

The cycle of infection

Break any link and the infection stops.

Link	Break it with
1. Infectious agent	Hand washing, antiseptics, disinfection, sterilization
2. Reservoir host	Sanitization, disinfection, sterilization, pest control
3. Portal of exit	Standard Precautions, controlling splatter
4. Means of transmission	Hand hygiene, PPE, food safety, germicides
5. Portal of entry	Standard Precautions, PPE, first aid, personal hygiene
6. Susceptible host	Immunizations, patient education

- ✓ **Portals of exit and entry are the same list:** mouth, eyes, nose, ears, intestines, reproductive tract, urinary tract, open wounds
- ✓ **Direct transmission:** contact, discharges, droplet. **Indirect:** airborne, fomites, vectors
- ✓ **Carrier:** transmits the pathogen without showing the disease
- ✓ **Vectors:**
 - Mosquitoes: malaria, yellow fever, West Nile, Zika
 - Ticks: Lyme, encephalitis, rickettsial
 - Fleas: plague

Sanitize, disinfect, sterilize

Level	Does what	Leaves behind
Sanitization	Reduces organisms to a safe level, removes organic debris	Must come first: debris blocks the other two
Disinfection	Kills or inactivates pathogenic organisms	Not always effective against spores, TB bacilli, some viruses
Sterilization	Destroys all organisms	Nothing: pathogens and spores both

Disinfectant	Kills	Used on	Example
Low	Most vegetative bacteria, some fungi and viruses	Exam tables, countertops	Hydrogen peroxide
Intermediate	Mycobacteria, vegetative bacteria, most viruses and fungi; not spores	Stethoscopes, percussion hammers	Isopropyl alcohol
High	All but large numbers of bacterial spores	Flexible fiberoptic sigmoidoscope	Cidex OPA

Chemical disinfectants **never** go on skin. Antiseptics do: alcohol, povidone-iodine (Betadine).

The autoclave

Setting	Value
Pressure	15 psi
Temperature at 15 psi	250 °F (121 °C)
Recommended range	250–255 °F (121–123 °C)
Unwrapped items	20 minutes
Small wrapped items	30 minutes
Large or tightly wrapped items	40 minutes

- ✓ **Timing starts only after** the chamber reaches 250 °F and 15 psi, not when the cycle begins
- ✓ **Residual air is the main cause of incomplete sterilization:** one tenth of 1% trapped around an instrument is enough to prevent it
- ✓ **Biological indicator:** *Bacillus stearothermophilus*, destroyed at 250 °F. CDC recommends running it **weekly**
- ✓ **Autoclave tape is a chemical indicator only:** it proves high temperature was reached, not that time, temperature and steam were maintained
- ✓ **Wrap hinged instruments open.** Gauze over sharp tips. Polypropylene takes longer than stainless steel
- ✓ **Label with contents, date and initials in permanent marker,** never a ballpoint pen
- ✓ **Spores survive** up to 240 °F (115 °C) for 4 hours

OSHA, exposure and waste

- ✓ **Universal Precautions:** CDC, 1987. **Bloodborne Pathogens Standard:** OSHA, 2001. **Needlestick Safety and Prevention Act:** 2000
- ✓ **Penalties:** up to \$7,000 for a first violation, up to \$70,000 repeated
- ✓ **Hand hygiene:** 15 seconds minimum with soap and warm running water when visibly soiled; alcohol sanitizer at least 60% alcohol, rubbed 20–30 seconds until dry; first wash of the morning at least 1 minute; natural nail tips no longer than ¼ inch, no artificial nails
- ✓ **Eye flush after exposure:** minimum 15 minutes
- ✓ **Sharps:** never recapped, bent, broken or resheathed. Container closed at three-fourths full
- ✓ **Biomedical waste:** not held on site longer than 30 days
- ✓ **Hepatitis B vaccine:** offered free within 10 days of hire, IM, no boosters currently recommended. Over 90% of healthy adults develop protective antibodies; titer 1–2 months after the final dose. Declining requires a signed declination form

Post-exposure, in order: wash or flush the area → report to the supervisor → confidential medical evaluation → incident report → source tested for HBV/HCV/HIV → employee testing offered (blood stored 90 days if declined) → HBV series offered → written opinion within 15 days → counseling. **Records are kept for the duration of employment plus 30 years.**