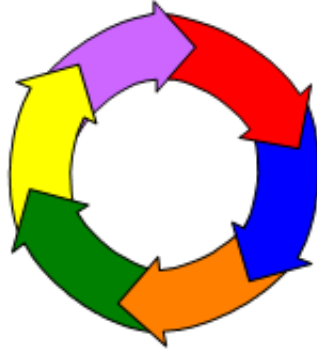


## D. Education Module 2 - Chain of Transmission of Infection

### TIP Study Module 2: The Chain of Transmission of Infection



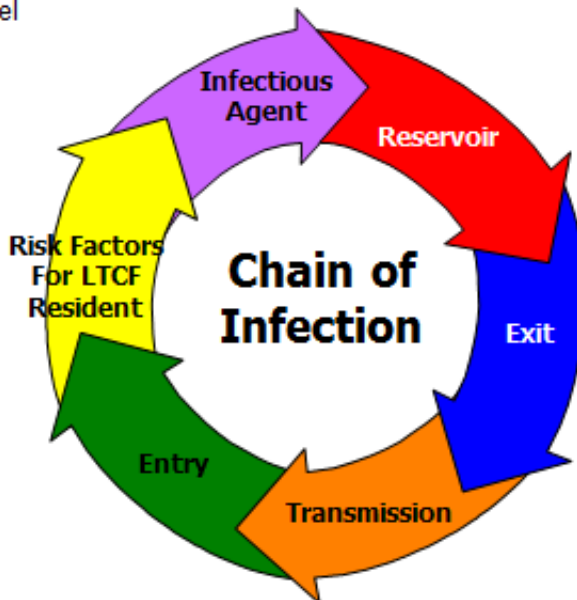
Ruth Anne Rye, RN, BS, CIC;  
Russell Olmsted, MPH, CIC

INFECTION PREVENTION  
IN AGING RESEARCH GROUP

Mody L, et al. JAMA Intern Med 2015;175(5):714-723

The Infectious  
Disease Model  
On Cross  
Transmission  
Of Microbes  
[Germs]  
Or...

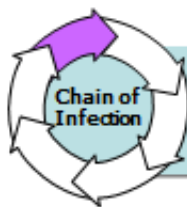
How  
Microbes  
Move  
around



LTCF = long-term care facility

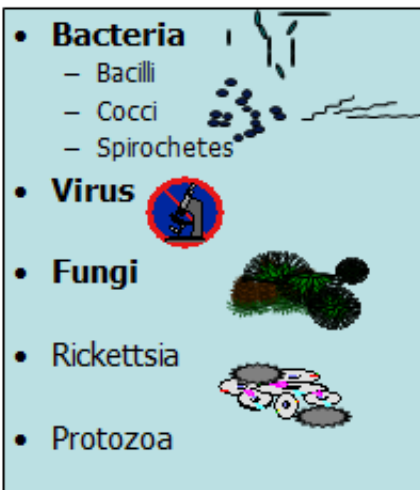
# The Chain of Infection

- Each link represents a component or element in the cycle, and must be present in sequential order for infection transmission to occur.
- Understanding the characteristics of each link and the relation to the other links is important to determine interventions and strategies to break the chain and prevent infection.
- Breaking the chain of infection is the responsibility of every healthcare professional.



## 1. The Infectious Agent or Microbe

- **Exogenous flora:** from outside the body
  - Example: bacteria = methicillin-resistant *Staph. aureus* [MRSA] is carried to the resident via hands of healthcare workers (HCW)
- **Endogenous flora:** from inside or on the body





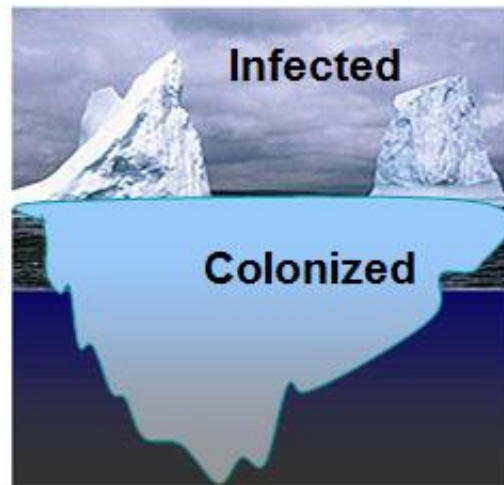
## 2. The Reservoir

- **Place where microbe (germ) grows and reproduces**
  - **Humans:** Resident's own microbial flora – transient (temporary) or resident (more permanent)
  - **Other sources:** healthcare workers, family, visitors
  - **Animals:** pet therapy program
  - **Environment:** (food, beverages, soil, healthcare equipment)
    - Contaminated
    - Handling
    - Storage



## The "TIP" of the Iceberg

- This iceberg represents colonization versus infection.
- Residents may carry organisms that could be transferred to another person, even if they do not show signs or symptoms of infection



## Colonized or Infected What is the Difference?

- **Colonization:** bacteria is present without evidence of infection (e.g. fever, increased white blood cell count)
- **Infection:** active process where the bacteria is causing damage to cells or tissue;
  - example purulent drainage from an open wound on the resident's skin.
  - UTI: resident has new fever and complains of burning pain when urinating plus frequency and urgency
- If an infection develops, it is usually from bacteria that colonize residents, e.g. their endogenous microbial flora, but can also be an exogenous source, e.g. transmitted by hands of HCW

~ **Bacteria can be transmitted even if the resident does not have an active infection** ~



### 3. The Mode of Exit

- **Microbe leaves the Reservoir**
  - Respiratory tract
    - Cough, sneeze, talking
  - Gastrointestinal tract
    - vomitus, feces
  - Skin, mucous membranes
  - Genitourinary tract
    - Urine, semen, vaginal secretions
  - Blood: from a cut through the skin or contaminated needle
  - Artificial openings, e.g. tracheostomy or feeding tube inserted through the skin



## 4. Mode of Transmission

- Contact
  - Direct
  - Indirect
- Droplet
- Airborne



- Other sources of infection
  - Example: food-borne from contaminated food



## 5. The Mode of Entry

- **Infectious agent enters the new host (resident)**

- Respiratory tract
  - Breathing contaminated air droplets
- Gastrointestinal tract
  - Eating, drinking, hand-to-mouth (fecal-oral route)



- Skin, mucous membranes
  - Non-intact skin
  - Hand-to-eye and nose



- Genitourinary tract
  - Urinary catheter is present; bacteria move up catheter into the bladder

- Blood
  - Contaminated lancet used for blood glucose





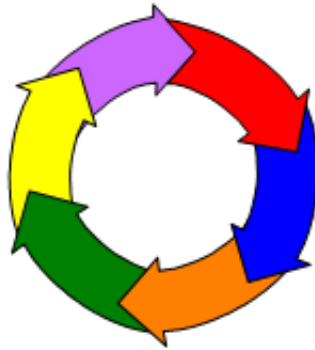
## 6. Resident Risk Factors

*They increase risk for infection*

- **Functionally dependent:** resident needs lots of help with activities of daily living
- **Immune system:** e.g. does not work as well as one gets older
- **Barrier Compromised:**
  - Fragile skin: tear, burn injury, chronic wound
  - Device use: indwelling urinary catheter (Foley); feeding tube
- **Additional factors:**
  - Admission to acute care hospital
  - Antibiotic use



## Breaking the Chain



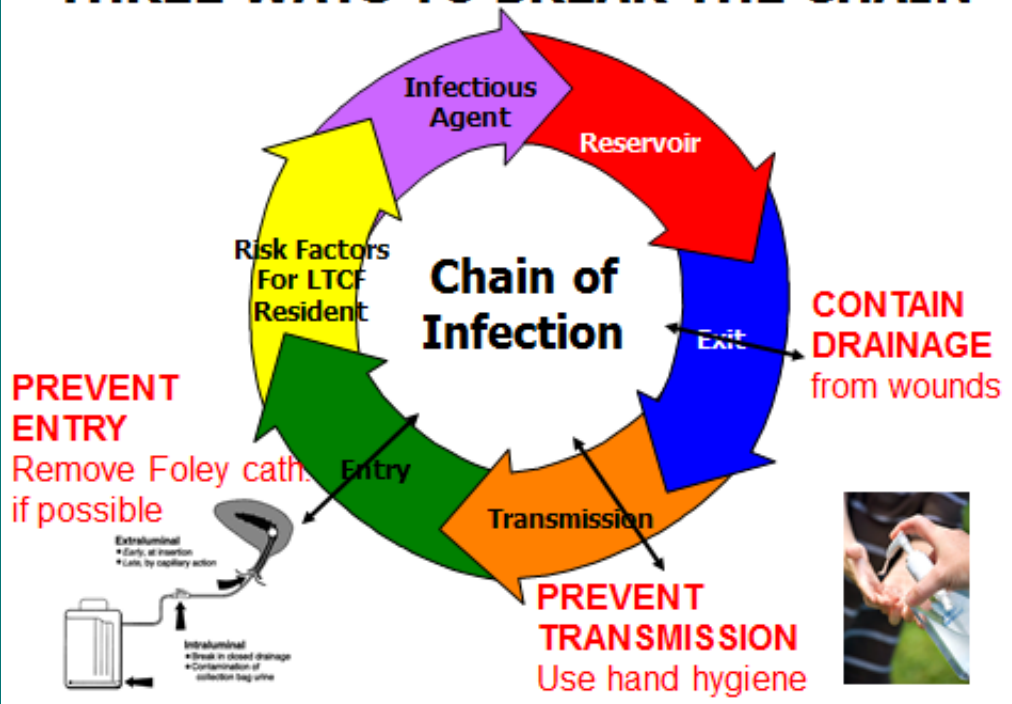
Preventing Cross Transmission & Infection

## Example: A Completed Chain of Cross Transmission & Infection

- Infectious agent – methicillin-resistant Staphylococcus aureus (MRSA)
- Reservoir - skin
- Exit – open, draining wound on Resident A
- Transmission – HCW picks up MRSA on hands & does not use hand hygiene before contact with Resident B
- Entry – HCW contaminates indwelling urinary catheter tubing during manipulation of catheter... MRSA ascends to meatus and then into the bladder
- Resident risk factor: indwelling urinary catheter
- Infection: UTI develops in Resident B

Chain is complete – how can we break this chain?

## THREE WAYS TO BREAK THE CHAIN





**Targeted Infection Prevention (TIP) Program**  
**Module 2: The Chain of Transmission of Infection**

PRE/POST-TEST

DATE: \_\_\_\_\_

Please check one answer for each of the following questions.

1. The best way to break the chain of infection and prevent transmission of infections is:

- a. Using proper hand hygiene
- b. Wearing gloves
- c. Getting a flu shot
- d. Disinfecting dinner tables

2. Microbes (germs) can exist on a person, in food, or on contaminated equipment.

True       False

3. Most resident infections are acquired through airborne transmission.

True       False

4. Colonization is bacteria (germs) that are present but do not cause signs or symptoms of an active infection.

True       False

5. A risk factor that puts residents at higher risk for an infection is a(n):

- a. Dependence on nurse aides for activities of daily living
- b. Immune system not working properly
- c. Skin that is easily cut or bruised
- d. Recent admittance to an acute care hospital
- e. All of the above

6. Each link in the infectious disease model or chain of infection must be present for transmission to occur.

True       False



7. Infection prevention and breaking the chain of infection is the responsibility of:

- a. Administration
- b. Physicians
- c. Nurses
- d. Every employee

8. An infectious agent (microbe or germ) can leave a resident (Mode of Exit) in a body fluid; for example in urine, stool, or wound drainage.

True       False

9. One way an infectious agent can enter a resident (Mode of Entry) is through or around an indwelling urinary (Foley) catheter.

True       False

## Module 2: PRE/POST-TEST ANSWER KEY

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