

eLearning

by  **Dr. M.G.R.** EDUCATIONAL AND RESEARCH INSTITUTE



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EDUCATIONAL AND RESEARCH INSTITUTE

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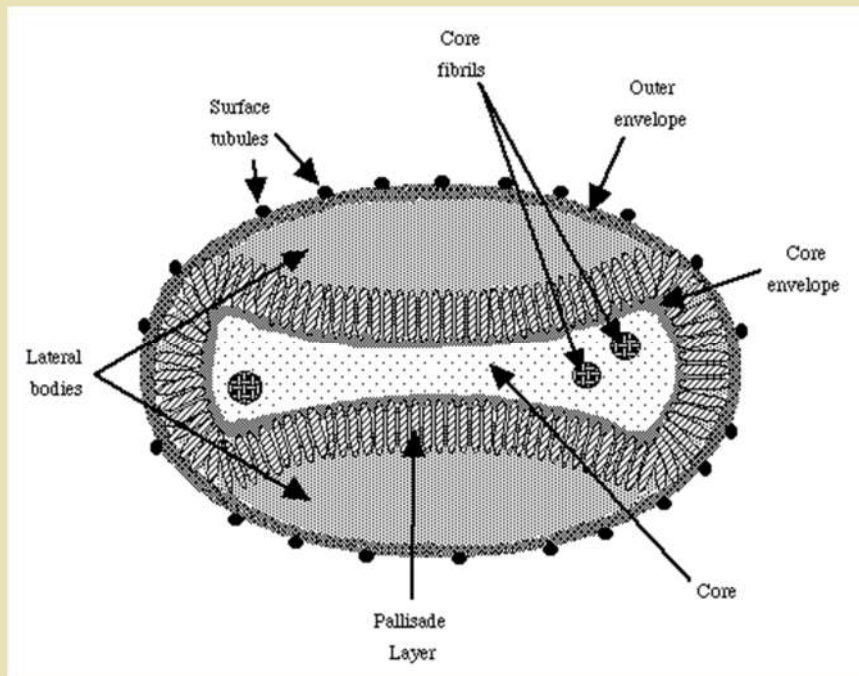
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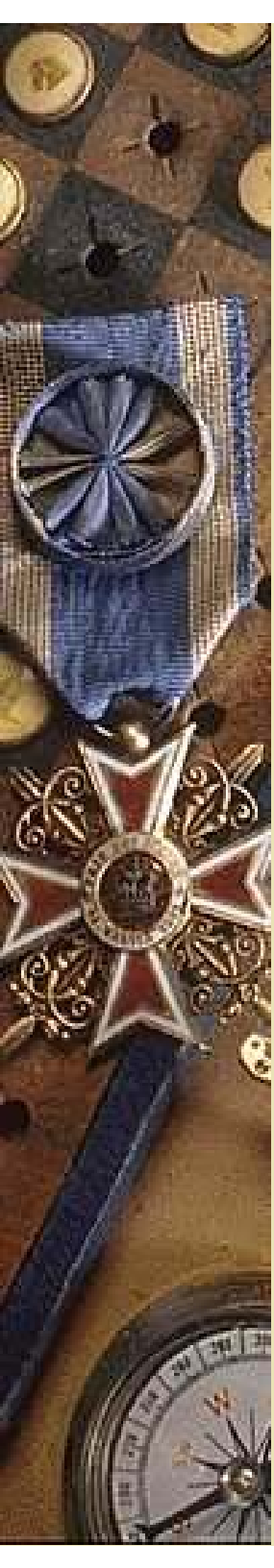
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Poxviridae

- ◆ Pox viruses are the largest and most complex of all viruses
- ◆ They infect a wide range of hosts
- ◆ In October 1977, after vigorous efforts by the [World Health Organization](#) this disease became the first ever to be completely eradicated





Classification and Taxonomy

- ◆ Pox viruses are the largest of all viruses large enough, to be seen under a light microscope.
- ◆ Divided into two subfamilies: Chordopoxviridae and Entomopoxviridae.
- ◆ Chordopoxoviridae subfamily, and most of them belong to either the Orthopoxvirus (variola, vaccinia, cow pox) or the Parapoxvirus (Orf virus) genus.



VIRUS CHARACTERISTICS

- ◆ ● **Genome:** double-stranded DNA, Linear, noninfectious; encodes over 100 genes, including DNA dependent RNA transcriptase
- ◆ ● **Morphology:** "complex", ovoid or brick-shaped nucleocapsid
- ◆ ● **Envelope:** orthopox are enveloped, parapox are not
- ◆ ● **Replication:** takes place in cytoplasm
- ◆ ● **Oncogenicity:** may cause benign tumors



Transmission

- ◆ Pox viruses are most commonly spread by direct contact.
- ◆ In the case of small pox, the virus is found in lesions in the upper respiratory tract, which can be transmitted to others in droplet secretions, and in skin lesions.
- ◆ Although the virus is considered to be highly contagious, this route of transmission makes its spread relatively slow.



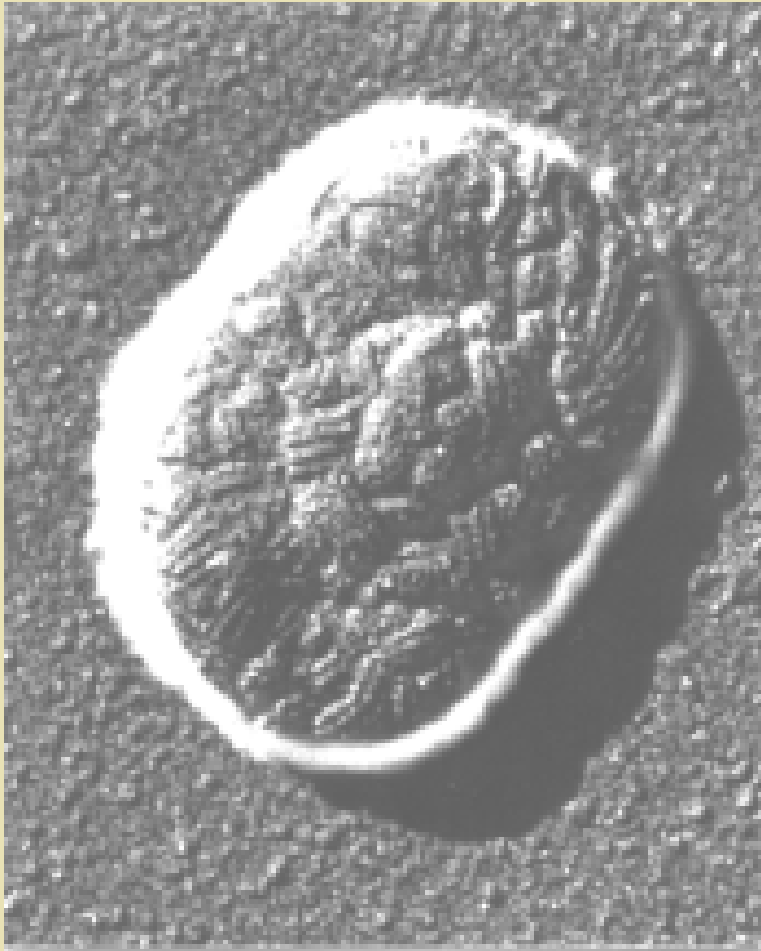
The Small Pox Vaccine

- ◆ The vaccine for small pox was the first vaccine ever developed
- ◆ variolation, the process in which the virus was inoculated
- ◆ Jenner's accomplishment was a landmark event in the history of medicine
- ◆ In 1796, the world's first vaccination was performed when an English country doctor named **Edward Jenner** inoculated James Phipps, an eight year old boy, with cow pox virus.

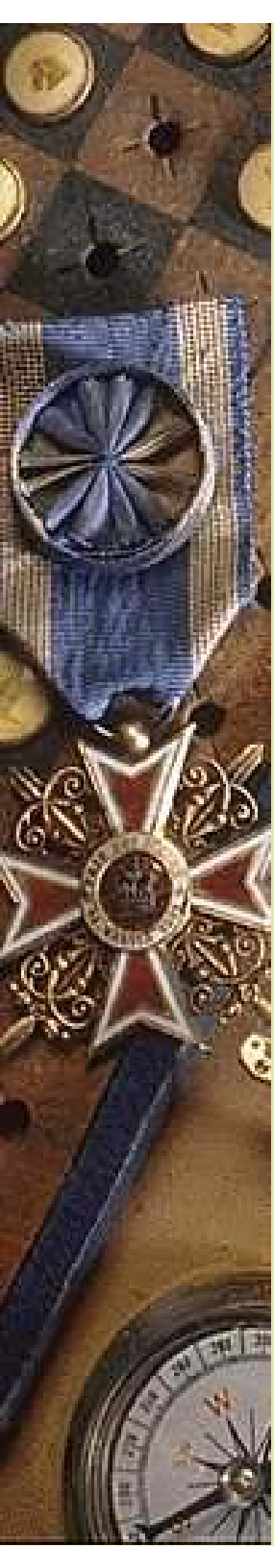


- ◆ The vaccine that was eventually used to eradicate small pox was made from **vaccinia**, not cow pox.
- ◆ The vaccinia virus is a relatively avirulent virus that is similar to cow pox
- ◆ But its origins are not clearly understood.
- ◆ Inoculation with vaccinia causes a single pock at the site of injection, which dries up and scabs after about ten days, leaving a vaccination scar. By this time, the vaccinated individual has become immune to both vaccinia and small pox.
- ◆ Complications of vaccinia injection include eczema vaccinatum and postvaccinal encephalitis

Vaccina virus



- ◆ This is the virus used to vaccinate small pox



Eradication of Small Pox

- ◆ The deadly disease was eradicated with surveillance and containment
- ◆ The last case of small pox was reported in Bangladesh in 1975
- ◆ The last case of variola minor occurred in Somalia in 1977
- ◆ WHO waited for two more years, then declared on October 26, 1977 that small pox had become the first disease ever to be eradicated



**Characteristics of small pox that made its
eradication possible**

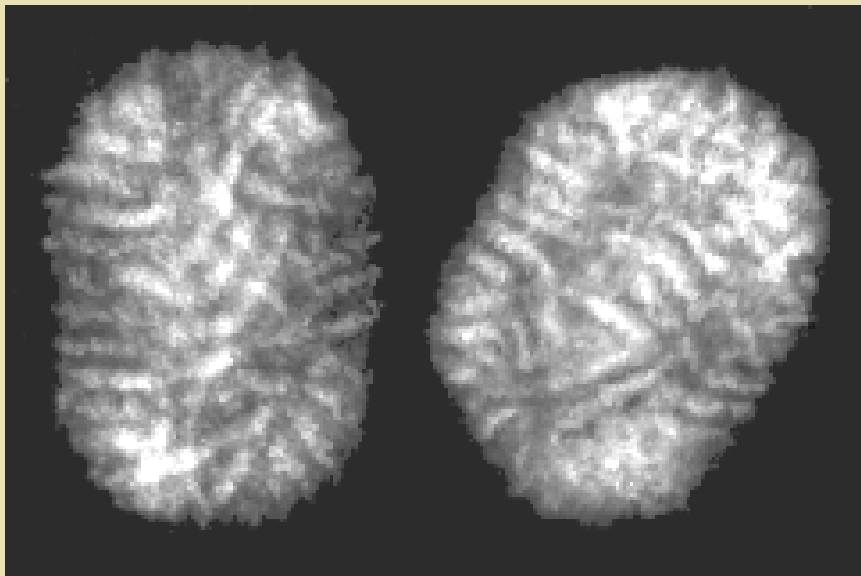
- ◆ **Short incubation period 10 –14 days**
- ◆ **Not infectious in the prodromal stage**
- ◆ **No animal reservoir**
- ◆ **High morbidity and mortality**
- ◆ **An unusual virus causes Clinically apparent disease**
- ◆ **Mode of transmission: person-to-person contact**



Characteristics of small pox that made its eradication possible

- ◆ **An effective vaccine**
- ◆ **One dose of the small pox vaccine produced life-long immunity**
- ◆ **Subsequent shots or boosters were rarely needed**
- ◆ **The vaccine was stable**
- ◆ **Could be transported without refrigeration**
- ◆ **Delivered with a bifurcated needle with a minimum amount of training**

Molluscipoxvirus



Molluscum
contagiosum virus is a
large DNA virus of the
pox group.

common
mucocutaneous
disease



Epidemiology

- ◆ The disease is common and worldwide.
- ◆ Can occur in any age -mostly found in children.
- ◆ Transmitted primarily by person to person spread and possibly by fomites. Swimming pools, communal bathing facilities, shared towels and close contact between children at play are the usual sources of infection. In teenagers and adults, sexual transmission is well recognised.
- ◆ Commonly seen on the genital and perineal skin of children

Clinical Features

- ◆ Incubation period varies between two weeks to six months
- ◆ Onset is gradual
- ◆ Lesions begin as a group of minute papules in one to two areas.
- ◆ Individual lesions are discrete, smooth, pearly to flesh-coloured dome-shaped papules with central umbilication.
- ◆ Face, neck and hands of children ;the genitalia or lower abdomen





Clinical Features(contd)

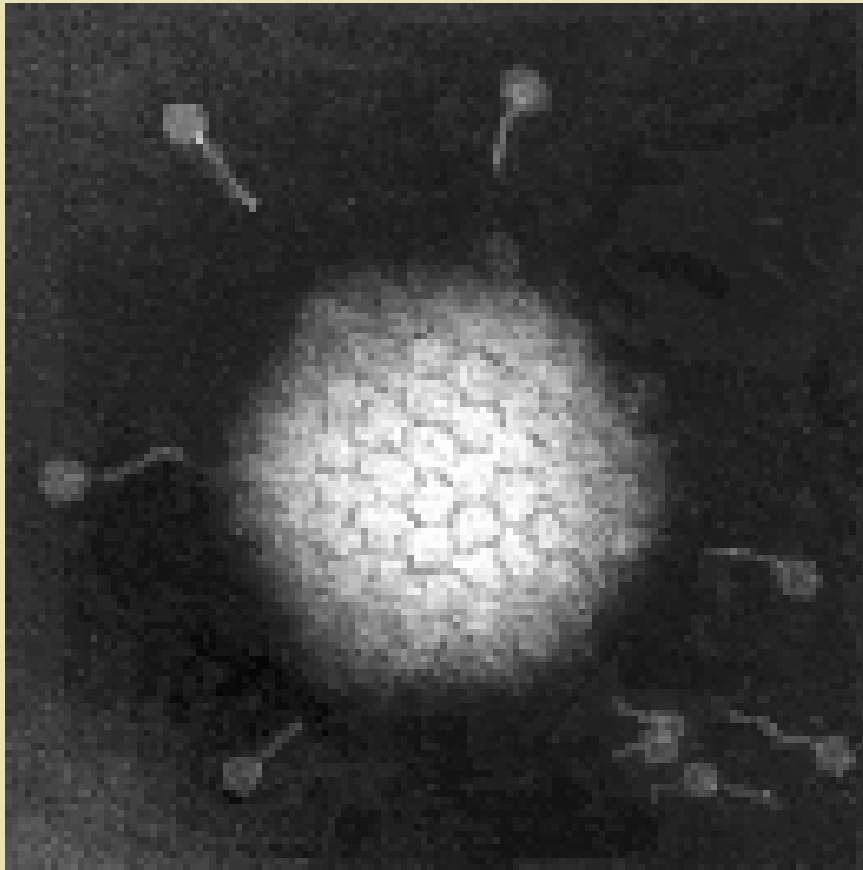
- ◆ Occurs more frequently in patients with atopic eczema
- ◆ Unusually widespread lesions can be present in immunocompromised patient
- ◆ Complications include eczematous reaction, conjunctivitis and keratitis.
- ◆ Secondary bacterial infection also occurs



Diagnosis & Treatment

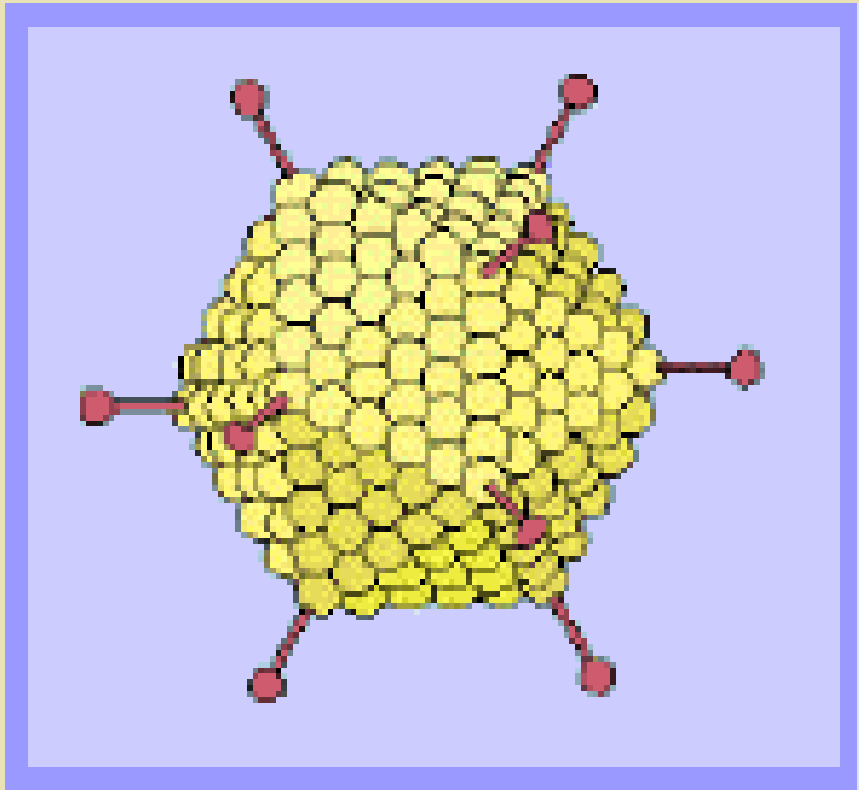
- ◆ Often based on the characteristic clinical appearance
- ◆ Individual lesions may last for two to four months. New lesions can develop through autoinnoculation.
- ◆ Spontaneous resolution can occur without scarring.
- ◆ Treatment is by puncturing each papule with a sterile needle or by curettage, followed by iodine application. It can also be treated with phenol or trichloroacetic acid. Cryotherapy is also effective

ADENOVIRUS



- ◆ Adenoviruses are double-stranded DNA viruses
- ◆ They have icosahedral capsids with twelve vertices and seven surface proteins.

Viral Structure and Function



- ◆ The virion is non-enveloped & spherical
- ◆ seventy to ninety nm in size
- ◆ Both strands of adenovirus DNA encode genes.



Adenovirus-Associated Human Disease

- ◆ Pharyngitis
- ◆ Acute Respiratory Disease
- ◆ Pneumonia
- ◆ Pharyngoconjunctival Fever
- ◆ Epidemic Keratoconjunctivitis
- ◆ Genitourinary Infections (cervicitis, urethritis, hemorrhagic cystitis)
- ◆ Gastroenteritis
- ◆ Adenovirus oncogenically transforms rodent cells but not human cells



Transmission

- ◆ Ingestion/Fecal-Oral Route
- ◆ Respiration (through respiratory droplets)
- ◆ Contact/Hand-to-eye transfer
- ◆ Venereal



Clinical Course

- ◆ Incubation Period: 5 to 8 days
- ◆ **Causes localized infection, but generalized infection can occur in immuno-compromised patients.**
- ◆ **Five percent of acute respiratory childhood illness**
- ◆ **Meningoencephalitis is a complication of respiratory adenovirus infection.**
- ◆ **Ten percent of infantile gastroenteritis.**



Diagnosis

- ◆ Virus isolation in cell cultures
- ◆ Cellular cytopathic effect -- rounded, swollen cells and basophilic intranuclear inclusions.
- ◆ Enzyme immunoassay
- ◆ Immunofluorescence techniques



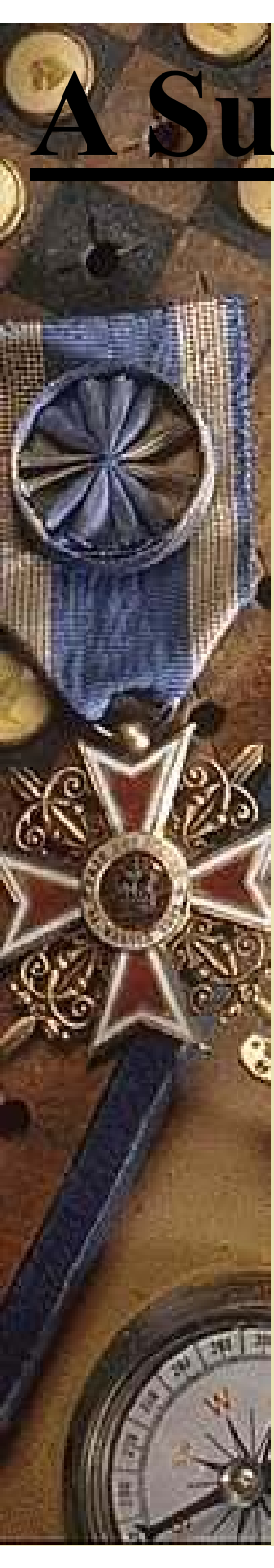
Treatment and Therapy

- ◆ Adenovirus infection results in long-lasting immunity against the specific serotype.
- ◆ Maternal antibody is protective
- ◆ Antivirals have generally been ineffective
- ◆ Intravenous ribavirin is a potential treatment.



Vaccination

- ◆ Live, oral and attenuated vaccine that result in mucosal and intestinal immunity
- ◆ Administered to the military personnel only because of the live vaccine's oncogenic potential and the level of attenuation achieved in children.



A Successful Vector for Vaccination and Gene Therapy

- ◆ Vaccination: A DNA segment that codes for an antigen that stimulates an immune response in humans can be inserted into the genome of adenovirus and then inserted into a host.
- ◆ Hepatitis B, HIV, herpes simplex, rabies and respiratory syncytial virus regions can be inserted into adenovirus DNA
- ◆ Gene Therapy: A DNA segment that codes for an enzyme or protein product that corrects a human genetic defect can be delivered to the host by an adenovirus vector. For example, a normal copy of the defective gene in cystic fibrosis patients can be inserted into patients through an adenovirus vector



Prevention

- ◆ Chlorination of swimming pools, drinking water, wastewater
- ◆ High hygiene standards in ophthalmology practice
- ◆ Hand-washing
- ◆ Measures to prevent nosocomial transmission



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