


INFLUENZA

- common cold : rhinoviruses , adenoviruses & parainfluenza virus , cause more upper respiratory symptoms .
- flu : acute , sudden onset of **fever** , myalgia arthralgia , headache **تعب عام**
- in flu there is not viremia, symptoms because “cytokines : IL-1, IL-6, IL-8 , TNF α ”
- Myxoviruses (affect mucus): Paramyxo viruses (larger, single RNA) , Orthomyxo viruses (Smaller, Segmented RNA, Liable to Agic **variation**= influenza)
- Respiratory syncytial virus is the most common cause of bronchiolitis in children .
- influenza types :
 1. type A : humans , **pandemics** (significant illness , sustain transability , wide reservoir) , 8 segments
 2. type B : humans , 8 segments , seals 
 3. type C : humans , stable , 7 segments (lack Neuraminidase)
 4. type D : chattels 7 segments (lack Neuraminidase)
- CORE ANTIGENS : influenza types : nucleoprotein , ribonucleoprotein , matrix protein .
- M2 (Ion channel) inhibitors were used drug but not anymore , don't work on type b , cause resistance in type a subtypes. we use Neuraminidase inhibitors .
- Haemagglutinin : agglutinate RBCs , bind at beginning of virus replicative cycle .
- Neuraminidase : Cleaves neuraminic acid, end of virus cycle.” minimal role antibodies”
- virus fusion :”Haemagglutinin ” binds to membrane sugar “sialic acid’ (proteases)> fusion > uncoating > nucleus > negative sense to positive > spikes to membrane > Neuraminidase > infect more .
- birds shed virus in feces for 2 weeks .
- Pigs “completely new strains to which no one is immune & not covered by annual vaccinations Human = China new pandemics ”
- flu : H1N1 (Spaine) , H2N2 China , H3N2 Hong Kong , H1N1 Russia .
- antigenic drift : A,B,C , new subtypes , endemic , no transability + partial immunity in people
- **antigenic drift & antigenic shift cause new subtypes .**
- nomenclature : type > animal > geographic origin, strain number, and year of isolation.
- in human mainly : HN (1,2,3) , notifiable without transability “H 5,7,9”, “N7,9” .
- proteases to activate virus in labs .
- reproductive number is 2 for influenzas “fear for immune compromised ”, measles high contagious 7 people.
- on paras objects : hands for 6 hours , on table 48 hours .
- virus shedding correlates with symptoms severity .
- Non-productive as well as productive cough = pneumonia
- viral pneumonia rapid onset , severe progress , bacterial pneumonia “mostly staph” , long window periods .
- Encephalopathy (Reye syndrome) , fatty liver , recovering child , [aspirin](#) .

- gold standard test : nasal swap = RT-PCR
- Serology = no viremia , look for antibodies
- H3 segment is shared between human, Swine , horse and avian .
- virus in whole vaccine grow in embryonated eggs, watch out for egg allergy .
- don't give live attenuated vaccine to pregnant & immunocompromised .
- quadrant vaccine : 2 A Subtypes h1n1, h3n2 , 2 b type hem Agata
- oseltamivir (Tamiflu)orally or zanamivir IV = treatment quick less than 48h .
- Avian Influenza : can not be eradicated “silent reservoir = waterfowl” , severe depression in domesticated birds . direct contact + **Manure** سماد , lower respiratory track , **three people**
- low or high pathogenic avian influenza cause severe influenza in human .

Bacterial infections

- group a beta hemolytic streptococci : three majors :
- pyogenic “pus”: pharyngitis + skin infections (cellulitis , fasciitis “gangrene” , impetigo) .
- toxin related : toxic shock syndrome “positive, cytokine storm” , scarlet fever .
- immune sequelae : glomerulonephritis “3” , rheumatic fever “2” .
- STREPTOCOCCUS : gram positive , facultative anaerobes “grow without o₂” , catalase negative , non-motile , non-spore former , non-acid fast , have hydrogen peroxide = green sample “biliverdin” , appear in chains .
- group **a strep** : strep throat , strep pyogenes, **group b strep** : strep agalactiae , newborn sepsis + meningitis . **group c** : dysgalactiae “similar to A” , **group d** : enterococcus (growth in 6.5% NaCl)& non-entero “strep Bovis ” (sensitive to penicillin).
- B-Lancefield Grouping did not work with **s. pneumonia & viridians** .
- strep pyogenes is A bacitracin sensitive , strep agalactiae B bacitracin resistance , **s. pneumonia** inhibited by optochin .
- Virulence factors : gram positive “peptidoglycan membrane” , A polysaccharide , young & sever cases : hyaluronic acid capsule “antiphagocytic , molecular Memic” , streptolysin O = o₂ labile =reduced state , immunogenic , antigenic . streptokinase “أبرة الحياة” .
- Bronectin : matrix protein , Adhesion , as well as F protein, surface-exposed lipoteichoic acid and M proteins .
- M proteins : high variable region , type & serotype specific , molecular Memic , antiphagocytic , prevent opsonization of C3b .
- C5a peptidase : in pyogenes inhibits chemo- attractants “C5a”.
- SPE-A, SPE-B and SPE-C are Pyrogenic (fever inducing) and erythrogenic (rash inducing) exotoxins= toxic shock syndrome.
- Transmission: respiratory droplet, direct contact with skin lesions, stay in convalescent carriers.
- pharyngitis: commonly by virus and most common disease form caused by Str. pyogenes.

- Pharyngitis : abrupt onset of sore throat , malaise , tonsils patches of grey–white exudate.
- patches of yellow–white exudate , gray tongue , Palat petechiae , enlarged uvula , painful lymph nodes: bacterial infection .
- Scarlet fever : sand paper rash , after sore throat , trunk& chest rash then to face , strawberry tongue .”major killer before antibiotics”.
- Acute Glomerulonephritis **49**: after weeks of sore throat , “smoky” urine & hypertension& periorbital **edema** , no antibiotics 95% recover , if not chronic renal failure , recurrent episodes don't make it worse .
- Acute Rheumatic Fever **12** : JONES criteria , chorea“ dance , uncontrollable extremities ” , recurrent episodes make it worse , antibiotics in ten days .
- culture is gold standard test , RST, rapid strep test (GAS) if the control test is not there then it is invalid .
- Treatment : penicillin ,with allergy = Clindamycin ,erythromycin , azithromycin .
- There are no vaccines available against any of the streptococci except S. **pneumoniae** .

STREPTOCOCCUS PNEUMONIAE

- positive , non motile , non spore forming , facultative anaerobes , antigenic& anti-immunogenic **capsule** , capsular vaccine .
- most common cause of : **community** acquired PNEUMONIAE , 15% bacteremia in sepsis or asplenia , meningitis in very young or old people .
- oploid in shape - pairs , pointed in one end “lancet shape - bullet shape diplococci ”
- 91 serotype , α -hemolysis by Pneumolysin after autolysins , not groupable by Lancefield , sensitive to optochin , bile acid soluble .
- IgA protease leads to colonization = with antiphagocytic **protective** capsule , aspiration then autolysins then Pneumolysin release .
- Lipoteichoic acid is complement activator , inflammatory inducer .
- inducer factors : depress the cough reflex , alcohol or drug , geriatrics ,CVA, mental impairment , abnormality of the respiratory tract , congestion heart failure , splenectomy , Trauma , head injury , malnutrition .
- spleen produce opsonin against capsular bacteria , so no spleen !!
- transmission : droplets , aerosols , aspiration of own pneumonia , inhalation .
- nosocomial infections in 48 h hospitalization : pneumonia , ventilator acquired : pseudomonas , enterobacteria .
- walking pneumonia : normal life - chlamydia , mycoplasma & Legionella .
- cause bacterial conjunctivitis , 5% fatality , may resolve spontaneously , cause single lobule or lobe inflammatory, empyema “pleural space” , Pericarditis ,abscess .
- on Xray : demarcated fissure , lobe calcification , air bronchogram . positive blood test (Quellung reaction)
- no loss of structure “reversible”, high morbidity & mortality in serotype 3 .
- infections in 20%newborn after 6 months , crowds , old (bimodal age) , serotype specific immunity .
- CAUSE SINUSITIS “FLUID-FILLED” & ACUTE OTITIS , MENINGITIS (BIMODAL AGE) , SYMPTOMS : CHILL , FEVER , PRODUCTIVE COUGH , **RUSTY** SPUTUM .
- treatment = penicillin, **altering binding protein** cuz resistance = Vancomycin.
- 13-valent pneumococcal **conjugate vaccine** (Prevnar 13) , must be conjugated in babies to active immunity t cells , could be non in 50 old .

HAEMOPHILUS

- gram negative bacilli
- most common cause of : community acquired PNEUMONIAE , 15% bacteremia in sepsis or , meningitis in very young or old people , **epiglottitis** .
- polyribitol phosphate capsule = pathogenesis .
- typable - capsule - invasive - serotype B = meningitis , epiglottitis .
- non typable = upper respiratory tract , sinusitis , otitis , bronchitis , elderly adults .
- REQUIAR BOTH heme (factor X) and NAD (factor V from staph) differentiate from Neisseria
- higher fatality , positive blood culture
- Epiglottitis : emergency , swollen “cherry-red” epiglottis , drooling, stridor (high pitched breathing noise) and comfort on sitting up. thump sump on Xray , don't try to swap it !
- lysed blood agar “chocolate” , fluorescent antibody staining
- treatment : ceftriaxone , upper respiratory tract infections= amoxicillin-clavulanate.
- Rifampin to close children .
- vaccine

CORYNEBACTERIUM DIPHTHERIAE

- toxin mediated systemic manifestation (may cause peripheral neuropathy / myocarditis), has vaccine so low carriage rate .
- diphtheria respiratory or cutaneous human disease , diphtheroid animals nonpathogenic - may cause cutaneous .
- gram positive bacilli , non motile , non Spore forming , **aerobes** .
- palisades , chines letters , bedded end , metachromatically granules .
- A- B toxin fashion (active/binding) , b- binds heparin epidermal like factor then Internalization , then A inhibits protein synthesis by ADP-ribosylation of elongation factor-2 (EF-2) which inhibits protein synthesis .
- pseudo membrane formation - airway obstruction - Myocarditis- cranial nerves (صعوبة بالتكلم و الرؤية).bull neck , **don't take a swap or manipulate it !!**
- persistent damage - negative blood sample - Loeffler's medium or **CTBA agar (more specific)** = black colony or PCR confirmation.
- main treatment antitoxin , give antibiotic with antitoxin to reduce carriers .
- formaldehyde treatment of the toxin , part of vaccine , 5 doses , 3 in year1 .

BORDETELLA pertussis - whooping

- gram negative coccobacilli , non motile , non Spore forming , aerobes .
- 2 month newborn - whooping cough - anoxia “encephalitis ”- has capsule but toxin is cause of disease , more contiguous .
- loose ciliated upper track cell , **nasal washing sample** , Filamentous hemagglutinin attachment to cilia then A-B fashion then toxin -enzymatic ADP ribosylation of G proteins - excessive mucus secretion .Tracheal cytotoxin induce nitric oxide to kill cells . fimbria type2 &3 .
- non specific Catterall stage then paroxysmal stage coughing 1 month then convalescent stage
- death is due mainly to pneumonia.
- sound from epiglottal closure , atypical whooping in adults”larger airways” : 100 day cough .
- Bordet-Gengou medium = selective agar .
- Azithromycin (macrolide) is the drug of choice , no benefit after paroxysmal stage .
- oxygen therapy and suction of mucus for infants .
- acellular vaccine

Mycobacteria

- Mycobacteria + Tuberculosis + leprae = partially **acid fast bacteria** , branching filamentous , high lipid content .
- non spore forming , non motile , non capsulated , aerobic facultative intracellular .
- Isolation of Bacteria: Tuberculosis, Mycobacteria cancanasi, M. avium complex, and Gordonia

Tuberculosis

- Koch bacillus ,Tuberculosis , consumption , white plaque , phthisis .السل
- 18h to duplicate , 6 months treatment . viable infected sputum for 6 months
- malnutrition , overcrowding , poverty .
- carbon Fuxin stain , then heating , high lipid content , acid & alcohol “acid fast” .
- culture : Löwenstein- Jensen”green” , fluid Broth media , solid Semisynthetic agar media.
- inner layer : peptidoglycan , arabinogalactan , mycolic acid = high lipid , NAM& NAG heavy cross linkage , polysaccharide is antiphagocytic , **serpentine growth in vitro = Cord factor, or trehalose dimycolate.**
- latent then secondary reactive . 3 bacilli are enough to cause infection .
- immunocompromised patients =more risk ,most cause of death in HIV .
- INDIA , AFRICA , RUSSIA = high disease distribution .
- pulmonary TB : miliary TB , both lung , blood > meningitis > inhibit macrophages , bone focus , in spine “pott’ , lymphadenitis “scrofula ”
- transmission : respiratory 10-3 latent “secondary reactive”-1 active
- block alveolar then fibrosis or **granuloma “mark”** .
- exudative = edema , productive type : chronic granuloma , pale mid Casius necrosis .
- reactivation : apex , where oxygen tension (PO₂) is highest .
- fever, night sweats, haemoptysis (coughing blood) , weight loss .
- culture : Radiometric broth culture , microscope : Ziehl-Neelsen .
- Tuberculin skin tests (TSTs), Interferon-gamma release assays (IGRAs) = past exposure (immunized = false positive).
- treatment : 2 phases , 2 months intensive (isoniazid (INH), rifampin (RIF), pyrazinamide (PZA), and either ethambutol (EMB) or streptomycin (SM)), 4 months continuation (Isoniazid & rifampin = multi drug resistance > untreatable) .
- Isoniazid preventive therapy before immunocompromised state .
- Mycobacterium bovis Bacillus Calmette–Guérin (BCG)

nontuberculous mycobacteria (NTM)

- rapid growers (grow in <7 days) and slow growers. chromogen or scotochromogen
- Mycobacterium kansasii (Tuberculosis like),Mycobacterium marinum(fish aquarium granuloma) and Mycobacterium ulcerans(soft tissue)= slow + photochromogenic .
- scrofulaceum = most common children scrofula , avium complex ”Non chromogen” = slow , fortuitum+ chelonae-abscessus = rapid + non chromo

Miscellaneous respiratory tract infections

- Atypical pneumonia caused by Mycoplasma and Chlamydia, Legionella , (**walking pneumonia** , gradual , less severe , don't respond to penicillin).
- Mycoplasma = no cell wall, no stain , not affected by penicillin or cephalosporine .
- Mycoplasma and Chlamydia - person to person , Chlamydia, Legionella are gram negative .
- M. pneumoniae : Aerobic Growth , Genitourinary track . pharyngitis or milder pneumonia , children + young adults , hemolytic anemia (Cold-Agglutinin) , FRIS culture ,
- Chlamydia : : Infectious elementary bodies & reticulate bodies(active , not infectious outside) , obligate intracellular , less contagious , close contact droplet , sputum sample culture : McCoy Cell Culture & Microimmunofluorescence MIF .Treatment: Tetracyclines , no vaccine
- C. psittaci : parrots , ornithosis , resolve spontaneously , Macrolides treatment .
- Legionella pneumophila ; **not** person to person , water system , live in amoeba , obligate intracellular , severe Legionnaire (pneumonia + GI hepatosplenomegaly ,Delirium) , most common Pontiac fever (flu like) , not contiguous , risk factors : smoking , old , renal failure, cancer, diabetes . blood / urine / throat swap , Macrolides treatment.

OPPORTUNISTIC MYCOSES

- at risk : HIV & immunosuppressants .
- Cryptococcus neoformans : exogenous , yeast ,antiphagocytic capsule , birds droppings , inhalation - lung - **neurotropic meningitis** mostly , India Ink for capsule stain , Bird seed agar , latex particulate agglutination test , PCR .
- Aspergillosis : in soil , allergic or invasive (A. fumigatus), inhalation - lung - invasive - fungal balls "Aspergilloma IgE"= sinuses, ear canals, eyelids, and conjunctiva , asthma , necrotic pneumonia , heart , brain . surgery .
- Zygomycosis : aka Mucor & Rhinocerebral (germs in nose , invasive brain)/ Rhizopus, Absidia, and Mucor , **Diabetic ketoacidosis , bad prognosis** , surgery.
- PNEUMOCYSTIS : PNEUMOCYSTIS pneumonia , interstitial plasma pneumonitis , not ex-vivo , TMP-SMX is treatment .

Endemic mycosis

- in healthy person - resolve spontaneously , 5% coccidioidomycosis (desert sand , erythema) , histoplasmosis "no capsule - worldwide- birds-soil , Africa , tuberculate conidia - granuloma - histoplasmin - hepatosplenomegaly " , blastomycosis(spore in woods ,erythema ,) , and paracoccidioidomycosis (brasiliensis ,probe base , multi pud) , biomorphic , inhalation (spore , asexual conidia)soil , Sabouraud dextrose agar ,not Serological tests .