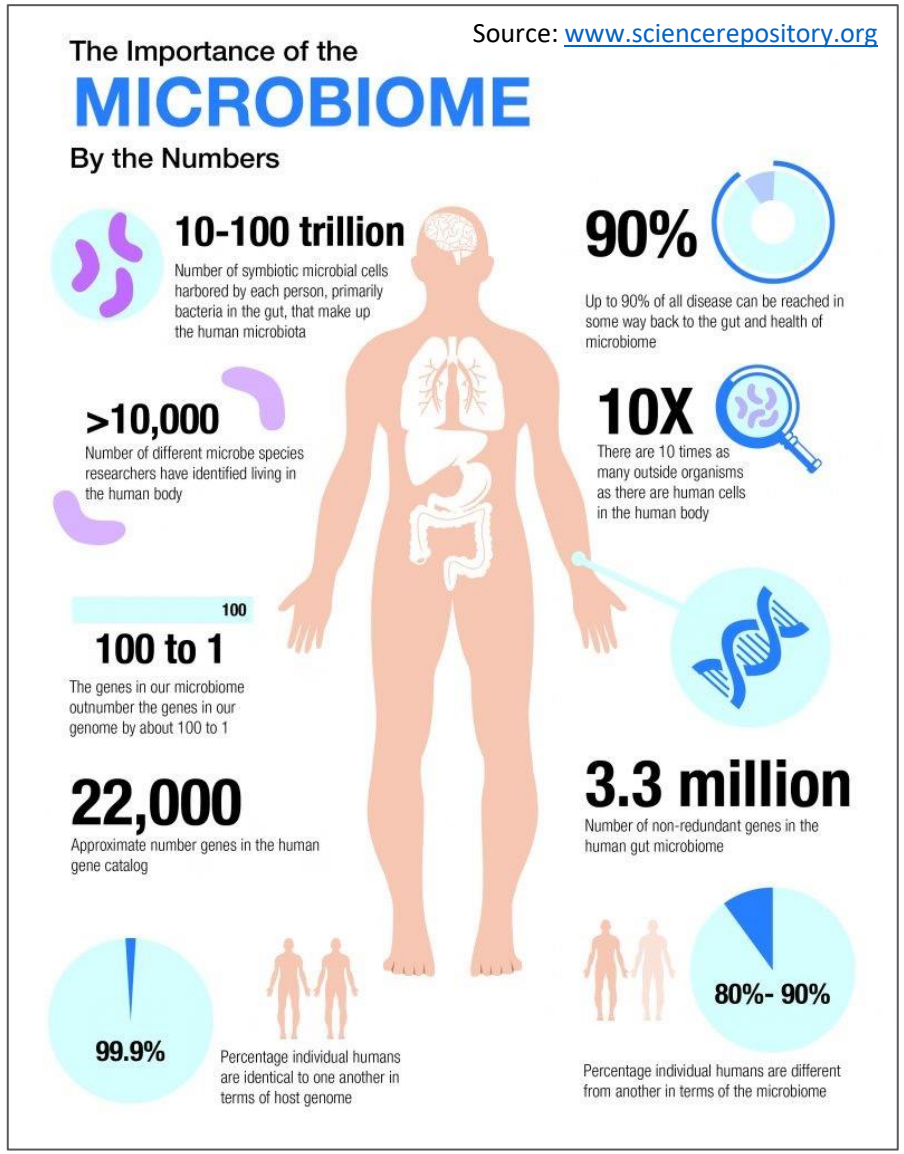
ANTIMICROBIAL-RESISTANT ORGANISMS (AROs) OF CONCERN

- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Vancomycin-resistant enterococcus (VRE)
- Carbapenemase-producing *Enterobacteriaceae* (CPEs)
- *Candida auris*
- Extended spectrum β-lactamase producing *Enterobacteriaceae* (ESBLs)
- *Clostridioides difficile**



- Humans are colonized with around the same number of microbes as cells in the body (1:1)
- >10,000 number of different species identified living in and on the human body
- Colonized areas include skin, conjunctiva, urethra and bladder, vagina, uterus, oral cavity, lungs, nasal cavity, and the GI tract

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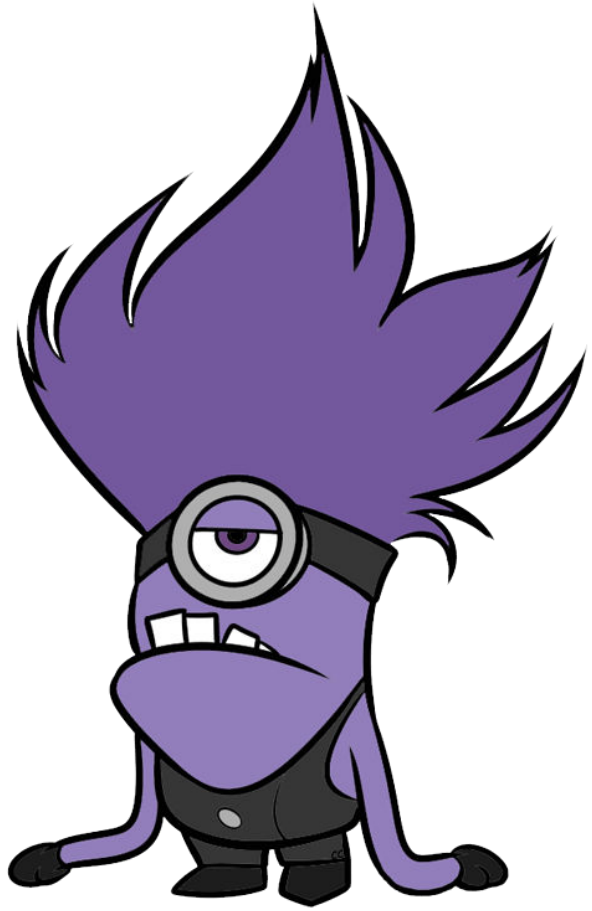
COLONIZATION VS INFECTION

Organisms are present with **no** symptoms or illness.
But can be transmitted to others



Organisms start invading bodily tissue, show clinical symptoms and cause disease.

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METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA)

- Can be either health care-associated or community-associated (CA-MRSA)
- Colonized residents are a major reservoir in a health care setting
- Is typically spread by direct **contact** with an infected wound or from contaminated hands, usually those of health care workers (HCWs)
- In Canada, the rate of MRSA bloodstream infection is increasing since past few years
- Hand hygiene and environmental surface cleaning are two important prevention measures

VANCOMYCIN-RESISTANT *ENTEROCOCCUS* (VRE)

- Are strains of enterococci that are resistant to the antibiotic vancomycin
- Is spread from one person to another by **contact**, usually on the hands of caregivers
- Hands of HCWs can get contaminated when interacting with resident or from contaminated material or equipment
- Residents with colonized GI tract are the major reservoir
- Can survive for a prolonged period for few months under dry conditions
- Hand hygiene, good technique and proper use of disinfectants

CARBAPENEMASE-PRODUCING *ENTEROBACTERIACEAE* (CPE/CPO)

- Are resistant to some of our most effective antibiotics – carbapenems
- Are also usually resistant to first-, second-, and third-generation cephalosporins and penicillins
- New Delhi metallo-β-lactamase (NDM) is the most widespread carbapenemase in south central Ontario
- Colonized residents are the main reservoir for CPE. Can also be found in environmental reservoirs such as sinks and shower drains

CPE (CONT.)

- Transmission of CPE occurs via direct or indirect **contact**
- Spreads from person to person by the hands of HCWs or shared medical equipment
- An individual is infectious for as long as he/she is colonized or infected
- Confirmed cases of CPE (colonization and infection) are designated **reportable** in the province of Ontario

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CANDIDA AURIS

- Is a fungal pathogen and commensal of human skin
- *Candida* infections are usually multidrug-resistant
- Difficult to identify. Misidentification may lead to incorrect treatment
- Antibiotics used for bacterial infections increase the risk of *Candida*
- Transmission occurs from person to person via direct or indirect **contact**
- Adherence to hand hygiene, appropriate use of additional precautions, and environmental cleaning are important prevention measures
- ABHR is recommended when hands are not visibly soiled

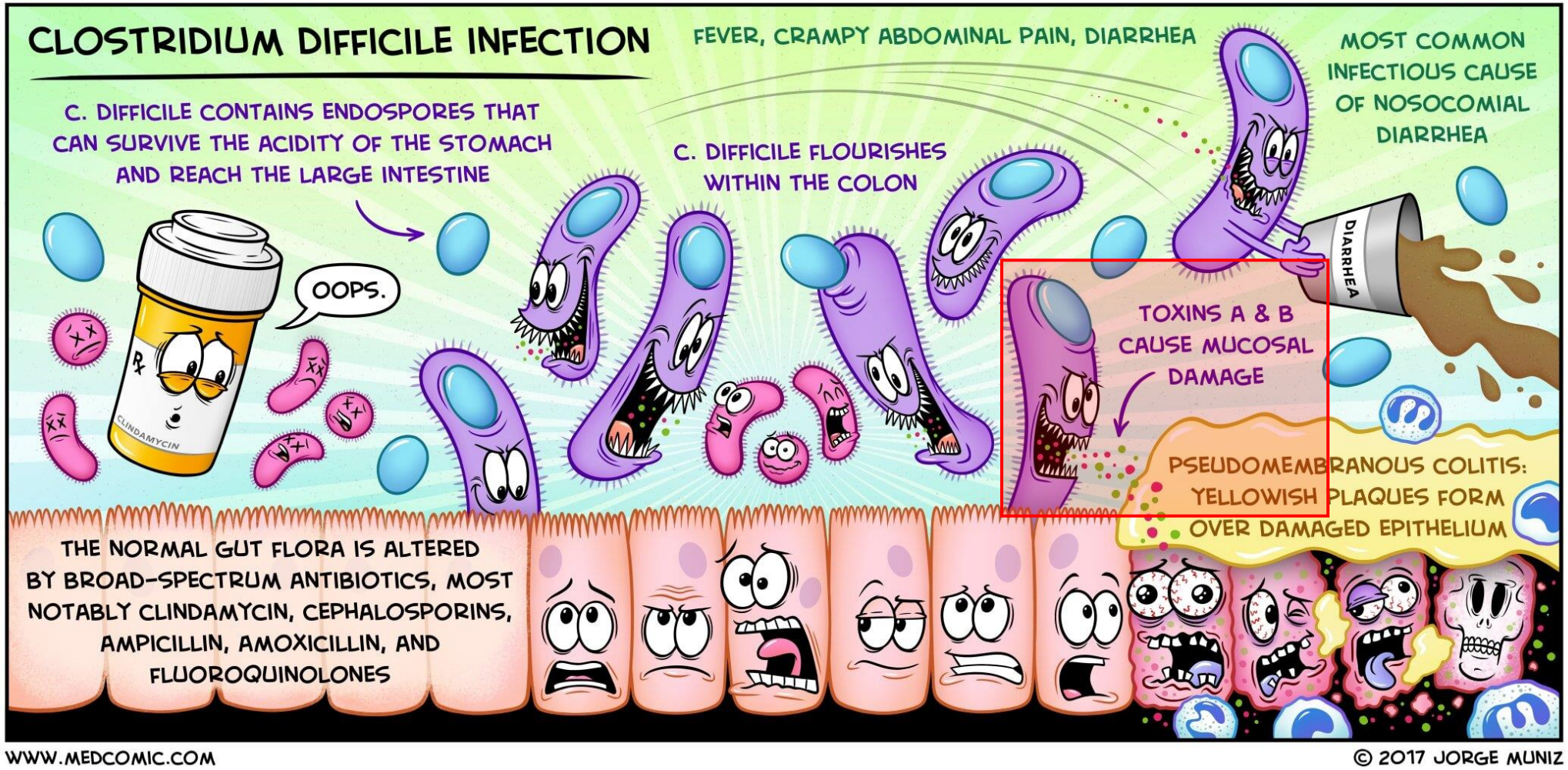
ESBL-PRODUCING BACTERIA

- Produce enzymes called extended-spectrum β-lactamases
- Become resistant to penicillin and cephalosporin antibiotics
- Risk factors similar to other AROs but can cause UTIs in healthy people
- Capable of causing colonization and infection
- Transmission occurs from person to person via direct or indirect **contact**
- Hand hygiene, cleaning and disinfection of medical equipment, and routine environmental cleaning are important prevention measures

CLOSTRIDIOIDES DIFFICILE INFECTION (CDI)

- Most common cause of infectious diarrhea in hospitals and LTCHs
- Can occur following the use of antimicrobials in high doses or over a prolonged period of time
- *C. difficile* produces spores that are resistant to destruction, and can survive for long periods in the environment (up to 5 months)
- Transmission occurs from person to person via direct or indirect **contact**
- Hand washing (not sanitizing), use of additional precautions, and thorough environmental cleaning are three important prevention measures
- Confirmed cases designated as **reportable** in the province of Ontario

Source: www.medcomic.com



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PREVENTION MEASURES

- All AROs mentioned mostly spread via **contact**, either through contaminated hands, medical equipment, or environmental surfaces.
- Hand hygiene is one of the most important step in prevention.
- Usage of Contact or Enhanced Contact Precautions in addition to routine practices for residents colonized or infected with an ARO.
- Cleaning and disinfecting patient care environment and shared equipment with appropriate products.
- Screening of residents upon admission with risk factors for AROs.

RECOMMENDATIONS FOR ADDITIONAL PRECAUTIONS

ORGANISM	COLONIZATION	INFECTION
MRSA	✓	✓
VRE	✓	✓
CPE	✓	✓
C. Difficile	✗	✓
Candida auris	✓	✓
ESBLs	✗	✓

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CLEANING AND DISINFECTION

- 1:10 dilution of freshly-mixed household bleach or approved sporicidal product should be used for *C. difficile* spores. Alcohol and common hospital disinfectants **are not** effective against spores.

- Accelerated hydrogen peroxide (AHP) one-step cleaning and disinfectant wipes (0.5%) can kill most AROs with general contact time of 1 minute.

- Quats (quaternary ammonium compounds) wipes can kill most AROs (with a contact time of usually 4-5 minutes depending on the product used.

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DECOLONIZATION

- Medical intervention to remove antimicrobial-resistant pathogen.
- Can reduce likelihood of a resident developing life-threatening HAIs.
- Common sites of bacterial colonization include nasal passage, groin, oral cavity and skin.
- Prolonged or widespread use of antibiotics for decolonization may promote antibiotic resistance.
- Decolonization for VRE, CPE, and ESBL is not effective and not recommended.
- Decolonization for MRSA can be considered in certain conditions.

REFERENCES

- Arnold FW. Antimicrobials and Resistance. In Boston K.M., et al, eds. APIC Text Online. 2017. Available at: https://text.apic.org/toc/microbiology-and-risk-factors-for-transmission/antimicrobials-and-resistance#book_section_26694. Accessed October 10, 2022.
- Appendix 1: Case Definitions and Disease-Specific Information - Disease: Carbapenemase-producing *Enterobacteriaceae* (CPE) infection or colonization. 2022. Ontario Public Health Standards - Infectious Disease Protocol. *Ministry of Health*. Available at: https://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/CPE_chapter.pdf. Accessed on October 10, 2022.
- Appendix 1: Case Definitions and Disease-Specific Information - Disease: *Clostridium difficile* infection (CDI) outbreaks in public hospitals. 2022. Ontario Public Health Standards - Infectious Disease Protocol. *Ministry of Health*. Available at: https://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/cdi_chapter.pdf. Accessed on October 10, 2022.

REFERENCES (CONT.)

- Antibiotic Resistant Organisms Surveillance Protocol for Ontario Hospitals. *Ontario Hospital Association/Ontario Medical Association* (2019). Available at: https://www.oha.com/Documents/Antibiotic%20Resistant%20Organisms%20(May%202019).pdf. Accessed October 10, 2022.
- Canadian Antimicrobial Resistance Surveillance System Report. 2021. *Public Health Agency of Canada*. Available at: https://www.canada.ca/content/dam/phac-aspc/documents/services/publications/drugs-health-products/canadian-antimicrobial-resistance-surveillance-system-report-2021/canadian-antimicrobial-resistance-surveillance-system-report-2021.pdf. Accessed October 07, 2022.
- Fact Sheet – *Clostridium difficile* (*C. difficile*). Public Health Agency of Canada. Available at: https://www.canada.ca/en/public-health/services/infectious-diseases/fact-sheet-clostridium-difficile-difficile.html. Accessed on October 10, 2022.
- How Antimicrobial Resistance Happens. *Centers for Disease Control and Prevention*. Available at: https://www.cdc.gov/drugresistance/about/how-resistance-happens.html. Accessed on October 10, 2022.

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REFERENCES (CONT.)

- Handle with care: preserving antibiotics now and into the future — Chief Public Health Officer of Canada's 2019 spotlight report. *Public Health Agency of Canada*. Available at: https://www.canada.ca/content/dam/phac-aspc/documents/corporate/publications/chief-public-health-officer-reports-state-public-health-canada/preserving-antibiotics/Final_CPHO_Report_EN_June6_2019.pdf. Accessed October 07, 2022.
- Infection Prevention and Control for Candida auris. Centers for Disease Control and Prevention. Available at: https://www.cdc.gov/fungal/candida-auris/c-auris-infection-control.html. Accessed on October 10, 2022.
- Ontario Agency for Health Protection and Promotion, Provincial Infectious Diseases Advisory Committee. *Annex A – Screening, testing and surveillance for antibiotic-resistant organisms (AROs)*. Annexed to: Routine Practices and Additional Precautions in All Health Care Settings. Toronto, ON: Queen's Printer for Ontario; 2013.

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REFERENCES (CONT.)

- Ontario Agency for Health Protection and Promotion (Public Health Ontario). Carbapenemase-producing *enterobacteriaceae*: frequently asked questions. Toronto, ON: Queen's Printer for Ontario; 2019.
- Ontario Agency for Health Protection and Promotion (Public Health Ontario), *Provincial Infectious Diseases Advisory Committee*. Interim guide for infection prevention and control of *Candida auris*. Toronto, ON: Queen's Printer for Ontario; 2019.
- Ontario Agency for Health Protection and Promotion (Public Health Ontario). *Provincial Infectious Diseases Advisory Committee*. Executive summary: evidence review and revised recommendations for the control of vancomycin-resistant enterococci in all Ontario health care facilities. Toronto, ON: Queen's Printer for Ontario; 2019.

QUESTIONS?