

Respiratory System infections:

Upper Respiratory tract infections

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Upper Respiratory tract infections:

Lecture Content :

A-Barriers to infection. (Part-1)

B-Types of upper Respiratory tract infections:

1-Rhinitis (nasopharyngitis) and Sinusitis. (Part-1)

2-Tonsillitis and oropharyngitis. (Part-2)

3-Otitis media. (Part-3)

4-Epiglottitis. (Part-3)

5-Croup (Laryngo-trachritis and Laryngo-tracheobronchitis). (3)

2-Tonsillitis and oropharyngitis: (Part-2)

-Inflammation of tonsils and oropharyngeal area due to bacterial (15–30 % of cases) or viral etiology (50–70 % of cases).

A–Viral tonsillitis and oropharyngitis:

–**Viral tonsillitis** and **oropharyngitis** is caused by different types of viral classes.

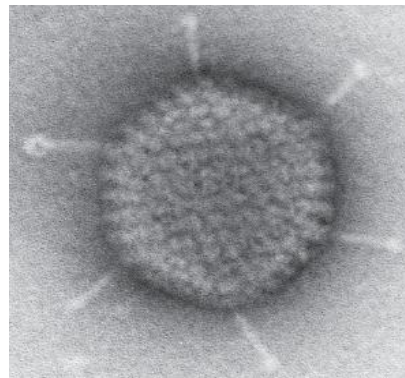
–The Clinical presentations of viral tonsillo–pharyngitis in general are:

- 1– Rhinorrhea and Coryza.
- 2– Cough and Conjunctivitis.
- 3– Oral ulcers and stomatitis.
- 4– Absence of fever or Low–grade fever.

-^N**However**, some viral infections (**Adenovirus**, **Coxsackievirus group-A**, **Herpes simplex virus**, and **EBV**) have specific diagnostic features which can recognize it clinically from other causative agents of viral tonsillo-oropharyngitis.

-**Adenovirus** oropharyngitis is characterized usually by **redness of tonsils** and **oropharyngeal area** with **conjunctivitis**.

Electron microscopy:
Double-Stranded DNA,
Icosahedral naked virus;
(Adenovirus).

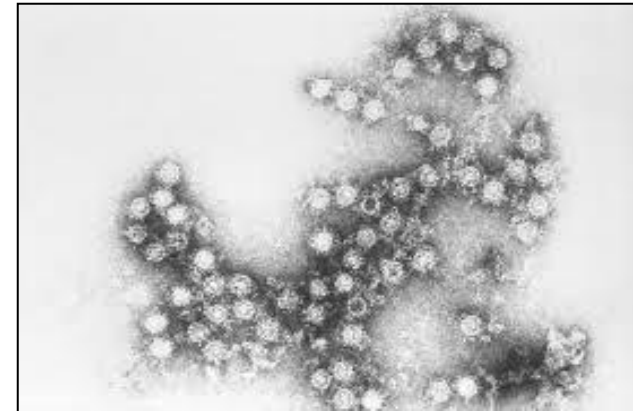


-**Coxsackievirus-A** is the causative agent of **herpangina**; a specific type of oropharyngitis characterized by presence of **multiple-one mm vesicles** located on the **posterior oropharyngeal area** and tonsils with **redness**. These **vesicles could be seen** as a part of **hand-foot-mouth disease**.

-**Coxsackievirus classification:**

-**Non-Enveloped Ss RNA viruses.**

-**Family: Picornaviridae. Genus: *Enterovirus*.**



Coxsackievirus-group A infection: herpangina and hand-foot-mouth disease

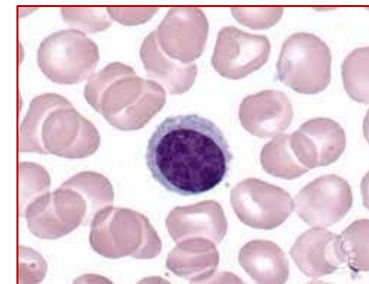
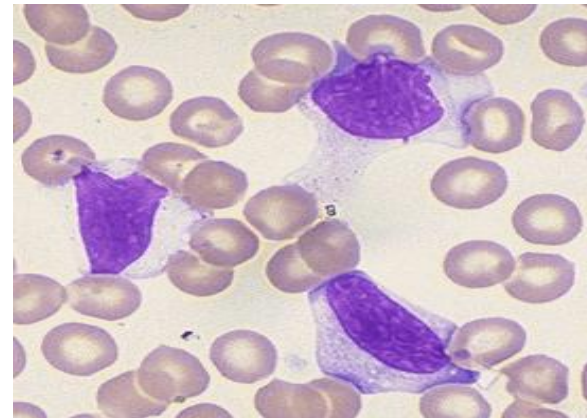
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- **Herpes simplex virus** could cause another type of **oropharyngitis** which can be recognized clinically by presence of **multiple vesicles aggregates** on the **anterior oropharyngeal area** and **lips**, (also known as **gingivo- stomatitis**), with sore throat and fever.



- **Epstein-Barr virus (EBV)** causes a type of **tonsillitis with infectious mononucleosis (IM)**. This type is characterized clinically by fever, fatigue, sore throat and inflammation, Lymphadenopathy (ex. cervical), and skin rash on different body parts.
- **In EBV case**, if **peripheral blood sample** is requested for medical Laboratory tests; **blood smear** will show **Lymphocytosis** with presence of **atypical Lymphocyte**. **Monospot test** will be **positive** for **heterophil antibodies**.



^N 2–Tonsillitis and oropharyngitis:

B–Bacterial tonsillitis and oropharyngitis:

-Bacterial tonsillitis is classified according to clinical presentation into suppurative and pseudomembranous tonsillitis.

-Suppurative tonsillitis is the most common infection in school-aged children which is caused by Group A Streptococci (*Streptococcus pyogenes*).

-Pseudomembranous type is associated classically with Diphtheria (*Corynebacterium diphtherium*), but it could be seen in some viral tonsillitis such as EBV with I.M.

–A rare type of necrotizing bacterial tonsillitis is the **Vincent's angina** in which anaerobic mixed bacteria and spirochetes causing unilateral ulcer on pharyngeal tonsil, and it is associated with presence of dental disorder or gingivitis.

^N Streptococcus pyogenes tonsillitis :

Transmission:

Direct transmission: through saliva, nasal secretions or respiratory droplets.

Indirect contact with contaminated objects.

Microbial Virulence factors:

1- Capsule and teichoic acid :

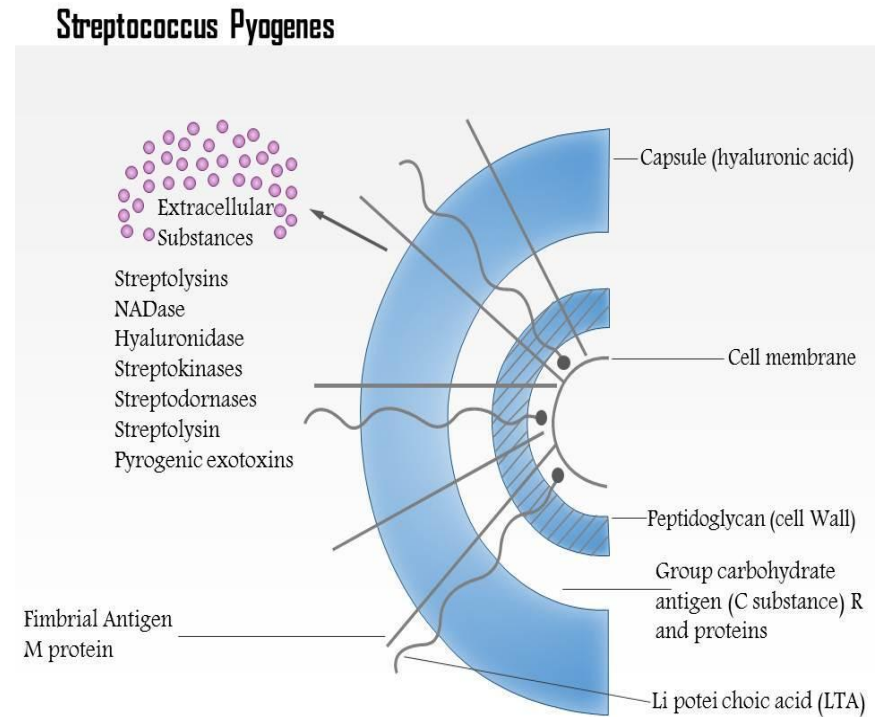
Adherence to host tissues.

2- M protein : Anti-phagocytic activity.

3- Hyaluronidase: Spreading factors.

4- Enzymes (Streptolysin-O & S) : hemolysin & cytolysins.

5- Toxins: **pyrogenic toxins** (act as super-antigens) cause **scarlet fever** and **toxic shock syndrome.**



Clinical presentation of *Streptococcus pyogenes* :

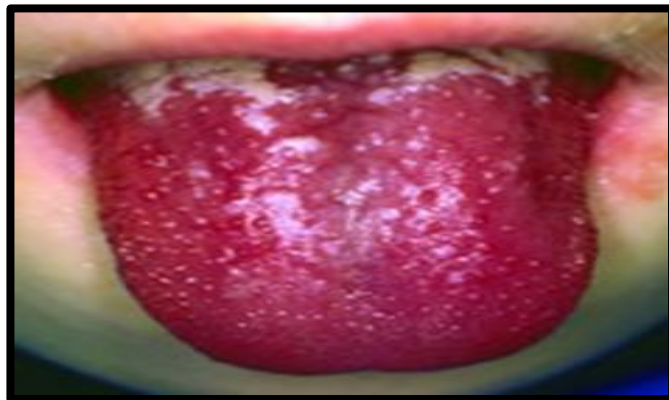
(in the Respiratory system):

1–**Suppurative disease (pus forming):**

Acute follicular tonsillitis and pharyngitis.

2–**Toxigenic disease:**

Scarlet fever: pharyngitis, fever, **strawberry tongue**, skin rash on the chest & extremities.



^N-**Clinical features of Suppurative *Streptococcus pyogenes* tonsillitis :**

- Sudden onset of symptoms: **fever (T)**, sore throat, dysphagia.
- Significant inflamed pharyngeal area and /or tonsillar erythema.
- Tonsillar **Exudate** (rare in children < 3 years old).
- Cervical Lymphadenitis (Lymph **Node**).
- Absence of Cough. (**Can not Cough**)

Clinical diagnosis: CENTOR criteria:

† CENTOR Criteria for Diagnosis of Streptococcus tonsillitis :

Criteria:	Present (Yes) Absent (No)	Points	Interpretation: (Score: Sum of Points)
Exudate on tonsil	Yes No	:+1 : 0	If the score < or = 1 : No further diagnostic test is required.
Fever (Temperature > 38 C) >100.4 F	Yes No	:+1 : 0	
Tender or swollen anterior cervical Lymph node	Yes No	:+1 : 0	
Cough	Absent Present	:+1 : 0	If the score > or = 4 : Consider empiric antibiotic therapy.
Age	3-14 years 15-44 years >44 years	:+1 : 0 : -1	

Laboratory diagnosis of *Streptococcus pyogenes* tonsillitis :

-Specimen: Tonsillar swab or pharyngeal swab.

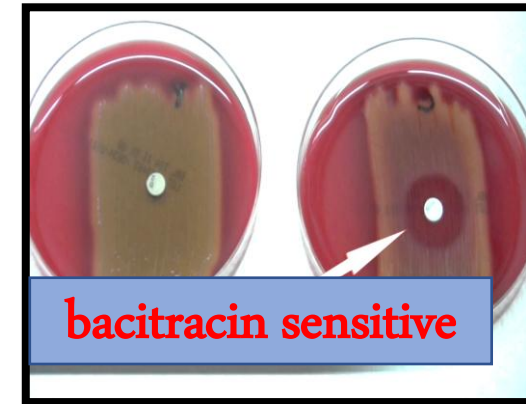
A-Direct diagnosis: In Microbiology Lab:

1-Culture on blood agar :

Gram-positive beta-hemolytic Streptococci bacitracin sensitive:



Beta-hemolysis



bacitracin sensitive

2-Rapid antigen detection test: Immunoassay: **Positive** or negative.

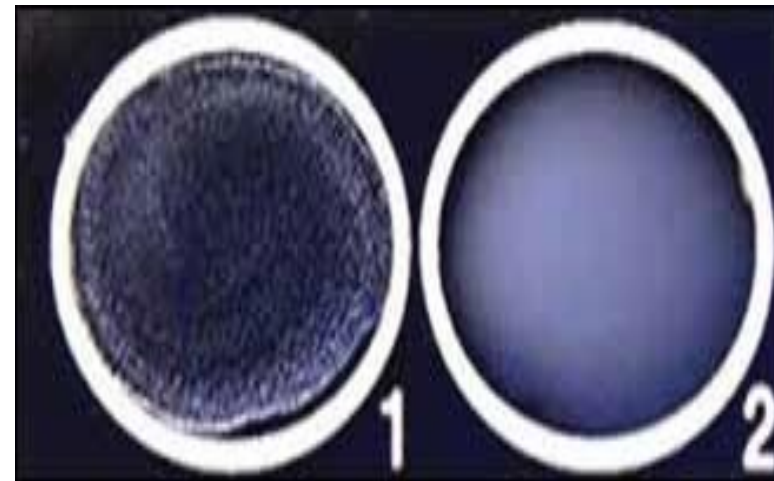
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Laboratory diagnosis of *Streptococcus pyogenes* tonsillitis :

-Specimen: Serum sample.

B-Indirect diagnosis: In serology Lab: ASOT agglutination test:

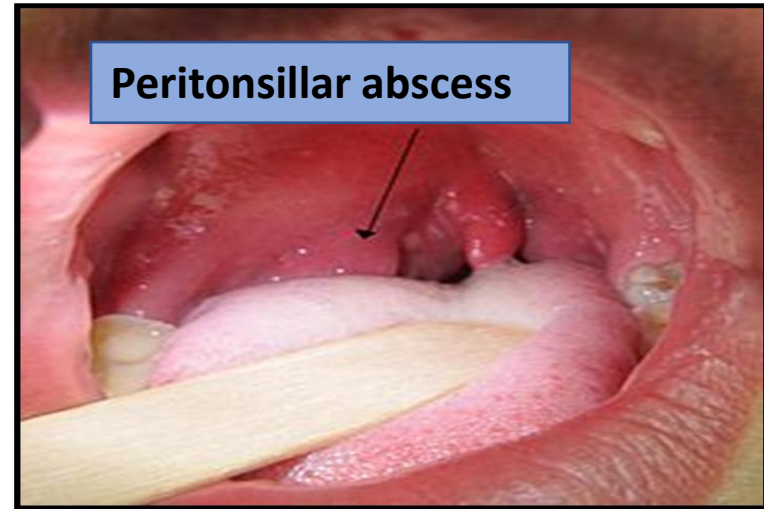
Significant titer ≥ 200 IU ; mainly for diagnosis of **rheumatic fever.**



^NComplications of acute Streptococcus pyogenes tonsillitis :

A–Suppurative:

- 1– Peritonsillar abscess.
- 2– Otitis media, and Sinusitis.
- 3– Lymphadenitis.
- 4– Infectious thrombophlebitis.



B–Non-suppurative Immune mediated :

- 1–Scarlet fever.
- 2–Acute rheumatic fever.
- 3–Poststreptococcus glomerulonephritis.

^N Treatment of Acute *Streptococcus pyogenes* tonsillitis :

1– No penicillin allergy:

–Penicillin or amoxicillin for 10 days.

:(inhibit bacterial cell wall).

2–In penicillin allergic patients:

–Azithromycin for 5 days or Clindamycin for 10 days.

: (inhibit protein synthesis).

Prevention :

Benzathine Penicillin (long acting):

to prevent **rheumatic fever**

Bacterial tonsillitis and oropharyngitis: Diphtheria:

Corynebacterium diphtheriae

-**Transmission:** inhalation of droplet.

-Pathogenesis:

- C. diphtheriae** colonizes the mucus membrane of upper resp.
- Toxigenic strains** produce exotoxin (**diphtheria toxin**; *tox* gene).
- Destruction of epithelia** of tonsils and pharyngeal area as **fragment A** of the **exotoxin** catalyzes the **transfer of ADP-ribosylation** of the **elongation factor-2** which inhibit **protein synthesis** ; **cell death** and **necrosis**.
- Deposition of **necrotic epithelium** on tonsils; **fibrino-suppurative inflammatory exudate** ;
Pseudomembrane formation due to Local effect of exotoxin.
- Systemic spreading of exotoxin; effect on **cardiac Myocardium**; **toxigenic Myocarditis**.

Diphtheria:

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-Clinical presentation:

-Patients initially present with **fever** and **sore throat**.

-**Four to five days** after onset of primary symptoms;

Other symptoms due to spreading of toxin will appear:

1-Anterior nasal diphtheria: **bloody rhinorrhea**.

2- Formation of **Grayish-white Pseudomembrane** over the **posterior pharyngeal wall and tonsils**

3- **Bull neck** due to **Cervical Lymphadenopathy**.

4- Swelling of soft tissue of the neck; **airway obstruction**.

5-Systemic spreading of exotoxin ;

toxigenic Myocarditis and **arrhythmias**.



Diphtheria Pseudomembrane



Diphtheria Bull neck

Laboratory diagnosis of Diphtheria:

-Clinical specimen: nasal/ pharyngeal sample or swab.

1-Culture on Cystine-tellurite agar :

C. diphtheria produce **black colonies**.

on **Loeffler media**: metachromatic granules appear.

2-Microscopy of Grams stained smear:

Gram positive club-shaped bacilli

clustered in **angular arrangements**;

(Chinese letters).

3- If culture is positive; **Elek test** will be used to:

identify the toxicogenic strain.



Treatment of Diphtheria:

-Airway management, patient isolation.

1- Antibiotic therapy: **Penicillin G** (IM injection) or **Erythromycin** (oral/ IV) for **14 days**.

2-Immediate administration of **diphtheria antitoxin** (Passive **antibodies vaccine**) ; early before diagnostic confirmation of Lab results if diphtheria is suspected.

-ECG to Monitor cardiac function.

Prevention of Diphtheria:

-**DTaP** vaccine which is a toxoid vaccine should be used in childhood immunization schedule.

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- Pathogenesis and microbial virulence, Clinical presentation and diagnosis.

2-Lippincott's Microbiology, Third Edition: Cynthia Nau Cornelissen

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