Lecture outline: 16.2.2016

POX VIRUSES -*2016*

POX VIRUSES *(POXVIRIDAE FAMILY)*

POX VIRUSES

(I). Orthopox viruses

1. ***Variola***
2. ***Vaccinia***
3. ***Cowpox***
4. ***Monkey pox***

(II). Parapox viruses

1. ***Orfvirus (CPD)***
2. ***Milker's node virus***

(III). Unclassified viruuses

1. ***Molluscum contageosum***
2. ***Tana pox***
3. ***Yaba pox***

Properties of POX VIRUSES

- Ds DNA linear genome.
- Complex - Nucleocapsid symmetry.
- Brick/oval shape
- largest viruses just visible by light.
- Microscope. 200 x300 x 100 nm. size.

Small pox (Variola)

Smallpox is an ancient disease, documented as endemic at least 2000 years ago.

Two types

- Variola major (severe)
- Variola minor (mild)

History of smallpox

- The Pharaoh Ramses V died of smallpox in 1157 BC.
- The disease reached Europe in 700AD and was transferred to America by Hernando Cortez in 1520 & 3.5. Million Aztecs died in the next 2 years.
- In the cities of 18th century Europe, smallpox reached plague proportions and was feared scourge – highly infectious. Five reigning European Monarchs died of small pox during the 18th century

Pathogenesis

- Transmission by droplet infection(material from vesicles)
- enter mucosa - lesions first at Buccal Mucosa (Exanthem)
- Upper resp. tract.
- regional lymphnode
- Replicate in RE cells
- Blood
- settle in skin & mucosa
- macules, papules & vesicles → scab
- crust separate & leave a scar

Clinical Features

- Incubation period : 12 days
- Started with malaise , vomiting, headache & fever
- 2-3days - skin Rash
- 2-5 days - single crop of eruptions (all lesions are in the same stage of development)

- Comparison of small pox and chicken pox symptoms:

Symptoms	Smallpox	Chickenpox
Fever	3 days before rash	Same time as rash
Rash 1. Appearance 2. Distribution 3. development 4. Palms & soles	 Crops at same stage Slow Centrifugal usually	 Crops in stages Fast Even distribution uncommon
Death	10-30% (V major)	rare

Lab diagnosis of Small Pox

Eradicated disease

Therefore, important to know & inform authorities.

- Refer to differentiation with VZV
- Collection of specimen from lesions
- *Demonstration of virus* by Light microscope (barely visible) & Electron microscope
- Viral antigen by serology PIG, CF, HA, IF
- Isolation of virus from throat washings, skin lesions, blood

Eradication of Small Pox

- Chinese used variolation method for at least 1000 years. But risky – Jenner was nearly killed by vaccination in 1756!
- Variolation " - administration of material from known smallpox cases (hopefully variola minor!!!) to protect recipients
- **First vaccine system - Edward Jenner, 1796 (Cowpox inoculum).**
- **Vaccinia virus antigenically similar to smallpox was used later instead of cowpox virus.**
- Prepared by inoculating sheared skin of buffalo calves or sheep
- culture on Bovine cells & CAM of chick embryo
- stored as liquid and freezed dried form
- Intra-dermal multiple inoculation with bifurcated needle.

- 1970 Incidence of Smallpox less.
- 1971 Last case in South America.
- 1975 Last case in Asia. (Bangladesh)
- 1977 Last case in world.(Somalia)
- Small pox has now been eradicated- the last naturally occurring outbreak of smallpox was in Somalia on 26th October 1977.

Why Study Poxviruses?

- Recombinant vaccinia virus is an important vector for vaccine use and protein expression
- Bioterrorism

Small pox: Deadly again

- Current controversy over destruction of remaining virus specimens
- Concern: Human population once again vulnerable to this deadly disease.
- Reason: Immunization stopped nearly 20yrs ago.
- Risk: Possibility of using small-pox as a BIOLOGICAL WEAPON.
- **Parapox viruses**
- Widespread in sheep, goats and cattle.
- Lesions in humans are essentially same but go under different names.
- Naming is based on the identity of the host from which the infection was acquired.
- **Parapox viruses and Skin diseases :**

Mode of spread	Resulting human disease
Cattle to humans	Pseudocowpox, paravaccinia or milker's nodes
Sheep or goats to humans	Orf or CPD

Contagious pustular dermatitis (CPD/Orf)

- Caused by CPD virus (Orf virus)
- Cause papulo-vesicular rash on hands which may ulcerate.
- Acquire directly from infected sheep & goats
- Painless lesions (diagnostic feature)
- Re-infections may occur
- Occupationally associated (farm and animal workers)
- Constitutional upset is slight
- Host immune response to infection is poor
- Recurrent lesions due to re- infection (not reactivation) may occur

Pathogenesis Orf

- Erythematous papules → progressed into red centre surrounded by white halo and outer inflamed halo (target stage)
- → proceeds to a nodular stage (which may have a weeping surface)
- last a week → heals

Diagnosis of Orf:

- Usually based on the history
- Laboratory confirmation by demonstration of pox virus particles by electron microscopy
- Specimen: fluid exuded from the nodule

Cowpox & Milker's Node Virus

- Both cause infection in cattle.
- Cow pox produce small vesicular eruptions on hands of Milkers
- Milker's node virus produce Small nodules
- Do not ulcerate

Molluscum Contagiosum

- Infect epidermal cells form fresh lesions
- often with umbilicated center (cup shape lesion)
- Only infect human
- Often with axilla & trunk
- Spread by contact in case of genital lesions (sexually)
- Particles can be seen by EM

Prof. N.P. Sunil-Chandra, Senior Professor of Microbiology, Dept. of medical Microbiology, Faculty of Medicine, University of Kelaniya