

Pediatrics TeamWork <sup>K</sup>  
437

# Common Pediatric Infections

Done by:

Rinad Alghoraiby Layan Alwatban

Revised by:

Aseel Badukhon

Team Leader:

Aseel Badukhon

## Definitions

- **Exanthem:** A skin eruption occurring as a symptom of a general disease.
- **Enanthem:** Eruptive lesions on the mucous membrane.



## Causes of Fever and Rash

Classification depend on the type of rash:

Maculopapular Rash		Vesicular, bullous, pustular	
<b>Viral</b>	<ul style="list-style-type: none"> <li>● HHV 6 or 7 (Roseola infantum) – &lt;2 years old</li> <li>● Enteroviral rash</li> <li>● Parvovirus (“slapped cheek”) – usually school-age</li> <li>● Measles – uncommon if immunised</li> <li>● Rubella – uncommon if immunised</li> </ul>	<b>Viral</b>	<ul style="list-style-type: none"> <li>● Varicella-zoster virus – chickenpox, shingles</li> <li>● Herpes simplex virus</li> <li>● Coxsackie – hand, foot and mouth</li> </ul>
<b>Bacterial</b>	<ul style="list-style-type: none"> <li>● Scarlet fever (group A streptococcus)</li> <li>● Erythema marginatum – rheumatic fever</li> <li>● Salmonella typhi (typhoid fever) – classically rose spots</li> <li>● Lyme disease – erythema migrans (in north america)</li> </ul>	<b>Bacterial</b>	<ul style="list-style-type: none"> <li>● Impetigo – characteristic crusting (honey crust)</li> <li>● Boils – infection of hair follicles/sweat glands</li> <li>● Staphylococcal bullous impetigo</li> <li>● Staphylococcal scalded skin</li> <li>● Toxic epidermal necrolysis</li> </ul>
<b>Other</b>	<ul style="list-style-type: none"> <li>● Kawasaki disease</li> <li>● Juvenile idiopathic arthritis</li> </ul>	<b>Other</b>	<ul style="list-style-type: none"> <li>● Erythema multiforme; Stevens-Johnson syndrome</li> </ul>
Petechial, purpuric			
<b>Viral</b>		<b>Viral</b>	<ul style="list-style-type: none"> <li>● Enterovirus and other viral infections</li> </ul>
<b>Bacterial</b>		<b>Bacterial</b>	<ul style="list-style-type: none"> <li>● Meningococcal, other bacterial sepsis</li> <li>● Infective endocarditis</li> </ul>
<b>Other</b>		<b>Other</b>	<ul style="list-style-type: none"> <li>● Henoch-Schönlein Purpura (HSP)</li> <li>● Thrombocytopenia</li> <li>● Vasculitis</li> <li>● Malaria</li> </ul>

## Classic Childhood Exanthems

Petechiae and purpuric rash are serious in children eg. Meningococcal, vasculitis

- Measles (Rubeola)
- Scarlet Fever
- Rubella (German measles)
- Erythema Infectiosum (fifth disease), Parvovirus B19
- Roseola Infantum



- Pt looks unwell
- Redness of the eye
- There is coryza symptoms; (nasal congestion and discharge)



Buccal mucosa shows whitish Enanthem spots which are called Koplik's spots → one of the features of measles almost pathognomonic of measles



- Maculopapular rash
- Some are adjacent while other are distant from each other

# Measles

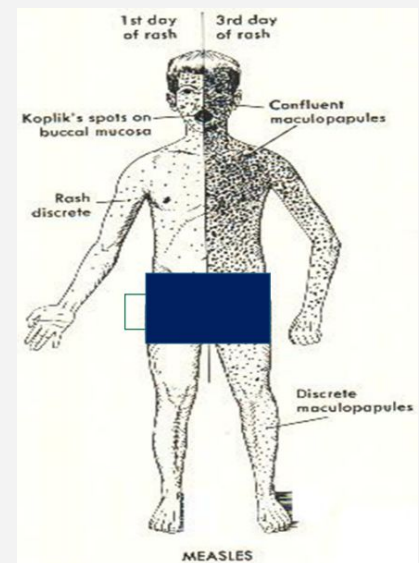
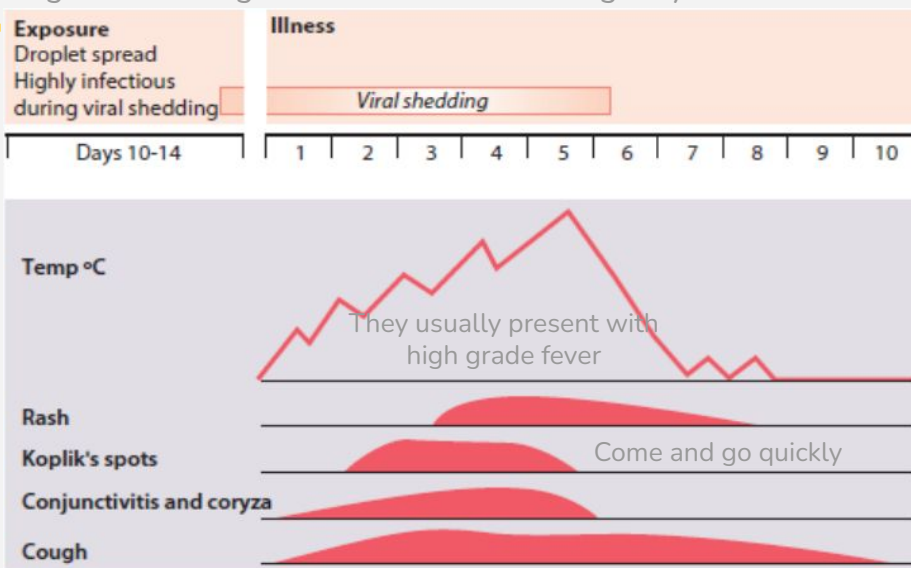


- Paramyxovirus
- **At risk:** children who are not yet vaccinated or who miss vaccination (+ parent who keep delaying the vaccine for their children)
- **Incubation period:** 10-14 days
- **Infectious period:** 1-2 days before prodrome to 4 days after onset of rash (prodrome; coryzal sx, redness of the eye and other sx)

## Clinical Features

- **Prodrome:** day 7-11 after exposure
  - Fever, cough, coryza, conjunctivitis
  - Enanthem: Koplik's spots appear 2 days before the rash, last 2 days into the rash
- Rash spread downwards from face
- Highly contagious **because it's an airborne disease**

High chance to get the disease in this stage if your not immune



Initial symptoms are **fever**, cough, conjunctivitis and coryza= **runny nose**, then Koplik spots, and lastly rash

Symptoms start from up (the face) then the rash start to descend downward. Always ask the parent where did the rash started?

## Management

- **Treatment:** symptomatic, Vitamin A reduce the complication
- **Prevention:** 2 doses of measles vaccine
- Immunize susceptible contacts, Immunoglobulin  
If someone gets contact with measles case and he WAS NOT immunize → give immunoglobulin

## Complications

- Otitis media
- Bronchopneumonia (very severe)
- Encephalitis
- Myocarditis
- Pericarditis
- Subacute sclerosing panencephalitis SSPE – late sequelae due to persistent infx of the CNS (may come up to 10 yrs; on average 7 years)

# Scarlet Fever



- **Due to:** erythrogenic exotoxin-producing Group A beta-hemolytic streptococci
- **Peak age:** 4-8 yr
- **Incubation period:** 2-5 days

## Clinical Features

- Abrupt onset fever, headache, vomiting, malaise, sore throat
- Bright red oral mucosa
- Palatal petechiae
- **Tongue change** it starts initially with white then red strawberry tongue
- **Rash appears 1-2 days after the onset of illness:** Described as "sandpaper" in quality, you can feel the rash better than seeing it **sandpaper like**. Can last for over a week
- As the rash fades, peeling (desquamation) may occur (finger tips, toes, and groin area)



White strawberry tongue



Red strawberry tongue



Peeling of the skin on finger tip



Petechiae on the soft palate



Small discrete rash (not as measles adjacent)



Sandpaper rash!

## Treatment

- Penicillin or erythromycin if there is penicillin allergy for **10 days** to prevent rheumatic fever.

## Complications

### Purulent complications:

- Otitis media
- Sinusitis
- Peritonsillar/retropharyngeal abscesses  
Requires drainage
- Cervical adenitis

### Nonsuppurative sequelae:

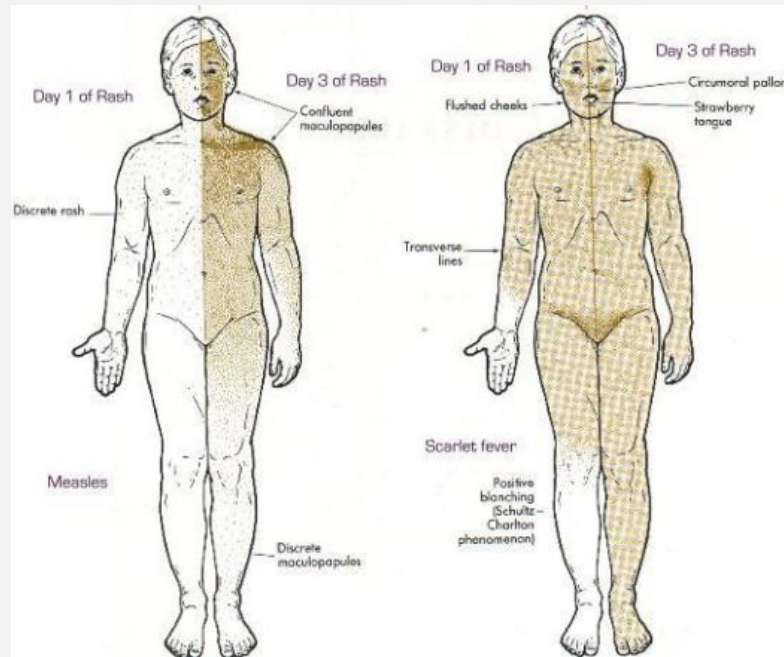
- Rheumatic fever
- Acute glomerulonephritis

# Measles VS. Scarlet Fever



## Measles

## Scarlet Fever



Rash start on face then descending pattern, Start after a while.

Rash discrete all over the body especially in the folds area, circumoral pallor (cause the rash will be over cheek), start From day 1

# Human Parvovirus



- AKA **Fifth Disease, Erythema Infectiosum**. It has three names!
- Raised, red, warm rash, first appearing on cheeks (slapped cheek appearance). After 1 - 4 days, a **lace-like rash** spreads to the rest of the body. It can cause another type of rash in older children called **papular purpuric gloves and socks syndrome**
- **Infectiousness** greatest before onset of the rash and not after the rash. After rash he's no longer infectious he can go to school
- **Control** In school outbreaks, alert pregnant staff causes hydrops fetalis.
- In pts hemolytic anaemia (e.g SCA) causes aplastic crisis.
- **Treatment:** supportive except high risk patient.



Swollen red cheeks; like slapped cheeks



Face: Redness of the cheek  
Body: lace like (net like) rash

# Roseola Infantum



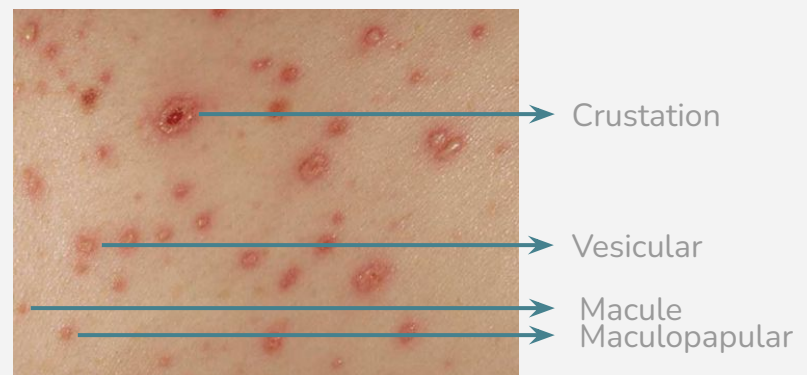
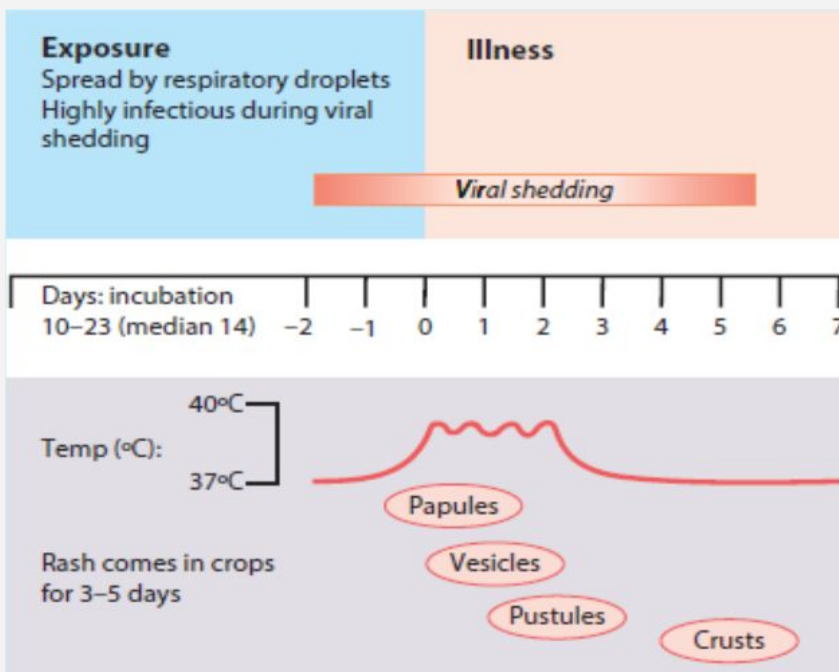
- Roseola infantum (exanthema subitum)
- Caused by Human Herpesvirus-6
- They will present with fever fever fever lastly rash
- Once they develop rash fever resolves



# Varicella



- Chicken Pox
- DNA Virus
- **Incubation Period:** 10 – 21 days
- **Very contagious;** can be spread by direct contact, airborne transmission
- **Infectivity:** 1-2 days before rash till all skin lesions have crusted (~ 6th day of rash)
- Vaccine
- **Treatment:** Acyclovir



Character of chicken pox rash is you're going to have all stages of rash

Incubation days → viral start shedding (infectious stage) until crustation happen → become non infectious



Chicken Pox



Zoster



Neonatal varicella with secondary bacterial infection

- Very bad hemorrhagic lesions in neonate

## Complications

- Secondary infection of the blisters may occur (staphylococcal and streptococcal)
- Pneumonia, myocarditis
- Cerebellar ataxia may appear during the recovery phase or later
- Encephalitis (rare)
- Congenital infection
- Newborns are at risk for severe infection (if mother is not immune)
- Disseminated dis: immunocompromised

# Mumps



- RNA Virus
- **Incubation Period:** 15 – 24 days
- **Clinical Features:** fever, parotitis, may be subclinical
- **Complications:** meningitis, encephalitis, orchitis
- Treatment
- **Isolation & Infectivity:** 7 days after onset of parotid swelling
- Vaccine



Mumps → due to bilateral enlarged parotid swelling

# Rubella



- RNA Virus
- **Incubation Period:** 15 – 20 days
- **Spread by:** respiratory droplet (not airborne which is smaller, spreads faster)
- Generally a mild disease in childhood, Lymphadenopathy particularly the occipital and postauricular nodes, is prominent, arthralgia and arthritis. (rash is often first sign of infection)
- **Serious in pregnancy:** congenital infection
- Treatment (There is no effective antiviral treatment. Prevention therefore lies in immunization.)
- **Isolation & Infectivity:** 7 days from onset of rash (remember mumps 7 days from parotitis)
- **Congenital Rubella:** infectivity until 1 year of age
- Vaccine



Discrete maculopapular rash of rubella

## Congenital Rubella Syndrome

- Infection of seronegative mother during pregnancy
- **Risk of fetal infection**  
First trimester : 75-90%
- Crosses placenta when mother has acute infection
- The earlier the fetus infected x more serious disease
- May result in a serious congenital abnormalities
  - Intrauterine growth retardation
  - Hepatosplenomegaly
  - Cataracts
  - Mental retardation
  - Sensorineural hearing loss
  - Heart – Patent ductus arteriosus
  - Pulmonary stenosis
  - Thrombocytopenic purpura
- **Classic Triad:**
  - PDA
  - Cataracts, and deafness
  - +/- blueberry muffin rash



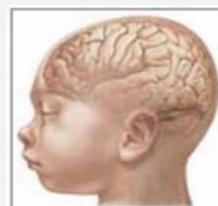
Blueberry muffin rash



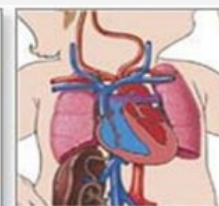
PDA



Cataracts



Microcephaly



PDA



Cataracts

**Q.** 14-year-old girl, unvaccinated, presented with sore throat, low-grade fever, and a diffuse maculopapular rash. During the next 24 hours, she develops tender swelling of her wrists. In addition, her physician notes mild tenderness and marked swelling of her posterior cervical and occipital lymph nodes. Four days after the onset of her illness, the rash has vanished. **Which of the following is the most likely diagnosis?**








- a. Rubella    b. Rubeola    c. Roseola    d. Erythema infectiosum    e. Erythema multiforme

# Enterovirus Infection



- **Non Poliovirus and Parechovirus Infections (Group A and B Coxsackieviruses, Echoviruses, Numbered Enteroviruses, and Human Parechoviruses)**
- The most common manifestation of enteroviruses is nonspecific febrile illness
- **Other manifestations can include the following:**

Vesicular lesion present on mucus of the mouth

 <p>Coryza, pharyngitis, herpangina, stomatitis, bronchiolitis, pneumonia.</p>	 <p>Vomiting, diarrhea, abdominal pain, hepatitis, pancreatitis.</p>
 <p>Hand-foot-and-mouth disease, and nonspecific exanthems.</p>	 <p>Acute hemorrhagic conjunctivitis and uveitis.</p>
 <p>Aseptic meningitis, encephalitis, and motor paralysis.</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Myocarditis</p> </div> <div style="text-align: center;">  <p>Myositis</p> </div> </div>

Muscles become tender.  
Suddenly inability to walk then they recover.

## Hand - Foot & Mouth Disease

- Coxsackievirus infection
- Usually a mild illness
- Generally complete recovery occurs in 5-7 days
- **Complications:**
  - Dehydration may occur (Mouth lesions cause pain with swallowing)

Sole of the foot



In summer (the peak) we see it usually as cluster

# Herpes Simplex Virus 1



- **Most common sites:** lips and fingers or thumbs (herpes whitlow).
- **Herpes "cold sores".** For adults mostly, in children it's primary gingivostomatitis
- **Symptoms:** Superficial clear vesicles (blisters) with red base, usually on face or lips, which crust and heal within days.
- **Method of transmission:** Direct contact.
- Avoid contact with children with eczema or burns and the immunocompromised. Present with complications
- **Gingivostomatitis** – may necessitate, intravenous fluids and acyclovir.
- Eczema herpeticum – may result in secondary bacterial infection and septicaemia. due to extensive skin inflammation
- Herpetic whitlows – painful pustules on the fingers.
- Eye disease – blepharitis, conjunctivitis, corneal ulceration and scarring. Call ophthalmologist
- CNS – aseptic meningitis, encephalitis.
- Pneumonia and disseminated infection in the immunocompromised.
- The ones underlined are severe lesions.

## Eczema Herpeticum

- **Kaposi Varicelliform Eruption**
- Serious condition, emergency care
- Widespread vesicular lesions develop on eczematous skin
- This may be complicated by secondary bacterial infection, which may result in septicaemia, high fever, irritability, lesions then rupture and crust over the course of a couple of days
- Lesions can become hemorrhagic
- If area of involvement is large, can be lots of fluid loss and potentially fatal
- Treat promptly with acyclovir. Large areas affected you may need IVF!!



# Herpes Simplex Virus 1



On the mouth: It can present as Gingivostomatitis Few lesion or severe many lesion. Painful lesion >> dehydration because they can't swallow



Few lesions



Eczema herpeticum (severe involvement)



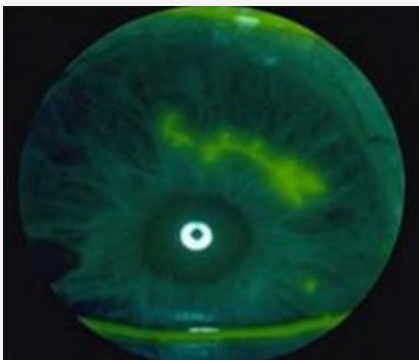
Herpetic whitlow → lesion on the finger



Herpes with eczema



Herpes with eye involvement = Emergency call Optha (any lesion around the eyes, just call them!)



Dendritic ulcers in herpetic keratitis



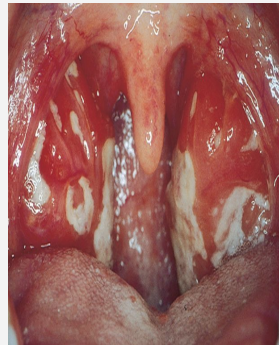
# Infectious Mononucleosis



- **Cause:** Epstein-Barr virus and Cytomegalovirus
- Enlarged lymph nodes
- **Rash:**
  - Pink, measles-like rash (more common if given amoxicillin for throat infection)
- Enlarged spleen & liver
- **Transmitted by:** saliva and close contact
- **Diagnosis:** serology, PCR
- **Treatment:** usually supportive, unless immunocompromised, where antiviral is indicated



Maculopapular rash



Bilateral large tonsils with white patches



Bilateral cervical lymph node involvement

# Adenovirus



- **Incubation period:** 2-14 days.
- **Clinical syndromes:**
  - Eye: Epidemic keratoconjunctivitis, acute follicular conjunctivitis, pharyngoconjunctival fever.
  - Respiratory: system Common cold (rhinitis), pharyngitis, tonsillitis, bronchitis, pneumonia.
  - Genitourinary: Acute hemorrhagic cystitis, orchitis, nephritis (hematuria)
  - Gastrointestinal: Gastroenteritis, mesenteric adenitis, appendicitis.
- **Rare results of adenovirus infections:** Meningitis, encephalitis, arthritis, myocarditis, hepatitis.
- Fatal disease may occur in immunocompromised patients, as a result of a new infection or reactivation of latent virus.



Adenoviral tonsillitis



Keratoconjunctivitis = intense redness of the conjunctiva

**Q.** An 8-year-old sickle-cell patient seen at the emergency room (ER) for fever. Over the previous several days, the child has become progressively tired and pale. The hemoglobin concentration in the ER is 3.1 mg/dL. **Which of the following viruses commonly causes such a clinical picture?**

- a. Roseola    b. Parvovirus B19    c. Coxsackie A16    d. Echovirus 11    e. Cytomegalovirus

## Otitis Media



Bulging tympanic membrane with loss of cone of light

### Case:

- A six month old male, had the acute onset of fever to 39°C and irritability.
- He was seen in your office and examination of the tympanic membranes revealed the physical findings noted.

Diagnosis: acute otitis media

Rx: conservative + antibiotic

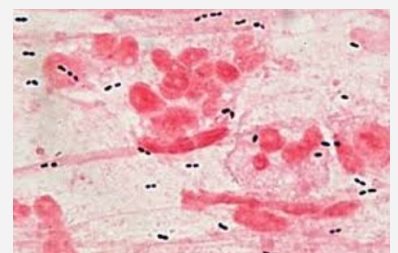


- **Risk factors:**
  - Children cared for in group settings
  - Children who live with adults who smoke
  - Infants who nurse from a bottle while lying down
  - Children who are not breastfed
- Strep. Pneumoniae Nontypable cause types like B are covered by vaccines
- H. influenzae
- M. catarrhalis
- Strep. Pyogenes
- Staph. Aureus
- No growth either due to antibiotic treatment was initiated or other viral cause
- **Treatment:** Amoxicillin
- **Complications:**
  - Chronic effusion, hearing loss
  - Mastoiditis
  - Intracranial extension (brain abscess, subdural empyema, or venous thrombosis)
  - Cholesteatoma (mass-like keratinized epithelial growth)

## Pneumococcal Infections



- Often carried in nasopharynx of healthy children
- **Transmission:** by respiratory droplets
- The incidence of invasive disease has declined
- Susceptibility is increased in hyposplenism (e.g. SCD, nephrotic syndrome, splenectomy)
- May cause pharyngitis, otitis media, conjunctivitis, sinusitis, invasive disease (pneumonia, bacterial sepsis and meningitis)
- **Prevention:** Vaccine (PCV13, PPV23)
- **Prophylaxis:** for high risk. (See [book slide](#) to know who are at risk)



# Impetigo



- Impetigo is a bacterial skin infection
- Staphylococcus aureus / streptococcus pyogenes
- Honey-coloured crusted lesions
- Lesions are usually on the face, neck and hands
- Most common in infants and young children
- It is contagious by direct contact
- Topical antibiotics (e.g. mupirocin) in mild cases; cover staph, MRSA, +ve strep
- Systemic: cloxa, augmentin, cephalexin (1st generation cephalosporin) if extensive



Honey like crustation

# Cellulitis



- Inflammation of the subcutaneous connective tissue – may lead to abscess
- Streptococcus pyogenes, Staphylococcus aureus (includes MRSA), Haemophilus influenzae (<2 yrs)
- **Therapy:** clindamycin (1st choice if you are thinking of staph, MRSA), cefazolin, cloxacillin



Cellulitis with pustule

Place of organism entry



Cellulitis

## Periorbital Cellulitis

- Fever with erythema, tenderness, oedema of the eyelid.
- It is almost always unilateral.
- In young, unimmunised children it may also be caused by Haemophilus influenzae type b which may also be accompanied by infection at other sites, e.g. meningitis (unimmunized always test for meningitis).
- It may follow local trauma to the skin.
- In older children, it may spread from a paranasal sinus infection or dental abscess.
- **Treatment:** i.v antibiotic. Admit, start ABx, exclude orbital involvement.
- **Complications:** cavernous sinus thrombosis, orbital infection/ abscess, CNS infection



# Pertussis



- Whooping Cough
- Bordetella Pertussis
- **Incubation Period:** 7 – 14 days
- Coughing adults are major reservoirs, cause adult immunity will go down due to no booster vaccine so they will carry it, but not get affected by it → unimmunized children will get affected
- **Clinical Features:** The infection usually lasts 6 weeks
  - Cold symptoms (~2 weeks) initial symptoms
  - Progressively worse cough (~4 weeks)
  - Complete resolution (may take months)
- **Treatment:** erythromycin (other macrolides)
- **Isolation & Infectivity:**
  - Up to 6 weeks
  - But with treatment → 5 days after starting therapy
- **Vaccine:** doesn't provide lifelong immunity, booster doses are needed in adults
- **Complications:**
  - OM
  - Pneumonia
  - Apnea
  - Convulsions
  - Brain damage from lack of oxygen (with repeated coughing)
  - Cerebral hemorrhage



**Q. Which of the following is responsible for causing Hand-Foot-and-Mouth Disease?**

- a. Adenovirus    b. Coxsackievirus    c. Cytomegalovirus    d. Echovirus 22    e. Epstein-Barr Virus

## Tuberculosis



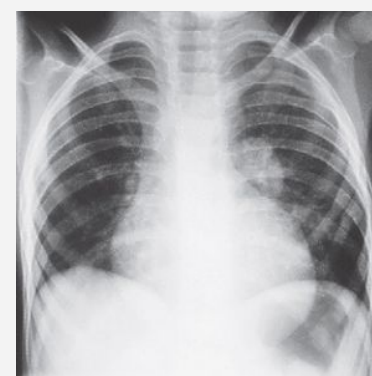
- TB affects millions of children worldwide; low but increasing incidence in many developed countries.
- Diagnosis of TB in children is even more difficult than in adults. The clinical features of the disease are nonspecific, such as prolonged fever, malaise, anorexia, weight loss or focal signs of infection. lymph node enlargement or bone infection
- Clinical features follow a sequence – primary infection, then dormancy, which may be followed by reactivation to post-primary TB.
- TB disease can present as local disease or may be widely disseminated, miliary TB to sites such as bones, joints, kidneys, pericardium and CNS.
- In infants and young children, seeding of the CNS is particularly likely, causing tuberculous meningitis.
- Diagnosis is often difficult, so decision to treat is usually based on **contact history**, Mantoux test, interferon-gamma release assays (Quantiferon), chest X-ray and clinical features.
- **Young children swallow their sputum, so early morning gastric aspirate are required (3 samples).** In adult we do sputum culture but children swallow sputum even at night all the time so we take their sputum through NGT at morning before they eat anything.
- Contact tracing is important.
- TB is more difficult to diagnose and more likely to disseminate in the immunosuppressed.



We don't measure the redness, we measure the induration (elevation)



Go from 2 opposite sites get your pen until your reach the elevation not the redness



**Table 124-3 Recommended Treatment Regimens for Drug-Susceptible Tuberculosis in Infants, Children, and Adolescents**

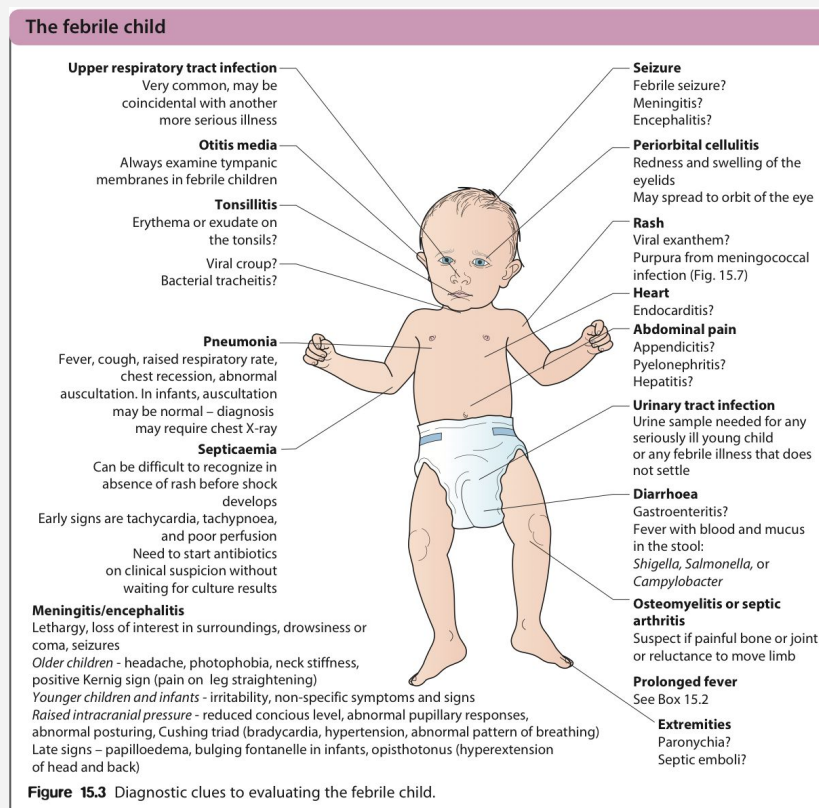
INFECTION OR DISEASE CATEGORY	REGIMEN	COMMENTS
<b>LATENT TUBERCULOSIS INFECTION (POSITIVE TST RESULT, NO DISEASE)</b>		
Isoniazid-susceptible	9 months of isoniazid, once a day	If daily therapy is not possible, DOT twice a week can be used for 9 months.
Isoniazid-resistant	6 months of rifampin, once a day	
Isoniazid-rifampin-resistant	Consult a tuberculosis specialist.	
Pulmonary and extrapulmonary (except meningitis)	2 months of isoniazid, rifampin, and pyrazinamide daily, followed by 4 months of isoniazid and rifampin twice weekly under DOT	If possible drug resistance is a concern, another drug (ethambutol or an aminoglycoside) is added to the initial three-drug therapy until drug susceptibilities are determined. DOT is highly desirable.
		If hilar lymphadenopathy only, a 6-month course of isoniazid and rifampin is sufficient.
Meningitis The worst	2 months of isoniazid, rifampin, pyrazinamide, and an aminoglycoside or ethionamide, once a day, followed by 7–10 months of isoniazid and rifampin, once a day or twice a week (9–12 months total)	Drugs can be given 2 or 3 times per week under DOT in the initial phase if nonadherence is likely.
		A fourth drug, usually an aminoglycoside, is given with initial therapy until drug susceptibility is known.
		For patients who may have acquired tuberculosis in geographic areas where resistance to streptomycin is common, capreomycin, kanamycin, or amikacin may be used instead of streptomycin.

# Book!



## Fever

- A fever in children is a temperature over 38 C. In general axillary temperatures underestimate body temperature by 0.5 C
- In rheumatology lecture, we added a nice approach to fever in pediatrics, make sure to go through the article or you can read it from the book



## Bacterial infections

- **Meningococcal infection:** the characteristic skin lesions are non blanching on palpation
- Any febrile child with purpuric rash or who is very unwell should be given **IM benzylpenicillin or IV 3rd generation cephalosporin** before urgent transfer to hospital
- **Pneumococcal infections:** Prophylactic penicillin should be given to high risk children (hyposplenism or asplenic)
- **Scarlet fever:** on average we give antibiotics for 16 hours, it is extended to 10 days to prevent complications such as rheumatic fever and glomerulonephritis and is indicated in high risk countries for RF, if the child or young person is returning to a closed institution, or is at increased risk of infection
- **Impetigo:** affected children should not go to nursery or school until the lesions are dry
- **Boils:** infection of hair follicles or sweat glands, and is usually caused by *S. aureus*. The lesion should be swabbed and treatment is with systemic antibiotics and occasionally surgical incision. Recurrent boils >> usually from persistent nasal carriage in a child or family so skin decontamination of the whole family with bodywash (chlorhexidine) and nasal treatment (mupirocin)
- **Orbital cellulitis:** proptosis, painful or limited ocular movement with or without reduced visual acuity. If you suspect it you should perform CT/MRI and call ophthalmologist
- **Staphylococcal scalded skin syndrome:** they have areas epidermis separate on gentle pressure (Nikolsky sign), leaving denuded areas of skin. Treatment: IV anti staphylococcal antibiotic (flucloxacillin), analgesia and monitoring of hydration and fluid balance

# Book!



## Viral infections

- The infectious period characteristically begins a day or two before the rash appears
- **Herpes simplex virus:** HSV-1 (lip and skin lesions), HSV-2 (genital lesions).
- **Disseminated infection of HSV:** Neonatal HSV (encephalitis, mortality is high), infection in the immunocompromised host (they may develop esophagitis and proctitis)
- **Primary varicella zoster infection:**

Secondary bacterial infection	It may lead to toxic shock syndrome or necrotizing fasciitis <b>we should consider bacterial infection when there is onset of a new fever or persistent high fever after the first few days</b>
CNS involvement	<b>Encephalitis</b> which is milder than the one caused by HSV, more characteristically they may develop <b>cerebellitis</b> where a child presents with ataxia and other cerebellar signs; it develops after rash onset by one week. Usually resolves in a month
Purpura fulminans	Rarely occur after VZV infection due to production of <b>antiviral antibodies</b> , which cross-react and <b>inactivate the inhibitory coagulation factors protein C or protein S</b> . This results in an increased risk of <b>clotting</b> , which most often manifests as <b>purpuric skin rash</b> .

- **Human varicella zoster immunoglobulin** – if immunocompromised and in contact with chickenpox or if there is maternal chickenpox shortly before or after delivery. **Treatment** is mainly supportive; intravenous acyclovir for severe chickenpox and for immunocompromised children.
- Recurrent or multidermatomal shingles suggests a **primary or secondary T-cell immune defect**
- **EBV (Glandular fever):** It is strongly associated with **burkitt's lymphoma** and **nasopharyngeal carcinoma**. Presentation (things were not mentioned in dr's slides): their breathing may be compromised due to severe tonsillitis, petechiae on soft palate, jaundice (**EBV can cause hepatitis**). You can see **atypical lymphocytes** on blood film, positive monospot test (**heterophile antibodies**), monospot test can be negative in young children and early infection (**EBV clinical features + positive monospot test is diagnostic for the infection**), VCA IgM and IgG are unnecessary i monospot test is positive. **Fatigue** is a prominent symptom in adults and adolescents. Treatment is symptomatic and if the airway is severely compromised we give **corticosteroids**.
- **CMV:** Most children have been infected by 2 years of age, often via **breastmilk**. **Heterophile antibodies negative**. Maternal CMV infection may result in congenital CMV infection (*At the end of this lecture, there is a very good figure summarizing all TORCH!!! Make sure to go through it*). In the **immunocompromised host**, CMV can cause retinitis, pneumonitis, bone marrow failure, encephalitis, hepatitis, oesophagitis, and enterocolitis. **It is a very important pathogen following bone marrow and organ transplantation (antiviral prophylaxis (ganciclovir))**. CMV disease may be treated with intravenous ganciclovir, oral valganciclovir, foscarnet or cidofovir.
- **Roseola:** confirmed by PCR since it can misdiagnosed as measles or rubella (**less likely if he child is immunized**). Rarely, they may cause aseptic meningitis, encephalitis, hepatitis, or a mononucleosis like syndrome.
- **Parvovirus (Disease presentation):**

Asymptomatic	Common, especially in adults.
Erythema infectiosum	The most common illness. Fever, malaise, headache and myalgia followed by rash (slapped cheek) which progress week later into lace-like rash on trunk and limbs.
Aplastic crisis	The most serious consequence; common in immunocompromised children and children with hemolytic anemia.
Fetal disease	Hydrops fetalis due to severe anemia.

# Book!



## Viral infections

- **Pleurodynia (Bornholm disease):** An acute illness with fever, pleuritic chest pain, and muscle tenderness. It is an enterovirus clinical syndrome. Resolves in few days.
- **Eczema coxsackium:** it can be confused with eczema herpeticum. Affect young children with eczema, characterized by vesicles, bullae and erosions. It resolves spontaneously. There is no treatment.
- **Enteroviral neonatal sepsis syndrome:** it is intrapartum infection or transplacental. Similar to bacterial sepsis, they present with hypotension and multiorgan failure. The use of intravenous immunoglobulin remains controversial. And there is no antiviral so treatment is supportive.
- **Influenza:** The incubation period is 1–4 days. Children can have severe complications of the virus (myocarditis, pericarditis, encephalopathy) or associated bacterial or fungal superinfection. **Pneumonia** is a major complication. Treatment for hospitalized children is with **neuraminidase inhibitors** (oseltamivir or zanamivir). **Immunization** is the most effective way of preventing infection.
- **Measles:** diagnosis of SSPE is clinical and supported by finding high levels of measles antibody in both blood and CSF, and by characteristic electroencephalogram abnormalities. Impaired cellular immune responses, such as in HIV infection, may result in a modified or absence of rash, with an increased risk of dissemination, including giant-cell pneumonia or encephalitis. **Criteria to diagnose SSPE:**

1. Clinical	Progressive, subacute mental deterioration with typical signs like myoclonus
2. EEG	Periodic, stereotyped, high voltage discharges
3. Cerebrospinal fluid	Raised gammaglobulin or oligoclonal pattern
4. Measles antibodies	Raised titre in serum ( $\geq 1:256$ ) and/or cerebrospinal fluid ( $\geq 1:4$ )
5. Brain biopsy	Suggestive of panencephalitis

Definitive: criteria 5 with three more criteria; probable: three of the five criteria.

- **Mumps:** plasma amylase levels can be elevated and that is due to parotid inflammation and if the it is associated with abdominal pain, pancreas can be involved. The most feared complication is orchitis.
- **Rubella:** Complications are rare in childhood but include arthritis, encephalitis, thrombocytopenia, and myocarditis.
- **Pediatric multisystem inflammatory syndrome:** severe illness in response to **SARS-Cov2** or a **history of contact with infected individual** . Persistent fever, evidence of inflammation (neutrophilia, lymphopenia, high CRP) and single or multi-organ failure. Gastrointestinal symptoms, rash and conjunctivitis. Cardiac involvement includes myocarditis, coronary artery abnormalities, valve involvement and pericardial effusion. Affected children are older than those with KD. We start them on antibiotics until infection is ruled out, treatment is similar to KD treatment (IVIg, low dose aspirin, and corticosteroids). PCR is usually negative but serology is positive in those children.

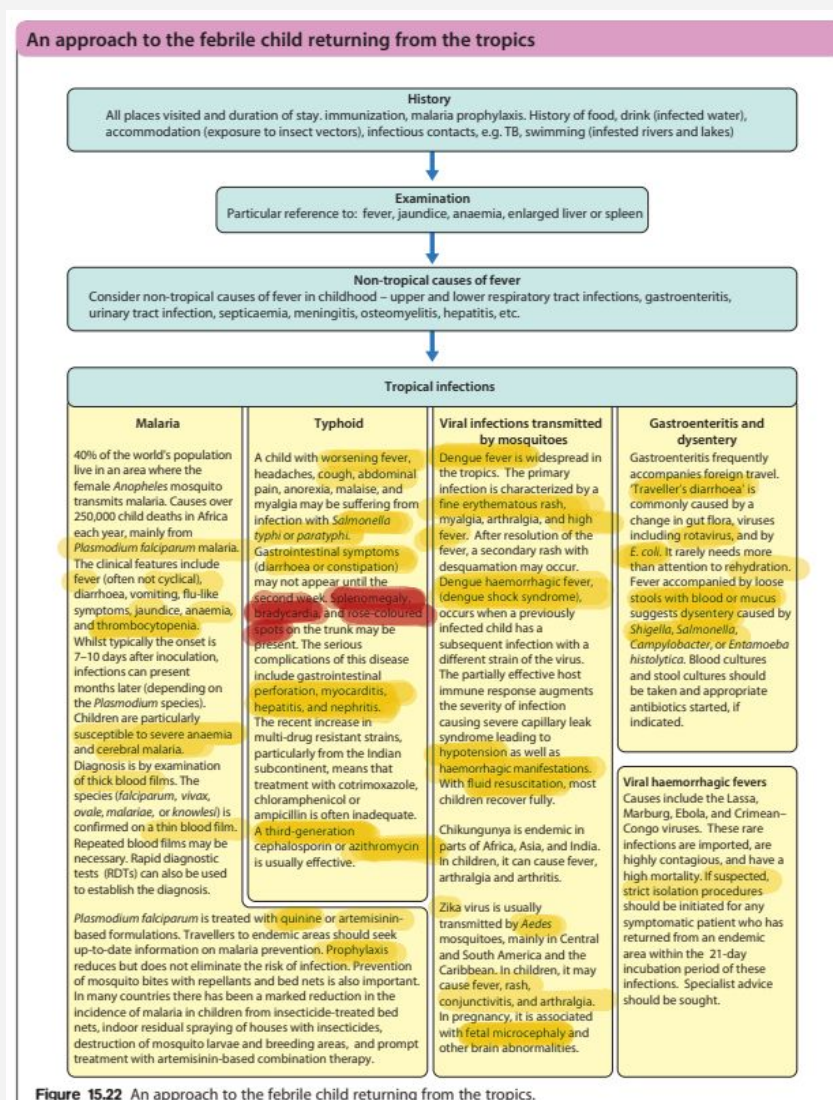


# Book!



## Other infections

- **Nontuberculous mycobacterial infection:** it causes **persistent lymphadenitis** in young children, who are otherwise well, primarily affecting the cervicofacial region. **The skin overlying the node often becomes violaceous and thin.** . Where technically possible without risk of **damage to the facial nerve**, the most commonly used treatment approach is **complete lymph node excision**, as biopsy or partial excision can result in formation of a **chronic fistula and poor healing**. We may also just wait and see as majority of cases will resolve spontaneously or we can use antimycobacterial antibiotics. **Contact tracing is not required like in TB.** **Mycobacterium avium-intracellulare** infections are common in HIV patients. It is also seen in **cystic fibrosis**.
- **Tropical infections:**



- **HIV infection:** In children **over 18 months of age**, HIV infection is diagnosed by detecting antibodies against the virus. Children **less than 18 months of age** who are born to infected mothers will have **transplacental maternal IgG HIV antibodies**; therefore, **at this age a positive antibody test confirms HIV exposure but not HIV infection**. The most sensitive test for HIV diagnosis before 18 months of age is **HIV DNA PCR**, but internationally the most commonly used test is the **viral load assay**. **All infants born to HIV-infected mothers should be tested for HIV infection, whether or not they are symptomatic**. Children with persistent lymphadenopathy, hepatosplenomegaly, recurrent fever, parotid swelling, thrombocytopenia, or any suggestion of serious, persistent, unusual, recurrent infections **should be tested for HIV**.

# Book!



## Other infections

- HIV infection:** Combination antiretroviral therapy should be started in all children regardless of CD4 counts (read about IRIS with ART in HIV, it is interesting manifestation of starting these drugs!! EXTRA), prophylaxis against PCP with **cotrimoxazole** is prescribed for infants who are HIV-infected, and for older children with low CD4 counts. **BCG should not be given** as it is a live vaccine that can cause disseminated disease. Reduction of vertical transmission: Avoidance of breastfeeding reduces the rate of transmission by about 4% for every 6 months. And Postexposure prophylaxis with ART given to the infant for 2–4 weeks after birth. **In low- and middle-income countries, WHO recommends lifelong ART for all pregnant mothers with HIV infection, whatever their CD4 count, and to exclusively breastfeed their babies for the first 6 months before weaning, and continue to breastfeed as long as they wish until 24 months.**



**Figure 15.23** Lymphocytic interstitial pneumonitis in a child with human immunodeficiency virus infection. There is diffuse reticulonodular shadowing with hilar lymphadenopathy.

## TORCH (EXTRA but good to read);

