FEVER and RASH:

MORE THAN MEETS the EYE

Introduction

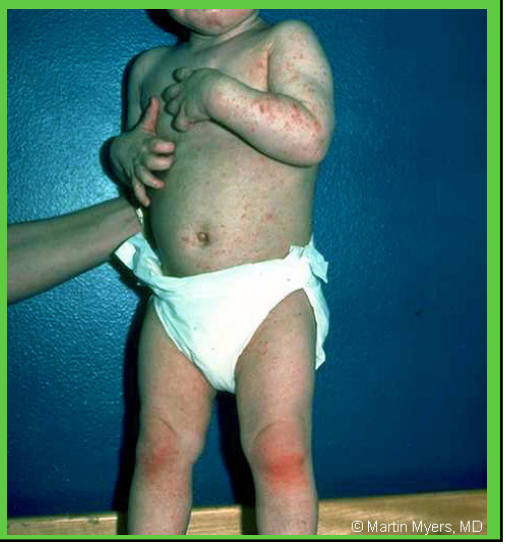
"RASH"

- Most hallmark of disease or
- Ar ess
- Di critic
- Re d
- appropriate ment and in tion control

Panic?

Beware of the child with skin lesions!

- Rashes (+/-fever)
- Skin Infections
- Skin Infestations



"Rashes"
Cutaneous Manifestations of Systemic Infections

Cutaneous Manifestations of Systemic Infections ("Rashes")

- Rashes: caused by many different types of viruses, bacteria, fungi, protozoan and metazoan agents
- Exanthem: often offers important clues to the etiology of a patient's illness
- By skin examination alone, it is difficult to differentiate a "rash" from a systemic infection vs primary cutaneous (local) diseases

Important Aspects in the Diagnosis of Exanthematous Illness

- Exposure
- Season
- Incubation Period
- Age
- Previous exanthems
- Relationship of rash to fever
- Adenopathy
- Type of rash
- Distribution of rash
- Progression of rash
- Enanthem
- Other associated sxs
- Laboratory tests

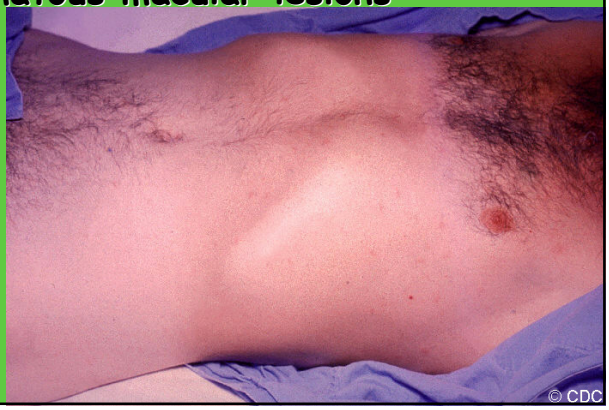
Erythematous Macular Exanthems

Infectious Agent	Illness
Human herpes virus 6, 7	Roseola Infantum
Epstein-Barr virus	Infectious mononucleosis
Parvovirus	Erythema infectiosum
Coxsackie viruses B1, B2, B5	-
Echoviruses 2, 4, 5, 14, 17-19, 30	-
Enterovirus 71	-
Dengue virus	Dengue Fever
Mycoplasma pneumoniae	-
Staphylococcus aureus	Septicemia and toxic shock synd
Salmonella typhi	Typhoid Fever
Leptospira species	Leptospirosis

Typhoid Fever

Fever, headache, anorexia, malaise, abdominal pain, "Rose spots"

- **abdomen, less on chest and back**
- **2-4mm erythematous macular lesions**

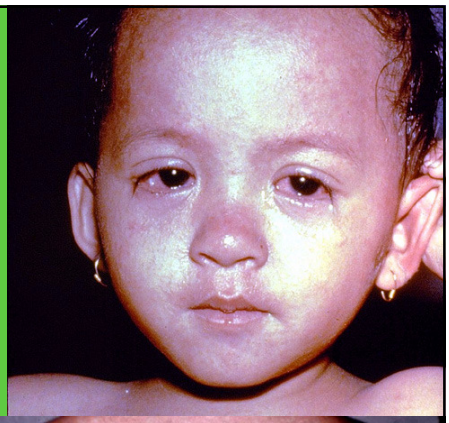


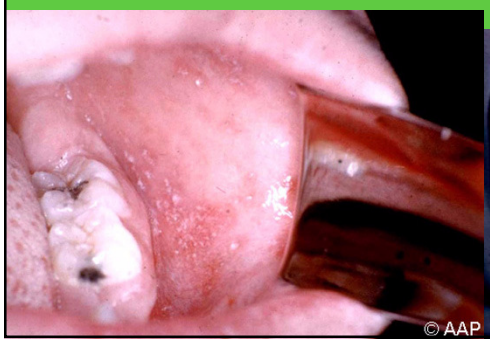
Erythematous Maculopapular Exanthems

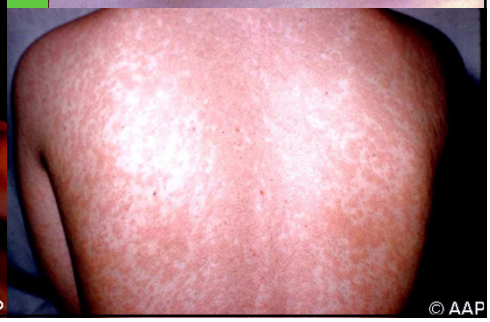
Infectious Agent	Illness
Parvovirus	Erythema infectiosum
Adenoviruses 1, 2, 3, 4, 7, 7a	
Human herpesvirus 6	Roseola infantum
Epstein Barr virus	Infectious mononucleosis
Coxsackieviruses A2, A4, A7, A16, B1-B5	
Echoviruses 1-7, 9, 14, 16-19, 22, 25, 30	
Enterovirus 71	
Dengue virus	Dengue Fever
Rubella virus	German Measles
Mumps virus	Mumps
Measles virus	Measles
Hepatitis B virus	Hepatitis
Mycoplasma pneumoniae	
Staphylococcus aureus	Staphylococcal Scarlet Fever
Streptococcus pyogenes	Scarlet Fever
Neisseria meningitidis	Meningococcemia
Bartonella henselae	Cat-scratch fever
Treponema pallidum	Secondary syphilis
Leptospira species	Leptospirosis

Measles (Rubeola)

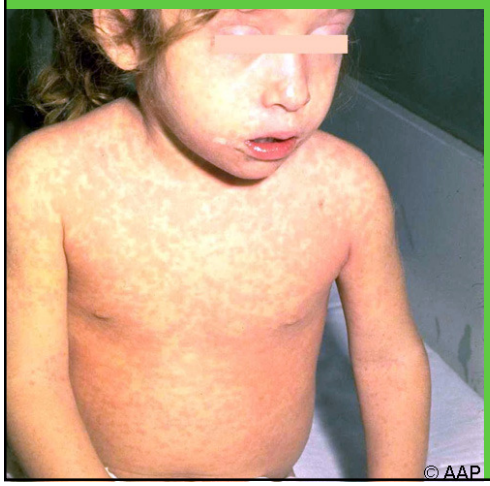
- Fever, cough, coryza, conjunctivitis, maculopapular rash, "Koplik spots"

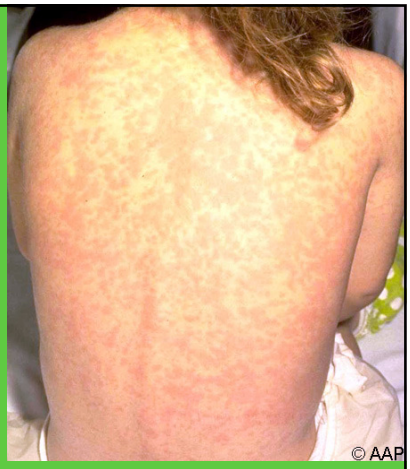






Measles (Rubeola)

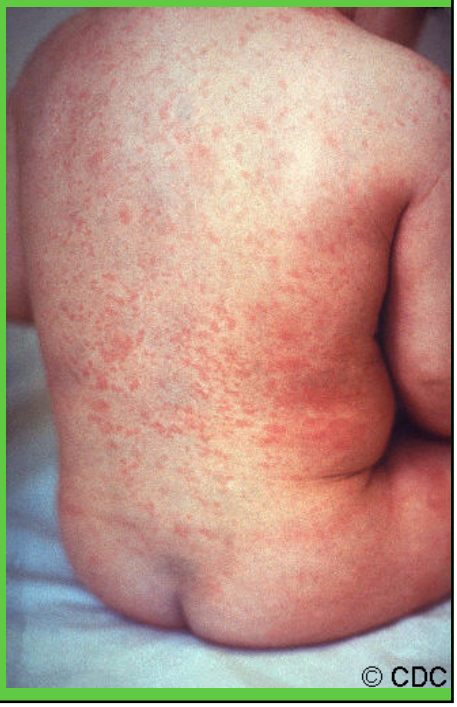




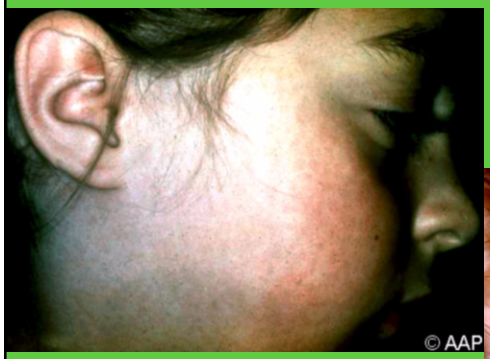
Airborne precautions until 4 days after the onset of rash and the duration of illness for immuno-compromised patients.

German Measles (Rubella)

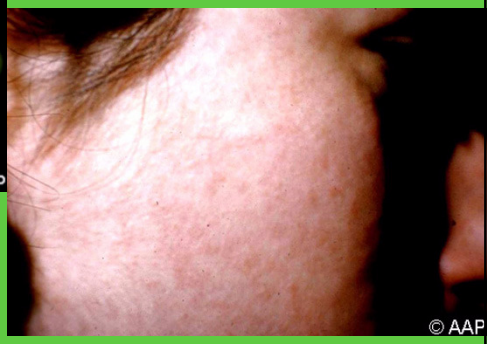
- Mild, slight fever, maculopapular rash, generalized lymphadenopathy
- Rash:
  - cephalocaudal spread
  - Lasts approx. 3 days



German Measles (Rubella)



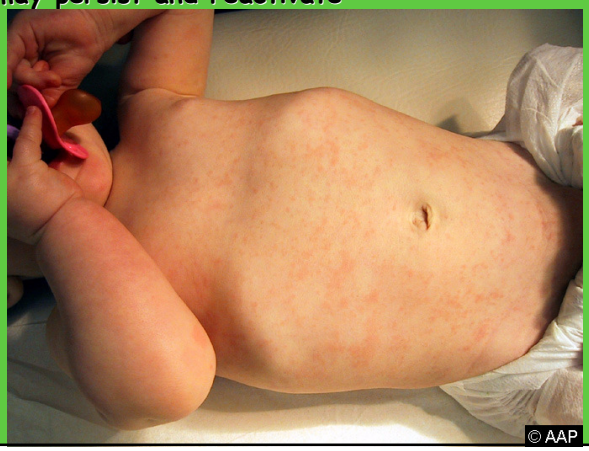
Adolescent females: commonly with polyarthralgia/polyarthritis



- Droplet precautions until 7 days after onset of rash

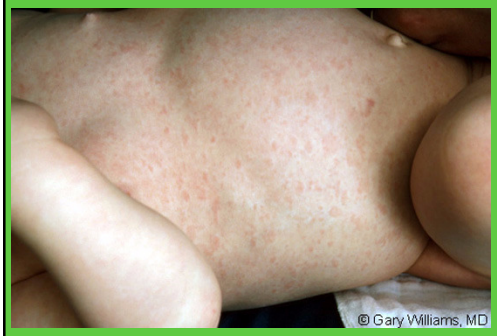
Roseola infantum
(Exanthem subitum, Human herpesvirus 6)

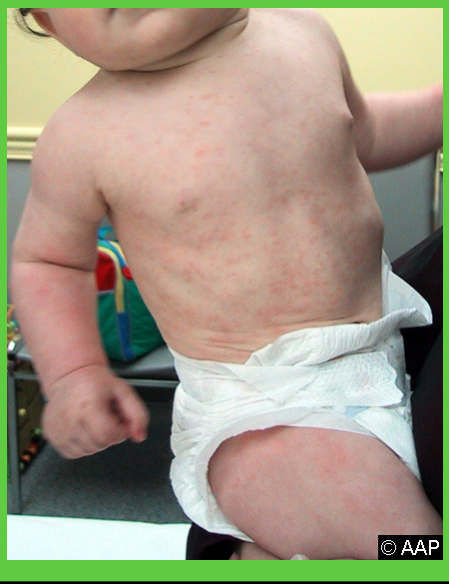
- High fever (3-7 days), followed by maculopapular rash lasting for hours to days, (10-15% with seizures)
- Lymphadenopathy, GIT/RT sxs, inflamed lympanic membrane, +/- bulging anterior fontanelle
- Virus may persist and reactivate



Roseola infantum

(Exanthem subitum, Human herpesvirus 6)



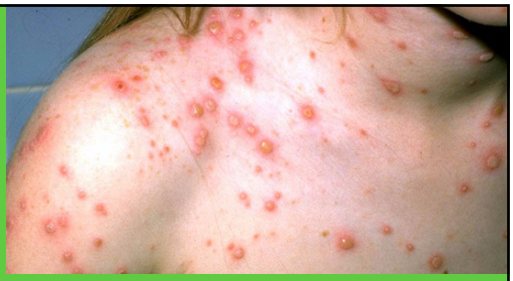


Standard precautions

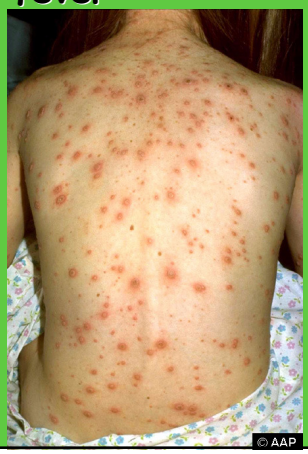
Vesicular Exanthems

Infectious Agent	Illness
Herpes simplex virus type 1 and 2	Cold sores, genital herpes, or neonatal
Varicella-zoster virus	Chickenpox or herpes zoster
Orf virus	Smallpox
Coxsackieviruses A4, A5, A8, A10, A16	Ecthyma contagiosum
Coxsackieviruses B1-3	
Echoviruses 6, 9, 11, 17	
Enterovirus 71	
Mumps virus	Mumps
Measles virus	Atypical measles
Streptococcus pyogenes	Impetigo
Bacillus anthracis	Anthrax
Mycobacterium tuberculosis	Papulonecrotic tuberculids
Candida albicans	Congenital cutaneous candidiasis
Necator americanus	Hookworm disease

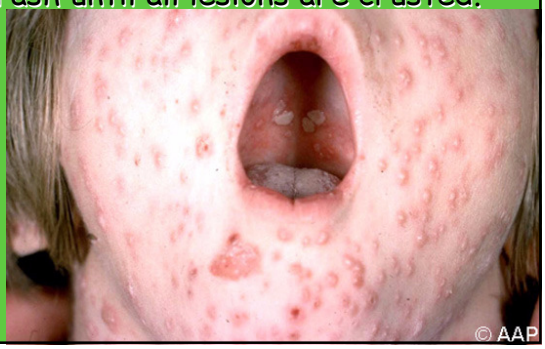
Chickenpox (Varicella zoster)



Generalized, pruritic vesicular rash, mild fever



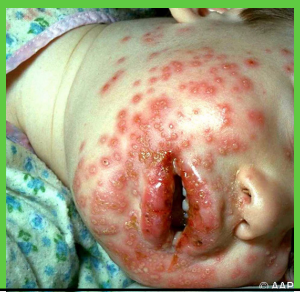
Airborne and contact precautions – minimum of 5 days after onset of rash until all lesions are crusted.

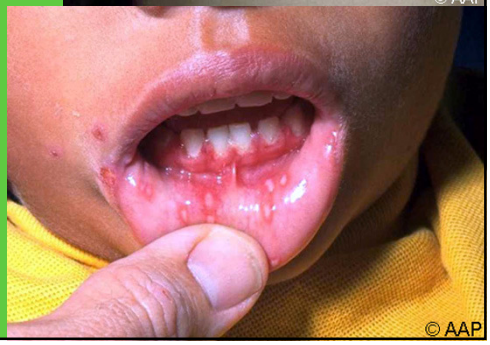


Herpes simplex 1 and 2

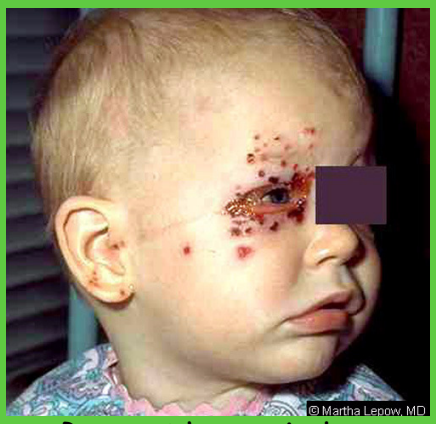
Most common clinical manifestation in children = gingivostomatitis

(fever, irritability, tender submandibular adenopathy, ulcerative enanthem on gingiva and mucous membranes of mouth, and perioral vesicular lesions)



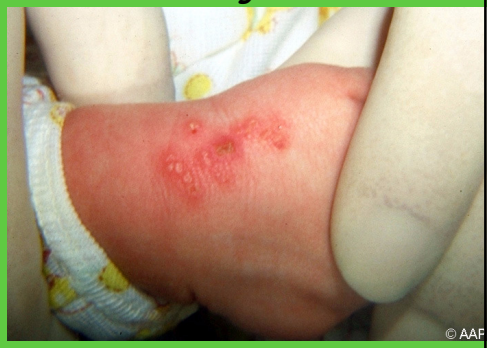


Herpes simplex 1 and 2



Recurrent herpes simplex periorbital vesicles

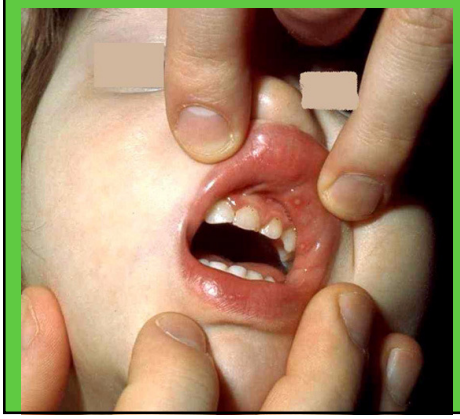
"sucking blisters"

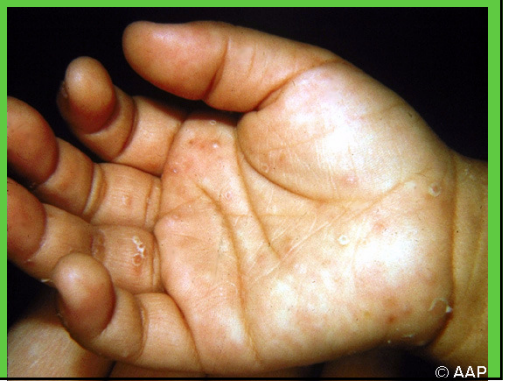


Contact precautions during duration of illness.

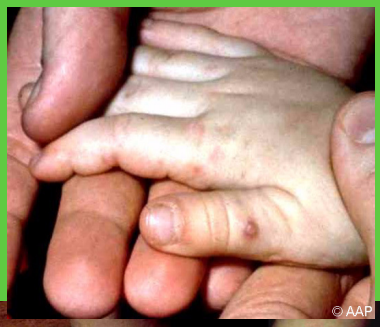
Hand, Foot, and Mouth Syndrome

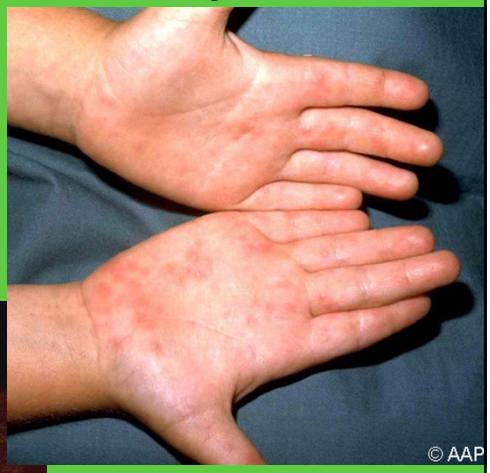
- Vesicular lesions in the anterior of the mouth and on the hands and feet
- +/- fever, sore mouth, anorexia, malaise, abdominal pain
- Enteroviruses, HSV, but commonly Coxsackievirus A16

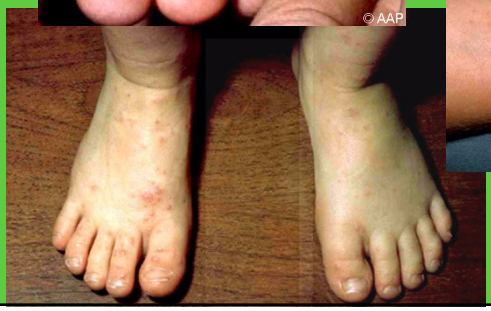




Hand, Foot, and Mouth Syndrome







Contact precautions for the duration of illness

Petechial and Purpuric Exanthems

Infectious Agent	Illness
Human Parvovirus B19	Glove and socks syndrome
Varicella-zoster virus	Hemorrhagic chickenpox
Cytomegalovirus	Congenital cytomegalovirus infection
Coxsackieviruses A4, A9, B2-B4 Echoviruses 4, 7, 9	
Rubella virus	Rubella or congenital rubella
Measles virus	Hemorrhagic or atypical measles
Streptococcus pyogenes	Scarlet fever or septicemia
Streptococcus pneumoniae	Pneumococcal septicemia
Neisseria gonorrheae	Gonococcemia
Neisseria meningitidis	Meningococcemia
Haemophilus influenzae	H. Influenzae septicemia
Pseudomonas aeruginosa	Ecthyma gangrenosa
Bartonella henselae	Cat-scratch fever
Treponema pallidum	Congenital syphilis
Toxoplasma gondii	Congenital toxoplasmosis

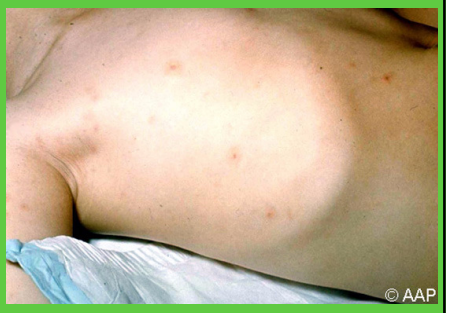
Meningococcemia

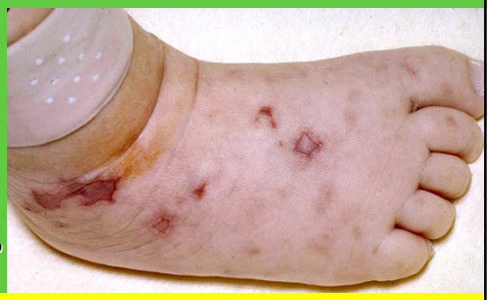
Abrupt onset of fever, chills, malaise, rash (macular → petechial)

Fulminant – DIC, shock, coma, death within hours

Flu-like illness followed within 48 hrs by a rash in 70-90% of patients

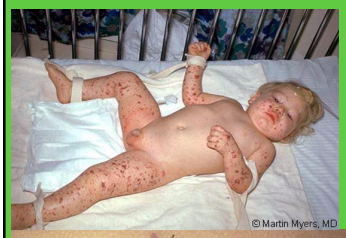
- petechial/purpuric 60-70%
- maculopapular in 10-15%
- purpura fulminans in 5-10%

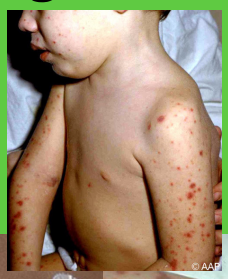


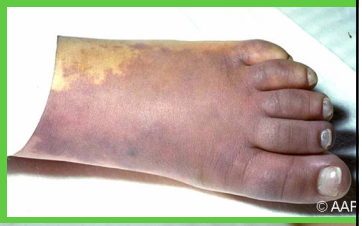


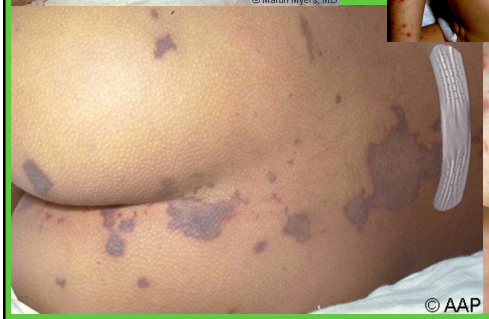
Chemoprophylaxis for those at high risk warranted within 24 hours of diagnosis of case.

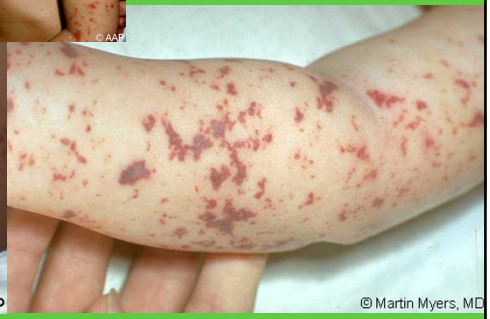
Meningococcemia



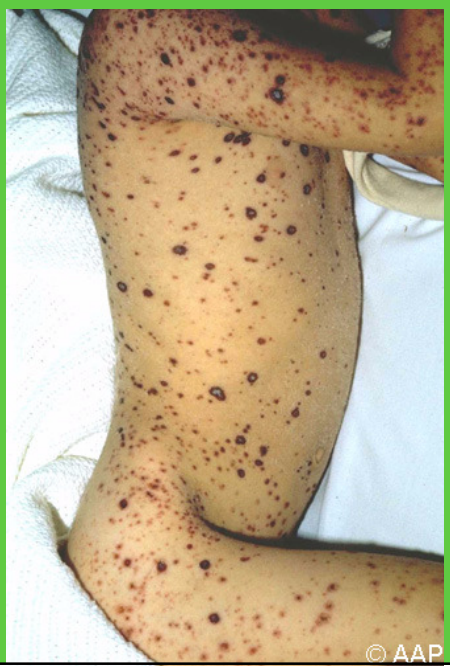








Droplet precautions until 24 hours after initiation of effective antimicrobial therapy



Hemorrhagic Chickenpox

Hemorrhagic varicella common in immunocompromised hosts.

DIAGNOSTIC CHALLENGE!!!

FEVER AND RASH IN CHILDREN

MA. CARMEN NIEVERA, MD, DPIDSP
Pediatric Infectious Disease Specialist

MA. TERESITA GABRIEL, MD, FPDS
Dermatologist

Definition

- Acute, febrile, self-limited, systemic vasculitis of unknown etiology that occurs predominantly in infants and young children, diagnosed based on characteristic clinical symptoms.

- Dr. Tomisaku Kawasaki 1967

  "febrile oculo-oro-cutaneo-acrodesquamatous syndrome with or without nonsuppurative cervical lymphadenitis"

Epidemiology

- Endemic and community-wide epidemic forms
- Children of all races

  Japanese > Asians and Pacific islanders > African Americans > Hispanics > Caucasians
- Leading cause of acquired heart disease in children
- Evidence of familial susceptibility:

  Patients with parents who also had KD:
  - Increased odds for + sibling cases (OR 6.94)
  - Mean age of onset younger than parents
  - More likely for recurrence, retreatment, complications

Uehara R. et al. *Clinical Features of Patients with Kawasaki Disease Whose Parents Had the Same Disease.* Arch Pediatr Adolesc Med. 2004 Dec; 158 (12): 1166-9.

Epidemiology

- Usual age range: 1 to 5 years old
  - Median: 2 years old (20 days old – 31 yrs old)
  - Boys (1.5 to 1.7) > girls (1)
- Recurrence rate: 1.3 - 3%
- Rate in a sibling: 2.1% (within 1 year)
- Seasonality:
  - US: winter and early spring
- Reports of associations with:
  - Antecedent respiratory illness
  - Exposure to carpet-cleaning fluids, rugs, tatami mats
  - Preexisting eczema
  - Using humidifier
  - Living near standing body of water

Chang et al. *Epidemiologic Features of Kawasaki Disease in Taiwan, 1996-2002.* Pediatrics. 2004 Dec; 114 (6):e678-82

Diagnosis, Treatment, and Long-Term Management of Kawasaki Disease: A Statement for Health Professionals From the Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association

KAWASAKI DISEASE
Diagnostic Criteria

Persistent fever (>5 days)= > 38.3 ºC

→100%

Plus 4 out of 5 conditions:

1. **Bilateral conjunctivits (non-purulent) → 92%**
2. **Oral mucosa involvement: →100%**
   (injected or fissured lips,injected pharynx or strawberry tongue)
3. **Peripheral extremity changes → 72%**
4. **Rash (polymorphous) →100%**
5. **Cervical lymphadenopathy → 72%**

Pediatrics 2004;114;1708-1733

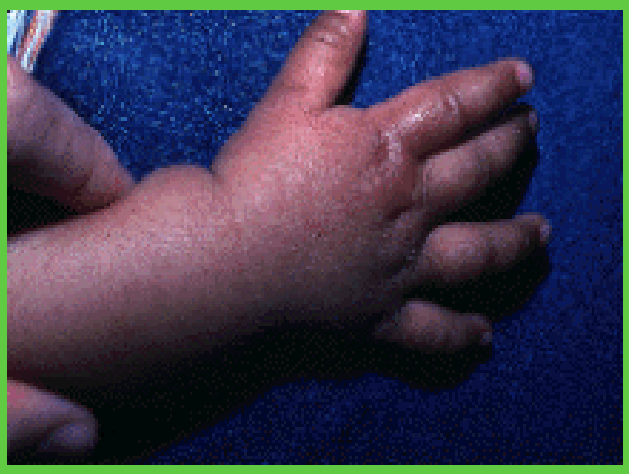
Clinical and Laboratory Findings

- **Fever:**
  - **CDC: Fever (>38.5 rectally) present for at least 5 days without other explanation**
  - **Day 1 = 1st day of fever**
  - **High-spiking, remittent**
  - **39 to 40ºC**
  - **Untreated: Persists for mean of 11 days (may extend to 3 to 4 weeks)**
  - **Treated: usually resolves in 2 days**

Clinical and Laboratory Findings

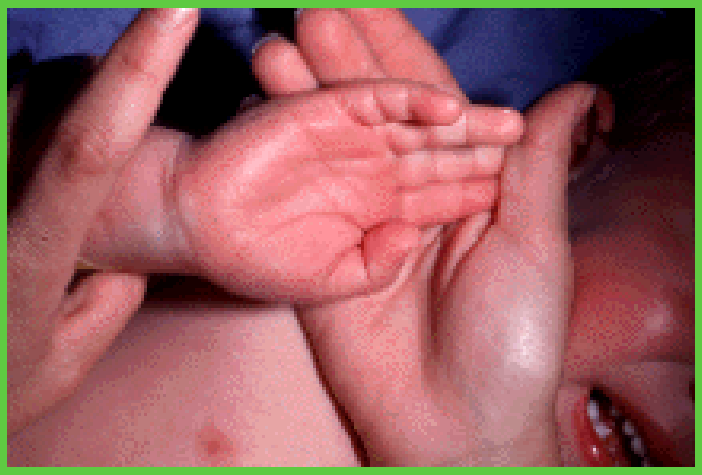
1. **Changes in extremities** (at least one of the following):
   - Acute phase:
     - Erythema of palms and soles (80%)
     - Firm, painful induration of hands and/or feet (67%)
   - Subacute (2 to 3 weeks after onset of fever):
     - Desquamation of fingers and toes (29%)
     - Periungual region → palms and soles
   - Convalescent (1-2 months after onset of fever):
     - Beau's lines (deep transverse grooves across the nails)

(Kawasaki Disease)



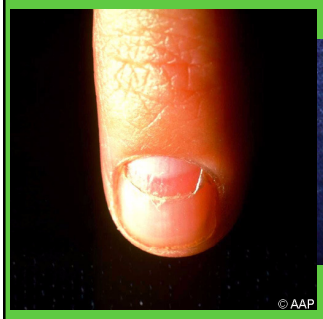
Swelling of the dorsum of the hand associated with fusiform swelling of the digits. Erythema of the PIP and DIP joints suggests small joint arthritis.

(Kawasaki Disease)

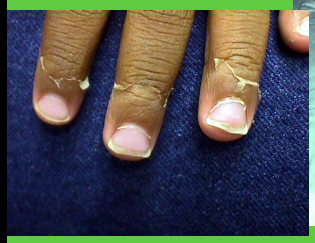


Diffuse erythema of the palm. This finding is usually bilateral and may fluctuate in intensity with the height of the fever. Unlike the rash on other parts of the body, there is no pattern to the erythema.

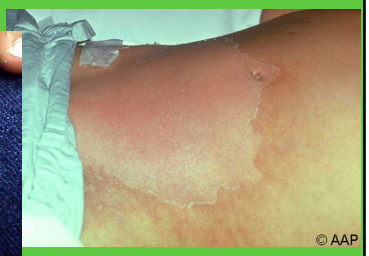
(Kawasaki Disease)



Periungual desquamation of a patient with Kawasaki syndrome.



Desquamation of the skin of the distal fingers following Kawasaki syndrome in a 4-year-old boy.



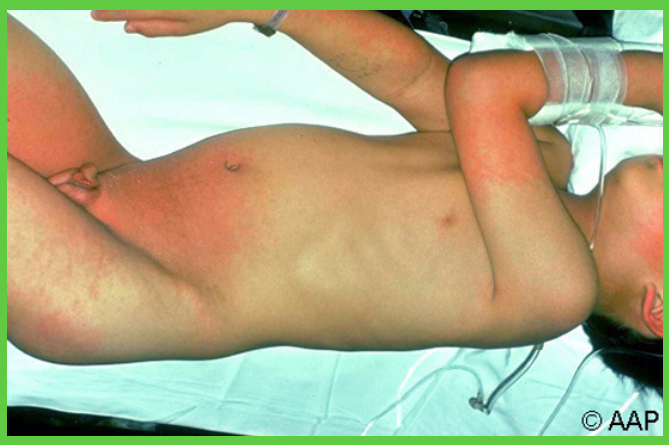
Desquamation of the skin Over the abdomen

Clinical and Laboratory Findings

2. Polymorphous exanthem (92%) :

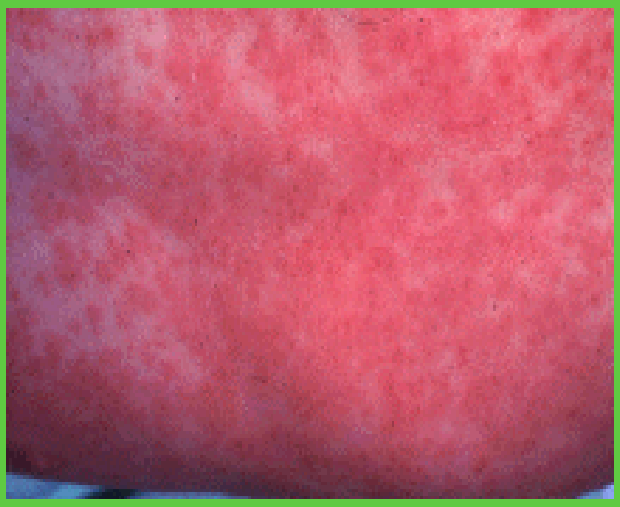
- Appears within 5 days of fever
- Various forms:
  - Nonspecific, diffuse, maculopapular (common)
  - Others :
    - Urticarial exanthem
    - Scarlatiniform rash
    - Erythroderma
    - Erythema-multiforme-like rash
    - Fine micropustular eruption
    - NOT DESCRIBED: bullous, vesicular
  - Extensive:
    - Face, trunk, extremities, perineal accentuation

(Kawasaki Disease)



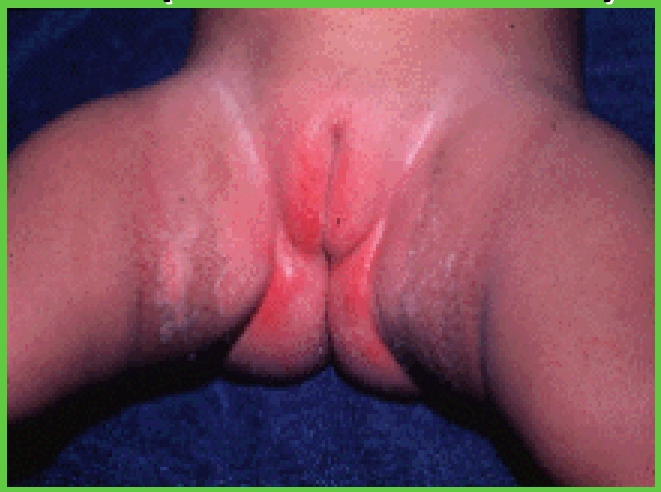
Characteristic distribution of erythroderma of Kawasaki syndrome. The rash is accentuated in the perineal area in approximately two thirds of patients.

(Kawasaki Disease)



Micropustular rash of Kawasaki disease with petechiae. This unusual rash is uncommon but is quite specific for Kawasaki disease. Tiny micropustules can be seen when a beam of light is shined tangentially across the skin.

(Kawasaki Disease)



Accentuation of rash in groin associated with desquamation during acute Kawasaki disease (seen in 50% of KD patients).

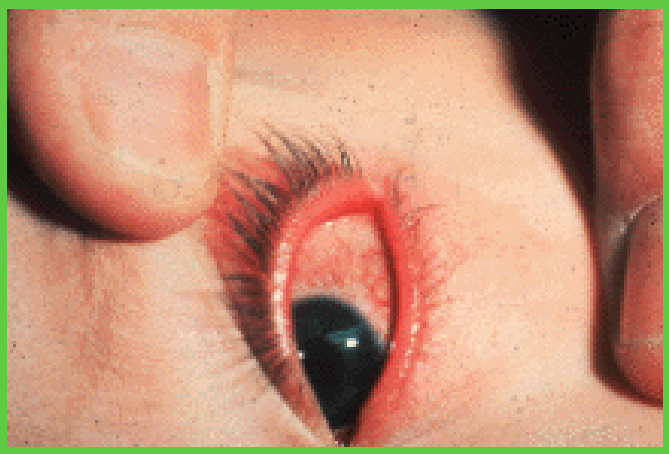
Clinical and Laboratory Findings

3. Conjunctival injection:

- Bilateral, painless
- Begins shortly after fever onset
- Bulbar conjunctivae
- Spares limbus
- NOT SEEN: exudate / conjunctival edema / corneal ulceration
- Keratitis is seen in the minority of patients.
- Resolves rapidly
- 94%: *percentage of U.S. patients manifesting this clinical sign within the first ten days after onset of fever.*

Burns, et al.,

(Kawasaki Disease)



Characteristic bilateral, non-exudative conjunctivitis associated with KD. Note the perilimbal sparing with a halo of white around the iris. The dry conjunctivitis of KD is virtually pathognomonic for this systemic vasculitis.

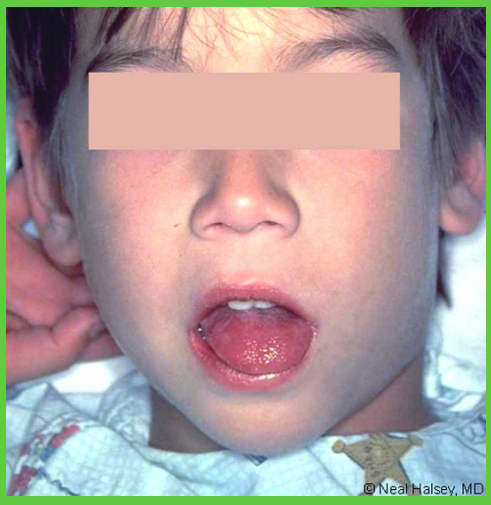
Clinical and Laboratory Findings

4. Changes of lips and oral cavity

(at least one of the following):

- **Lips: erythema, dryness, fissuring, peeling, cracking, and bleeding (70%)**
- **“strawberry tongue” (71%)**
- **Diffuse oropharyngeal erythema without discrete lesions (70%)**
- **NOT SEEN: ulcerations and exudates**

(Kawasaki Disease)



Characteristic cutaneous and mucous membrane changes of Kawasaki syndrome.

Clinical and Laboratory Findings

5. Cervical lymphadenopathy :

- Least common (42%)
- Usually unilateral
- Anterior cervical triangle
- ≥1 lymph node that is ≥1.5 cm in diam.
- Firm, nonfluctuant, non-suppurative
- No associated erythema
- Nontender or slightly tender

Other clinical and laboratory findings

- **Cardiovascular findings**
  - Congestive heart failure, myocarditis, pericarditis, valvular regurgitation
  - Coronary artery abnormalities
  - Aneurysms of medium-size noncoronary arteries (subclavian, brachial, axillary, iliac, femoral, abdominal aorta, renal arteries)
  - Raynaud's phenomenon
  - Peripheral gangrene
- **Musculoskeletal system**
  - Arthritis, arthralgia
- **Gastrointestinal tract**
  - Diarrhea, vomiting, abdominal pain
  - Hepatic dysfunction, obstructive jaundice
  - Hydrops of gallbladder

Other clinical and laboratory findings

- **Central Nervous System**
  - Extreme irritability
  - Aseptic meningitis
  - Sensorineural hearing loss
  - Facial nerve palsy
- **Genitourinary system**
  - Urethritis/meatitis
- **Other findings**
  - Erythema, induration at BCG inoculation site
  - Anterior uveitis (mild)
  - Desquamating rash in groin

Laboratory findings in Acute Kawasaki disease

- Leukocytosis with neutrophilia and immature forms
- Elevated ESR
- Elevated CRP
- Anemia
- Abnormal plasma lipids
- Hypoalbuminemia
- Hyponatremia
- Thrombocytosis after week 1
- Sterile pyuria
- Elevated serum transaminases
- Elevated serum gamma glutamyl transpeptidase
- Pleocytosis of cerebrospinal fluid
- Leukocytosis in synovial fluid

Laboratory findings in Acute Kawasaki disease:

- **Thrombocytosis:**
  - 500,000 to > 1 million/mm^3
  - Mean: 700,000/mm^3
  - Usually in 2nd week
  - Peaks in 3rd week
  - Returns to normal by 4 to 8 weeks
- **Thrombocytopenia:**
  - May be a sign of DIC
  - Risk factor for coronary aneurysms

Clinical Phases of Illness:

ACUTE PHASE	SUBACUTE PHASE	CONVALESCENT PHASE
Fever, rash, conjunctival injection, strawberry tongue, erythema/ edema of hands and feet, lymphadenitis, aseptic meningitis, myocarditis, pericardial effusion, hepatic dysfunction	Fever and physical findings disappear, irritable, anorexic, arthritis, desquamation, thrombocytosis	All clinical signs and symptoms disappear, until ESR returns to normal.
8 - 30 days →	2 to 4 weeks →	6 to 8 weeks

Greatest risk for sudden death

Therapeutic Options

Recommended:

✓ IVIG - 2g/kg over 10 to 12 hours as a single dose combined with ASA -
Old dosaging - 400 mg/kg/day over 2h x 4 consecutive days

✓ Aspirin (ASA)
- 80mg to 100 mg/kg/day in four divided doses
- 3 to 5 mg/kg/day continued for 6 to 8 weeks after onset of illness
- indefinitely for coronary artery abnormalities

✓ Emollients for desquamating skin
✓Antihistamine for pruritus
✓ IV Methyprednisolone
- pulse dose of 30mg/kg for 30 days (if fever persists after two or three doses of IVIG.

✓***CURRENT STANDARD:***
- IVIG 2 g/kg plus salicylates before day 10 of fever

Treatment
(Acute and Subacute Stages)

1. **Aspirin**
   - Does not lower frequency of coronary aneurysms
   - ASA + IVIG = additive effect
   - **High dose** (anti-inflammatory):
     - 80-100 mg/kg/day in four divided doses
     - High dose until 14th illness day and patient afebrile at least 2-4 days; until afebrile for 3-4 days; until afebrile for 4-5 days
   - **Low dose** (anti-thrombotic):
     - 3-5mg/kg once daily for 6-8 weeks
     - Maintain indefinitely if patient has coronary abnormalities
   - Reminders:
     - Ibuprofen antagonizes ASA irreversible platelet inhibition.
     - Risk of Reye Syndrome:
       high dose ASA + active Varicella or Influenza
     - Annual Influenza Vaccine
     - Avoid ASA 6 weeks after Varicella Vaccine

Treatment
(Acute and Subacute Stages)

2. **Intravenous gamma globulin (IVIG)**
   - Mechanism: unknown
     (generalized anti-inflammatory effect)
   - 2 g/kg single infusion over 10-12 hours
     - Within 1st 7-10 days of illness
     - Tx within <5 days → increased need for IVIG retreatment.
     - Give after 10th day of illness if + persistent fever, aneurysm, ongoing systemic inflammation.
     - IVIG may be repeated if fever persists or recurs together with at least one classic sign of Kawasaki disease
   - Adverse effects – vary among products
   - Defer measles and varicella immunization ≥ 11 months after IVIG administration
   - Sequelae: 5% → transient coronary dilation
     1% → coronary aneurysm

Complications

1. **Coronary Artery Aneurysm**
   - **Untreated = 20-25%**
   - **Treated = 2%**
2. **Neurologic**
   - **1-30% of cases**
   - **Aseptic meningitis (26-50%)**
   - **Seizures**
   - **Increased ICP**
   - **Ataxia**

Complications

- Death - 1-2 % of all cases
  - within 2 months of DX.
  - Acute myocarditis
  - Cardiac arrhythmia
  - Myocardial Infarction
- Early recognition
- Prompt management
  - reduce morbidity
    (reduce inflammation in the myocardial wall)
  - prevent mortality (prevent coronary thrombosis)

Meningococcal Disease

- *Neisseria meningitidis* (gram negative diplococcus)
- **Incubation period:** 1 – 10 days (< 4 days)
- **Epidemiology:**
  - Most cases of meningococcal disease are endemic
    - <5% associated with outbreaks
  - A, B, C, Y, W-135 most commonly implicated in invasive disease worldwide
  - Peak ages of attack:
    - < 1 year old and 15 – 18 years old

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Meningococcal Disease

- **Fulminant case (meningococcemia):**
  purpura, limb ischemia, coagulopathy, pulmonary edema, shock, coma, death within hours
- **Meningococcal meningitis:**
  ssxs indistinguishable from meningitis caused by *S pneumoniae* and other meningeal pathogens

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Meningococcal Disease

- **Associated with Death:**
  - young age, absence of meningitis, coma, hypotension, leukopenia, thrombocytopenia
- **Case fatality rate:** 10%
- Less common:
  - pneumonia, febrile occult bacteremia, conjuctivitis, septic arthritis, chronic meningococcemia
- **Invasive meningococcal infections:**
  - arthritis, myocarditis, pericarditis, endophthalmitis
- **Sequelae:** 11 – 19%
  - Hearing loss, neurologic disability, digit or limb amputations, skin scarring

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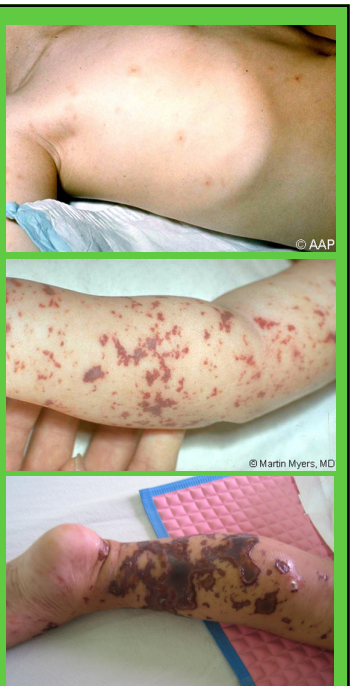
Meningococcal Disease

- **Maculopapular and petechial rash**
  - Indistinguishable from rash of other viral infections
- **Purpuric rash** – occurs in severe sepsis
  - May be caused by other bacterial pathogens, including *S pneumoniae*
- Disease progression: rapid !



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Meningococcal Disease

- **Diagnostic Tests:**
  - Gram stain (may be helpful)
    - Petechial/purpuric scraping, CSF
    - buffy coat smear of blood
  - Culture (diagnostic)
    - Blood, CSF
    - Petechial/purpuric lesion scraping
  - Nasopharyngeal swab – not helpful
  - CSF Bacterial antigen detection
    - helpful if clinically compatible
  - PCR of clinical specimens when available

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Meningococcal Disease

- **Treatment:**
  - Treat shock and raised intracranial pressure!
  - Empiric tx: Cefotaxime or Ceftriaxone
  - Etiology confirmed:
    - Penicillin G (drug of choice)
      - 250,000-300,000 U/kg/day max: 12 mil U/day div q 4-6 hours
    - Alternatives: Cefotaxime, Ceftriaxone, Ampicillin
    - 5 to 7 days antimicrobial treatment
    - Ceftriaxone – most cost effective
      - Reduced nursing time, single daily dose
      - Clears CSF rapidly
      - Clears nasopharyngeal carriage after 1 dose

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Meningococcal Disease

- **Infection Control:**
  - Standard precautions
  - Droplet precautions until after 24 hrs of effective antimicrobial therapy
  - Chemoprophylaxis

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Invasive Meningococcal Disease: Case Definitions

- **Confirmed**
  - Clinically compatible case, and
  - Isolation of N meningitidis from a sterile site (blood, CSF, pleural fluid, skin lesions)
- **Probable**
  - Clinically compatible case, and
  - +antigen test/immunohistochemistry/PCR
- **Suspect**
  - Clinically compatible case and gm(-) stain in any sterile fluid (CSF, synovial fluid) or skin lesion
  - Clinical purpura fulminans without + culture

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Disease Risk for Contacts of People with Meningococcal Disease

- **High Risk: chemoprophylaxis recommended** (close contacts)
  - **Household contact** (specially children <2yrs)
  - **Childcare/preschool contact** within 7 days of onset of illness
  - **Direct exposure to patient's secretions** (kissing, sharing toothbrushes, eating utensils) within 7 days of onset of illness
  - **Mouth-to-mouth resucitation, unprotected contact** during ET intubation within 7 days of illness
  - **Frequently slept in same dwelling** as patient within 7 days of illness
  - Passengers **seated directly next to patient** during airline flights lasting > 8 hrs

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Disease Risk for Contacts of People with Meningococcal Disease

- **Low Risk: chemoprophylaxis NOT recommended**
  - **Casual contact:** no direct exposure to patient's secretions
  - **Indirect contact:** only contact is with high-risk contact, no direct contact with patient
  - **Healthcare professionals without direct exposure** to patient's secretions
- **In outbreak or cluster**
  - Chemoprophylaxis for people other than people at high risk should be administered only after consultation with local public health authorities

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Recommended Chemoprophylaxis for High Risk Contacts and People with Invasive Meningococcal Disease

Age of child/ adult	Dose	Duration	Efficacy (%)
Rifampicin			90-95
< 1 mo	5mg/kg q 12h PO	2 days	
≥ 1 mo	10mg/kg (max 600mg) q 12h PO	2 days	
Ceftriaxone			90-95
<15 y	125mg IM	Single dose	
≥15 y	250mg IM		

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Recommended Chemoprophylaxis for High Risk Contacts and People with Invasive Meningococcal Disease

Age of child/ adult	Dose	Duration	Efficacy (%)
Ciprofloxacin			90-95
≥1 mo	20mg/kg (max 500mg) PO	Single dose	
Azithromycin	10mg/kg (max 500mg) PO	Single dose	90

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Recommended Meningococcal Vaccines in Previously Unimmunized People to Prevent Invasive Meningococcal Disease

Population Group	< 2yrs old	2 – 10 yrs old	11 – 18 yrs old	19 – 55 yrs old
General population	NR	NR	MCV4 IM	NR
Increased Risk: College freshmen, certain travelers, outbreaks, increased susceptibility, military recruits	NR	MCV4 IM or MPSV4 SQ	MCV4 IM (MPSV4 acceptable)	MCV4 IM (MPSV4 acceptable)

MCV4 – tetravalent meningococcal (A, C, Y, W-135) conjugate vaccine
MPSV4 – tetravalent meningococcal (A, C, Y, W-135) polysaccharide vaccine

PFV 2009: single dose ≥ 2yrs old at high risk for disease (outbreak: infants 3mos-2yrs old may be given 2 doses at least 3mos apart; revaccination if w continued risk 3-5 yrs later.

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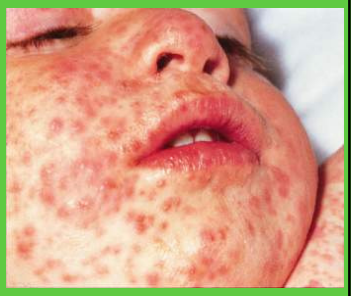
Varicella Zoster (Chickenpox)

- Varicella zoster virus (VZV)
- Member of herpesvirus famiy
- **Incubation period:** 14 – 16 days (10-21 days)
- **Contagiousness:** 1-2 days before onset of rash to crusting of all lesions

Varicella disease: chickenpox

- Primary infection causes varicella (chickenpox)
- Generalized pruritic vesiculo-papular rash 250-500 lesions in various stages
- Usually accompanied by fever + other systemic symptoms



[1] CDC 2007 In: Atkinson W *et al.*, eds. Epidemiology and prevention of vaccine-preventable diseases. 10th. Washington DC: Public Health Foundation, 2007:175–96.

Varicella complications

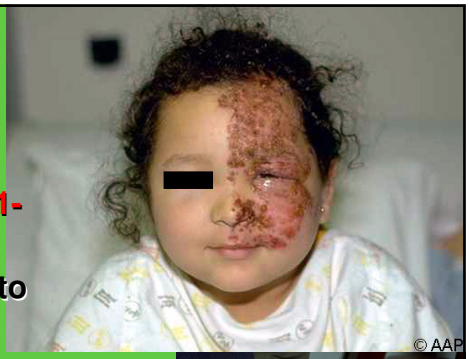
Majority of complications in otherwise healthy individuals[1,2]

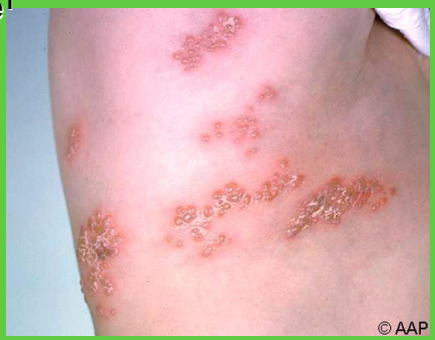
Skin/soft tissue/bone/joint infections	Central nervous system complications	Respiratory complications/ others
Bacterial superinfections	Acute cerebellar ataxia	Pneumonia
Osteomyelitis	Encephalitis	Bronchitis
Necrotising fasciitis	Meningitis	Thrombocytopenia
Orbital cellulitis	Central facial palsy	
Septic arthritis	Reye's syndrome	
	Guillain-Barré syndrome	

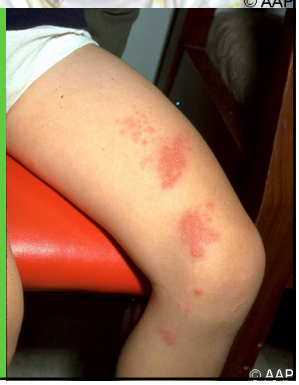
[1] CDC 2007 In: Atkinson W *et al.*, eds. Epidemiology and prevention of vaccine-preventable diseases. 10th. Washington DC: Public Health Foundation, 2007:175–96. [2] Banz K *et al. Eur J Health Econ* 2004; **5**: 46–53.

"Shingles"

- Reactivates as herpes zoster
- Grouped vesicular lesions in 1-3 dermatomes
- Post-herpetic neuralgia in up to 20% of patients ≥70 years of age[1]







[1] Oxman MN *et al. N Engl J Med* 2005; **352**: 2271–84. [2] Thomas SL, Hall AJ 2004; **4**: 26–33.

Diagnostic tests for VZV Infection

Test	Specimen	Comments
Tissue culture	Vesicular fluid, CSF, biopsy tissue	Limited availability, cost, up to a week for results
PCR	Vesicular swabs/scrapings, scabs from crusted lesions, biopsy tissue, CSF	Very sensitive, specific for VZV
DFA	Vesicle scraping, swab of lesion base (must include cells)	Specific for VZV, faster than culture, less sensitive than PCR
Tzanck smear	Vesicle scraping, swab of lesion base (must include cells)	Not specific for VZV, less sensitive and accurate than DFA
Serology (IgG)	Acute and convalescent serum for IgG	Specific for VZV, not sensitive to identify vaccine induced immmunity
Capture IgM	Acute serum for IgM	Specific for VZV, inconsistently detected, not routinely reliable

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Varicella Zoster (Chickenpox)

- **Infection control:**
  - **Patients with varicella**
    - Standard precautions
    - Airborne and Contact precautions (minimum 5 days after onset or rash until all lesions crusted)
  - **Exposed patients with no immunity**
    - Airborne and Contact precautions (8 to 21 days until after exposure to index patient)
  - **Immunocompromised patients/disseminated zoster**
    - Airborne and Contact precautions for duration of illness
  - **Immunocompetent with localized zoster**
    - Contact precautions until all lesions are crusted

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Varicella Zoster (Chickenpox)

- **Treatment:**
  - Consider: host factors, timeline, extent of infection, initial response to therapy
  - Antiviral drugs: **limited window of opportunity**
  - **Oral Acyclovir**
    - **not recommended routinely in healthy children**
    - Given **within 24 hrs of rash** → modest decrease in ssxs
    - Considered in healthy people at increased risk:
      - > 12 yrs of age
      - Chronic cutaneous or pulmonary disorders
      - Long term salicylate therapy
      - Short, intermittent, or aerosolized steroids
      - Secondary household cases
      - Pregnant women in 2nd/3rd trimester

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Varicella Zoster (Chickenpox)

- **Treatment:**
  - Varicella in ≥2 yr old immunocompetent host :

    Oral Acyclovir 80mg/kg/day div 4 doses x 5 days (max 3200mg/day)

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Varicella Zoster (Chickenpox)

- Treatment:
  - IV Acyclovir
    - Immunocompromised patients
    - Chronic corticosteroids
    - Give within 24 hrs of rash onset
  - Other treatments
    - High-dose oral acyclovir, valacyclovir, famcyclovir (selected immunocompromised pxs at lower risk)
    - VZIG, IVIG
      - Given shortly after exposure
      - Not effective once disease is established
    - Do not use salicylates!

Varicella Zoster (Chickenpox)

- Care of exposed unimmunized people:
  - Varicella vaccine in persons ≥ 12 months old within 3 days (up to 5 days after exposure)
  - VZIG/IVIG (up to 4 days after exposure)
    - VZIG: 125 units/10kg IM (max 625 units)
    - IVIG: 400mg/kg IV
    - Depends on:
      - Likelihood of no immunity to varicella
      - Probability that exposure will result in infection
      - Likelihood of complications
  - Prophylactic oral Acyclovir beginning 7 days after exposure

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How effective is Varicella Vaccination as Post Exposure Prophylaxis?

"Effectiveness of Varicella Vaccines as Post Exposure Prophylaxis"

- Brotons M. et al. PIDJ Vol 29, no. 1, 2010
- Prospective Cohort Study
- Varilrix™ (GSK) or Varivax™ (Sanofi Pasteur MSD)
- May 2002 to 2007

- **67 subjects:** 21pxs < 13 yrs old; 46 pxs ≥ 13 yrs old
- **Effectiveness:**
  - **Preventing any type of disease: 62.3%**
  - **Preventing moderate to severe disease: 79.4%**

Varicella Vaccination:

- Live-attenuated monovalent varicella vaccine (VV)
  - 12 months or older
- Quadrivalent measles-mumps-rubella-varicella (MMRV)
  - 12 months to 12 years of age
- Dose: 0.5ml SQ
- Immunogenicity and Effectiveness:
  - Single dose: 70 - 90%
  - 2 doses: approaching 100%
    - Less breakthrough varicella

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Varicella Vaccination:

Recommendations:

- **2-dose schedule**
  - **recommended by AAP, PFV (with PIDSP and PPS)**
- **1º reason: to induce protection in children without an adequate response to the 1st dose (not waning immunity)**

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Varicella Vaccination:

Recommendations:

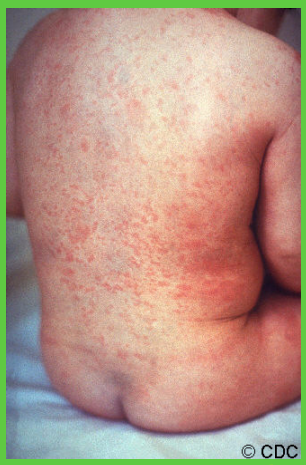
- **Children 12 mos – 12 yrs:** 2 doses SQ VV or MMRV
  - 1st dose: 12-15 months old
  - 2nd dose: 4-6 years old
  - Minimum interval: 3 months
- **13 years old or older:** 2 doses SQ VV at least 28 days interval

AAP. Red Book; 2009 Report of the Committee on Infectious Diseases 28th ed.

Summary

- Many illnesses caused by infectious agents have associated cutaneous manifestations.
- Diagnosis of infectious exanthems: not impossible
- "Rashes": offer important clues to the etiology of patient's illness
- Hallmark of diagnosis: Recognition!

  good history + good physical examination



Thank you!