O Microbiology 2025-2024 Dr.Saja Ebdah



Adenoviruses

Introduction

- > First Isolated: From adenoids surgically removed from children in 1953.
- Replication & Disease: Can replicate and cause disease in epithelial cells (respiratory, gastrointestinal, urinary tracts, and eye).
- Subclinical Infections: Many adenovirus infections are subclinical; the virus may persist for months in the host.
- Research Use: Valuable for molecular and biochemical studies of eukaryotic cell processes and gene therapy.
- > Oncogenic Potential: Some strains are oncogenic to animals but not important in human cancer.

• Structure

- Size: 70–90 nm in diameter.
- **Genome:** Linear double-stranded DNA.
- > Terminal Protein: A virus-encoded protein covalently linked to the end of the linear genome.
- > Capsid:
 - ✓ Icosahedral structure with 252 capsomeres.
 - ✓ Composed of hexons (240), pentons (12), and fibers (12) at each vertex.
- > Enveloped: Unenveloped (naked).
- Infectivity: DNA can be isolated in an infectious form, but infectivity reduces 100-fold if the terminal protein is removed.
- > Major Antigens: Hexons, pentons, and fibers; important in viral classification.
- > Penton Base: Carries a toxin-like activity that causes rapid cytopathic effects.
- Fibers: Associated with hemagglutinating activity and used for viral typing due to type-specific hemagglutinin.

Classification

- Human Adenoviruses: At least 57 distinct antigenic types isolated from humans and animals.
 About one-third of the 57 known serotypes are responsible for most human diseases.
- Groups: Divided into seven groups (A–G) based on genetic, physical, chemical, and biological properties.

• Replication and Pathogenesis

- Target Cells: Replicate primarily in epithelial cells (respiratory, gastrointestinal, urinary tract, and eye).
- > Attachment: Virus attaches to cells via fiber structures.
 - ✓ Host cell receptor: CAR (Coxsackie–Adenovirus Receptor), a member of the immunoglobulin gene superfamily.
- Cytopathic Effect: Causes rounding, enlargement, and aggregation of affected cells into grape-like clusters in human epithelial cell cultures.

• Epidemiology

- Global Presence: Adenoviruses are present worldwide and circulate year-round, with occasional community outbreaks.
- > Transmission:
 - 1. Respiratory: Via inhalation of respiratory droplets, contaminated hands, or surfaces.
 - **2.** Intestinal: Via the fecal-oral route.
 - **3.** Eye: Through contaminated hands, towels, or ophthalmic instruments.

• Clinical Manifestations

- Diseases Associated with Adenoviruses:
 - ✓ Keratoconjunctivitis (eye infection)
 - ✓ Pharyngo-conjunctival fever
 - ✓ Acute respiratory diseases
 - ✓ Gastroenteritis
 - ✓ Urinary tract infection
 - ✓ Meningitis

Respiratory Diseases

- ✓ Group C, Serotypes 1–7: Common in infants and children.
- ✓ Symptoms: Fever, sore throat, malaise, hoarseness, and cough.
- ✓ Pneumonia: Develops in ~10% of cases and can be fatal.
- Military Recruits: Adenoviruses cause acute respiratory disease syndrome, with fever, sore throat, nasal congestion, cough, and sometimes pneumonia.

Keratoconjunctivitis

- ✓ Group D, Serotypes 8, 19, and 37:
 - Characterized by aggressive conjunctivitis, pain, photophobia, and lymphadenopathy.
 - Development of superficial punctate keratitis.
- > Gastroenteritis
 - ✓ Group F, Serotypes 40 and 41:
 - Common in young children and neonates.
 - Second most common viral cause of gastroenteritis (7–15% of endemic cases).
 - Similar to rotavirus infections.
 - Most children develop antibodies against enteric adenoviruses by age three.

• Laboratory Diagnosis

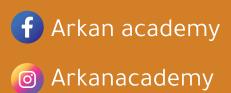
- Virus Isolation: Can be isolated from eye swabs, throat swabs, urine, feces, and CSF.
 ✓ Grown on human embryonic kidney cells, Hep-2 cells, or monkey kidney cells.
- Antigen Detection:
 - ✓ ELISA, latex agglutination, or immunofluorescence for fastidious enteric adenovirus antigens.
 - ✓ PCR for genetic identification.
- Serology: A rise in complement-fixing antibodies indicates recent infection.

• Treatment and Prevention

- > Treatment: No antiviral drug therapy available; treatment is supportive.
- > Vaccine: Live adenovirus vaccine used in military settings (rarely used elsewhere).
- Conjunctivitis Prevention: Adequate chlorine levels in swimming pools can prevent swimming poolassociated conjunctivitis.
- Prognosis
 - > General Outcome: Self-limiting disease with usual recovery.
 - Immunocompromised: Can cause disseminated infections in individuals with weakened immune systems.



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