Sterilization and Disinfection

* Terms :

1 Sterilization:

- Destruction of All microbes (Bacteria, virus, prions, spores)
- 100% Killing.

Ex: surgical instruments, Parenteral fluid.

2 commercial Sterilization:

- Limited Kill / Heat treatment
- Target specific pathogen.
- Ex: Canned food

Target: clostridum Botulinum spores

3 Disinfection:

- Destruction on inanimate objects / Non-living.
- 3 Levels:

① High-Level: Kill ALL microbes (Including spores)

② Intermediate: Kill viruses, Fungi, Myco Bacteria

③ Low-level : Kill wide range but Not spores & TB Bacteria (mycoBacteria)

4 Anti sepsis:

- Destruction on: living objects → Ex: wound cleansing
  preoperative skin preperation
  surgical Hand scrub.

Medical materials:

Critical material:
with sterile tissues
↓
Sterilization

Semicritical
with mucous membranes
↓
High level disinfection

Non-critical
with skin
↓
Low → Intermediate disinfection.

* Factors that Influence the degree of Killing:

① Types of organisms:

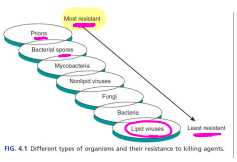


FIG. 4.1 Different types of organisms and their resistance to killing agents.

② Number of organisms:

↑ # of organism ∝ ↑ time of exposure to Killing agent

③ Concentration of DisInfecting agent

at proper concentration. Ex: Alcohol 70%

④ Presence of organic material:

⑤ Nature of surface to be disinfected.

⑥ Contact Time:

↑ contact time → ↑ Killing. (Alcohol = 15 min)

⑦ Temperature :

⑧ pH:

⑨ Biofilm:

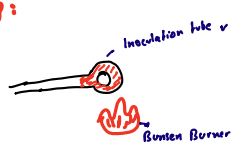
⑩ compatibility of DisInfectants:

*Methods of Sterilization

- Physical
  - Sunlight
  - Heat
    - Dry Heat
    - moist Heat
  - Filtration
  - radiation
    - Ionizing
    - Non-Ionizing.
- Chemical

1 Dry Heating:

- Red Heat:



- Flamming:

- Incineration:
  For Clinical/medical waste + Animal carcasses
  at high pressure & Temp (1500°)

- HoT air oven

2 Moist Heating:

- more effective
- MoA: protein coagulation
- Forms:

(A) < 100°c

* Pasteurization:
  - Holder methode: 63°c for 30 min
  - Flash Method: 72°c for 15 min → cooling. 13°c

  Don't Kill spores

* Vaccine Bath:
  - Vaccine in water Bath at 60°c for 1 hour
  - Don't Kill spores

(B) at 100°c:

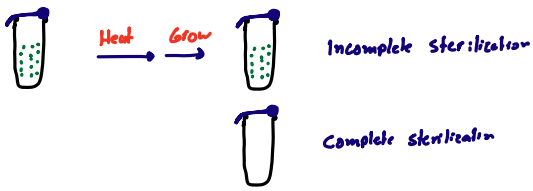
* Boiling:
  100°c for 10 min
  Don't Kill spores

* Tyndallization:
  100°c for 20 min on 3 days
  Kill spores

(C) Above 100°c:

* Autoclave:
  120° for 15 min & 1 atm → Kill spores
  135°c for 1 hour & 2 atm → Kill prions
  Method of choice for Heat stable object.

4 Biological / spore Indicator:

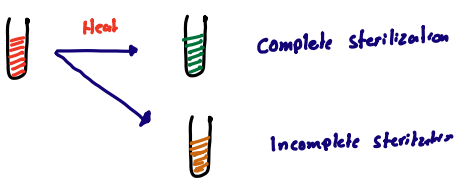


5 Bowie Dick Tap

Buff / white → (Heat) → Dark Black / Brown strips

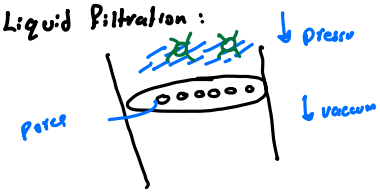
* How to test efficency of Autoclave:?

1. Thermometer
2. Barometer
3. Browne's tube:



3 Filtration: < Liquid / air

* Liquid Filtration :



For: vitamin, AB, Vaccines, Serum.

* Air Filters: (HEPA: high efficiency particulate air)

More than 0.3 μm

- **Pore size of:**
  - 0.45 and 0.80 μm: most bacteria, yeasts, and molds
  - 0.22 μm: for critical sterilizing, e.g. parenteral solutio
  - 0.01 μm: for retaining small viruses

4 Radiation:

	Ionizing	Non-Ionizing:
Type :	Gamma rays, electron Beam	Ultraviolet (UV) (280-200nm)
Characteristics:	Short wavelength high energy high Pentration	Long wavelength Low energy Limited Pentration
Used For:	Disposable medical materials that is Heat sensitive (syrngies, gloves)	Smooth surfaces air borne Pathoger

5 Chemicals:

Alcohol:

- ? Protein Denaturation
- 70% Concentration ?
  we need water for denaturation
- Dont Kill spores.
- If contaminated with spores?
  use .22μm Filter.

Aldehyde

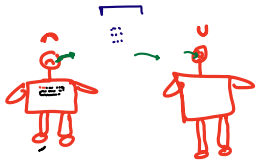
Halogens:

- Iodine
  - Tincture (Alcohol + I)
  - Povidone Iodine (I + surfactants)
- Phenols:
  - Dont Kill spores.

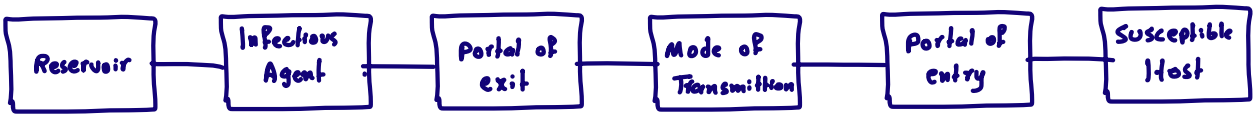
By:Mahmoud Melhem

* Infection control:

Discipline concerned with
- Prevent Nosocomial / Healthcare Associated Infection
- Control spread of Infection
  - Patient → Patient
  - Patient → staff
  - staff → Patient
  - staff → staff



* Chain of Infection:



Methods of Infection control

Standered precautions :

- For All patient.
- Basic level of Infection prevention & Control.

  Mainly: Blood Borne viruses.

Transmition Based precautions

- To prevent Transmition of Specefic Infection

3 types:

1. Contact precautions.
2. Droplet precautions.
3. Air Borne precautions.

3 types:

① Hand washing: visible soiled Hand

② Alcohol Gel / rubs: Hands Not visibly Soiled

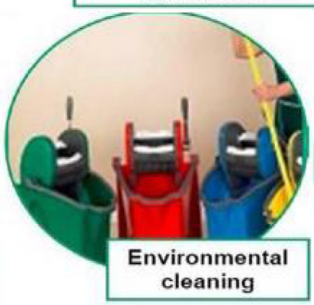
③ surgical Hand scrub: 5 min → First wash
2-3 min → Btw operations

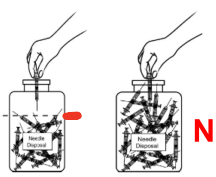
when? 5 moments

2 Before:
- Touching a patient
- clean / Aseptic procedures

3 after:
- Touching a patient
- Body fluid exposure
- Touching patient surrounding

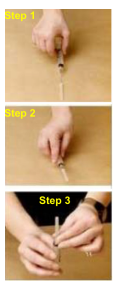
PPE





Sharp container should not exceed $\frac{2}{3}$ of its capacity.

but if you Have to recap,

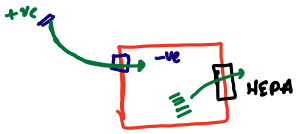


One Hand technique

If needle Injury occurs?

1. ① Hold under running water
2. ② Do not Squeeze.
3. ③ wash the affected area
4. ④ report
5. ⑤ Follow up, post exposure prophylaxis.

* Transmisson Based precautions:

	Contact precautions:	Droplet precautions	Airborne precautions
	To prevent Transmiton of Infection by Direct or Indirect contact	>5 Mm 2 meter	<5 Mm long Distances
Patient Placment	Single patient room ↓ X Cohort patients (same Characteristics) ↓ X Ex: Infected with non Infected X Immunocompromised physical seperation Hygeine.	Same 〃 〃 〃	AIIR: (Air Born Infection Isolation room) Single room with -ve pressure. (*) ✓ 
Patient Transport:	- Limit Transport - cover / contain Infected area	- Limit Transpot - wear A mask.	
Examples:	Enteric Infection → C.difficile Skin Infection → varicella zoster & Impetigo Resistant Bacteria → MRSA, VRE Incontinent patient → E.coli, Shigella ✓ Hepa, rota virus ✓	✓ Bortodella pertusis ✓ Influenza virus ☑ Adenovirus, rhinovirus ✓ N. Meningitids ✓ GAS	
Should use:	Gloves / Gowns.	Surgical mask	N.95 respirator

Spill managment of mercury:

→ Never vaccume it ☆

Airborne transmitted diseases

نوع المرض	المادة المعدية	زمن العزل	ملاحظات
الجديري Chickenpox	إفرازات الجهاز التنفسي أو مكان الإصابه	حتى ظهور قشرة لجميع الإصابات، وللمرضى الذين تعرضوا لخطر العدوى من 10 الى 21 يوم بعد التعرض	الاشخاص المعرضون للعدوى الذين لا يملكون المناعه يجب ألا يدخلوا الغرفه
التهاب هيربس (داء المنطقه المنتشر) Disseminated Herpes Zoster	إفرازات مكان الإصابة	فترة البقاء بالمستشفى	الأشخاص المعرضون للعدوى الذين لا يملكون المناعه يجب ألا يدخلوا الغرفه
الحصبه Measles (rubeola), all presentation	إفرازات الجهاز التنفسي	لمدة 5 ايام بعد ظهور الطفح، وفي حالة ضعف جهاز المناعه للمريض فيكون زمن العزل فترة البقاء بالمستشفى	فقط الأشخاص الأكثر قابلية للعدوى يقومون بارتداء القناع، أو يبقون خارج الغرفه
الجدري Smallpox	إفرازات مكان الإصابة	فترة البقاء بالمستشفى	
السل الرئوي Pulmonary Tuberculosis السل لبلعومي pharyngeal Tuberculosis	تنفسي – ميكروب السل	كحد ادنى 14 يوم بعد بداية العلاج الكيماوي، كما يجب وجود استجابة إكلينيكية مع عدم وجود الجراثيم داخل عينات البلغم، وفي حالة ما إذا كانت العينات سلبية مع تحسن حالة المريض فيمكن أن تصبح فترة الاحتياطات 5 ايام	
Corona virus	تنفسي	فترة البقاء بالمستشفى	

Chickenpox rash