Electron Microscopy and Viruses

The Forgotten Diagnostic Tool

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Introduction

- The Electron Microscope
- History
- Requirements
- Advantages and Disadvantages
- Specimen Types and Viruses Detected
- The Future
History

- Poxvirus – 1938
- Smallpox and VZV in late 1940’s
- Negative staining – late 1950’s
- Hendra and Menangle virus – 1995
- SARS Coronavirus 2003
- Melaka virus 2006
Requirements

- Should be quality controlled
- Swabs unsuitable
- Need $10^6$-$10^8$ particles/mL
- Concentrate specimen
Advantages

- Simple and rapid
- No prior knowledge of virus required
- No reagent selection
Disadvantages

- Low sensitivity and specificity – may be enhanced by IEM
- Analysis based on morphology only
- Expensive equipment
- Expensive maintenance
- Experienced technician
- Not suitable for large numbers
- Wrong specimen collection
Specimens

- **Faeces**
  - Rotavirus
  - Adenovirus
  - Enterovirus
  - Coronavirus-like particles (CVLP)
  - Astrovirus
  - Calicivirus
  - Norovirus
  - Reovirus
  - SRVLP
  - Hepatitis A and E
Specimens

- Skin scrapings and vesicle fluid

  Poxvirus

  Wart virus

  HSV and VZV
Specimens

- Respiratory
  - Myxoviruses
  - SRV
  - Adenovirus
  - Herpesviruses
  - Coronavirus
Specimens

- Tissues
- Urine
- CSF
- Cell culture
The Future (1)

- Emergent Situations
- Frontline method
- Co-ordinated and run in parallel with other diagnostic tests
- Morpho-diagnosis allows treatment and containment
The Future (2)

- **Bioterrorism**
  - Assist in poxvirus diagnosis and/or rule out other cause of rash illness
  - Cannot distinguish between poxviruses
  - Requires BSL-2 containment with BSL-3 precautions
Conclusion

Don’t forget...

Electron microscopy is still a valuable diagnostic tool when combined with other testing methods!