Electron Microscopy and Viruses

The Forgotten Diagnostic Tool

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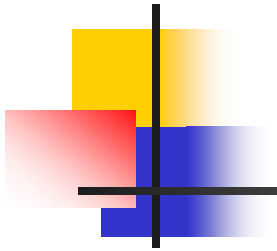


Introduction

- 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

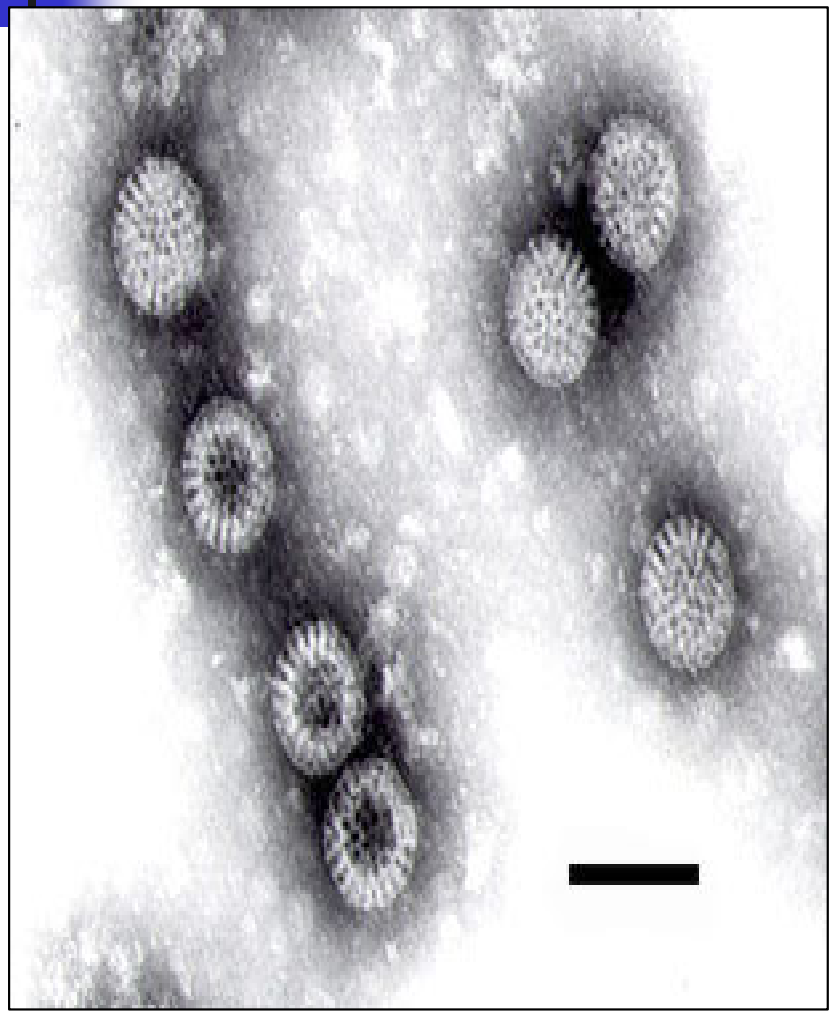
- Simple and rapid
- No prior knowledge of virus required
- No reagent selection

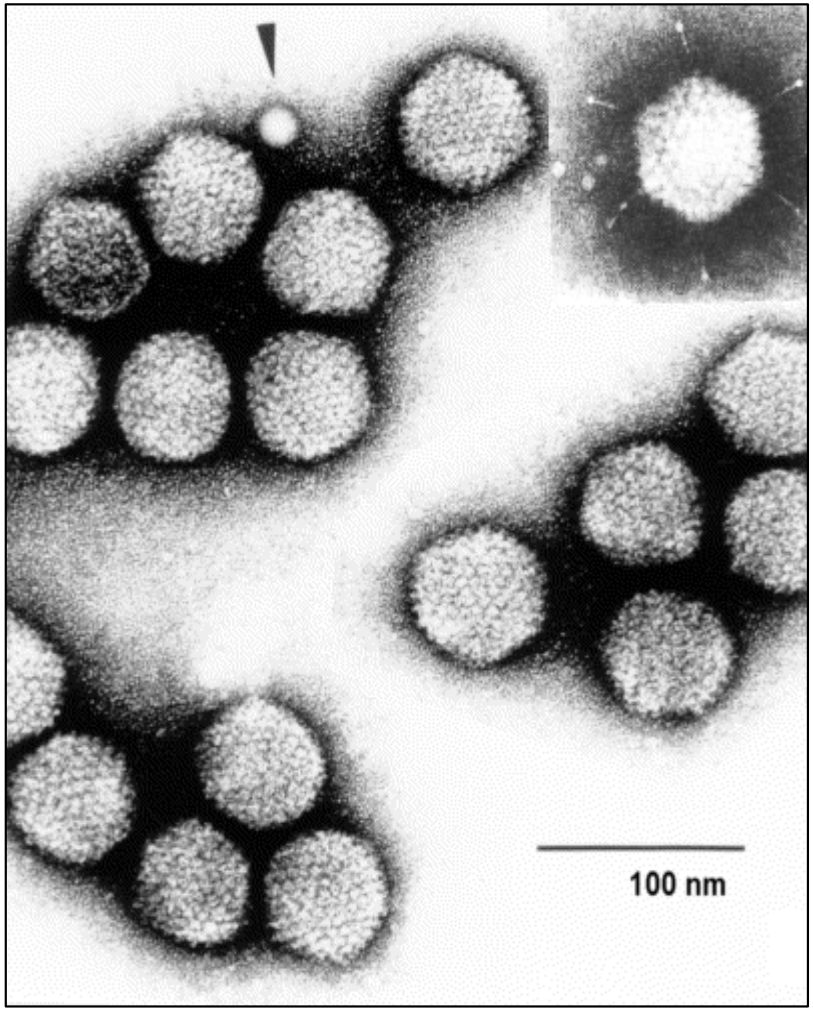
Disadvantages

- 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




100 nm

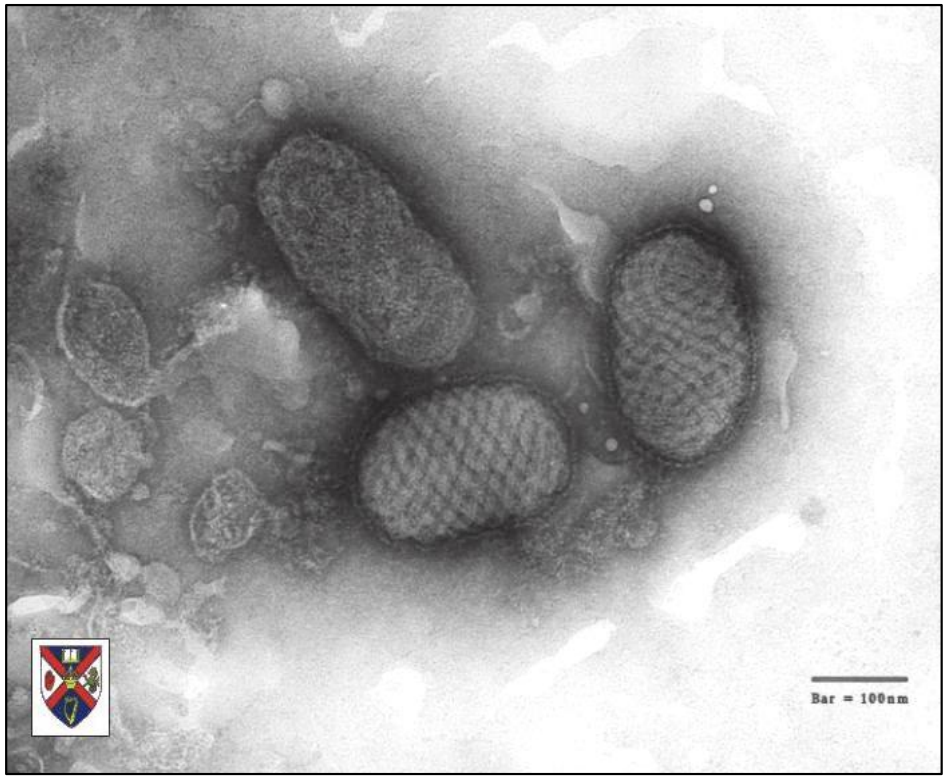
Specimens

- **Skin scrapings and vesicle fluid**

  Poxvirus

  Wart virus

  HSV and VZV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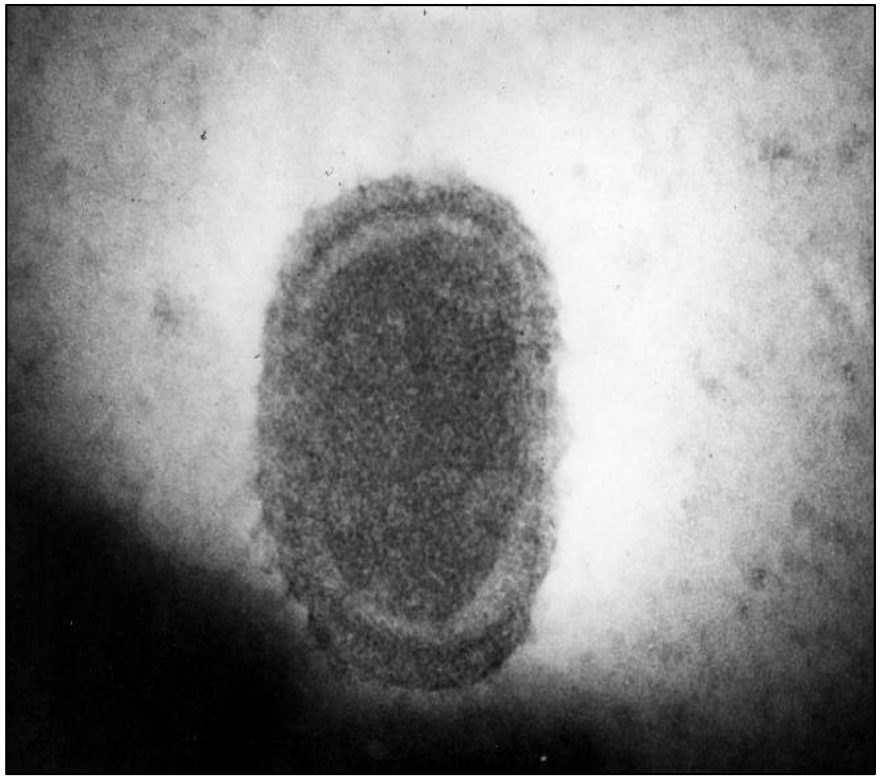


Specimens

- **Respiratory**

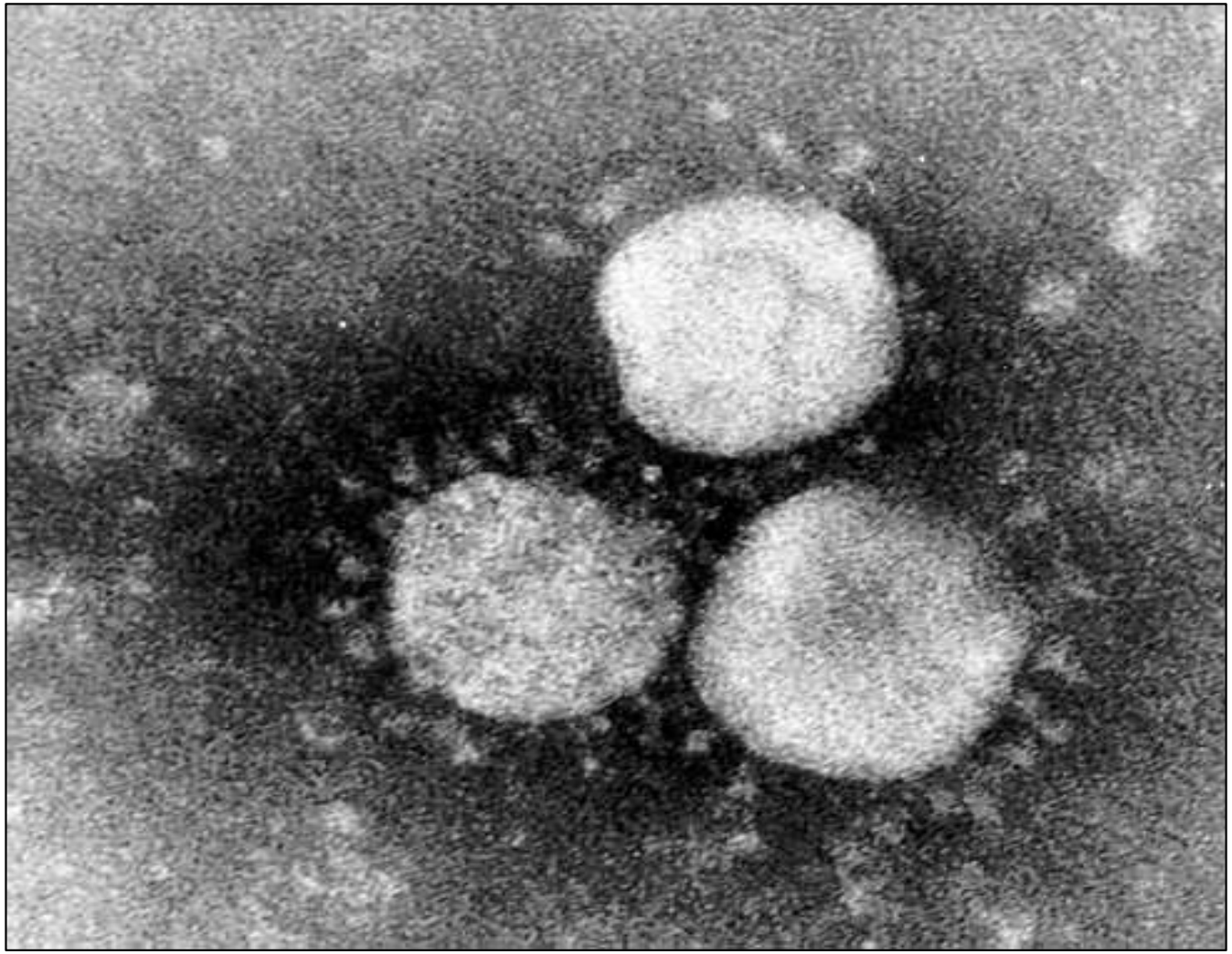
  Myxoviruses

  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!