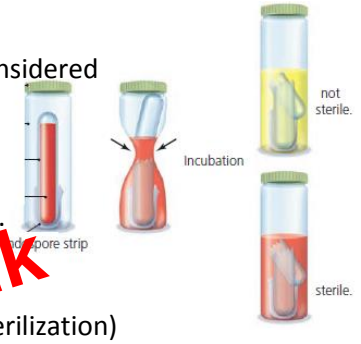
- **Organic materials**: Fats, feces, vomit, blood, and biofilms can cancel effects of disinfectants.

8. *Discuss the advantages and disadvantages of using moist heat in an autoclave and dry heat in an oven.*
    - **Moist Heat in a Autoclave**
        - Advantages are water is a better conductor than dry heat and it is relatively fast within 15 minutes.
        - Disadvantages are with sterilizing solid substances because it takes extra time.
    - **Dry Heat in an Oven**
        - Advantages are its better for powders and oils that can't be boiled or steamed
        - Disadvantages are it requires ~16 hours (at the same temperature of autoclave)

9. *Explain the use of Bacillus sterothermophilus endospores in sterilization techniques.*
    - **Method 1**: After autoclaving sample on a tape, if no growth, original material is considered sterile.
    - **Method 2**: After autoclaving, squeeze bigger vial to break small vial inside.
    - This puts endospores (in small vial) in contact with sample.
    - If no there is no color change, then there is no change in pH. This means it's sterile.




10. *What is Pasteurization? What are the three different pasteurization methods?*
    - Pasteurization prevents the spoilage of beverages by heating microbes (not sterilization)
    - **Batch method**: 30 min at 63°C
    - **Flash pasteurization**: (mostly used today) 15 seconds at 72°C, destroys all pathogens
    - **Ultra-high-temperature pasteurization**: 135°C for 1 sec, consumer claims taste changes

11. *Describe the use and importance of refrigeration and freezing in limiting microbial growth*
    - Refrigeration (0°C - 7°C) slows their metabolic rate, growth, and reproduction, but does not kill them.
        i. Notable exceptions: Listeria reproduce in food and Yersinia reproduce in blood
    - Slow freezing (below 0°C) allow time for ice crystals to form and puncture cell membranes.
        i. Cysts and tapeworms cannot survive; endospores and viruses can

12. *Compare and contrast dessication and lyophilization*
    - **Dessication** is drying all water so microbes cannot grow. Used to preserve fruits, peas, beans, grain, nuts.
    - **Lyophilization** combines freezing liquid nitrogen or frozen $CO_2$ and drying $H_2O$ with a vacuum to preserve.

13. *Describe the use of filters for disinfection and sterilization*
    - Filters sterilizes heat sensitive materials like vaccines, enzymes, antibiotics, and some culture media.
    - Health care and lab workers use filtration masks to prevent airborne contamination.
    - Microbiologists estimate the number of microbes in a fluid by counting the number deposited on the filter
    - High-efficiency particulate air (HEPA) filters are used in operating rooms to remove bacteria from air