Pediatric Case Files:

Exposure Dermatology

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From laptops to sandboxes, here are five common environmental exposures that can manifest in the skin.

These days, it is common knowledge that visiting the beach on a bright summer day without sun protection is harmful to your skin. But did you know that skin damage could also occur from using a laptop on your legs? Many people are not aware that exposures to common things found in our daily environment—such as sunlight, heat, insect bites, plants, and sand—can actually cause skin manifestations. So as the summer heat gives way to the sight of falling leaves and jack-o-lanterns, here are five different types of dermatologic conditions that can result from common environmental exposures and may present in your practice.

**Condition: Phytophotodermatitis**

**Source: Sun exposure.**

Phytophotodermatitis occurs when the radiant energy of the sun interacts with particular photosensitizing compounds found in a number of plants. These photosensitizing agents include several isomers of psoralens, also known as furocoumarins, which are found in many common fruits and vegetables, such as limes, lemons, oranges, celery, fig, parsnip, parsley, and carrots. If a psoralen-containing compound (e.g., lime juice) lands on the skin and is then exposed to UVA of a specific wavelength (320-400 nm), a phototoxic compound is formed that can induce a variety of skin findings. Phytophotodermatitis is frequently seen in people who are active outdoors, beachgoers, and children who have been playing in the sun.

Within a few hours to days of exposure, patients can develop erythematous plaques, vesicles, or bullae. Hyperpigmented patches without any preceding erythematous phase are also common. Skin lesions classically present with strange configurations and can appear in the shape of streaks or as finger marks corresponding to areas of sun-exposed skin that came into contact with the psoralens. Extensive involvement of the hands and mouth region is also common due to the eating and handling of the plants. The clinical manifestation of phytophotodermatitis can be confusing to healthcare provider and patient alike and can be mistaken for child abuse, atopic dermatitis, scalding cellulitis, or fungal infection. However, a thorough history that reveals past contact with one of the offending plants and sunlight exposure often helps in clinching the diagnosis.

Preventing this condition involves avoidance of exposure and use of protective clothing when outdoors. Treatment is primarily symptomatic, as the skin lesions tend to resolve spontaneously over the following weeks and months. Analgesics, antihistamines for itching, and wet compresses may be used to alleviate pruritus that may be related to acute erythematous or bullous lesions. Additionally, blistered areas should be kept clean to prevent any secondary infection of the skin. Early and short use of a topical steroid (triamcinolone 0.1% cream twice daily) can also help to diminish inflammation and thus possibly prevent the sequelae of hyperpigmentation. “Tincture of time” and photoprotection are the most useful interventions for hyperpigmented lesions. Families must be counseled that it may take months for such pigmentation to resolve.

**Condition: Erythema ab igne**

**Source: Heat exposure.**

Erythema ab igne (EAI) is a localized cutaneous eruption that occurs after chronic exposure to heat. In the past, EAI was a common condition seen on the legs of women who stood or sat too close to a fire, but in current times, the development of EAI has been linked to space heaters, fireplaces, car heaters, and even the use of laptop computers propped on the legs! It has also been known to develop after repeated application of hot water bottles or heating pads used to treat chronic pain or
EAI occurs when exposure to heat is recurrent but acutely insufficient to cause a classic burn. The typical initial manifestation of EAI after a single exposure is transient reticular erythema. With continued exposure to heat, a more marked erythema with hyperpigmentation develops and occasionally superficial epidermal atrophy. Eventually, the skin becomes persistently erythematous with pigment changes, reticulate telangiectasia, and diffuse hyperkeratosis. Subepidermal bullae are rare but have been reported. Although lesions are typically asymptomatic, patients may describe burning or itching sensations. On rare occasions, squamous cell carcinoma and Merkel cell carcinoma have also been known to arise in the lesions.

Avoidance of chronic heat to any one site on the body is the best preventative measure, and immediate removal of the source of heat is the mainstay of therapy for EAI. Early removal of the heat source results in an excellent prognosis with spontaneous resolution over time. However, chronic exposure without discontinuation can result in persistent pigmentary abnormalities, atrophy, or even malignancy. Some reports have shown that 5-Fluorouracil cream is effective in clearing epithelial atypia. Furthermore, it is important to perform a biopsy of the lesion if any evidence of cutaneous malignancy such as nodules or ulceration exists.

**Condition: Papular urticaria**

Insect bite-induced hypersensitivity reactions, also known as papular urticaria, are a common dermatological complaint in the pediatric population, especially in urban environments. It is most common in children age two to 10 but can occasionally occur in adolescents and is even seen in adults. Papular urticaria is caused by a hypersensitivity reaction to biting or stinging insects, most commonly cat and dog fleas (Ctenocephalides felis and canis). However, other offenders include mosquitoes and the common bedbug (Cimex lectularius). True papular urticaria requires a long period of sensitization during which the patient is repeatedly exposed to the insect. Fortunately, most children will develop tolerance to the insect bites by about 10 years of age.

The typical skin lesions of papular urticaria present as recurring eruptions of pruritic papules, vesicles, and wheals. They are usually grouped into linear or triangular clusters on exposed areas of skin such as the face, neck, arms, and legs. The diaper area, palms, soles of the feet, and trunk are commonly spared. Intense pruritus may occur, and scratching can lead to excoriations, secondary infection, scarring, or permanent pigmentary abnormalities. Other characteristics that help distinguish papular urticaria from other pediatric rashes include a symmetric or sometimes “meal cluster” distribution.

It’s also important to keep in mind that often only one member of the family is affected. To prevent papular urticaria, children are advised to wear protective clothing when playing outdoors. They can also use insect repellents to ward off mosquitoes and other arthropods. However, parents should take care to avoid prolonged exposure to high concentrations of pesticides, particularly in young children. It is a good idea to spray clothing when possible rather than skin and resist the inclination for repeated, frequent dousing with multiple sprays due to potential neurologic toxicities.

Families with pets should ensure that their pets do not have fleas. There are a variety of flea solutions for animals, including flea collars, flea shampoo, and flea medications specifically designed for pets. Frequent bathing of the animal can also be helpful in preventing fleabites. We also recommend checking screens to avoid inadvertent entry points for mosquitoes. To prevent bed bugs from colonizing the home, all bedding and mattress pads should be laundered every two to four weeks. Also, applying double-sided tape to the legs of the bed can actually help prevent bedbug infestation. Finally, if more conservative measures are ineffective, families can consider professional pesticide treatments for their home.

In treating papular urticaria, most physicians have found that sparing use of high-potency topical steroids can be helpful in reducing inflammation and controlling pruritus. Antihistamines such as cetirizine, hydroxyzine, or diphenhydramine can also provide relief from itching in an acute setting, and sometimes are required for more prolonged use. Older children and adults with more localized papular urticaria may find intralesional steroids helpful in decreasing pruritus, but it’s best to avoid this method in young patients with widespread lesions.

Finally, although papular urticaria can be a frustrating and recurrent problem, patients should be reassured that even without any treatment, they will eventually develop tolerance to the insect bites and their symptoms will resolve.

**Condition: Allergic contact dermatitis**

Four commonly encountered species of the Anacardiaceae plant family (poison ivy, western poison oak, eastern poison oak, and poison sumac) account for the majority of allergic contact dermatitis seen in the United States. In fact, 50 to 70 percent of the population is sensitized to the toxic effects of these plants! This group of plants causes more allergic contact dermatitis than all other causes combined. Allergic contact dermatitis occurs after direct or indirect contact with the plant’s sap, which contains an allergenic component called urushiol. Uroshiol is also found in the leaves, stems, and roots of the plants. Direct contact with the sap results from touching or brushing against an injured
plant. Meanwhile, indirect contact may occur by a variety of vehicles including clothing, shoes, tools, pets, and even smoke from burning plants contaminated with the sap. Mango rind also cross-reacts with these plants, and can cause a perioral dermatitis after eating this fruit.

Like papular urticaria, allergic contact dermatitis requires prior sensitization to induce skin lesions. Following first exposure, it can take from seven to 21 days to develop lesions. However, a previously sensitized individual will begin to develop very intense pruritus and erythema within 24 to 48 hours, followed by the appearance of papules, vesicles, and even bullae if severe. The lesions often develop in multiple, linear arrangements that reflect the exposure (plant, twig, or scratching from a hand) and suggest an “outside-in” etiology. Untreated lesions usually last two to three weeks. Secondary bacterial infection, erythema multiforme, and urticaria may complicate the presentation, but these are quite rare.

The famous rule “leaves of three, let it be” is a good guideline to follow when trying to avoid the leaves of poison ivy or poison oak. Poison sumac, though, possesses seven to 13 smooth-edged leaflets and glossy pale yellow or cream-colored berries. Wearing protective clothing is another way to prevent exposure to these plants. An over-the-counter product called Ivy Block, an organoclay preparation, has shown to be effective in preventing reaction to uroshiol, as well. This lotion should be applied to the skin at least 15 minutes before exposure and forms a visible coating, but it needs to be reapplied at least every four hours for continual protection.

Once contact with the plant’s sap has occurred, the exposed area should be washed thoroughly with mild soap and water to remove any remaining uroshiol. Since the uroshiol can remain on surfaces for a long time and cause further exposure, clothing and gear should also be removed as quickly as possible to prevent any spread. If the uroshiol-containing sap is completely removed from the skin within 10 minutes of contact, dermatitis usually does not develop. However, if dermatitis does develop, topical therapies are usually sufficient. For weeping lesions, cool compresses, dilute aluminum acetate soaks, and calamine...
lotion can help reduce pruritis and dry the skin. High-potency topical corticosteroids can be useful in the early phase of a localized rash.

For severe or refractory allergic contact dermatitis, a course of systemic corticosteroids should be administered, along with frequent colloidal oatmeal baths and adhesive oral anti-helminthics. It is important to avoid "short pulses" (four to six days) of systemic therapy, as relapse may occur following discontinuation of systemic therapy lasting less than seven to 10 days. Most experts recommend 1-2mg/kg/d of oral prednisone, tapered over two to three weeks.

**Condition: Cutaneous larva migrans**

**Source:** Sand exposure

Dermatitis caused by the invasion and migration of nematode larva in the skin, cutaneous larva migrans (CLM) is most often seen in frequent beachgoers and children who play in sandbox or soil. In the US, this condition usually results from contact with soil contaminated with animal feces that contains the eggs of dog or cat hookworms. Once in the soil, the hookworm eggs hatch and release larvae that develop into an infective form within a week's time. These infective nematode larvae live in the top half-inch of the soil and penetrate through small fissures or hair follicles of the epidermis when they come into contact with human skin. Areas most commonly affected are those that remain in contact with the soil, such as hand, feet, buttocks, and anogenital region. Although CLM lesions may typically intensely pruritic.

The best method of preventing CLM is to avoid contact of exposed skin to contaminated soil or sand. By wearing shoes, gardening gloves, and using a beach towel when lying on sand, one can decrease the chance of exposure to the larvae. In addition, making sure that pets are dewormed can help reduce soil contamination, and keeping pets away from sandboxes or other areas where children frequently play may be beneficial as well.

Because humans are accidental hosts in which the larvae are not able to complete their life cycle, the larvae typically die a few weeks after invasion and the disease subsides. In the past, topical thiabendazole was used to treat CLM because it was effective in killing the larvae. However, topical thiabendazole is no longer a favored therapy as it requires repeated application, is not able to complete their life cycle, the larvae typically die a few weeks after invasion and the disease subsides. Currently, the drug of choice in treating CLM is albendazole, at a dose of 400-800mg/day for one to seven days. This drug is a well-tolerated anti-helminthic which acts against eggs, larvae, and adult stages of the helminthes. It has been shown to relieve pruritis in three to five days and resolve cutaneous lesions by day five to seven days of treatment.

**Intervention**

Despite the best efforts of physicians and parents, children are often prone to developing dermatologic conditions from exposures in their environment. However, preventative measures and effective treatment options do exist for the skin conditions discussed here, and with proper therapy, many of these manifestations can be quickly and easily resolved without serious risk to a child's health.

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