Unit 3.2
Supplement

Current Approaches to Cell Biology Hardware: From Simple to Complex

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Current approaches to cell biology hardware

Bioserve FPA/GAP hardware

- Cell culture test tubes
  - 6 1/2 ml total volume
- No gas exchange
- No 1-g centrifuge

Fluid processing apparatus (FPA)

automated - Group activation pack (auto-GAP)
Current approaches to cell biology hardware
NASA KSC BRIC hardware

Biological Research in Canisters (BRICs)

- Cell culture petri dishes
  - 6 cm and 10 cm dia dish options
- Can have no or passive gas exchange
- No 1-g centrifuge
Current approaches to cell biology hardware

Shot ADSEP hardware

- Variety of cassette designs (Cellcult shown)
- Cellcult - one bioreactor
  - 50 ml total volume
- Fluid processing cassette (FPC)
  - 4 independent bag cultures
- Passive gas exchange
- No 1-g centrifuge

Advanced separations (ADSEP) Incubator and Cellcult cassette
Current approaches to cell biology hardware

Bioserve MOBIAS hardware

- Silicone cell culture bags
  - 6 ea 50 ml total volume
- Passive gas exchange
- Sampling and media exchange
- No 1-g centrifuge

Multiple orbital bioreactor with instrumentation and automated sampling (MOBIAS)
Current approaches to cell biology hardware
WRAIR CCM hardware

- Hollow fiber cell cartridges
  - 10 ml or 30 ml volume
- Active gas exchange
- No 1-g centrifuge

Cell Culture Module (CCM)
Current approaches to cell biology hardware

Incubator hardware

- ESA Type I (65 ml) and Type II (345 ml) containers
- Three centrifuges (0 to 2-g; 300 mm dia)
- Passive gas exchange

Opticell specimen chamber
Current approaches to cell biology hardware

ESA Biopack hardware

- ESA Type I (65 ml) and Type II (345 ml) containers
- Three centrifuges (0 to 2-g; 300 mm dia)
- Passive gas exchange
Current approaches to cell biology hardware

ESA Biolab hardware

- Major facility includes cell culture, stowage, automated sample processing, imaging
- Two 1-g centrifuges (600 mm dia; 0.001-g to 2-g)
- 6 experiment containers (360 ml volume)/rotor
- Several container designs (passive gas exchange)
Current approaches to cell biology hardware

NASDA CBEF hardware

• Samples:
  – 2 large or 6 medium canisters in microgravity
  – 2 large or 4 medium canisters on centrifuge

• 1-g centrifuge (0.1 to 2-g)

• Cell canister has active gas exchange

Cell Biology Experiment Facility (CBEF)
Current approaches to cell biology hardware

NASA ARC CCU hardware

- Cell specimen chambers
  - 9 ea 10 ml volume
- Active gas exchange and mixing
- Automated sampling, video microscopy, subculture
- Mounts on centrifuge (2.5 m dia; 0 to 2-g)

Cell Culture Unit (CCU)
Current approaches to cell biology hardware

JSC BTF hardware

- Cell culture bags
  - 10 ml total volume
- Passive gas exchange
- Media exchange, sampling
- No 1-g centrifuge

Biotechnology Facility (BTF)
Beyond basic culture capabilities

- Ways to mix solutions, add to cultures in glovebox
- Ways to image cells with microscopes
- Ways to measure cell responses to micro-g
  - Count cells with cytometer, fluorescently activated cell sorter (FACS)
  - Measure gene expression
  - Optical tweezers