Nosocomial Antibiotic Resistant Organisms

How Antibiotic Resistance Happens

- There are many bacteria and a few of them are drug resistant, naturally.
- Patient is given antibiotics that kill the infecting bacteria that is not resistant as well as the 'good' bacteria in the gut that help protect the body from infection.
- The drug resistant bacteria are now allowed to grow and take over.
- Some of the drug resistant bacteria share their resistance with other bacteria causing more problems.

Examples of How Antibiotic Resistance Spreads

- Animals get antibiotics and develop resistant organisms in their gut. Humans get prescribed antibiotics and develop resistant organisms in their gut.
- Drug resistant bacteria from animals can spread to crops through using manure as fertilizer or when cuts of meat are not cooked or handled properly.
- Humans can spread resistant bacteria in the community they are in or get treatment in a health care facility like a nursing home or hospital and spread the resistant organisms there.
- Once in a health care facility resistant organisms are spread through fomites or inanimate objects or by health care workers going between patients.

- Methicillin-resistant *Staphylococcus aureus* (MRSA) is becoming more prevalent in healthcare settings. MRSA is a type of staph bacteria that is resistant to certain antibiotics called beta-lactams. These antibiotics include methicillin and other more common antibiotics such as oxacillin, penicillin, and amoxicillin. According to CDC data, the proportion of infections that are antimicrobial resistant has been growing. In 1974, MRSA infections accounted for two percent of the total number of staph infections; in 1995 it was 22%; in 2004 it was 63%.

MRSA - Methicillin resistant *Staphylococcus aureus*

- Resistant to most antibiotics
- Found in health care facilities
  - hospitals
  - long term care facilities
  - other care facilities
- Not a threat to a healthy individual

MRSA Concerns

- MRSA is difficult to contain
- MRSA is easily spread

MRSA Risk Factors

- Surgery
- Devices used in invasive procedures
- Burn wards or intensive care units (ICU)
- Age
- Treatment with multiple antibiotics
- Severe illness or disability
- Prolonged or repeated hospital stays
- Compromised immune system

MRSA Transmission

- Direct contact between health-care workers and clients.
- Health-care workers are the main carriers of MRSA
- Colonization vs. Infection
  - Colonization means that the organism is present or in the body, but is not causing illness.
  - Infection means that the organism is present and causing illness.
- MRSA is not usually spread through the air

Identifying MRSA infection

- Symptoms
  - Drainage from a wound
  - Fever and chills
  - Elevated white blood count
- Common sites of infection
  - Respiratory tract
  - Surgical wounds
  - Perineum or rectum
  - Skin
  - Urinary tract

MRSA Prevention

- Proper hand-washing
  - Before caring for each patient
  - After removing gloves
  - Before leaving the patient's room
- Follow facility protocol for standard precautions

Community Acquired MRSA

- MRSA infections that are acquired by persons who have not been recently (within the past year) hospitalized or had a medical procedure (such as dialysis, surgery, catheters) are known as CA-MRSA infections.
- Staph or MRSA infections in the community are usually manifested as skin infections, such as pimples and boils, and occur in otherwise healthy people.

- Vancomycin resistant *enterococcus (*VRE) – The majority of VRE infections occur in the hospital setting. Enterococci are bacteria that are normally present in the human intestines and in the female genital tract and are found in the environment. Vancomycin is an antibiotic used to treat infections caused by enterococci. In some instances, enterococci have become resistant to this drug and thus are called vancomycin-resistant enterococci (VRE).

VRE Concerns

- VRE is hard to treat
- VRE can pass on their drug-resistant genes

VRE Risk Factors

- Severe illness
- Treatment with multiple antibiotics
- Abdominal or cardiac surgery
- Devices used in invasive procedures
- Age
- Intensive care unit (ICU)
- Prolonged or repeated hospital stays
- Compromised immune system

Pathogenesis of VRE

- Opportunistic
- Bacteria transmitted between clients and health-care workers
  Colonized vs. infected persons

Signs of Infection

- Drainage from a wound
- Fever and chills
- Elevated white blood count

Role of health care workers in prevention of VRE

- Hand-washing helps stop the spread of VRE
  - Wash before caring for a patient
  - After removing gloves
  - Before leaving the patient's room
- Follow facility protocol for standard precautions

- Gram-negative bacteria are those bacteria that do not retain crystal violet dye in the Gram staining protocol.

Gram-negative Infections

- Include those caused by *Klebsiella*, *Acinetobacter*, Pseudomonas aeruginosa, and *E. coli*, as well as many other less common bacteria..
  - *Klebsiella* bacteria are normally found in the human intestines and in human stool. Patients whose care requires devices like ventilators or intravenous catheters, and those taking long courses of certain antibiotics are most at risk for *Klebsiella* infections.
  - *Acinetobacter* is a group of bacteria commonly found in soil and water. *Acinetobacter* can also be found on the skin of healthy people, especially healthcare personnel.
  - Serious *Pseudomonas* infections usually occur in people in the hospital, especially those with weakened immune systems, those on breathing machines, those with devices such as catheters, and those with wounds from surgery or burns.

Gram-negative Infections

- Cause infections including pneumonia, bloodstream infections, wound or surgical site infections, and meningitis in healthcare settings
- One of the several unique characteristics of Gram-negative bacteria is the structure of the outer membrane. This outer membrane protects the bacteria from several antibiotics, dyes, and detergents which would normally damage the inner membrane or cell wall.