Overview of Current Disinfection Hierarchy Models

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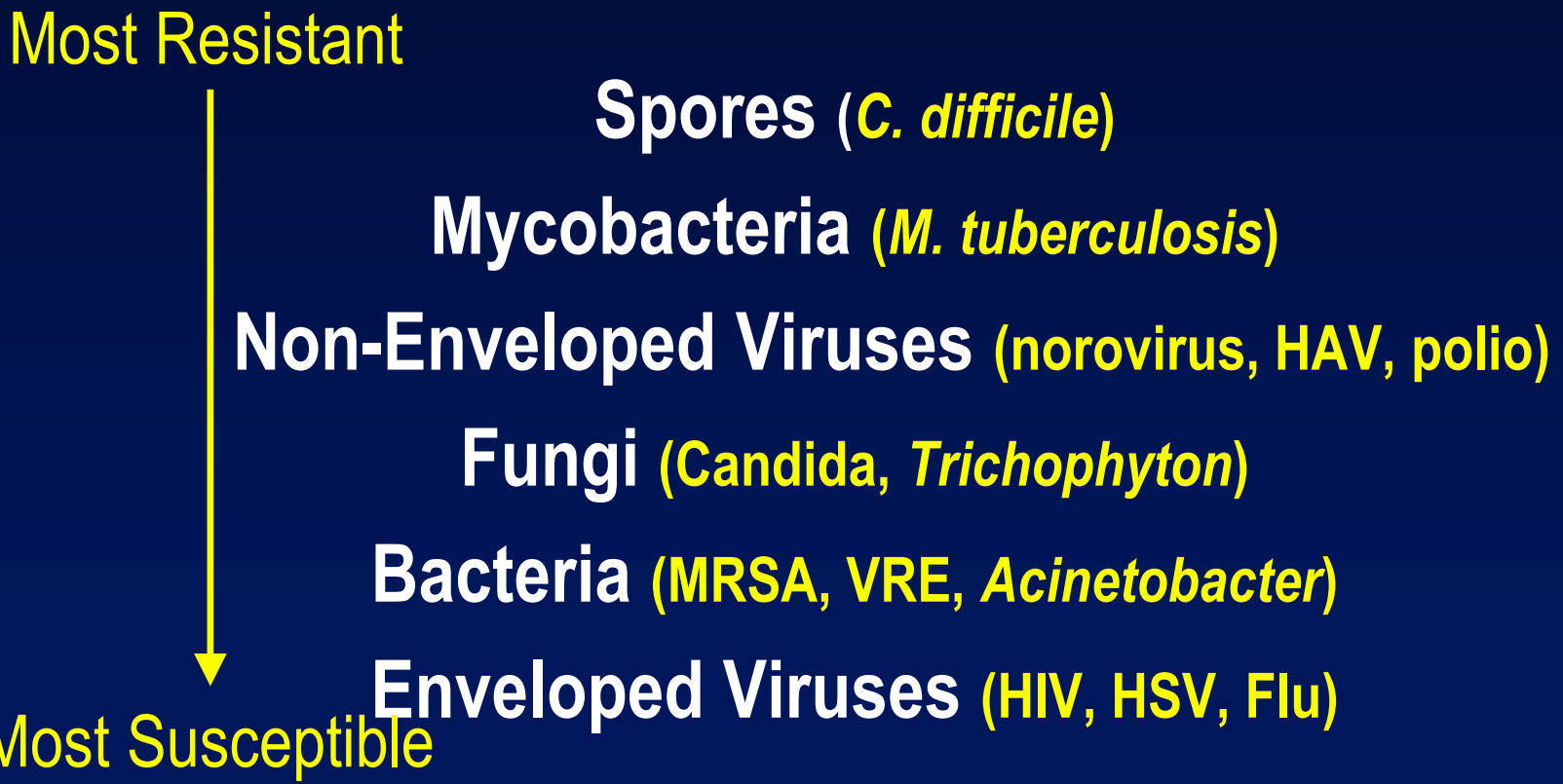
Spaulding Classification Scheme

- Disinfection and sterilization (D/S) is a cornerstone of infection prevention
- D/S considered a horizontal control measure as it prevents transmission of all healthcare-associated pathogens
- Spaulding scheme for D/S used for over 50 years (since 1957) throughout the world
- EH Spaulding believed that how an object will be disinfected depended on the object's intended use. It uses the microbiological disinfectant hierarchy model.

Microbiological Disinfectant Hierarchy

Microbes Exhibit a Wide Variation in Intrinsic Resistance to Disinfectants

Rutala WA, Weber DJ, HICPAC. www.cdc.gov



Disinfection and Sterilization

Rutala, Weber, HICPAC. November 2008. www.cdc.gov

EH Spaulding believed that how an object will be disinfected depended on the object's intended use.

CRITICAL - objects which enter **normally sterile tissue** or the vascular system or through which blood flows should be **sterile**.

SEMICRITICAL - objects that **touch mucous membranes** or skin that is not intact require a disinfection process (**high-level disinfection** [HLD]) that kills all microorganisms and some bacterial spores.

NONCRITICAL -objects that touch **only intact skin require low-level disinfection** (or non-germicidal detergent).

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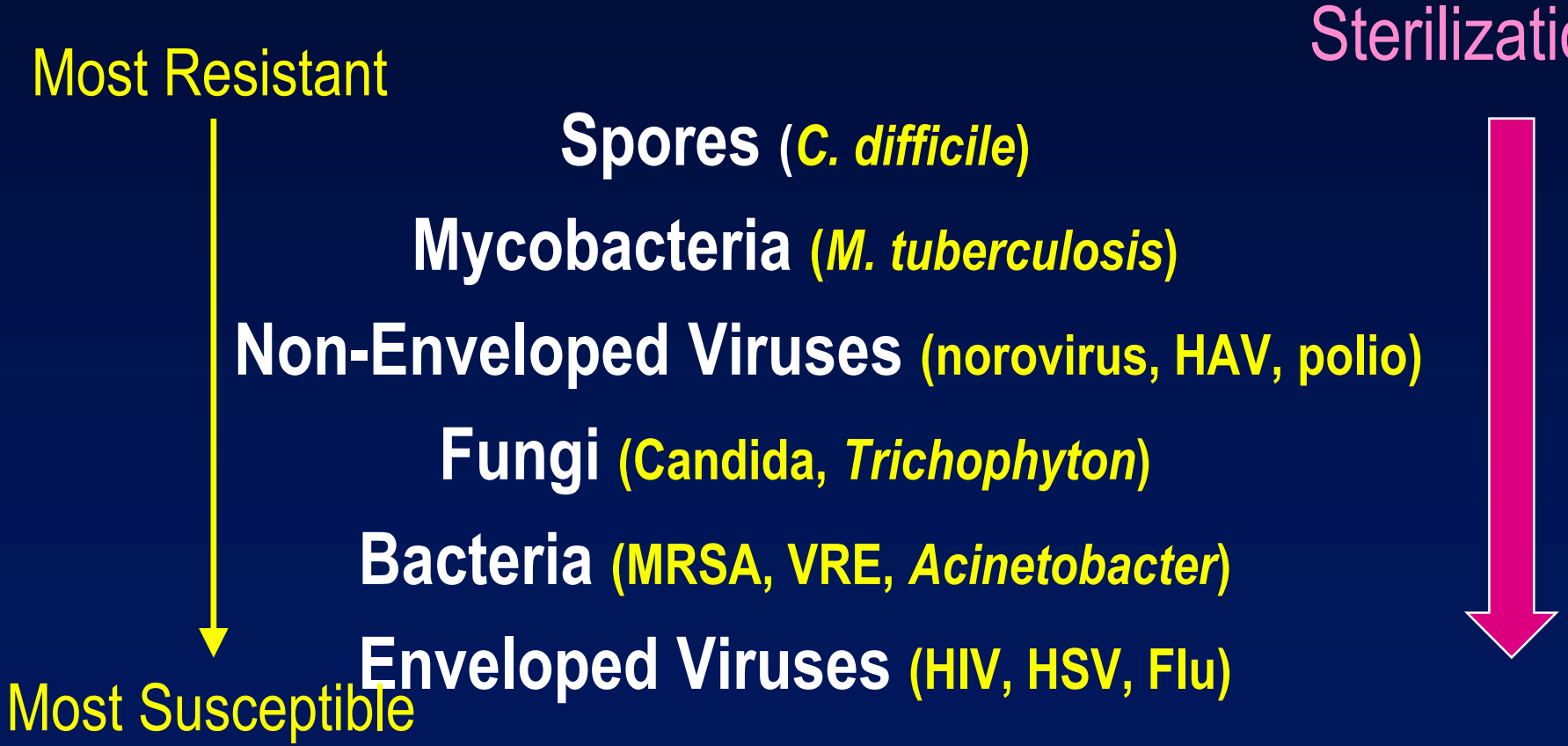
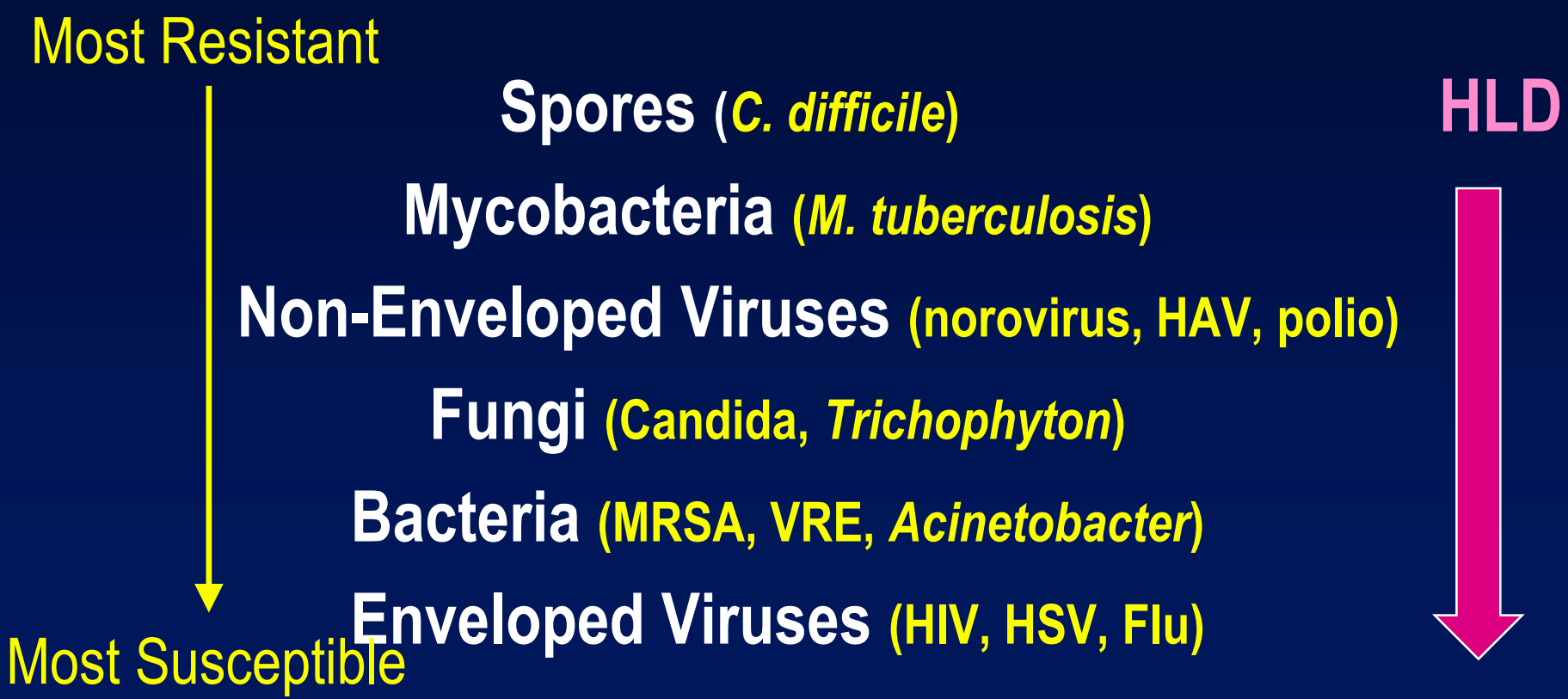


Microbiological Disinfectant Hierarchy

Decreasing Order of Resistance of Microorganisms to Disinfectants

Rutala WA, Weber DJ, HICPAC. www.cdc.gov

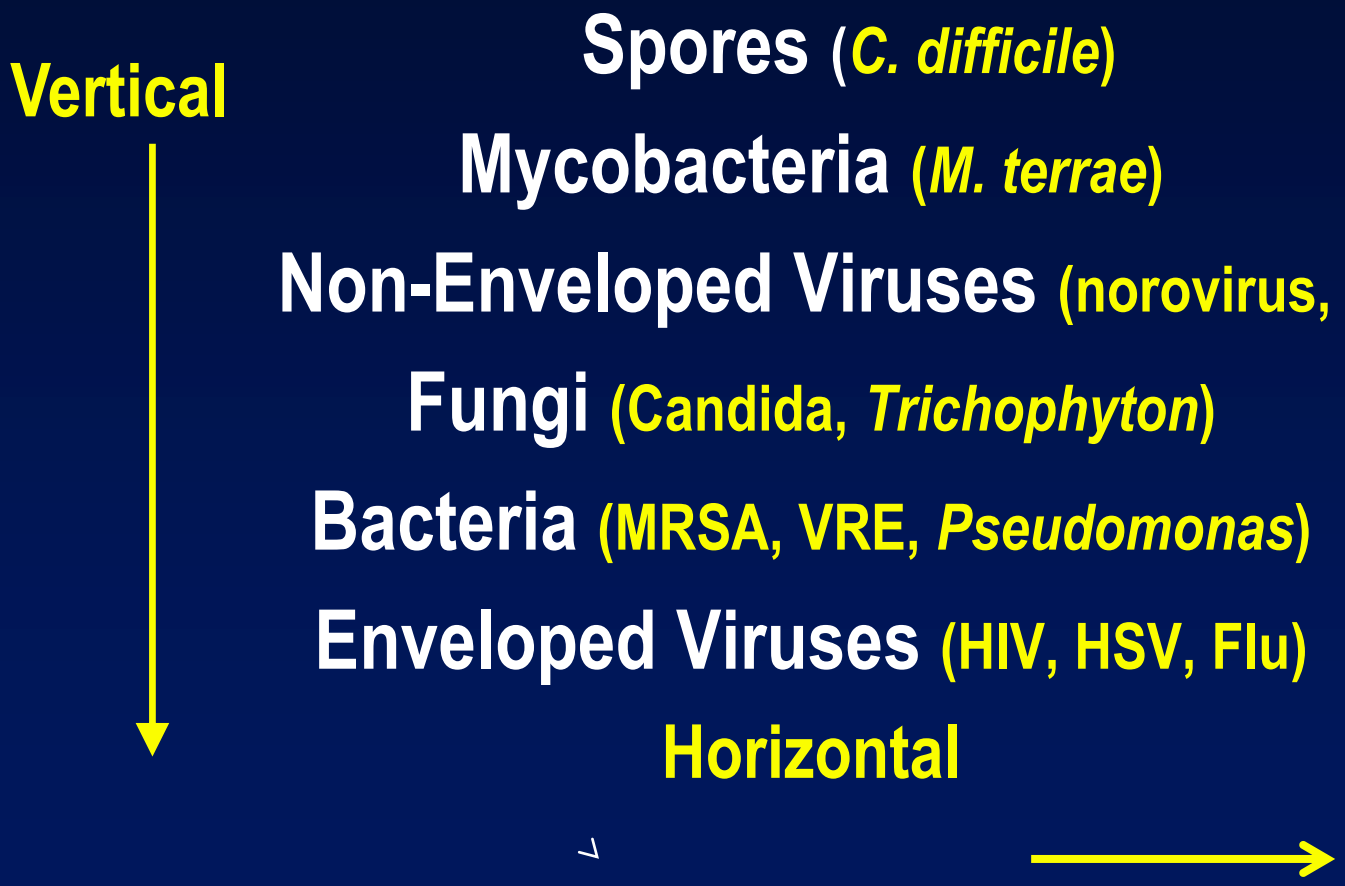


Hand Contamination after Touching a Contaminated Environmental Surface

Expanding the Use of the Disinfection Hierarchy

Susceptibility Order Could be Horizontal (Within) or Vertical (Between) Classes

Rutala WA, Weber DJ, HICPAC. www.cdc.gov



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Most Resistant

Spores (*C. difficile*)

Mycobacteria (*M. tuberculosis*)

Non-Enveloped Viruses (norovirus, HAV, polio)

Fungi (Candida, *Trichophyton*)

Bacteria (MRSA, VRE, *Acinetobacter*)

Enveloped Viruses (HIV, HSV, Flu)

Most Susceptible

LLD

Expanding the Use of the Disinfection Hierarchy

Vertical-Applied Down

Rutala WA, Weber DJ. ICHE 2004;25:331-341

- The vertical method is a logical method for assessing the efficacy of a disinfectant and would test the disinfectant's activity against a higher-class microbe, mycobacteria, and efficacy data would support ability to kill lower-class microbes (bacteria, fungi and viruses). The test microbe may have the following characteristics:
  - **Microbiologically well characterized**
  - **A clinically important human pathogen or a validated surrogate for a human pathogen**
  - **Standardized stock strains available from commercial sources**

Expanding the Use of the Disinfection Hierarchy

Vertical Expansion-Applied Down

Rutala WA, Weber DJ. ICHE 2004;25:331-341

- The test microbe may have the following characteristics **(cont)**
  - **Require only biosafety level 1 or 2 for propagation and evaluation**
  - **More resistant (or comparable resistance) to disinfectants than other members of the class or lower classes**
  - **Standard methods available for propagation (sufficiently high numbers to allow a 4 to 6-$\log_{10}$ reduction), assay, and storage.**

Expanding the Use of the Disinfection Hierarchy

Horizontal Expansion-Applied to One Class

Rutala WA, Weber DJ. ICHE 2004;25:331-341

- A horizontal expansion is logical method for assessing the efficacy of a disinfectant and would be to test the disinfectant's activity against an appropriate member of a class of microbes in the hierarchy (e.g., *P. aeruginosa* or *S. aureus* for all bacteria)
- Representative of the class would have following characteristics
  - **Microbiologically well characterized**
  - **A clinically important human pathogen or a validated surrogate for a human pathogen**
  - **Standardized stock strains available from commercial sources**

Expanding the Use of the Disinfection Hierarchy
Horizontal Expansion-Applied to One Class
Rutala WA, Weber DJ. ICHE 2004;25:331-341

- Representative of the class have characteristics (cont)
  - Require only biosafety level 1 or 2 for propagation and evaluation
  - More resistant (or comparable resistance) to disinfectants than other members of the class
  - Standard methods available for propagation (sufficiently high numbers to allow a 4 to 6-$\log_{10}$ reduction), assay, and storage.

Expanding the Use of the Disinfection Hierarchy

Hierarchy Is Only a Guide and May Vary by Factors

Rutala WA, Weber DJ. ICHE 2014;35:855-865

- **Need to consider microbes** that may deviate from the hierarchy-parvovirus, HPV, nontuberculous mycobacteria, prions, protozoa
- **Test method** may affect ranking of pathogens (carrier /dry vs suspension; alcohol, chlorine less effective in protein than glut)
- **Susceptibility of microbes** may vary by specific disinfectants (alcohol inactivate mycobacteria but not some viruses)
- Numerous **factors affect antimicrobial activity**: soil load, exposure time, temperature, concentration, surface type, pH, test method, clumping (e.g., virus), biofilms, culture prep, level of microbial contamination, nature of the object, delivery method (e.g., cotton)

Expanding the Use of the Disinfection Hierarchy

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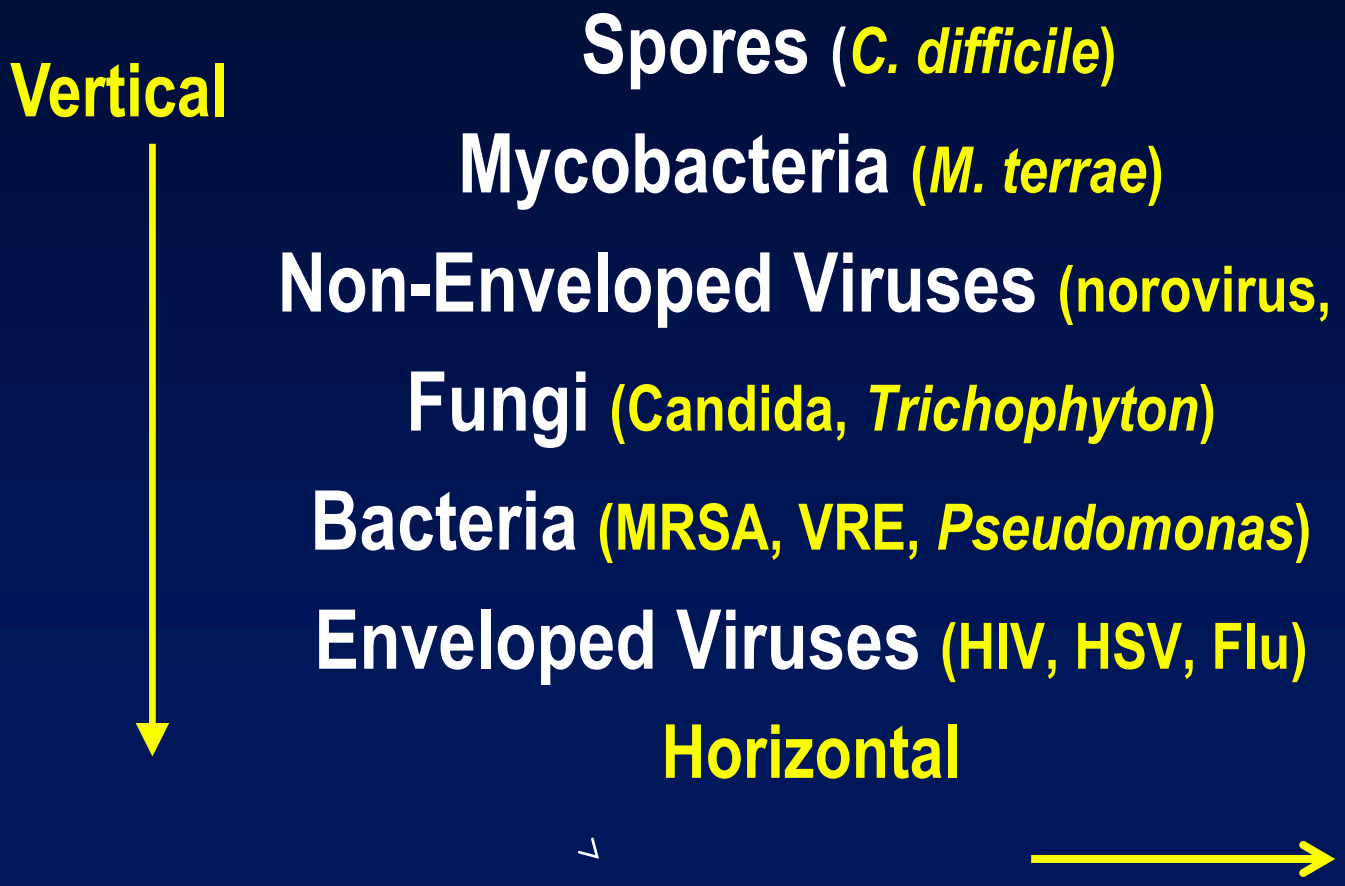

THANK YOU!

www.disinfectionandsterilization.org