# WATER AND WASTEWATER MONITORING

# Microbiological Analyses

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*http://ocw.ump.edu.my/course/view.php?id=635#section-10*

# Chapter Description

- Aims
  - Student explain the characteristic of indicator organisms.
  - Student review bacteriological analytical technique.
- Expected Outcomes
  - Student should be able to explain the characteristic of indicator organisms.
  - Student should be able to review bacteriological analytical technique.
- Other related Information
  - Environmental Protection Agency
  - Natural Resources Conservation Service
- References

  - Burden, Foerstner, McKelvie, and Guenther (2002) **Environmental Monitoring Handbook**, The McGraw-Hill Companies, Inc.
  - Jamie Bartram and Richard Balance. 1996. **Water Quality Monitoring: A Practical Guide to Design and Implementation of Freshwater Quality Studies and Monitoring Programmes**, CRC Press.



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# CHARACTERISTICS OF INDICATOR ORGANISMS

Total coliforms

- Refers to large group of Gram Negative, rod-shaped bacteria that share several characteristics
- Includes thermotolerant coliforms and bacteria of faecal origin, isolated bacteria from environmental

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# THERMOTOLERANT COLIFORMS

- Known also as Faecal Coliform
- Coliform organisms which grow at 44 or 44.5°C and ferment lactose to produce acid and gas
- 95% of thermotolerant coliforms isolated from water is *E. coli*

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# FAECAL STREPTOCCI

- Includes several species or varieties of *streptococci*
- They normally reside in intestinal tract of humans and animal
- Persist longer in the environment than thermotolerant
- Individual species include:
  - S. *faecalis* (from human)
  - S. *bovis* (from cattle)
  - S. *equinus* (from horses)

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# BACTERIOLOGICAL ANALYTIC TECHNIQUE

- Multiple fermentation tube technique
- Membrane filter technique

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# MULTIPLE FERMENTATION TUBE TECHNIQUE

- Common use for drinking-water analysis
- Only can be used if water samples are very turbid or semi-solids such as sediments or sludge
- Result is presented as most probable number (MPN) index

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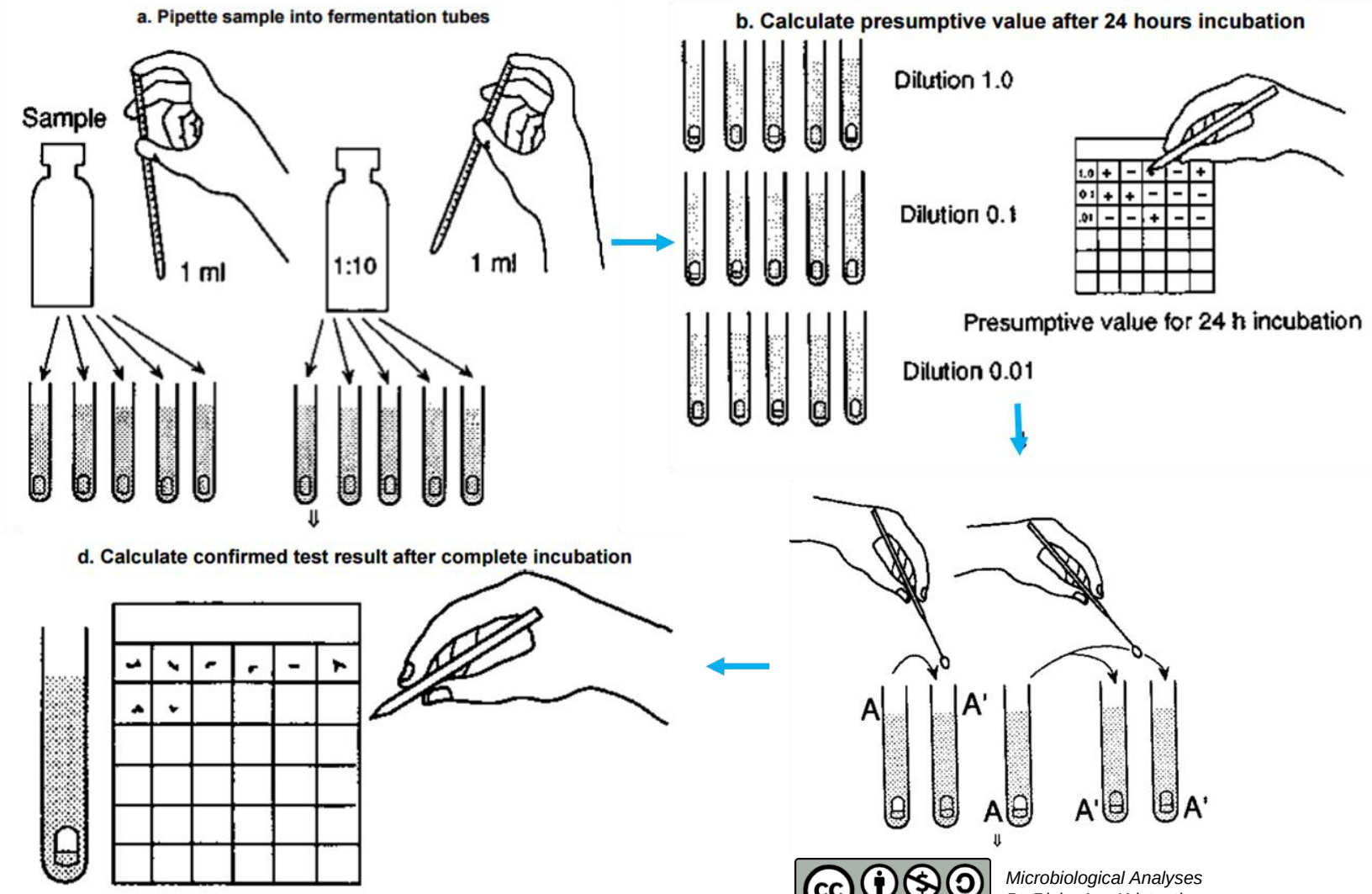
# MULTIPLE FERMENTATION TUBE TECHNIQUE (MFT)




Source: Jamie Bartram and Richard Balance, 1996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# MEMBRANE FILTER TECHNIQUE

- Use to test relatively large numbers of samples
- Faster than the multiple fermentation tube technique
- Gives a direct count of total coliforms and faecal coliforms present
- Unsuitable for natural waters containing very high levels of suspended material, sludge and sediments

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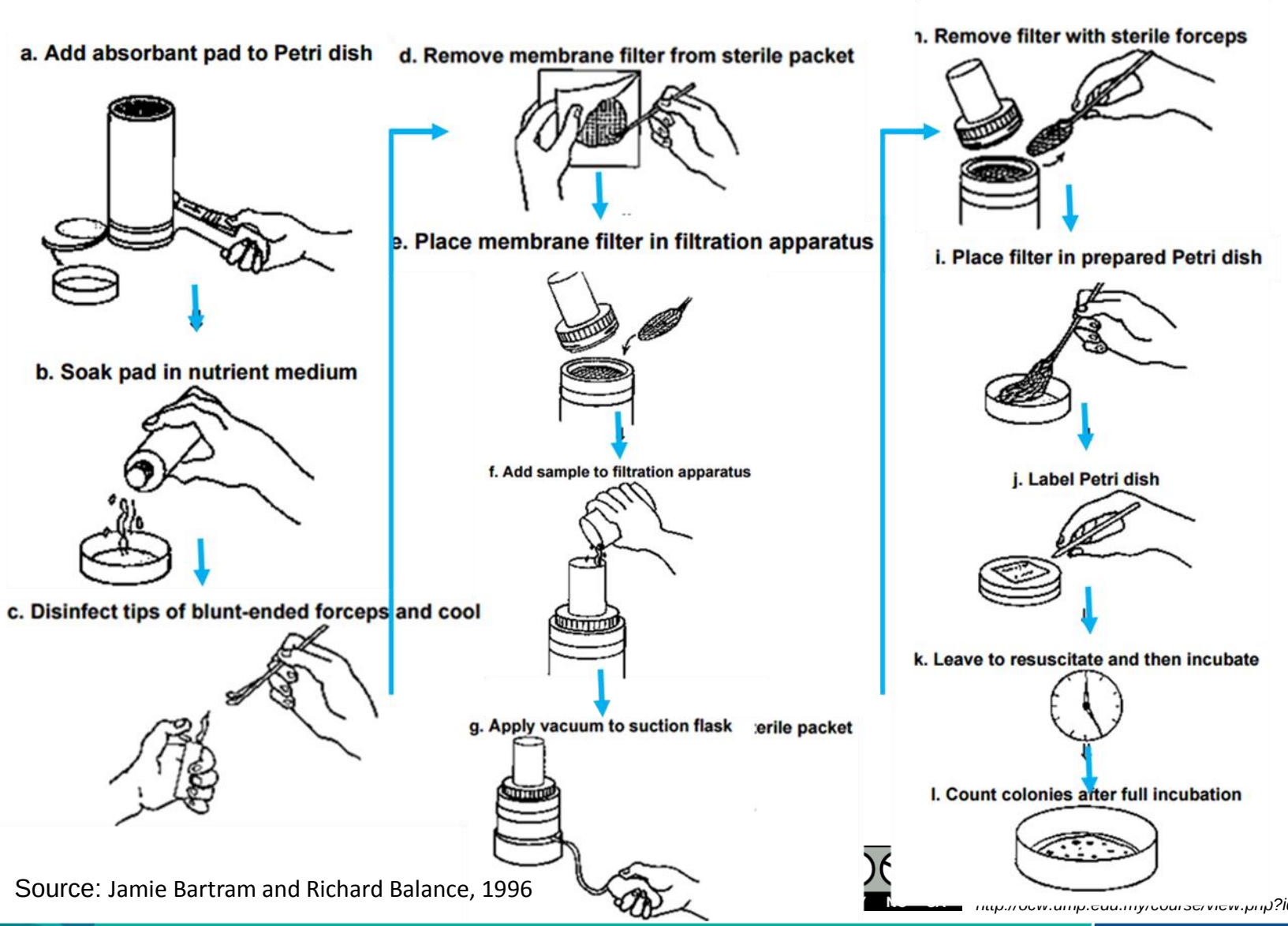
# MEMBRANE FILTER TECHNIQUE (MF)




Source: Jamie Bartram and Richard Balance, 1996

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# Conclusion of The Chapter

- The microbiological analyses are indicated by the presence of thermotolerant coliforms and bacteria in the water source.
- Two common technique used to identify, includes multiple fermentation tube and membrane filter techniques.

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