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## HEALTHCARE WORKER MUST KNOW

- ▶ What infectious diseases are
- ▶ How they spread
- ▶ How they are controlled
  
- ▶ It's the responsibility not only to the patients entrusted in our care, but also to the entire public sector



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## MICROORGANISMS

- ▶ Grow in or on a host organism and cause disease
  - ❖ Known as infections
- ▶ *Infection*- establishment and growth of a microorganism on or in a host



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## PATHOGENS

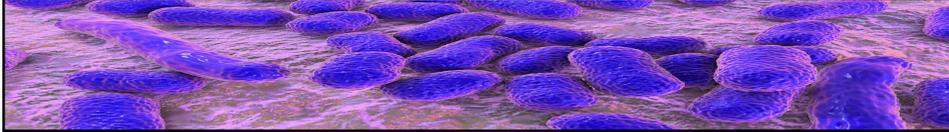
- ▶ Disease producing microorganisms
  1. multiply in large numbers and cause an obstruction
  2. cause tissue damage
  3. can secrete organic substances called exotoxins
    - ❖ Produce high temperatures, nausea, vomiting, or shock



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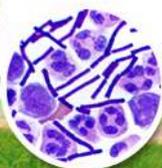
# BACTERIA

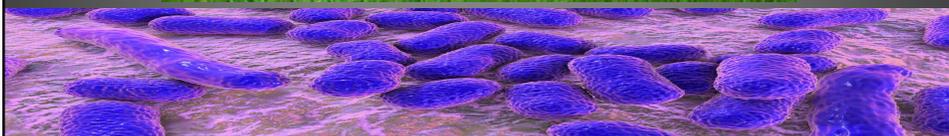
- ▶ Microscopic, single-celled organisms
- ▶ May reside in host, in a group, or cluster
  - ❖ Grows in a colony
- ▶ Classification by size of shape:
  - ❖ Cocci or spheres
  - ❖ Bacilli or rods
  - ❖ Spirals
- ▶ Common bacterial infections encountered today:
  - ❖ Streptococcal pharyngitis (strep throat)
  - ❖ Klebsiella pneumoniae infection (bacterial pneumonia)
  - ❖ Clostridium botulinum infection (food poisoning)



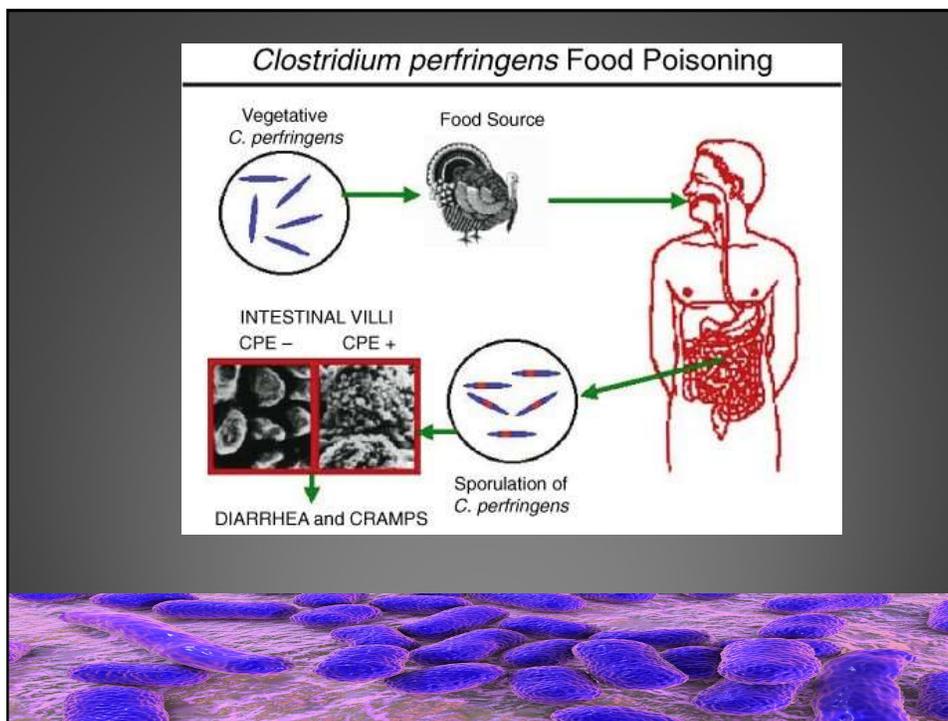
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# BACILLUS

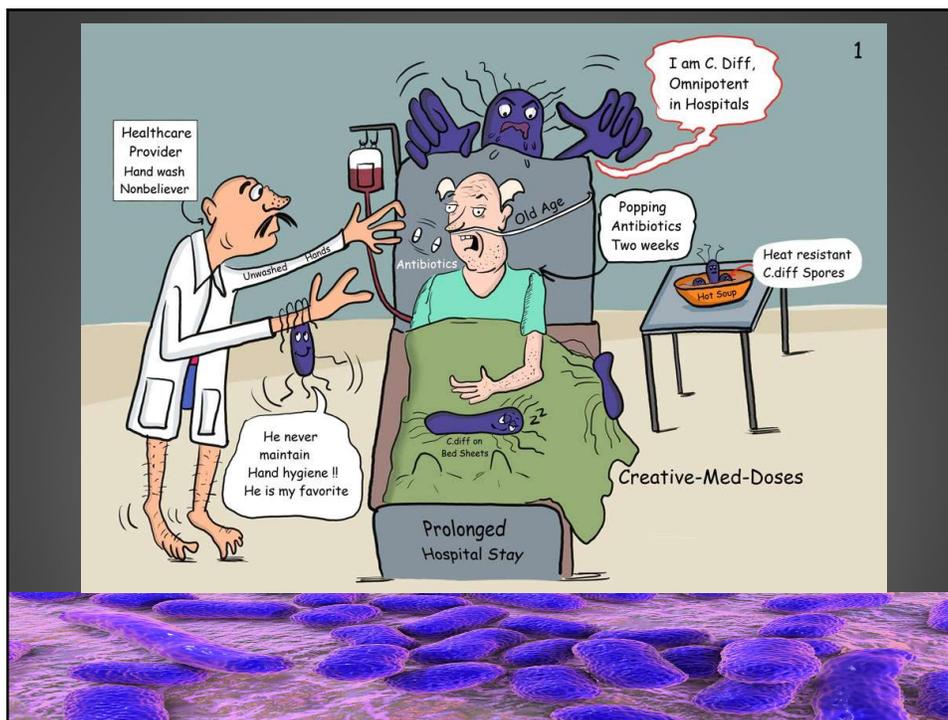
- 1** The bacteria known as *Bacillus anthracis* produce dormant spores (not active) that can live in the environment, like soil, for a long time, even decades.
 
- 2** When spores get into the body of an animal or person (a place rich with waters, sugars and other nutrients), they can be "activated" and turn into active growing cells.
 
- 3** When they become active, the bacteria can multiply, spread out in the body, produce toxins (poisons) and cause severe illness and death.
 



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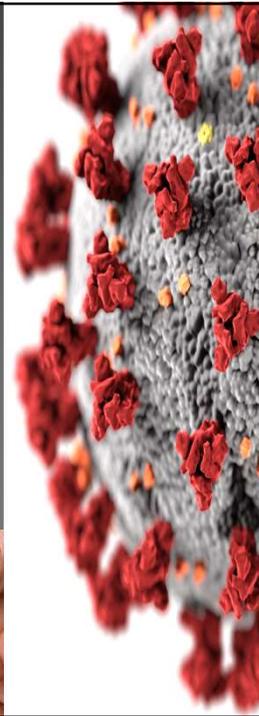
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## VIRUS

- ▶ Cannot live outside a living cell
- ▶ Depends on host cell to provide missing factors
- ▶ Viral particle (virion) attaches to host and inserts its genome or genetic information into the host
  - ❖ Genome redirects host cell and produces more viral particles – these can either die or travel into the nervous system
- ▶ Can lay dormant at times known as latent or dormant infection
- ▶ Common viral diseases:
  - ❖ Common cold (rhinovirus)
  - ❖ Infectious mononucleosis
  - ❖ Warts (caused by papillomavirus)



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## FUNGI

- ▶ Singular = fungus
- ▶ Size much larger than bacteria
- ▶ Two important medical forms = yeast and molds
- ▶ Some medically important fungi are called dimorphic (can grow as either yeast or mold)
- ▶ Common fungal infections:
  - ❖ Athlete's foot
  - ❖ Ringworm
  - ❖ Tinea nigra



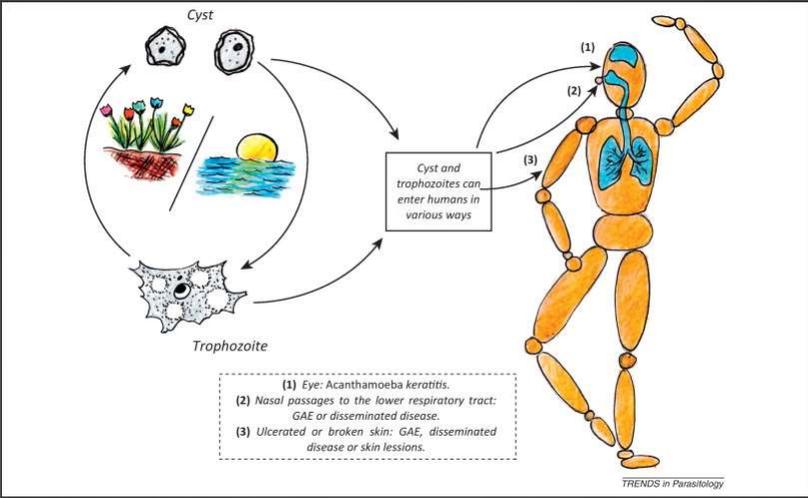
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# PROTOZOA

- ▶ Larger than bacteria
- ▶ Classified by their motility
- ▶ Live on or in other organisms at expense of host
- ▶ Usually have motile functionality
- ▶ Can ingest food particles, and some are equipped with digestive systems
- ▶ Common parasitic infections:
  - ❖ Pinworms
  - ❖ Tapeworms
  - ❖ Malaria

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Cyst

Trophozoite

Cyst and trophozoites can enter humans in various ways

(1) Eye: *Acanthamoeba keratitis*.  
 (2) Nasal passages to the lower respiratory tract: GAE or disseminated disease.  
 (3) Ulcerated or broken skin: GAE, disseminated disease or skin lesions.

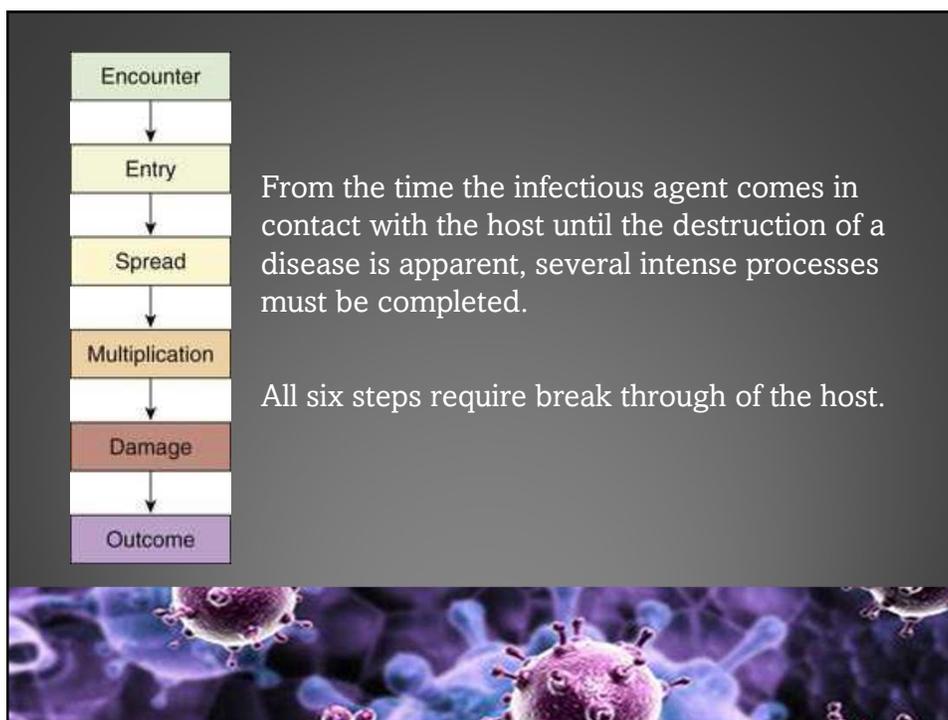
TRENDS in Parasitology

Can enter different ways. Some of these ways include: insect bites, walking around without shoes or socks on, drinking dirty water, eating raw fruits and vegetables and touching something dirty, like a door knob, or money, and then touching our faces or mouths. When it comes to avoiding parasites, the name of the game is being careful.

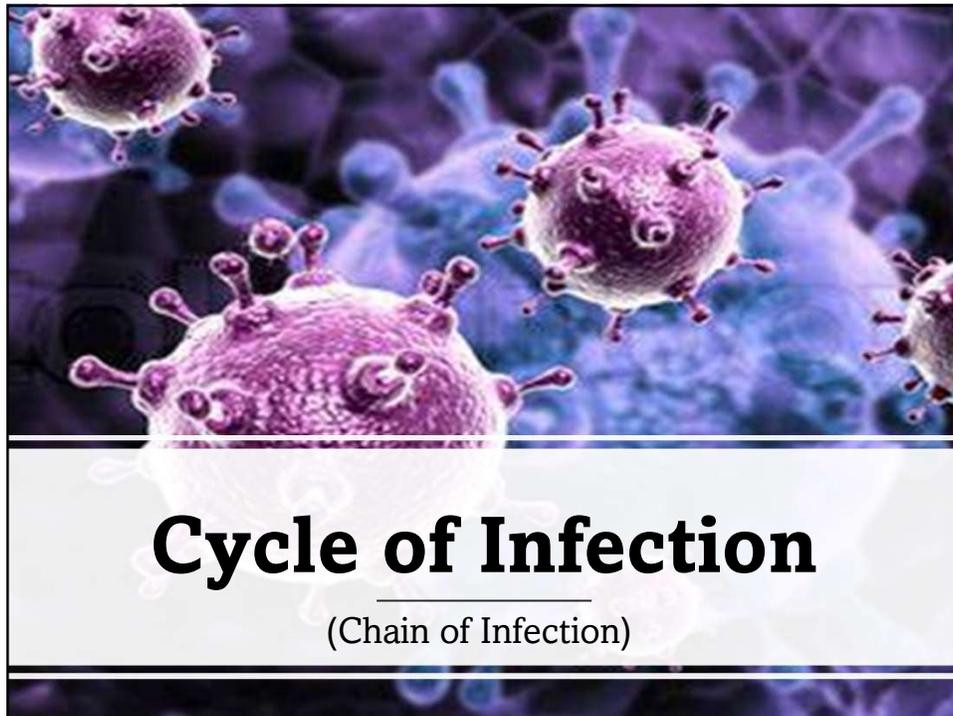
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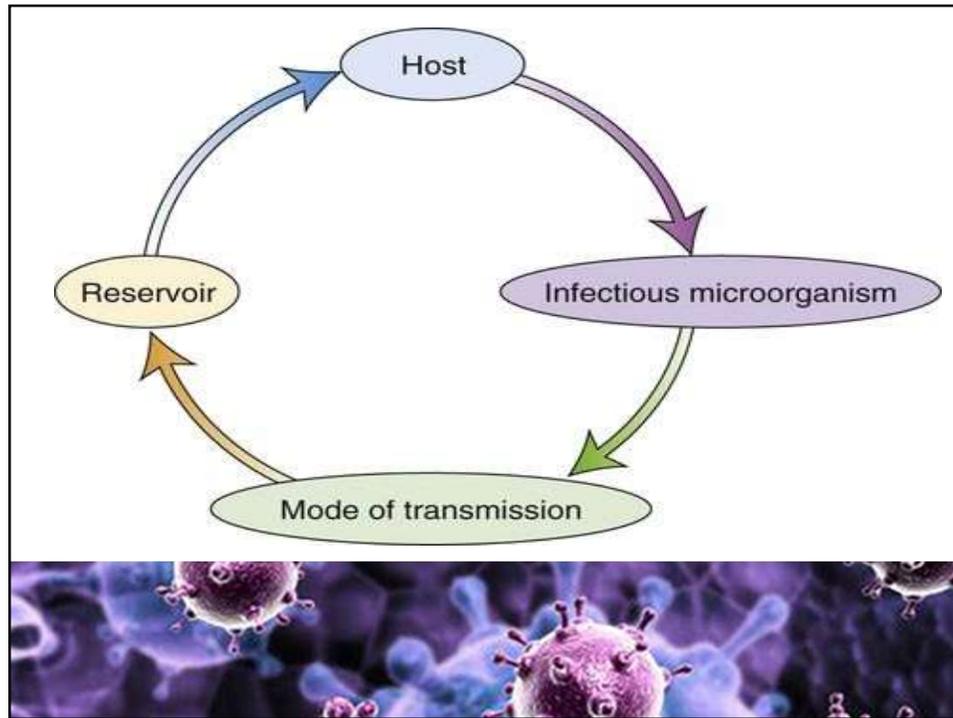


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- ▶ Four factors are involved with the spread of infection
  1. A host
  2. An infectious microorganism
  3. A mode of transportation
  4. A reservoir
- ▶ If at any point in the infection the chain is broken, the cycle cannot continue, and the infection will cease

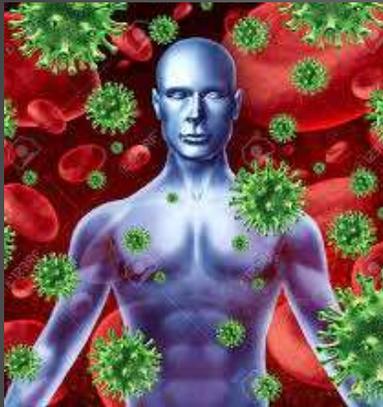


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## HUMAN HOST



- ▶ Humans provide favorable host environment due to the abundance of organic nutrients and metabolites
- ▶ Different temperatures throughout body, pH, or body fluid to grow
- ▶ \*\*\*Microorganisms tend to like:
  - ❖ warm temperature
  - ❖ moisture
  - ❖ darkness

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## INFECTIOUS MICROORGANISMS

- ▶ Bacteria
- ▶ Viruses
- ▶ Fungi
- ▶ Protozoa



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## MODE OF TRANSMISSION

- ▶ Exogenously – from outside the body  
Encounter with a microbe in the environment. Can be direct or indirect
- ▶ Endogenously – from inside the body  
Encounter with organisms already inside or on the body; when normal flora of the body is transported to a different area



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## EXOGENOUSLY (OUTSIDE)

- ▶ Encounter with microbe in the environment
- ▶ Direct or indirect host-to-host
  - ❖ Indirect – vector or a fomite
- ▶ Direct host-to-host
  - ❖ Infected individual transmits an infection by any number of methods
    - Handholding
    - Coughing
    - Sexual contact
  - ❖ Secretions and excretions with infective microbes can remove them from the body and is the common transport media
    - Phlegm
    - Aerosols from sneezing



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## THEY MAY NEED A LITTLE HELP....

- ▶ Some microorganisms require a vector to enter and exit the host
- ▶ Vector usually an arthropod
  - ❖ Takes blood from one host and carries it to the other
    - Tick – lyme disease
- ▶ Fomite
  - ❖ Inanimate object that has been in contact with an infectious organism
    - Food, water, radiographic equipment, and latex gloves



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## ENDOGENOUS (INSIDE)

- ▶ Organisms already in the body or normal flora
- ▶ Normal flora transported to a different area
- ▶ Staphylococci on surface of skin can go deeper with a laceration



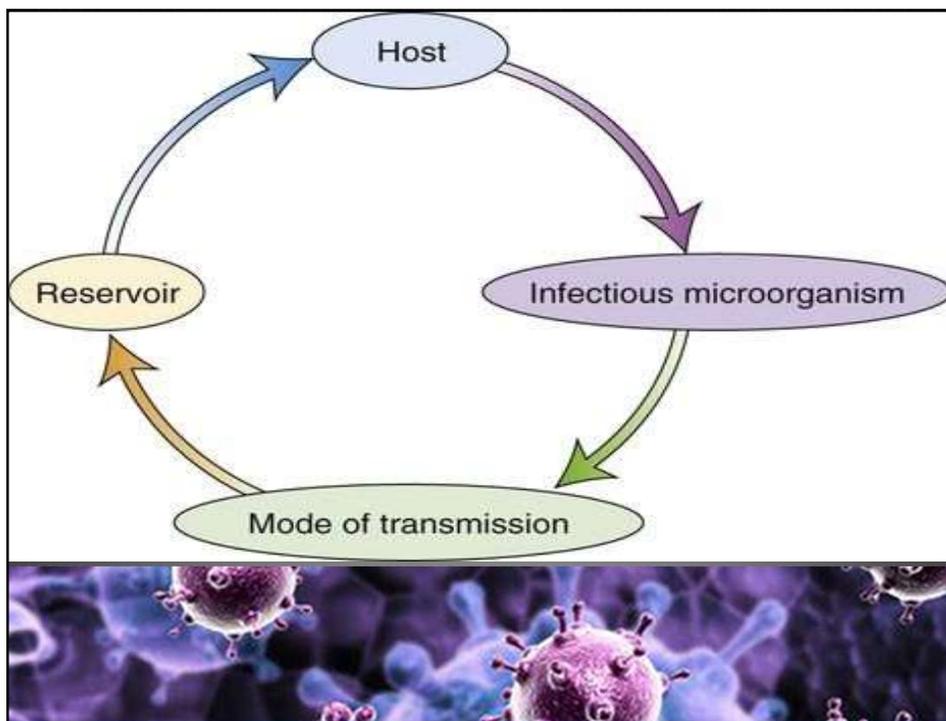
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## RESERVOIR

- ▶ Site where an infectious organism can remain alive and from which transmission can occur
- ▶ Types: people, animals and inanimate objects
- ▶ Person = carrier
  - ◊ Infected person who does not display the disease symptoms
- ▶ Animals- example cow
  - ◊ Ingestion of milk
- ▶ Insects
- ▶ Inanimate objects – dusty corner, contaminated linen, and food



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HAI (health care-associated infections):  
infections people acquire while that are  
receiving treatment in health care setting  
for another condition

- ❖ Majority of infections include:
- ❖ Urinary tract infections
- ❖ Surgical site infections
- ❖ Bloodstream infections
- ❖ Pneumonia



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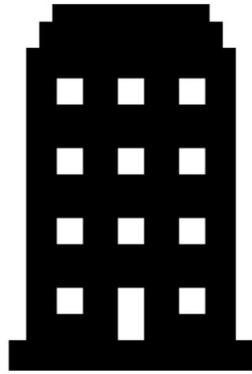
- ▶ Hospital acquired = nosocomial infections
- ▶ Communicable
- ▶ Iatrogenic
- ▶ Human immunodeficiency virus (HIV)
- ▶ Hepatitis
- ▶ Multidrug-resistant organisms (MDRO)
  - ❖ MRSA
  - ❖ VRE
  - ❖ C. Diff
- ▶ Many more, we will talk about TB since we will x-ray for positive PPDs



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# Nosocomial Infections

(Hospital acquired Infections)



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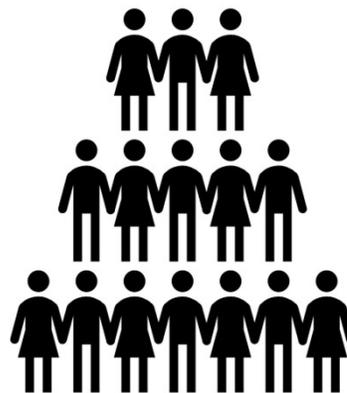
- ▶ Approximately 5% of all hospital patients acquire an additional condition while in the hospital
- ▶ **Iatrogenic** – infection that is the result of intervention with a physician
  - ❖ Patient had lung biopsy and developed pneumonia
- ▶ Given the right condition it will try to take over
- ▶ Most hospital patients have a greater sensitivity to infection:
  - ❖ Compromised
  - ❖ Immuno-suppressed



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## COMMUNICABLE DISEASES



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► Some communicable diseases are:

- ❖ HIV
- ❖ HBV
- ❖ Influenza
- ❖ Chicken Pox
- ❖ Malaria
- ❖ Tuberculosis
- ❖ Polio



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## HIV (BLOOD-BORNE PATHOGEN)

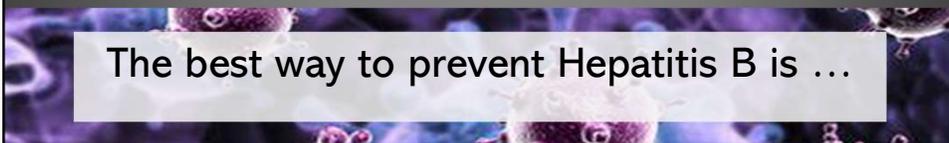
- ▶ Specifically infects the immune system CD4+ T cells in the human host
- ▶ Decreases cells effectiveness in preventing disease
- ▶ Is responsible for acquired immunodeficiency syndrome (AIDS)



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## HEPATITIS B (BLOOD-BORNE PATHOGEN)

- ❖ HBV
- ❖ Causes illness that primarily affects the liver
- ❖ Results in swelling, soreness, and loss of normal function in the liver
- ❖ Transmitted through:
  - ❖ **Contaminated needle – biggest for hospital workers**
  - ❖ Penetrating injury
  - ❖ Intimate contact



The best way to prevent Hepatitis B is ...

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# Hepatitis B Vaccination

- Series of three injections
- After receiving the Hepatitis B vaccine and a positive antibody titer is obtained, there is no risk of Hepatitis B disease
- Hepatitis B vaccine is safe and effective

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## MDRO

Multi-Drug Resistant Organism



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▶ Bacteria and other microorganisms that have developed resistance to antimicrobial drugs. Common examples of these organisms include:

- ❖ **MRSA** - Methicillin/oxacillin-resistant *Staphylococcus aureus*
- ❖ **VRE** - Vancomycin-resistant enterococci
- ❖ **C. DIFFICILE**- *CLOSTRIDIUM DIFFICILE*
- ❖ **ESBLs** - Extended-spectrum beta-lactamases (which are resistant to cephalosporins and monobactams)
- ❖ **PRSP** - Penicillin-resistant *Streptococcus pneumoniae*
- ❖ **Multi-drug resistant Tuberculosis** (MDR)



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## MRSA (METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS)

- ▶ *S. Aureus* is easily colonized on skin
- ▶ Assume all patients may be carriers
- ▶ Most susceptible patients:
  - ❖ Nursing home
  - ❖ Dialysis
  - ❖ The aged and debilitated
  - ❖ Intensive care
  - ❖ Hospitalized for long periods



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## MRSA: DISEASE PRODUCED

- ▶ Decubitus ulcers
  - ▶ Pneumonia
  - ▶ Endocarditis
  - ▶ Bacteremia
  - ▶ Osteomyelitis
  - ▶ Septic thrombophlebitis
- ▶ This if from direct contact or contact with infected objects or surfaces



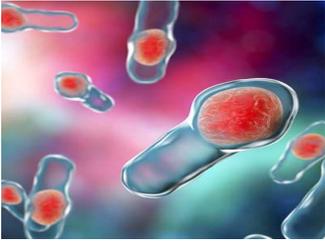
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## VRE (VANCOMYCIN-RESISTANT ENTEROCOCCUS)

- ▶ Part of the normal flora in the gastrointestinal tract
- ▶ Capable of causing disease when it affects blood, urine, or wounds
- ▶ Able to reproduce in large groups
- ▶ Has become resistant to many antibiotics
- ▶ It is also resistant to normal hand washing procedures, adheres to objects in the health care environment, and is difficult to remove

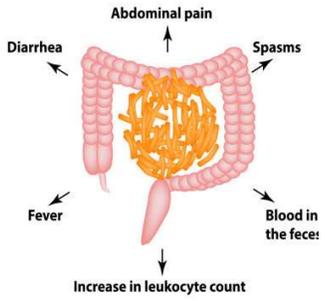


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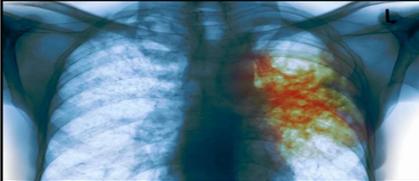
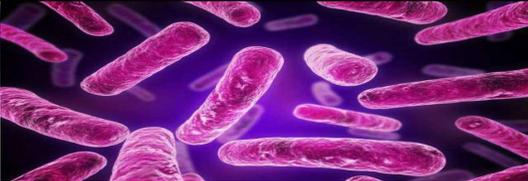


**CLOSTRIDIUM DIFFICILE**  
(CLOSTRIDIUM DIFFICILE)

- ▶ Spore forming bacterium that releases toxins into the bowel
- ▶ Resistant to disinfectants
- ▶ Easily spread from the hands of health care providers
- ▶ Frequent cause of nosocomial infections



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**TUBERCULOSIS (TB)**  
Drug resistant; Airborne bacilli

- ▶ Recurrent, chronic disease caused by the spore-forming *Mycobacterium tuberculosis*
- ▶ Mostly affects the lungs
- ▶ Communicable disease
- ▶ Treatable disease

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- ▶ Take transmission-base precautions
- ▶ As a healthcare worker you should:
  - Wash your hands
  - Get your immunizations
  - Get boosters
  - Follow post-exposure protocols

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## Centers for disease control and prevention (CDC)

*Vision - Equitably protecting health, safety & security.*

### CDC's Role



- Detecting and responding to new and emerging health threats
- Tackling the biggest health problems causing death and disability for Americans
- Putting science and advanced technology into action to prevent disease
- Promoting healthy and safe behaviors, communities and environment
- Developing leaders and training the public health workforce, including disease detectives
- Taking the health pulse of our nation



<http://www.cdc.gov/>

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## Standard Precautions (Review)

- Used when performing procedures that may require contact with blood, body fluids, secretions, excretions, mucous membranes, and non-intact skin
- All patients in the department should be regarded as potentially infectious
- Practice Biosafety:
  - Handwashing
  - Gloving
  - Personal Protective equipment
  - Needle Recapping
  - Biospills

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## Handwashing

- Required for standard and expanded precautions
- Remember sing Happy Birthday twice/20 seconds
- Perform...
  - Immediately after removing PPE
  - Between patient contacts
- Wash hands thoroughly with soap and water or use alcohol-based hand rub

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THE ONE HAND  
**SCOOP**  
TECHNIQUE



## Needle recapping

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- 800,000 needle stick injuries and other injuries from sharp objects occur to health care workers annually in the US
- Recapping used needles should be avoided
- If need to...
  - One-handed scoop technique or needle recapping device
- All sharps must be placed in *sharps container*

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## Transmission-Based precautions (isolation precautions)

- Airborne
- Droplet
- Contact
- RH has Additional Hand and Environmental Contact Precautions
- Applied when a patient is infected with a pathogenic organism or a communicable disease

OR

- When patient is at risk of becoming infected, such as immunosuppressed



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## Airborne

- Pathogenic organisms that remain suspended in the air for long periods on aerosol droplets or dust
- TB, Chickenpox (varicella), and Measles (rubeola)
- Patients are placed in a negative-pressure isolation room
- Health care worker is required to wear N95 respirator

Hand Hygiene: alcohol rub or soap and water

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**STOP: AIRBORNE PRECAUTIONS**  
**ALTO: PRECAUCIONES CONTRA LA TRANSMISIÓN POR LA VÍA AÉREA**

IN ADDITION TO STANDARD PRECAUTIONS  
ADEMÁS DE LAS PRECAUCIONES ESTÁNDAR

**CHECK WITH STAFF BEFORE ENTERING**    **CONSULTE CON EL PERSONAL ANTES DE INGRESAR**

**BEFORE ENTERING ROOM**  
ANTES DE INGRESAR A LA HABITACIÓN

Perform Hand Hygiene  
Desinfectase las manos

**DISINFECT REUSABLE ITEMS BETWEEN CLEANING**    **DESINFECTE LOS OBJETOS REUTILIZABLES EN CADA LIMPIEZA**

**HEALTHCARE WORKERS ENTERING THE ROOM MUST WEAR:**  
EL PERSONAL DE ATENCIÓN MÉDICA QUE INGRESE A LA HABITACIÓN DEBE UTILIZAR:

N95 Respirator  
Quite el respirador N95

Limit Patient Transport  
Place Mask on Patient During Transport  
Limite el transporte del paciente. Coloque una mascarilla al paciente al transportarlo

**VISITORS ENTERING THE ROOM MUST WEAR:**  
LOS VISITANTES QUE INGRESEN A LA HABITACIÓN DEBEN UTILIZAR:

Surgical Mask  
Mascarillas Quirúrgicas

**BEFORE LEAVING ROOM**  
ANTES DE SALIR DE LA HABITACIÓN

Perform Hand Hygiene  
Desinfectase las manos

**AFTER LEAVING ROOM**  
DESPUÉS DE SALIR DE LA HABITACIÓN

Close Door  
Cierre la Puerta

Remove N95 Respirator/Surgical Mask  
Quite el respirador N95

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Hand Hygiene: alcohol rub or soap and water

## Droplet

- Infected with pathogenic organisms
- Rubella, mumps, influenza, and adenovirus
- Pathogens disseminate through large particulate droplets expelled from the patient during coughing, sneezing, or even talking
- Infect another person through contact with the mouth, nasal mucosa, or conjunctiva
- Health Care workers should protect themselves by wearing a surgical mask when within 3 feet of the patient

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**STOP: DROPLET PRECAUTIONS**  
**ALTO: PRECAUCIONES CONTRA LA TRANSMISIÓN POR GOTAS**

IN ADDITION TO STANDARD PRECAUTIONS  
 ADEMÁS DE LAS PRECAUCIONES ESTÁNDAR

**CHECK WITH STAFF BEFORE ENTERING**      **CONSULTE CON EL PERSONAL ANTES DE INGRESAR**

**BEFORE ENTERING ROOM**  
 ANTES DE INGRESAR A LA HABITACIÓN

Perform Hand Hygiene  
 Desinfectese las manos

**DISINFECT REUSABLE ITEMS BETWEEN CLEANING**      **DESINFECTE LOS OBJETOS REUTILIZABLES EN CADA LIMPIEZA**

**EVERYONE ENTERING THE ROOM MUST WEAR:**  
 TODOS LOS QUE INGRESEN A LA HABITACIÓN DEBEN UTILIZAR:

Mask  
 Mascarillas

Limit Patient Transport  
 Place Mask on Patient During Transport  
 Limite el transporte del paciente  
 Coloque una mascarilla al paciente al transportarlo

**BEFORE LEAVING ROOM**  
 ANTES DE SALIR DE LA HABITACIÓN

Remove Mask  
 Quite la mascarilla

Perform Hand Hygiene  
 Desinfectese las manos

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Hand Hygiene: alcohol rub or soap and water

## Contact

- A patient is infected with a virulent pathogen that spreads by direct contact with the patient or by indirect contact with a contaminated object (patient's dressing, bed rail)
- Staphylococcus aureus, hepatitis A, impetigo, varicella, and varicella zoster
- You will have to properly don on gloves, gown, possibly face shield and bouffant prior to going into the room
- All radiographic equipment should be cleaned with antiseptic solution after procedure is performed



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### STOP: CONTACT PRECAUTIONS

ALTO: PRECAUCIONES CONTRA LA TRANSMISIÓN POR CONTACTO

IN ADDITION TO STANDARD PRECAUTIONS  
ADemás DE LAS PRECAUCIONES ESTÁNDAR

CHECK WITH STAFF BEFORE ENTERING      CONSULTE CON EL PERSONAL ANTES DE INGRESAR

**BEFORE ENTERING ROOM**  
ANTES DE INGRESAR A LA HABITACIÓN

Perform Hand Hygiene  
*Desinfectese las manos*

**DISINFECT REUSABLE ITEMS BETWEEN CLEANING**      **DESINFECTE LOS OBJETOS REUTILIZABLES EN CADA LIMPIEZA**

**EVERYONE ENTERING THE ROOM MUST WEAR:**  
TODAS LAS QUE INGRESAN A LA HABITACIÓN DEBEN UTILIZAR

Isolation Gown  
*Usa bata de aislamiento*

Clean Gloves  
*Guantes limpios*

Limit Patient Transport  
*Limite el transporte del paciente*

**BEFORE LEAVING ROOM**  
ANTES DE SALIR DE LA HABITACIÓN

Remove Gloves then Gown  
*Quite los guantes y después la bata*

**Perform Hand Hygiene**  
*Desinfectese las manos*

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## Contact Precautions technique

\*\*See pages 206-208

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## Gloves and Handwashing



- Wear gloves when entering the room (“clean” gloves)
- Change gloves after being in contact with infective material
- Remove gloves prior to leaving the patient’s room
- Wash hands immediately with an antiseptic agent (alcohol rub or soap and water)
- Make sure your hands don’t touch potentially contaminated surfaces or items

## Gown



- Wear gown when entering the room
- Remove gown before leaving the room
- Do not put a clean gown on and start walking in the hallways because you have a question = people think you are “dirty”

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## C. DIFF FACTSHEET

Clostridioides difficile (formerly known as Clostridium difficile) is a bacterium that causes diarrhea and colitis (an inflammation of the colon). C. diff infections can be deadly.

### IMPACT

- C. diff causes close to half a million illnesses each year and can affect people of all ages.
- 1 in 5 patients will get C. diff at least once more.
- One in 11 people over 65 diagnosed with a healthcare-associated C. diff infection die within a month.

### RISK

- People on antibiotics are 7 to 10 times more likely to get C. diff while on the drugs and during the month after.
- Extended stays in healthcare settings, especially hospitals and nursing homes, also increase risk.
- More than 80% of C. diff deaths occur in people 65 and older.

### SPREAD

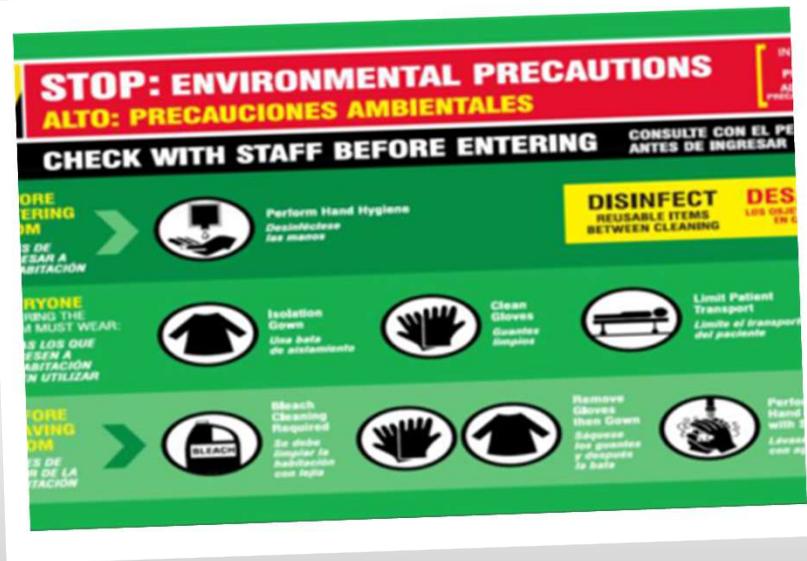
- C. diff spreads when people touch surfaces that are contaminated with poop from an infected person.
- Or when people don't wash their hands with soap and water.
- It can also happen when one healthcare facility fails to notify another when it transfers a patient with C. diff.

## Environmental Contact

Hand Hygiene: Soap and Water

- Having diarrhea of unknown origin
- C.diff
- Norovirus

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## STOP: ENVIRONMENTAL PRECAUTIONS

### ALTO: PRECAUCIONES AMBIENTALES

**CHECK WITH STAFF BEFORE ENTERING**      **CONSULTE CON EL PERSONAL ANTES DE INGRESAR**

**BEFORE ENTERING ROOM**

ANTES DE INGRESAR A LA HABITACIÓN

**Perform Hand Hygiene**

Desinfectarse las manos

**DISINFECT REUSABLE ITEMS BETWEEN CLEANING**

DESINFECCIÓN DE LOS OBJETOS REUTILIZABLES ENTRE LIMPIEZAS

**EVERYONE ENTERING THE ROOM MUST WEAR GLOVES**

TOODOS LOS QUE ENTRAN A LA HABITACIÓN DEBEN UTILIZAR GUANTES

**Isolation Gown**

Una bata de aislamiento

**Clean Gloves**

Guantes limpios

**Limit Patient Transport**

Limita el transporte del paciente

**BEFORE LEAVING ROOM**

ANTES DE SALIR DE LA HABITACIÓN

**Block Cleaning Required**

Se debe bloquear la habitación antes de limpiar

**Remove Gloves**

Retirar los guantes y desinfectar la bata

**Perform Hand Hygiene**

Lavar las manos con agua y jabón

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## Just one more to talk about...

- Compromised/Immunosuppressed patients (reverse isolation)
  - Also known as **neutropenic** and protective precautions
  - Patient who is at increased risk for infection against contact with potential pathogens
  - **You** wear PPE to protect the patient



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<p><b>Protective Precautions for Immunocompromised Patients</b> Visitors, Physicians, Nurses, Hospital Personnel — Report to Nurses Station With Questions</p>	<p><b>Conditions Requiring Protective Precautions</b></p>
<ol style="list-style-type: none"> <li>1. Keep alone.</li> <li>2. Strict <b>handwashing</b> — before and after patient care.</li> <li>3. No sick visitors or personnel.</li> <li>4. No live plants or flowers.</li> <li>5. No raw foods — hot cooked foods only.</li> <li>6. No foods brought from home.</li> </ol>	<p>Aplastic Anemia Leukemia Lymphoma AIDS Severe Burns Leukopenia Myelosuppression</p>
<p><b>Medidas de Protección para el Paciente de Inmunidad Comprometida</b> Visitas, Médicos, Enfermeras, y Personal General: La Estación de Enfermeras Contestará sus Preguntas</p>	<p><b>Medidas Preventivas se Requieren en los Sigüientes Casos</b></p>
<ol style="list-style-type: none"> <li>1. Mantenga el paciente solo.</li> <li>2. Estricto lavado de manos — antes y después del cuidado del paciente.</li> <li>3. Nadie sintiéndose enfermo, puede entrar; empleados o visitas.</li> <li>4. No se permiten plantas o flores en el cuarto.</li> <li>5. No se permiten comidas sin cocinar — solo comidas calientes.</li> <li>6. No se permiten comidas traídas de la casa.</li> </ol>	<p>Anemia Aplástica Leucemia Linfoma SIDA Quemaduras Severas Leucopenia Medula Ósea Suprimida</p>

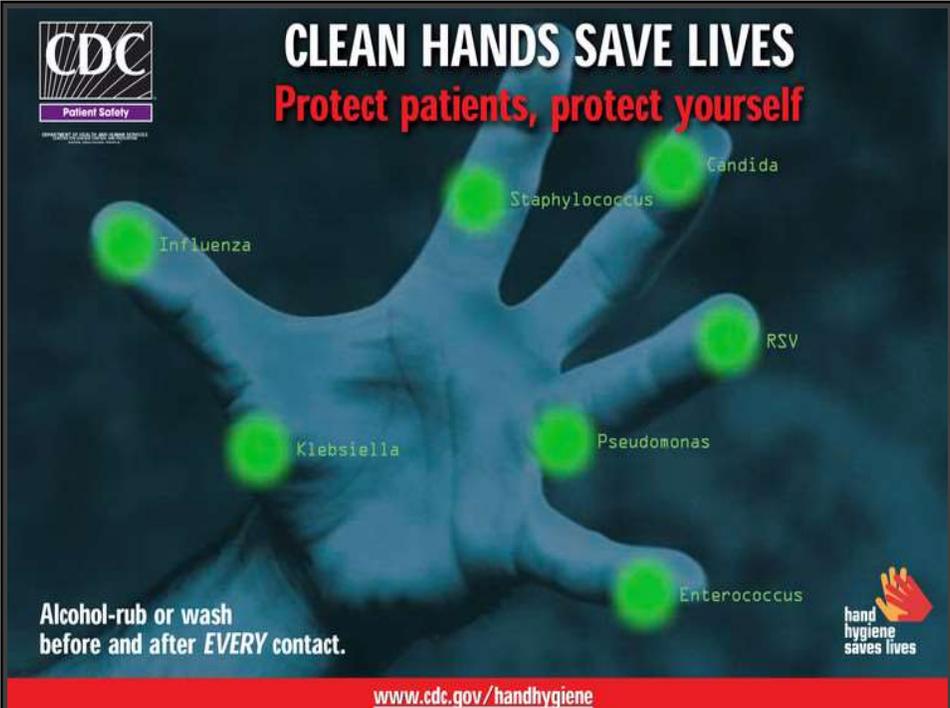
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## Psychological considerations of Isolation Precaution Patients

- Patient may feel alone and rejected
- Forced to remain in solitude for long periods and are often treated by visitors and hospital personnel as if they are undesirable
- You must treat them with respect and dignity
- Explain what is going to happen and ask if they have any concerns or questions
- They are no different than any other patient or person

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**CDC**  
Patient Safety

**CLEAN HANDS SAVE LIVES**  
**Protect patients, protect yourself**

Influenza  
Klebsiella  
Staphylococcus  
Pseudomonas  
Enterococcus  
RSV  
Candida

Alcohol-rub or wash before and after **EVERY** contact.

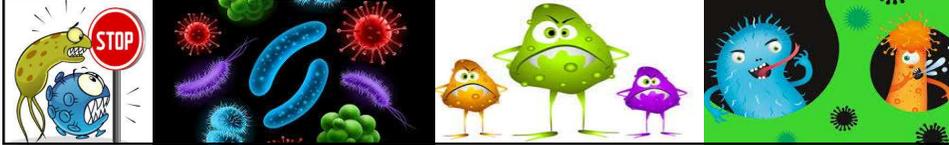
hand hygiene saves lives

[www.cdc.gov/handhygiene](http://www.cdc.gov/handhygiene)

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## FUN (GROSS) FACTS

- ▶ All bacteria in our body collectively weights \_\_\_\_\_ pounds
- ▶ The average office desk has \_\_\_\_\_ times more bacteria than a toilet
- ▶ The “smell of \_\_\_\_\_” is caused by a bacterium called *actinomyces*
- ▶ Researchers found 1,458 new species of bacteria in \_\_\_\_\_
- ▶ \_\_\_\_\_ has an anti-bacterial effect on the mouth and protects against tooth decay
- ▶ When two people kiss, they exchange between \_\_\_\_\_ and \_\_\_\_\_ bacteria
- ▶ A clean mouth has between \_\_\_\_\_ and \_\_\_\_\_ on EACH tooth



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