REFERENCES

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The common infectious diseases of children include a broad spectrum of both viral and bacterial infections. The clinical severity ranges from asymptomatic to severe and life-threatening. There is considerable overlap in the clinical features of these conditions, with fever and rash being common to many. The differential diagnosis includes drug-induced exanthems. It is useful to categorise the more common conditions as follows:
- Viral exanthems
- Non-viral exanthems
- Other common childhood infectious diseases without exanthems

VIRAL EXANTHEMS

MEASLES
- Aetiology: The incubation period runs from seven to 14 days.
- Prodrome: three to seven days. Fever, cough, coryza, Koplik spots (exanthem) may be present from two days before to two days after onset of the exanthema.
- Clinical features: fever, generalised maculopapular rash starting from behind the ears, forehead and neck and spreading down the body and conjunctivitis (see Figure 1)
- Diagnosis: clinical, serology (IgM), PCR on blood or urine
- Treatment: vitamin A, symptomatic
- Complications: pneumonia, otitis media, laryngotracheobronchitis, gastro-enteritis, eye involvement, encephalitis
- Period of communicability: from four days before the rash appears until four days after onset of rash (immunocompromised patients may be contagious for duration of illness)
- Prevention: vaccination – all children should receive at least two doses of measles vaccination. Measles vaccine (monocomponent) is usually administered at nine and 18 months of age but may be given from six months of age. If the first dose is given before nine months of age, two further doses are required. The measles, mumps and rubella (MMR) combination vaccine is recommended at 15-18 months of age (may be used in place of the second dose of measles monocomponent vaccine) and repeated at 4-6 years of age but may be given any time 4-6 weeks after the first dose. It is not registered for use over the age of 12 years.
- Hospitalised cases should ideally be isolated with airborne transmission precautions.

RUBELLA
- Aetiology: rubella virus
- Incubation period: 14-21 days
- Prodrome: zero to two days, mild nonspecific symptoms
- Clinical features: low-grade fever, mild to moderate maculopapular rash, lymphadenopathy (usually postauricular or occipital) (see Figure 2)
- Diagnosis: clinical, serology (IgM), PCR on urine or throat/nasopharyngeal swab
- Treatment: symptomatic

Figure 1. Measles

**VIRAL AND RICKETTSIAL INFECTIONS**

**ERYTHEMA INFECTIOSUM (ERYSIPHALIS)*
- **Aetiology:** Human herpes virus 6
- **Incubation period:** Approximately 10 days
- **Prodrome:** High fever, irritability
- **Clinical features:** Fever and wide array of different exanthems. Various organ systems may also be involved.
- **Diagnosis:** Serology (see Table 1), PCR
- **Complications:** Aseptic meningitis, encephalitis, paralysis, respiratory, gastrointestinal, myocardial, eye and muscle involvement
- **Period of communicability:** Variable
- **Treatment:** Symptomatic and supportive
- **Prevention:** No vaccine available

**HAND-FOOT-MOUTH DISEASE**
- **Aetiology:** Coxsackie A16 and enterovirus 71
- **Incubation period:** Usually three to six days
- **Prodrome:** May be absent or mild fever, anorexia, malaise and painful mouth for one to two days before skin lesions appear
- **Clinical features:** Vesicular lesions on an erythematous base which appear on palms, soles and mouth (buccal mucosa and tongue): may be painful or pruritic, usually resolve within seven days; may have maculopapular rash over buttocks and genitalia (see Figure 4)
- **Diagnosis:** Clinical (presumptive), serology or PCR
- **Complications:** Uncommon
- **Treatment:** Symptomatic and supportive

**ENTEROVIRAL INFECTIONS**
- **Aetiology:** Numerous different enteroviruses may cause exanthems, notably coxsackie A and B viruses and echoviruses.
- **Incubation period:** Variable
- **Prodrome:** Variable
- **Clinical features:** Fever, malaise, myalgia, headache seven to 10 days prior to onset of rash
- **Diagnosis:** PCR may be available.
- **Complications:** Aseptic meningitis, encephalitis, paralysis, respiratory, gastrointestinal, myocardial, eye and muscle involvement
- **Period of communicability:** Variable
- **Treatment:** Symptomatic and supportive
- **Prevention:** Hospitalised cases require contact precautions

**CYTOMEGALOVIRUS INFECTION**
- **Aetiology:** Cytomegalovirus (human herpes virus 5)
- **Incubation period:** Unknown
- **Prodrome:** May be absent or influenza-like symptoms
- **Clinical features:** May be asymptomatic, infectious mononucleosis-like syndrome including prolonged fever and mild hepatitis. Congenital or early postnatal acquisition of infection may result in neurodevelopmental problems and sensorineural hearing loss.
- **Diagnosis:** Serology, PCR
- **Treatment:** Specific antimicrobial therapy is not usually required in

**INFECTIOUS MONONUCLEOSIS**
- **Aetiology:** Epstein-Barr virus
- **Incubation period:** 30-50 days
- **Prodrome:** Fever, sore throat
- **Clinical features:** May be asymptomatic; fatigue, fever, pharyngitis, lymphadenopathy, generalised rash (including macular erythema, scarlatiniform, urticarial or Gianotti-Crosti syndrome: papular acrodermatitis of childhood), exacerbation of rash with amoxicillin or ampicillin, splenomegaly. Symptoms may last for weeks to months.
- **Diagnosis:** Serology (see Table 1), PCR
- **Treatment:** Symptomatic and supportive
- **Complications:** Hepatitis, haemolytic anaemia, thrombocytopaenia, meningo-encephalitis, EBV-associated malignancies in immunocompromised patients
- **Period of communicability:** Uncertain
- **Prevention:** No vaccine available

<table>
<thead>
<tr>
<th>VCA IgG</th>
<th>VCA IgM</th>
<th>EA</th>
<th>EBNA</th>
<th>Interpretation</th>
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<td>No acute or previous infection</td>
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</table>

VCA = viral capsid antigen; IgG = immunoglobulin G; EA = early antigen; EBNA = EBV nuclear antigen

**HAND OF INFECTIOUS DISEASES**
immunocompetent patients with mild disease. Immunosuppressed patients and neonates may require treatment with ganciclovir.

- Complications: Immunocompromised patients may have disseminated disease with severe end-organ manifestations (pneumonitis, retinitis, colitis).
- Period of communicability: uncertain
- Prevention: no vaccine available

HERPES SIMPLEX INFECTIONS
- Aetiology: herpes simplex virus (1 and 2)
- Incubation period: two to two weeks
- Prodrome: fever, irritability
- Clinical features: primary infection during early childhood: asymptomatic or gingivostomatitis (painful oral ulcers, drooling of saliva, perioral vesicles) (see Figure 5). Genital herpes in adolescents: vesicular or ulcerative lesions of male or female genitalia or perineum. Herpetic whitlow (clusters of vesicles on distal parts of fingers) and conjunctivitis/herpetic keratitis also occur. Eczema herpeticum: vesicular lesions in areas of eczematous skin in patients with atopic dermatitis. Reactivation of latent infection: herpes labialis (“cold sores” or “fever blisters”). Disseminated disease may occur in newborn infants and encephalitis at any age may occur following primary or recurrent herpes simplex infection.

Figure 5. Herpes simplex infections

Source: www.myherpcestips.com

- Diagnosis: clinical, serology, PCR, history of previous chickenpox for shingles
- Treatment: acyclovir for severe infections or immunocompromised patients, analgesia
- Period of communicability: primary infection: from one to two days before rash until all lesions are crusted (usually five to seven days after onset of rash).

Reactivation disease: from onset of rash until all lesions have crusted
- Prevention: vaccination (not included in current national immunisation schedule). A vaccine, indicated for adults aged 50 years and older, is now available. A single subcutaneous dose is recommended for those who have previously had chickenpox, even if they have already had an attack of shingles. Hospitalised chickenpox cases should be isolated with airborne transmission precautions, post-exposure prophylaxis for vulnerable contacts.

VARICELLA ZOSTER INFECTIONS
- Aetiology: varicella zoster virus
- Incubation period: 14-21 days
- Prodrome: zero to two days
- Clinical features: primary infection (chickenpox): fever, vesicular rash on trunk followed by peripheries (see Figure 6). Reactivation of latent infection months to years after primary infection (herpes zoster/shingles): vesicular rash in sensory nerve distribution (dermatome), local pain or pruritus

Figure 6. Varicella zoster infections

Source: www.capetownpaediatrician.co.za

- Diagnosis: clinical, serology, PCR, lymphadenopathy, blood culture of vesicular fluid
- Treatment: acyclovir for severe infections or immunocompromised patients
- Complications: uncommon, secondary infection, recurrent infection (e.g., herpes labialis or genital herpes), disseminated herpes infection
- Period of communicability: variable
- Prevention: contact precautions with active mucocutaneous lesions

NONVIRAL EXANTHEMS
The nonviral exanthems include various noninfective skin eruptions, drug-induced exanthems, and fungal, bacterial and parasitic infections. This section will focus on common infectious bacterial conditions and Kawasaki syndrome.

MENINGOCOCCAL DISEASE
- Aetiology: Neisseria meningitidis
- Incubation period: hours-days
- Prodrome: unusual
- Clinical features: fever, variable distribution of petechiae or purpura, but may have maculopapular rash in early phase
- Diagnosis: clinical, blood culture, CSF examination
- Treatment: intravenous antibiotics (penicillin G or cephalosporin), intravenous fluids ± inotropic support
- Complications: shock, meningitis
- Period of communicability: until two days after start of antibiotic treatment
- Prevention: vaccination (not included in current national immunisation schedule). Hospitalised cases require isolation and droplet transmission precautions for the first 48 hours of antibiotic treatment. Post-exposure prophylaxis is required for vulnerable contacts.

SCARLET FEVER
- Aetiology: group A beta-haemolytic Streptococcus
- Incubation period: hours to days
- Prodrome: fever, sore throat
- Clinical features: intense erythematous rash on face and trunk, strawberry tongue, circumoral pallor
- Diagnosis: clinical, culture of throat swab
- Treatment: penicillin
- Complications: rheumatic fever, myocarditis, acute glomerulonephritis, arthritis
- Period of communicability: until rash fades and desquamation starts
- Prevention: no vaccine available, antibiotic treatment of pharyngitis

Figure 7. Scarlet fever

Source: www.who.int

IMPETIGO
- Aetiology: Streptococcus and Staphylococcus species
- Incubation period: hours to days
- Prodrome: unusual
- Clinical features: vesicular/pustular rash on face or peripheries (see Figure 8)
- Diagnosis: clinical, culture of pus from lesions
- Treatment: antibiotics against Staphylococcus and Streptococcus, antiseptic soap washes
VIRAL AND RICKETTSIAL INFECTIONS

TOXIC SHOCK SYNDROME
- Aetiology: Staphylococcus aureus or Streptococcus species
- Incubation period: hours to days
- Prodrome: unusual
- Clinical features: sudden onset of high fever, vomiting, diarrhoea, headache, pharyngitis, myalgia, severe hypotension, diffuse macular or scarlatiniform erythema (erythroderma), accentuated in flexures, initially affecting trunk and periphery; occurs one to two weeks later. Conjunctival hyperaemia and peri-orbital or lip crusting are common.
- Diagnosis: clinical, blisters are typically sterile, skin biopsy
- Treatment: antibiotics against Staphylococcus aureus, management of fluid and electrolyte balance, skin lesions usually heal without scarring
- Complications: secondary infection, fluid and electrolyte imbalance
- Prevention: skin care and hand-washing

KAWASAKI SYNDROME
- Aetiology: unknown
- Incubation period: unknown
- Prodrome: fever lasting five days or more but without symptoms; typical of viral prodrome
- Clinical features and diagnosis: The majority of cases occur before the age of five years. Diagnosis is based on the presence of specific clinical features:
  - Fever persisting for at least five days (mandatory) plus four of the following five features:
    - Changes in peripheral extremities (erythema and/or oedema of palms and soles, desquamation during the later stages) or perineal area
    - Polymorphous exanthem
    - Bilateral conjunctival hyperaemia
    - Changes in lips and oral cavity (red fissured lips, strawberry tongue, hyperaemia of oral and pharyngeal mucosa)
    - Cervical lymphadenopathy
- In the presence of coronary artery involvement and fever, fewer than four of the remaining five criteria are sufficient (see Figure 9).

HEPATITIS A
- Aetiology: hepatitis A virus
- Incubation period: 15-50 days
- Prodromal period: two to five days. Anorexia, malaise, nausea and vomiting, diarrhoea, fever and flu-like symptoms
- Clinical features: frequently asymptomatic in young children. Jaundice, dark urine, tender palpable liver
- Diagnosis: hepatitis serology (IgM)
- Treatment: supportive, hydration, avoidance of hepatotoxic medication, high energy/low protein diet.
- Complications: Fulminant hepatitis and acute liver failure are rare. Danger signs which require admission to hospital and further investigation and management include: protracted vomiting, dehydration, persistent fever, hypoglycaemia, confusion, intercurrent infections and abnormal bleeding. Chronic infection does not occur.
- Period of communicability: The most infectious period is from one to two weeks before onset of jaundice until one week after onset of jaundice
- Prevention: vaccination (not included in current national immunisation schedule), improved sanitation and personal hygiene – particularly hand-washing to prevent faecal-oral spread

OTHER COMMON CHILDHOOD INFECTIOUS DISEASES WITHOUT EXANTHEMS

VIRAL GASTRO-ENTERITIS
- Aetiology: rotavirus (differential diagnosis of acute gastro-enteritis includes various other viral, bacterial and parasitic infections)
- Incubation period: one to three days
- Prodromal period: fever, vomiting
- Clinical features: loose or watery stools, vomiting, may have low-grade fever, abdominal cramps
- Diagnosis: enzyme immuno-assay, electron microscopy, PCR. Diagnosis is frequently presumptive and not confirmed by laboratory testing.
- Treatment: usually a self-limiting condition that resolves within three to seven days. Oral or parenteral rehydration, management of fluid and electrolyte imbalances.
- Complications: dehydration, hypovolaemic shock, acidosis
- Period of communicability: Rotavirus is present in stools for several days before and several days after onset of clinical disease.
- Prevention: vaccination, contact precautions – particularly hand-washing to prevent faecal-oral spread

Figure 8. Impetigo

Figure 9. Kawasaki syndrome

Source: www.healthyskinmd.com

TORCH syndrome
- Toxoplasmosis
- Other (e.g., rubella, cytomegalovirus, herpes simplex virus)
- Rubella
- Hepatitis B

Source: www.macpeds.com
and travellers to endemic areas. Post-exposure (within 72 hours and up to 14 days after contact) or pre-exposure prophylaxis may be provided by a single intramuscular dose of pooled human immunoglobulin (0.02-0.04 ml/kg) or hepatitis B vaccine (unlicensed for use as post-exposure prophylaxis).

**INFLUENZA**

- **Aetiology:** Influenza virus (A, B & C)
- **Incubation period:** One to four days
- **Prophylaxis:** Non-specific symptomatic and signs including cough, fever, sore throat, myalgia and headache
- **Clinical features:** Asymptomatic or range from uncomplicated upper respiratory tract disease to severe complicated illness including viral pneumonia, exacerbatation of underlying diseases and multi-organ failure. Nausea, vomiting, diarrhoea and otitis media may occur in young children. Uncomplicated influenza usually resolves in three to seven days but cough and malaise may persist for two weeks or more.
- **Diagnosis:** Patients who meet criteria for severe or complicated illness or patients who are at risk for developing severe or complicated illness should be tested for influenza infection using PCR-based testing on a nasopharyngeal or throat swab. Close liaison with the laboratory and experience in collecting samples are required. Rapid point-of-care tests are not very sensitive and a negative test result does not exclude influenza infection. The differential diagnosis of influenza includes numerous other pathogens and laboratory testing of uncomplicated influenza-like illness is not recommended.
- **Treatment:** Early treatment initiation is important and should not be delayed until the result of laboratory testing for influenza is available. Children with uncomplicated illness due to confirmed or strongly suspected influenza infection do not generally require antiviral therapy. Children with uncomplicated illness who are at risk of severe or complicated influenza infection, including all infants and young children under two years of age, and children with severe, complicated or progressive illness do require treatment with antiviral therapy, usually oseltamivir, as soon as possible. Treatment initiation within 48 hours of onset of symptoms is optimal but later initiation may still provide benefit. The usual duration of therapy is five days. Refer to detailed guidelines [see reference 5] or package insert for dosing instructions. Chemoprophylaxis is not currently recommended by the World Health Organization but post-exposure presumptive treatment may be beneficial in a high-risk setting, such as patients with severe immunosuppression.
- **Complications:** Infants and children under two years of age as well as children with chronic diseases (pulmonary, cardiac, renal, metabolic, hepatic, neurological, haematological, and immunosuppressive conditions) are at risk of severe or complicated influenza. Persistent vomiting, high fever, progressive dyspnoea or any rapid deterioration may indicate progression to severe disease.
- **Period of communicability:** From a few days before symptoms begin until five to seven days after onset of symptoms. Very young children and individuals with severe disease (e.g., viral pneumonia) may be infectious for >10 days after onset of symptoms and severely immunocompromised individuals may shed virus for weeks to months.
- **Prevention:** Vaccination: Recommendations for influenza vaccination are published in the South African Medical Journal during the late summer period annually. Hospitalised cases with confirmed suspected influenza ideally require droplet transmission precautions for a minimum of seven days after onset of symptoms or until 24 hours after resolution of fever.

**PERTUSSIS**

- **Aetiology:** Bordetella pertussis
- **Incubation period:** Usually seven to 10 days (range of five to 21 days)
- **Prodromal period:** Variable duration, usually mild upper respiratory tract symptoms.
- **Clinical features:** Progression from upper respiratory tract symptoms (catarrhal stage) to cough and paroxysmal cough (paroxysmal stage) characterised by inspiratory whoop and frequently followed by vomiting. Fever is usually absent or minimal. Symptoms decrease over weeks to months (convalescent stage). Immunised children may have milder cough manifestations. In young infants (less than six months of age), disease may be different and more severe with a short catarrhal stage, bradycardia or apnoea as early manifestations, absence of a whooping cough, and prolonged convalescent stage.
- **Diagnosis:** PCR testing on nasopharyngeal aspirate or swab. Culture is less sensitive.
- **Treatment:** Antimicrobial therapy during the catarrhal stage may reduce severity of the disease. Initiation of antimicrobial therapy after the cough is established may not affect the course of the illness but can reduce transmission to others. Treatment with azithromycin, erythromycin or clarithromycin is recommended for infants younger than one month of age as an association between oral erythromycin and hypertrophic pyloric stenosis has been reported.
- **Complications:** In infants, pneumonia, seizures, encephalopathy, hernias, sub-conjunctival and subdural bleeding, and sudden death may occur.
- **Period of communicability:** Patients are most infectious during the catarrhal stage and for the first two weeks after onset of cough. Other factors influencing communicability include age, immunisation status, and appropriate antimicrobial therapy.
- **Prevention:** Vaccination. Hospitalised cases ideally require droplet transmission precautions until five days after initiation of effective therapy or if appropriate therapy is not given, until three weeks after onset of cough. Postexposure chemoprophylaxis is indicated for vulnerable contacts.

**MUMPS**

- **Aetiology:** Mumps virus
- **Incubation period:** 14-21 days
- **Prodrome:** Zero to one day
- **Clinical features:** Fever, parotitis
- **Diagnosis:** Clinical, serology (IgM), PCR
- **Treatment:** Symptomatic
- **Complications:** Aseptic meningitis, orchitis (uncommon in childhood), arthritis, myocarditis, pancreatitis, hearing loss
- **Period of communicability:** Until parotid swelling subsides
- **Prevention:** Vaccination (vaccine not included in current national immunisation schedule)

Table 1 summarises common childhood infectious diseases that may present with erythematous rashes and Table 2 those that may present with vesicular rashes. Consult Table 3 for recommendations on when children with selected infectious diseases are no longer regarded as infectious and may return to school or other teaching institution, and Table 4 for recommendations on post-exposure prophylaxis for vulnerable contacts.

Table 1. Common childhood infectious diseases that may present with erythematous rashes

<table>
<thead>
<tr>
<th>Disease</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Measles</td>
<td>Rubella</td>
</tr>
<tr>
<td>Roseola infantum</td>
<td>Erythema infectosum</td>
</tr>
<tr>
<td>Enerviral infections</td>
<td>Infectious mononucleosis</td>
</tr>
<tr>
<td>Scarlet fever</td>
<td>Meningococcal disease</td>
</tr>
<tr>
<td>Tick bite fever</td>
<td>Kawasaki syndrome (unknown aetiology)</td>
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Table 2. Common childhood infectious diseases that may present with vesicular rashes

<table>
<thead>
<tr>
<th>Disease</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Chickenpox/shingles</td>
<td>Hand-foot-mouth disease</td>
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<tr>
<td>Herpes simplex infections</td>
<td>Eczema herpeticum</td>
</tr>
<tr>
<td>Impetigo</td>
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</table>
Table 3. Recommendations on when children with selected infectious diseases are no longer regarded as infectious and may return to school or other teaching institution

<table>
<thead>
<tr>
<th>Disease</th>
<th>Time to Return to School</th>
</tr>
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<tbody>
<tr>
<td>Measles</td>
<td>5 days from start of rash</td>
</tr>
<tr>
<td>Rubella</td>
<td>7 days from start of rash</td>
</tr>
<tr>
<td>Chickenpox</td>
<td>Until all skin lesions have crusted, usually 5-7 days after start of rash</td>
</tr>
<tr>
<td>Meningococcal disease</td>
<td>2 days after start of antibiotic treatment</td>
</tr>
<tr>
<td>Scarlet fever</td>
<td>Until rash fades and desquamation starts</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>7 days from onset of jaundice</td>
</tr>
<tr>
<td>Pertussis</td>
<td>5 days from starting effective antibiotic therapy or 3 weeks after onset of paroxysmal cough</td>
</tr>
<tr>
<td>Influenza</td>
<td>Until afebrile and feeling better or until 5-7 days after onset of symptoms</td>
</tr>
</tbody>
</table>

Table 4. Recommendations on post-exposure prophylaxis for vulnerable contacts (cont.)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Who qualifies for post-exposure prophylaxis?</th>
<th>Recommended prophylaxis</th>
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</thead>
<tbody>
<tr>
<td>Pertussis</td>
<td>Household and other close contacts, vulnerable contacts at high risk of severe or complicated pertussis disease (including neonates born to symptomatic mothers, infants &lt;1 year of age with incomplete immunisation, immunocompromised, chronic cardiac or lung disease)</td>
<td>Erythromycin or azithromycin or clarithromycin. (Erythromycin is not recommended under 1 month of age.) Chemoprophylaxis should start within 21 days of onset of cough in index case. Refer to guidelines for dosing and duration.</td>
</tr>
</tbody>
</table>

REFERENCES