Atopic Dermatitis

• What is it?
  - A chronically relapsing skin disorder with an immunologic basis
  - NOT “eczema” although the terms are sometimes used interchangeably
  - Eczema has several causes—one of them is atopic dermatitis
  - Allergens, irritants, autoimmune, idiopathic, inflammatory, seborrheic dermatitis

TREATMENT OF ATOPIC DERMATITIS

• IL-4 enhances differentiation of T-helper cells along the Th2 pathway, and IL-13 acts as a chemoattractant for Th2 cells to infiltrate atopic dermatitis lesions. IL-13 may also directly induce IL-5 expression and eosinophil infiltration, thereby facilitating the transition from acute lesions into chronic lesions.
Atopic Dermatitis—Cause?

- Significant evidence favors the hygiene hypothesis for the development of atopic dermatitis. An inverse relationship is recognized between helminth infections and atopic dermatitis but no other pathogens.
- Early day care, endotoxin, unpasteurized farm milk, and animal exposure appear to be beneficial.

Who Gets Atopic Dermatitis?

- Approximately 10-20% of children and 2% of adults. Children with concurrent asthma or hay fever have a 30-50% incidence of developing atopic dermatitis.
- Prevalence of atopic dermatitis in children with one affected parent is 60% and rises to nearly 80% for children of two affected parents.
- Often starts in infants aged 2-6 months. Ninety percent of patients with atopic dermatitis experience the onset of disease prior to age 5 years. Seventy-five percent of individuals experience marked improvement in the severity of their atopic dermatitis by age 14 years; however, the remaining 25% continue to have significant relapses during their adult life.

Presentation of AD

- Minor Characteristics
  - Xerosis (dry skin); Ichthyosis, palmar hyperlinearity, keratosis pilaris; Hand dermatitis, foot dermatitis; Cheilitis; Nipple eczema; Susceptibility to cutaneous infection (with Staphylococcus aureus, herpes simplex virus [HSV], other viruses, warts, molluscum, dermatophytes); Erythroderma; Perifollicular accentuation; Pityriasis alba; Early age of onset; Impaired cell-mediated immunity; Recurrent conjunctivitis; Orbital darkening; Infraorbital fold (Dennie pleat, Morgan fold); Anterior neck folds; Keratoconus; Anterior subcapsular cataracts; Sensitivity to emotional factors; Food intolerance; Pruritus with sweating; Intolerance of wool; White dermographism; Immediate type I skin test response; Elevated total serum immunoglobulin E (IgE); Peripheral blood eosinophilia
  - Adapted from the American Academy of Allergy, Asthma, and Immunology

Presentation of AD

- Patient must have 3 major and 3 minor characteristics.
- Major characteristics: Pruritus; Typical morphology and distribution (flexural lichenification and linearity in adults, facial and extensor involvement in infants and young children); Chronic or chronically relapsing dermatitis; Personal or family history of atopy (asthma, allergic rhinoconjunctivitis, atopic dermatitis)

Medications for AD

- Topical Steroids
  - To ensure adequate coverage, use Fingertip Unit amounts of steroids.
  - For children, the fingertip unit (FTU) has been shown to accurately measure an appropriate amount of medication. The FTU is defined as the amount of topical medication that will cover the child’s index finger from the tip to the metacarpophalangeal joint. For topical steroids, 1 FTU covers the hand or groin, 2 FTUs cover the face or foot, 3 FTUs cover an arm, 6 FTUs cover a leg, and 14 FTUs cover the trunk.

Medications for AD

- Hydrocortisone Topical (Cortizone, Dermolate, Westcort): Apply to skin or external mucous membranes. <3 months: Safety and efficacy not established; >3 months: Apply film to affected area q12hr.
- Triamcinolone Topical (Kenalog): Decreases inflammation by suppressing the migration of polymorphonuclear leukocytes and reversing capillary permeability. Cream/ointment (0.025%): Apply BID-QID. Cream/ointment (0.1%, 0.5%): Apply BID-TID. Spray: Apply TID-QID.
- Flurandrenolide (Cordran Tape): Intermediate potency topical corticosteroid. Each square cm provides 4 mcg. Tape: Apply qDay-q12hr. Cream/Lotion: apply qDay-q6hr (typically q8-12hr). Limit to minimum amount necessary for therapeutic efficacy.
### Medications for AD

- Systemic steroids offer dramatic improvement in first few days, but with rebound flares on discontinuance. Make sure to taper over 10-14 days, use topical steroids and hydrate with appropriate baths.
- Prednisone (Deltasone, Orasone): Decreases inflammation by reversing increased capillary permeability and suppressing PMN activity. 0.5-2 mg/kg/day PO in single daily dose or divided q12hr; not to exceed 80 mg/day.

### Medications for Secondary Infections

- **Amoxicillin plus clavulanate (Augmentin):** Treats bacteria resistant to beta-lactam antibiotics. Base dosage regimen on amoxicillin content. Because of different amoxicillin-clavulanic acid ratios in 250-mg tab (250/125) versus 250-mg chewable tab (250/62.5), do not use 250-mg tab until child weighs >40 kg.

### Medications for AD

- Antibacterials are helpful in secondary Staph infections.
- Antivirals are useful for herpes simplex or varicella infections.
- Antifungals may be used for dermatophytes.
- Diagnose the above and treat.

### Medications for Secondary Infections

- **Acyclovir (Zovirax):** Best when used within 48h of rash onset. May prevent recurrent outbreaks. ≥2 years and <40 kg: 20 mg/kg/dose PO q6hr for 5 days; not to exceed 800 mg/dose.
- **Ketoconazole (Nizoral):** Antifungal. ≥2 years old: 3.3-6.6 mg/kg/day PO.

### Medications to Control Itching

- **Pramoxine (Prax, PrameGel) or Doxepin topical cream (Zonalon):** ≥2 years: Apply to affected area up to 3-4 times/day.
- **Diphenhydramine (Benadryl):** PO for itching; best used at night. 2-6 years: 6.25 mg q4-6hr; not to exceed 37.5 mg/day. 6-12 years: 12.5-25 mg PO q4-6hr; not to exceed 150 mg/day. >12 years: 25-50 mg PO q4-6hr; not to exceed 300 mg/day.
Immunomodulators in AD

- These drugs are reserved for those refractory to steroids
- Usually work within 3 days and may offer relief for up to 12 months
- Have black box warnings for malignancy potential
- Reserved for children >2; use intermittently as needed; avoid use in immunocompromised patients; new diagnoses of AD should have a skin biopsy before initiating treatment; use protection from UV radiation

Tacrolimus Topical (Protopic): suppresses the release of cytokines from T cells and inhibits transcription for genes that encode IL-3, IL-4, IL-5, GM-CSF, and TNF-α, all of which are involved in the early stages of T-cell activation. Used for the short-term or intermittent long-term treatment of moderate-to-severe atopic dermatitis that is unresponsive to first-line therapies (topical corticosteroids) or in cases where first-line therapies are not applicable. The manufacturer and FDA recommend that the smallest amount and lowest potency that is efficacious be used to achieve control of symptoms. It is available as an ointment in concentrations of 0.03% and 0.1%.

Pimecrolimus (Elidel cream): Inhibits production and release of inflammatory cytokines from activated T cells by binding to cytosolic immunophilin receptor macrophilin-12. This agent is indicated only after other treatment options have failed. Available as a 1% cream.

Cyclosporine (Sandimmune, Neoral): PO cyclosporine has proven beneficial in patients with severe atopic dermatitis refractory to treatment with topical steroids. Discontinuation of cyclosporine frequently results in rapid relapse of skin disease. Significant adverse effects (nausea, abdominal discomfort, hypertrichosis, paresthesias, hypertension, hyperbilirubinemia, renal impairment) limit its use.

Seborrheic Dermatitis

- May present with intermittent active phases with burning, itching and scaling. Candidiasis may be present in diaper folds of infants. Scalp manifestations of patchy scaling to widespread, thick, adherent crusts—cradle cap in infants, dandruff in adolescents.
  - Rule out tinea capitis as a differential in adolescents
  - Consider medication use as a cause of seborrheic dermatitis

Seborrheic Dermatitis—Treatment

- Ketoconazole: Available as ketoconazole cream 2% (Nizoral), ketoconazole foam ( Extina), ketoconazole shampoo 2% (Nizoral 2%; prescription only in United States), ketoconazole shampoo 1% (Nizoral A-D Shampoo; over-the-counter in United States): Not for those under 12 years old. ≥12 years (shampoo): Apply twice weekly for 4 weeks, with at least 3 days between each shampoo.
- ≥12 years (cream/foam): Apply to affected area q12hr x4 weeks

TREATMENT OF SEBORRHIC DERMATITIS AND PSORIASIS

Seborrhic Dermatitis

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Seborrheic Dermatitis--Treatment

- Coal tar shampoo (DHS Tar, MG217, Theraplex T, Psoriasin); Scytera foam: > 2 years: As adults; apply to wet hair/scalp, lather for several minutes, then rinse thoroughly & repeat
- Immunosuppressants may be used for immunocompetent patients > 2y
  - Tacrolimus ointment (Protopic)—every 12 h
  - Pimecrolimus (Elidel cream 1%)—every 12 h

Psoriasis

- 10-15% of cases begin in children. Mean age of onset is 28
  - Recent streptococcal throat infection, viral infection, immunization might be causally linked
- Scaling erythematous macules, papules, and plaques, most commonly on the extensor surfaces of the knees, elbows, scalp, and trunk.

Psoriasis--Treatment

- Over-the-counter coal tar shampoos may be tried for scalp psoriasis
- Corticosteroids: Triamcinolone acetonide (Kenalog, Triderm, Pediaderm, Trianex) is a topical steroid of choice to reduce plaque formation. Cream/ointment (0.025%): Apply BID-QID. Cream/ointment (0.1%, 0.5%): Apply BID-TID.

TREATMENT OF DIAPER DERMATITIS

Causes of Diaper Rashes

- Combination of urine and feces
  - Fecal proteases and lipases, activity is increased as pH increases
- Wetness, friction
- Presence of microorganisms
- Folds and creases

Types of Diaper Rashes

- Miliaria
  - Obstruction of eccrine sweat glands when the stratum corneum becomes excessively hydrated and edematous is believed to cause miliaria.
- Intertrigo
  - Intertrigo occurs when wet skin, which is more fragile and has a higher coefficient of friction, becomes damaged from maceration and chafing.
Types of Diaper Rashes

- **Contact dermatitis**
  - Irritant contact dermatitis is most likely made up of some combination of intertrigo and miliaria. In addition, it has been shown to result from the irritating effects of mixing urine with feces. Urine in the presence of fecal urease becomes more alkaline due to the production of ammonia. This alkaline urine causes activation of fecal lipases, ureases, and proteases. These, in turn, irritate the skin directly and increase its permeability to other low molecular weight irritants.

- **Bacterial diaper dermatitis**
  - Bacteria may play a role in diaper dermatitis through reduction of fecal pH and the resultant activation of enzymes. Additionally, fecal microorganisms probably contribute to secondary infections when they occur.
  - Polymicrobial growth is documented in at least half of diaper rash cultures. Staphylococcus species are the most commonly grown organisms, followed by Streptococcus species and organisms from the family Enterobacteriaceae. Nearly 50% of isolates also contain anaerobes.

- **Candidal diaper dermatitis**
  - Once the skin is compromised, secondary infection by Candida albicans is common. Between 40% and 75% of diaper rashes that last for more than 3 days are colonized with C albicans. Candida has a fecal origin and is not an organism normally found on perineal skin. Amoxicillin was found to increase the colonization by Candida and worsens the diaper dermatitis.

- **Granuloma gluteal infantum**
  - Granuloma gluteal infantum is rare. It probably represents an unusual inflammatory response to long-standing irritation, candidiasis, or fluorinated corticosteroids.

Suspected Causes

- **Irritant contact dermatitis, miliaria (heat rash), and intertrigo**
  - Usually follows a bout of diarrhea
  - Exacerbated by scrubbing and the use of commercial wipes or strong detergents
  - Lasts less than 3 days after more diligent diaper changing practices are initiated
  - Asymptomatic (except for miliaria)

- **Candidal diaper dermatitis**
  - Lasts even after more diligent diaper changing practices are started
  - Should be suspected in all rashes lasting more than 3 d (Candida is isolated in 45-75% of such cases)
  - Painful - Parents often report severe crying during diaper changes or with urination and defecation.
  - May follow recent antibiotic use

- **Granuloma gluteal infantum**
  - Rash lasts months
  - Resistant to treatments with barrier creams, antifungal agents, and topical steroids
  - Asymptomatic

- **Atopic dermatitis**
  - Family or personal history of allergic rhinitis, hay fever, or asthma is common.
  - Pruritic
  - Associated with current or previous flares of rash on the face and extensor limb surfaces in infants
Suspected Causes

• Seborrheic dermatitis
  – Usually occurs in infants aged 2 weeks to 3 months
  – Consists of an eruption of an oily, scaly, crusted dermatitis of the scalp (cradle cap), face, retroauricular regions, axilla, and presternal areas
  – Asymptomatic
  – Any child with widespread seborrheic dermatitis, diarrhea, and failure to thrive should be evaluated for Leinerdisease, a functional defect of the C5 component of complement.

• Psoriasis
  – A family history of psoriasis can be a clue.
  – Not responsive to barrier creams, antifungal agents, and standard topical steroids
  – Involved areas include the scalp and nails

• Impetigo
  – Common in the first 6 months of life
  – Usually occurs during the warmer summer months

• Langerhans cell histiocytosis
  – Severe hemorrhagic diaper dermatitis unresponsive to any treatment
  – Other involved areas include the scalp and retroauricular areas
  – Diarrhea

• Acrodermatitis enteropathica
  – Associated with diarrhea, hair loss, and eczematous dermatitis
  – Patient may have a predisposition for malabsorption (i.e., cystic fibrosis) or malnutrition

• Scabies
  – Acute onset, Pruritic
  – History of close contacts with recent onset of a similar erythematous serpiginous eruption
  – Concurrent rash may be found in web spaces of hands or feet

• Human immunodeficiency virus
  – History of IV exposure or risk factors
  – Associated cytomegalovirus or herpes infection

Treatment Strategies

• Frequent diaper changes
• Breathable diapers; petrolatum-secreting diapers
• Barrier creams (petroleum jelly, zinc oxide, vitamin A and D), pastes, pastes covered with petroleum jelly
• Topical antifungals if candida is suspected: nystatin, clotrimazole, miconazole, or ketoconazole. Use with every diaper change.
  – Use PO nystatin if oral thrush is present
  – 2% sertaconazole cream may be used topically

• For mild bacterial infections, a topical antibiotic ointment (bacitracin) should be prescribed.
• More severe infections caused by gram-positive organisms and anaerobes can be treated with a broad-spectrum oral antibiotic (amoxicillin/clavulanate, 40-mg amoxicillin component/kg/d for 7-10 d).
• Impetigo can be treated with dicloxacillin 12.5-25 mg/kg/d or erythromycin 50 mg/kg/d for 7-10 d.
• Congenital syphilis can be treated with 1 dose of IM penicillin G 50,000 U/kg.

• In the case of granuloma gluteal infantum, recovery seems to be slow (several months), but complete.
• Low potency topical steroids may accelerate resolution in some patients.
• Management of this disease is beyond the scope of emergency care.
• Referral to a dermatologist for management and long-term follow-up care is recommended.
TREATMENT OF IMPETIGO

Impetigo

- Most common bacterial infection of children
- Primarily caused by Streptococcus pyogenes or Staphylococcus aureus
- Classified as either non-bullous (70%--impetigo contagiosa) or bullous
- Bullous impetigo is less contagious than non-bullous
  - MRSA may be a cause of non-bullous impetigo, especially in patients with a history of atopic dermatitis
  - GAS is another cause
  - Staph is a major cause of bullous impetigo

Treatment Strategies--Overall

- Topical mupirocin or retapamulin is adequate treatment for single lesions of nonbullous impetigo or small areas of involvement. Systemic antibiotics are indicated for nonbullous impetigo with extensive involvement, in athletic teams, childcare clusters, multiple family members, or for bullous impetigo

Treatment Strategies

- Without any treatment, usually heals within 2-3 weeks.
  Treatment reduces contagion, scarring, and speeds up cure
  - If toxins are absorbed into bloodstream, Staphylococcal Scalded Skin Syndrome may result
- Clean lesions; discourage touching; start topical antibacterials; keep child out of school/daycare 24 hours after antimicrobial therapy has been initiated

Treatment Strategies--Overall

- In patients with bullous impetigo who present to the emergency department with large areas of involvement resulting in denuded skin from ruptured bullae:
  - Management should include intravenous fluid resuscitation. Fluid is given at a volume and rate similar to standard volume replacement for burns

Treatment Strategies--Overall

- Inpatient care is required for patients with impetigo who:
  - Have widespread disease
  - For infants at risk of sepsis and/or dehydration due to skin loss. If inpatient care is warranted in the child with untreated impetigo, contact isolation is recommended.
Drugs for Impetigo

- Topical drugs are the treatment of choice
  - Apply after removal of crusts and debris
- Mupirocin ointment (Bactroban) has been used for both the lesions and to clear chronic nasal carriers. Apply 2-3 times daily for 7 days.
- Retapamulin (Altabax) ointment. Effective against S pyogenes and methicillin-susceptible S aureus in children older than 9 months. It is applied twice daily for 5 days. It is not for mucosal use; epistaxis has been reported with nasal mucosa application.

Drugs for Impetigo

- Clindamycin (cream, lotion, and foam) is useful in several MRSA infections.
- Gentamicin ointment or cream has been used for some gram-positive staphylococcal infections, including impetigo and pyoderma. Its use is precluded by the potential development of ear and kidney toxicity.

Drugs for Impetigo

- Systemic antibiotics may be used when infections are widespread or when there are multiple incidents of pyoderma in daycare, team or group settings.
- Cephalexin is the drug of choice
- If MRSA is suspected, alternative antibiotics include clindamycin, trimethoprim-sulfamethoxazole, and vancomycin
- Erythromycin and clindamycin are alternatives in patients with penicillin hypersensitivity

Drugs for Impetigo

- A recent study showed that PO co-trimoxazole was non-inferior to IM benzathine benzylpenicillin for extensive impetigo
  - Co-trimoxazole given twice daily for 3 days or once daily for 5 days had similar results
- This may become a treatment option for extensive impetigo

TREATMENT OF SCARLET FEVER

- Exudative pharyngitis, fever, and bright-red exanthem. It is caused by toxin-producing group A beta-hemolytic streptococci (GABHS)
  - The rash develops in less than 10% of cases of strep throat; most commonly in those 5-15 years old
  - May follow streptococcal infection of the skin and soft tissue, surgical wounds (surgical scarlet fever)
  - Incubation period for scarlet fever ranges from 12 hours to 7 days; patients are contagious during subclinical and acute illness phases
Scarlet Fever—Treatment

- Treat to prevent sequelae such as glomerulonephritis, acute rheumatic fever and to shorten the duration of the illness
- Encourage compliance with PO antibiotics
- Penicillin G benzathine (Bicillin LA): <27 kg: 600,000 unit IM x1. 27 kg or greater: 1.2 million units IM x1.
- Penicillin VK: Considered the drug of choice. 250 mg PO q8-12hr for 10 days

Varicella Zoster

- Incidence is approximately 5 in 1000
- Approximately 1 per 4000 children develops VZV encephalitis, an acute neurologic disorder with potentially severe complications
- Immunocompromised children (receiving chemotherapy for leukemia or those with advanced HIV infection) can develop disseminated VZV infection, a potentially fatal complication.

Treatment of Varicella Zoster

- Vaccine within 10 days of exposure to someone infected
- Acyclovir (Zovirax): ≥2 years and <40 kg: 20 mg/kg/dose PO q6hr for 5 days; not to exceed 800 mg/dose
- In obese patients, use IBW. >40 kg: 800 mg PO q6hr for 5 days
- Immunocompromised patients <12 years: 20 mg/kg/dose IV q8hr for 7 days. >12 years: 10 mg/kg/dose IV q8hr for 7 days

Treatment of Varicella Zoster

- Valacyclovir (Valtrex): >2 years: 20 mg/kg PO q8hr for 5 days; not to exceed 1 g PO q8hr
- Varicella virus vaccine (Varivax): Indicated for vaccination against varicella in individuals >1 y.
- Varicella Zoster immune globulin (VarIZIG): Indicated for reducing the severity of chicken pox infections in high risk individuals after exposure. – 125 IU/10kg IM; not to exceed 625 IU/dose

TREATMENT OF VARICELLA ZOSTER
TREATMENT OF MEASLES

Measles
• Onset of measles ranges from 7-14 days (average, 10-12 days) after exposure to the virus. Rash with mild pruritus develops about 14 days post-exposure.
  – Lesion density is greatest above the shoulders, where macular lesions may coalesce
  – The eruption may also be petechial or ecchymotic in nature
  – Patients appear most ill during the first or second day of the rash
  – The exanthem lasts for 5-7 days before fading into coppery-brown hyperpigmented patches, which then desquamate
  – Immunocompromised patients may not develop a rash

Measles—Case Reporting
• Immediately reporting any suspected case of measles to a local or state health department is imperative. The US CDC clinical case definition for reporting purposes requires only the following:
  • Generalized rash lasting 3 days or longer
  • Temperature of 101.0°F (38.3°C) or higher
  • Cough, coryza, or conjunctivitis

Measles
• Cases continue to be caused by virus brought into the country by travelers from abroad, with spread occurring largely among unvaccinated individuals
• Recently, US measles cases have increased dramatically. Most of these cases were outbreaks in children whose parents had refused immunization.

Measles—Case Reporting
• For reporting purposes for the CDC, cases are classified as follows:
  • Suspected: Any febrile illness accompanied by rash
  • Probable: A case that meets the clinical case definition, has noncontributory or no serologic or virologic testing, and is not epidemiologically linked to a confirmed case
  • Confirmed: A case that is laboratory confirmed or that meets the clinical case definition and is epidemiologically linked to a confirmed case; a laboratory-confirmed case need not meet the clinical case definition
Measles--Treatment

- Treatment consists of supportive care, rehydration, and Vitamin A (WHO recommendation)
  - Infants younger than 6 months: 50,000 IU/day PO for 2 doses
  - Age 6-11 months: 100,000 IU/day PO for 2 doses
  - Older than 1 year: 200,000 IU/day PO for 2 doses
  - Children with clinical signs of vitamin A deficiency: The first 2 doses as appropriate for age, then a third age-specific dose given 2-4 weeks later

Measles Vaccine

- Immunization Against Measles, Mumps & Rubella
  - Measles mumps and rubella vaccine, live (M-M-R II): Routine vaccination: First dose of 0.5 mL SC between age 12-15 months; administer second dose between 4-6 yr. Minimum age for 1st dose is 12 months
  - Measles, mumps, rubella, and varicella virus vaccine (ProQuad): Routine vaccination (2 doses): First dose of 0.5 mL SC between age 12-15 months; administer second dose between age 4-6 yr

Hand-Foot-and-Mouth Disease

- Acute viral illness that presents as a vesicular eruption in the mouth, hands, feet, buttocks, and/or genitalia
- Caused by Coxsackievirus A type 16 (CVA16)
- Sore throat, low grade fever, lesions in mouth, hard palate, malaise
- Peaks in summer-fall months; lasts 7-10 days.
- Usually seen in children younger than 10 years

Immunoglobulins

- Used in measles to prevent or modify measles in susceptible individuals if administered within 6 days of exposure.
- Immune globulin IM (IGIM) GamaSTAN, Gammaked, Hizentra, Gamunex-C: indicated for all susceptible contacts of patients with measles who reside in the same household who are pregnant, immunocompromised, or aged 6-12 months; it is also indicated for infants younger than 6 months who were born to mothers without measles immunity and also all children and adolescents with HIV infection who are exposed to measles, regardless of measles immunization status, unless they have received IV Ig (400 mg/kg as part of routine immunoprophylaxis) within 3 weeks of exposure. Individualized dosing.

Hand-Foot-and-Mouth Disease--Treatment

- Treatment is mostly supportive
- For fever, use ibuprofen or acetaminophen with age-appropriate dosing
- Topical Lidocaine (Dermallan) may be used to limit pain from lesions
- Diphenhydramine hydrochloride (Benadryl, Benylin) may be used to reduce inflammation
- There is no antiviral agent for this condition
- Amantadine, quinacrine and ribavirin are being explored as treatment options
Erythema Infectiosum

- Also known as Fifth Disease
  - "Slapped cheek" appearance, lacy exanthem
  - Caused by human parvovirus B19, an erythrovirus
- Symptoms begin 1 week after exposure to PV-B19 and include headache, sore throat, fever, abdominal pain. Then a 7-10 day symptom-free period followed by:
  - Phase 1 - The exanthem begins with the classic slapped-cheek appearance, which typically fades over 2-4 days
  - Phase 2 - This phase occurs 1-4 days later and is characterized by an erythematous maculopapular rash that fades into a classic lace-like reticular pattern as confluent areas clear
  - Phase 3 - Frequent clearing and recurrences for weeks or occasionally months during times of exercise, irritation, stress, or overheating of the skin from sunlight or bathing in hot water

Management of Erythema Infectiosum

- Typically a self-limiting condition which will resolve with no consequence
- Since the virus invades reticulocytes, individuals with sickle cell anemia, G-6-PD deficiency, Thalassemia, and other blood disorders, as well as those who are immunocompromised are at risk of prolonged or severe anemia

Erythema Infectiosum—Treatment

- NSAIDs may be used to decrease fever, malaise, headache and arthralgia. Ibuprofen is the drug of choice.
- Ibuprofen (Ibuprin, Advil, Motrin)
- Diclofenac (Voltaren XR, Cataflam, Cambia)
- Piroxicam (Feldene)
- Naproxen (Anaprox, Naprelan, Aleve, Naprosyn)
- Flurbiprofen
- Indomethacin (Indocin)

Erythema Infectiosum—Treatment

- Antihistamines provide symptomatic relief of pruritis
- Hydroxyzine (Vistaril)
- Diphenhydramine (Benadryl, Diphenhist, Allerdryl)
- Camphor/menthol lotion—may also be used to relieve itching

Erythema Infectiosum—Treatment

- Immunoglobulin, intravenous (Octagam, Privigen, Gammagard S/D): used in patients who develop severe anemia with infection, chronic aplastic crisis, or who are severely immunocompromised.
Molluscum Contagiosum

• Molluscum contagiosum virus causes a benign viral rash that appears as multiple, pink, dome-shaped waxy papules.
• Most common in children who become infected through direct skin-to-skin contact or indirect skin contact with fomites, such as bath towels, sponges, and gymnasium equipment. Lesions typically occur on the chest, arms, trunk, legs, and face
  – Prevalence in general pediatric population is 2%; in those infected with HIV, it is 5-18%
  – Cover infected areas; limit skin-skin contact; in adolescents, emphasize safe sex

Molluscum Contagiosum--Treatment

• Most of the time the rash will resolve within 18 months
• Imiquimod cream - An immune response modifier approved for the treatment of external genital and perianal warts in adults, imiquimod cream has been reported to be effective in the treatment of molluscum contagiosum; imiquimod cream may be used in conjunction with cantharidin
• Cantharidin - Several studies report that cantharidin, a chemovesicant that can be used in combination with imiquimod, is effective in treating molluscum contagiosum; to test the patient’s response to therapy, treat only a few lesions on the initial visit
• Tretinoin - This agent has reportedly been successful in the treatment of small molluscum contagiosum lesions
• Topical podophyllotoxin 0.5% cream self-administered twice daily for 3 weeks has been reported effective in a placebo-controlled, double-blind study
• Seventeen percent salicylic acid in collodion (Compound W, Freezezone, Wart-Off, Occlusal) is commonly used in treating verruca vulgaris. In most patients, repeated application to individual molluscum contagiosum lesions until an inflammatory response is generated is effective therapy.
• Physical trauma to the lesions has also been useful (shaving, duct tape, cryotherapy, laser therapy, etc.)
RMSF--Treatment

- Doxycycline (Adoxa, Doxy 100, Vibramycin, Monodox): The recommended dosage of doxycycline is 2.2 mg/kg body weight twice daily for children less than 45 kg (100 lb). For adults, the dosage is 100 mg every 12 hours. Patients should be treated for at least 3 days after the fever subsides and until there is evidence of clinical improvement. Standard duration of treatment is 7-14 days.

TREATMENT OF KAWASAKI DISEASE

Kawasaki Disease

- Presents with clinical features including irritability, nonexudative bilateral conjunctivitis (90%), anterior uveitis (70%), perianal erythema (70%), sterile pyuria, erythema and edema on the hands and feet; the latter impedes ambulation, strawberry tongue and lip fissures
- Etiology is unknown; causative agent may be infectious. Epidemics occur late-winter to spring. 3000 children hospitalized/year.

RMSF--Treatment

- Early treatment is key; never delay treatment awaiting the development of a rash or outcome of labs.
  - Consider the possibility of RMSF and promptly begin antibiotic treatment in any patient with potential tick exposure who develops fever, myalgia, or headache, even if they do not have a rash.
  - Begin Doxycycline within the first 5 days of symptoms

RMSF

- Most common rickettsial infection, causative organism is Rickettsia rickettsii, which is spread by bites of infected ticks.
- RMSF has the highest mortality of any tick-borne illness in the United States (up to 30%)
- The incubation period is 2-8 days after the tick bite. A history of tick bite is present in only two thirds of cases. Symptoms can begin gradually or abruptly. Fever, headache, rash, toxicity, myalgia, and mental confusion are the major clinical manifestations.
  - Rash begins as blanching maculopapular lesions, present in 80-90% of patients.

TREATMENT OF ROCKY MOUNTAIN SPOTTED FEVER
Kawasaki Disease—Diagnosis

- Diagnostic criteria established by the American Heart Association (AHA) are fever lasting longer than 5 days and 4 of the 5 following main clinical features:
  - Changes in the peripheral extremities: Initial reddening or edema of the palms and soles, followed by membranous desquamation of the finger and toe tips or transverse grooves across the fingernails and toenails (Beau lines)
  - Polymorphous rash (not vesicular): Usually generalized but may be limited to the groin or lower extremities
  - Oropharyngeal changes: Erythema, fissuring, and crusting of the lips; strawberry tongue; diffuse mucosal injection of the oropharynx
  - Bilateral, nonexudative, painless bulbar conjunctival injection
  - Acute nonpurulent cervical lymphadenopathy with lymph node diameter greater than 1.5 cm, usually unilateral

Kawasaki Disease—Treatment

- Admit all patients to the hospital for administration of IVIG and for observation until fever is controlled. Closely monitor cardiovascular function.
  - Echocardiogram
- Once the fever resolves, clinically significant heart failure or myocardial dysfunction is unlikely.
TREATMENT OF TINEA INFECTION

Tinea Infection
- Main presentation is tinea capitis, which is the primary dermatophyte in 92.5% of children under age 10.
  - Peak age range is 3-7
- Causes destruction of the cuticle and loss of the hair shaft
  - Alopecia is a common outcome
- Trichophyton tonsurans is the most common cause
  - Organism stays viable on combs, hats, sheets for months

Treatment of Tinea
- Drug of choice is Griseofulvin (20-25 mg/kg/d for 6-8 weeks).
- Alternative regimens:
  - Itraconazole continuous regimen (3-5 mg/kg/d with a full meal for 4-6 wk)
    - Itraconazole associated with heart failure, so not first-line
  - Terbinafine tablets at doses of 3-6 mg/kg/d for approximately 2-4 weeks
  - Fluconazole tablets or oral suspension (3-6 mg/kg/d) are administered for 6 weeks

TREATMENT OF SCABIES

Scabies
- Approximately 300 million cases worldwide/year
- In infants and small children, burrows are typically located on the palms and soles, as well as the face, scalp and neck
- Nodules occur in 7-10% of patients with scabies, particularly young children. In neonates unable to scratch, pinkish brown nodules ranging in size from 2-20 mm in diameter may develop

Scabies--Treatment
- Neonates should be treated only if the benefit outweighs the risk
- Nodular scabies may require steroid injections
- Patients should avoid skin-skin contact until after first treatment. They may return to school or daycare after 24 h
- Household members and close personal contacts older than 2 months should also be treated
Scabies—Treatment

- Permethrin 5% lotion—treatment of choice. Apply once and again in 7 days.
- Alternative drug therapy includes precipitated sulfur 6% in petrolatum, lindane, benzyl benzoate, crotamiton, and ivermectin; a possible new option is albendazole.
- Itching may be controlled with an antihistamine. Hydroxyzine hydrochloride (Atarax), diphenhydramine hydrochloride (Benadryl), or cyproheptadine hydrochloride (Periactin). More severe symptoms may require a short course of topical or oral steroids.
- Secondary infections may require antibiotics.

Scabies—Treatment

- Permethrin 5% lotion (Acticin, Elimite): For those over age 2 apply over the entire body, including the face and scalp in infants. It should be left on for 8-12 hours and then rinsed. Reapplication 1 week later is advised.
- Lindane: has increased neurotoxicity; not recommended for neonates or small children.
- Crotamiton 10% cream (Eurax): associated with many treatment failures.
- Ivermectin (Stromectol): not for children under 5 years of age. Off-label use.

Summary

- Dermatological conditions are common in children!
- Atopic dermatitis is very common in infants and young children; other rashes may not be seen until children are a bit older.
- Consider history as a major contributor: contact, infections, duration, comorbidities, family history, immunization status.

Summary

- Use resources if you are unsure:
  - Dermatology consult
  - Infectious disease consult
  - Monitor rashes closely! Often they are a harbinger of serious systemic pathology!

Scabies—Treatment

- Mupirocin (Bactroban, Centany): for secondary bacterial infections.
- Hydrocortisone, topical (Westcort, U-Cort, Ala Cort, Rederm): Low potency for itching.