

H A N D O U T O N H E A L T H

Atopic Dermatitis

(A type of eczema)

U.S. Department of Health and
Human Services
National Institutes of Health
National Institute of Arthritis and
Musculoskeletal and Skin Diseases



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Atopic Dermatitis

This booklet is for people who have atopic dermatitis (often called “eczema”), parents and caregivers of children with atopic dermatitis, and others interested in learning more about the disease. The booklet describes the disease and its symptoms and contains information about diagnosis and treatment as well as current research efforts supported by the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) and other components of the Department of Health and Human Services’ National Institutes of Health (NIH). It also discusses issues such as skin care and quality of life for people with atopic dermatitis. If you have further questions after reading this booklet, you may wish to discuss them with your doctor or your child’s pediatrician.

Defining Atopic Dermatitis

A topic dermatitis is a chronic (long-lasting) disease that affects the skin. It is not contagious; it cannot be passed from one person to another. The word “dermatitis” means inflammation of the skin. “Atopic” refers to a group of diseases where there is often an inherited tendency to develop other allergic conditions, such as asthma and hay fever. In atopic dermatitis, the skin becomes extremely itchy. Scratching leads to redness, swelling, cracking, “weeping” clear fluid, and finally, crusting and scaling. In most cases, there are periods of

time when the disease is worse (called exacerbations or flares) followed by periods when the skin improves or clears up entirely (called remissions). As some children with atopic dermatitis grow older, their skin disease

improves or disappears altogether, although their skin often remains dry and easily irritated. In others, atopic dermatitis continues to be a significant problem in adulthood.

Although atopic dermatitis may occur at any age, it most often begins in infancy and childhood.

Atopic dermatitis is often referred to as “eczema,” which is a general term for the several types of inflammation of the skin. Atopic dermatitis is the most common of the many types of eczema. Several have very similar symptoms. Types of eczema are described in the box on page 5.

Incidence and Prevalence of Atopic Dermatitis

Atopic dermatitis is very common. It affects males and females and accounts for 10 to 20 percent of all visits to dermatologists (doctors who specialize in the care and treatment of skin diseases). Although atopic dermatitis may occur at any age, it most often begins in infancy and childhood. Scientists estimate that 65 percent of patients develop symptoms in the first year of life, and 90 percent develop symptoms before the age of 5. Onset after age 30 is less common and is often due to exposure of the skin to harsh or wet conditions. Atopic dermatitis is a common cause of workplace disability. People who live in cities and in dry climates appear more likely to develop this condition.

Types of Eczema (Dermatitis)

- Allergic contact eczema (dermatitis): a red, itchy, weepy reaction where the skin has come into contact with a substance that the immune system recognizes as foreign, such as poison ivy or certain preservatives in creams and lotions
- Atopic dermatitis: a chronic skin disease characterized by itchy, inflamed skin
- Contact eczema: a localized reaction that includes redness, itching, and burning where the skin has come into contact with an allergen (an allergy-causing substance) or with an irritant such as an acid, a cleaning agent, or other chemical
- Dyshidrotic eczema: irritation of the skin on the palms of hands and soles of the feet characterized by clear, deep blisters that itch and burn
- Neurodermatitis: scaly patches of the skin on the head, lower legs, wrists, or forearms caused by a localized itch (such as an insect bite) that become intensely irritated when scratched
- Nummular eczema: coin-shaped patches of irritated skin—most common on the arms, back, buttocks, and lower legs—that may be crusted, scaling, and extremely itchy
- Seborrheic eczema: yellowish, oily, scaly patches of skin on the scalp, face, and occasionally other parts of the body
- Stasis dermatitis: a skin irritation on the lower legs, generally related to circulatory problems

Although it is difficult to identify exactly how many people are affected by atopic dermatitis, an estimated 20 percent of infants and young children experience symptoms of the disease. Roughly 60 percent of these infants continue to have one or more symptoms of atopic dermatitis in adulthood. This means that more than 15 million people in the United States have symptoms of the disease.

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Cost of Atopic Dermatitis

In a recent analysis of the health insurance records of 5 million Americans under age 65, medical researchers found that approximately 2.5 percent had atopic dermatitis. Annual insurance payments for medical care of atopic dermatitis ranged from \$580 to \$1,250 per patient. More than one-quarter of each patient's total health care costs were for atopic dermatitis and related conditions. The researchers project that U.S. health insurance companies spend more than \$1 billion per year on atopic dermatitis.

Causes of Atopic Dermatitis

The cause of atopic dermatitis is not known, but the disease seems to result from a combination of genetic (hereditary) and environmental factors.

Children are more likely to develop this disorder if one or both parents have had it or have had allergic conditions like asthma or hay fever. While some people outgrow skin

symptoms, approximately three-fourths of children with atopic dermatitis go on to develop hay fever or asthma. Environmental factors can bring on symptoms of atopic dermatitis at any time in individuals who have inherited the atopic disease trait.

Atopic dermatitis is also associated with malfunction of the body's immune system: the system that recognizes and helps fight bacteria and viruses that invade the body. Scientists have found that people with atopic dermatitis have a low level of a cytokine (a protein) that is essential to the healthy function of the body's immune system and a high level of other cytokines that lead to allergic reactions. The immune system can become misguided and create inflammation in the skin even in the absence of a major infection. This can be viewed as a form of autoimmunity, where a body reacts against its own tissues.

In the past, doctors thought that atopic dermatitis was caused by an emotional disorder. We now know that emotional factors, such as stress, can make the condition worse, but they do not cause the disease.

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Skin Features Associated With Atopic Dermatitis

- Atopic pleat (Dennie-Morgan fold): an extra fold of skin that develops under the eye
- Cheilitis: inflammation of the skin on and around the lips
- Hyperlinear palms: increased number of skin creases on the palms
- Hyperpigmented eyelids: eyelids that have become darker in color from inflammation or hay fever
- Ichthyosis: dry, rectangular scales on the skin
- Keratosis pilaris: small, rough bumps, generally on the face, upper arms, and thighs
- Lichenification: thick, leathery skin resulting from constant scratching and rubbing
- Papules: small raised bumps that may open when scratched and become crusty and infected
- Urticaria: hives (red, raised bumps) that may occur after exposure to an allergen, at the beginning of flares, or after exercise or a hot bath

Symptoms of Atopic Dermatitis

Symptoms (signs) vary from person to person. The most common symptoms are dry, itchy skin and rashes on the face, inside the elbows and behind the knees, and on the hands and feet. Itching is the most important symptom of atopic dermatitis. Scratching and rubbing in response to itching irritates the skin, increases inflammation, and actually increases itchiness. Itching is a particular problem during sleep when conscious control of scratching is lost.

The appearance of the skin that is affected by atopic dermatitis depends on the amount of scratching and the presence of secondary skin infections. The skin may be red and scaly, be thick and leathery, contain small raised bumps, or leak fluid and become crusty and infected. The box on page 8 lists common skin features of the disease. These features can also be found in people who do not have atopic dermatitis or who have other types of skin disorders.

Atopic dermatitis may also affect the skin around the eyes, the eyelids, and the eyebrows and lashes. Scratching and rubbing the eye area can cause the skin to redden and swell. Some people with atopic dermatitis develop an extra fold of skin under their eyes. Patchy loss of eyebrows and eyelashes may also result from scratching or rubbing.

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Researchers have noted differences in the skin of people with atopic dermatitis that may contribute to the symptoms of the disease. The outer layer of skin, called the epidermis, is divided into two parts: an inner part

containing moist, living cells, and an outer part, known as the horny layer or stratum corneum, containing dry, flattened, dead cells.

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Under normal conditions the stratum corneum acts as a barrier, keeping the rest of the skin from drying out and protecting other layers of skin from damage caused by irritants and infections. When this barrier is damaged, irritants act more intensely on the skin.

The skin of a person with atopic dermatitis loses moisture from the epidermal layer, allowing the skin to become very dry and reducing its protective abilities. Thus, when combined with the abnormal skin immune system, the person's skin is more likely to become infected by bacteria (for example, *Staphylo-*

coccus and Streptococcus) or viruses, such as those that cause warts and cold sores.

Stages of Atopic Dermatitis

When atopic dermatitis occurs during infancy and childhood, it affects each child differently in terms of both onset and severity of symptoms. In infants, atopic dermatitis typically begins around 6 to 12 weeks of age. It may first appear around the cheeks and chin as a patchy facial rash, which can progress to red, scaling, oozing skin. The skin may become infected. Once the infant becomes more mobile and begins crawling, exposed areas, such as the inner and outer parts of the arms and legs, may also be affected. An infant with atopic dermatitis may be restless and irritable because of the itching and discomfort of the disease. The skin may improve by 18 months of age, although the infant has a greater than normal risk of developing dry skin or hand eczema later in life.

In childhood, the rash tends to occur behind the knees and inside the elbows; on the sides of the neck; around the mouth; and on the wrists, ankles, and hands. Often, the rash begins with papules that become hard and scaly when scratched. The skin around the lips may be inflamed, and constant licking of the area may lead to small, painful cracks in the skin around the mouth.

In some children, the disease goes into remission for a long time, only to come back at the onset of puberty when hormones, stress, and the use of irritating skin care products or cosmetics may cause the disease to flare.

Although a number of people who developed atopic dermatitis as children also experience symptoms as adults, it is also possible for the disease to show up first in adulthood. The pattern in adults is similar to that seen in children; that is, the disease may be widespread or limited to only a few parts of the body. For example,

only the hands or feet may be affected and become dry, itchy, red, and cracked. Sleep patterns and work performance may be affected, and long-term use of medications to treat the atopic dermatitis may cause complications. Adults with atopic dermatitis also have a predisposition toward irritant contact dermatitis, where the skin becomes red and inflamed from contact with detergents, wool, friction from clothing, or other potential irritants. It is more likely to occur in occupations involving frequent hand washing or exposure to chemicals. Some people develop a rash around their nipples. These localized symptoms are difficult to treat. Because adults may also develop cataracts, the doctor may recommend regular eye exams.

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difficult to treat. Because adults may also develop cataracts, the doctor may recommend regular eye exams.

Diagnosing Atopic Dermatitis

Each person experiences a unique combination of symptoms, which may vary in severity over time. The doctor will base a diagnosis on the symptoms the patient experiences and may need to see the patient several times to make an accurate diagnosis and to rule out other diseases and conditions that might cause skin irritation. In some cases, the family doctor or pediatrician may refer the patient to a dermatologist (doctor specializing in skin disorders) or allergist (allergy specialist) for further evaluation.

A medical history may help the doctor better understand the nature of a patient's symptoms, when they occur, and their possible causes. The doctor may ask about family

history of allergic disease; whether the patient also has diseases such as hay fever or asthma; and about exposure to irritants, sleep disturbances, any foods that seem to be related to skin flares, previous treatments for skin-related symptoms, and use of steroids or other medications. A preliminary diagnosis of atopic dermatitis can be made if the patient has three or more features from each of two categories: major features and minor features. Some of these features are listed in the box on page 14.

Currently, there is no single test to diagnose atopic dermatitis. However, there are some tests that can give the doctor an indication of allergic sensitivity.

Pricking the skin with a needle that contains a small amount of a suspected allergen may be helpful in identifying factors that trigger flares of atopic dermatitis. Negative results on skin tests may help rule out the possibility that certain substances cause skin inflammation. Positive skin prick test results are difficult to interpret in people with atopic dermatitis because the skin is very sensitive to many substances, and there can be many positive test sites that are not meaningful to a person's disease at the time. Positive results simply indicate that the individual has IgE (allergic) antibodies to the substance tested. IgE (immunoglobulin E) controls the immune system's allergic response and is often high in atopic dermatitis.

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Major and Minor Features of Atopic Dermatitis

Major Features

- Intense itching
- Characteristic rash in locations typical of the disease
- Chronic or repeatedly occurring symptoms
- Personal or family history of atopic disorders (eczema, hay fever, asthma)

Some Minor Features

- Early age of onset
- Dry skin that may also have patchy scales or rough bumps
- High levels of immunoglobulin E (IgE), an antibody, in the blood
- Numerous skin creases on the palms
- Hand or foot involvement
- Inflammation around the lips
- Nipple eczema
- Susceptibility to skin infection
- Positive allergy skin tests

Recently, it was shown that if the quantity of IgE antibodies to a food in the blood is above a certain level, it is diagnostic of a food allergy. If the level of IgE to a specific food does not exceed the level needed for diagnosis but a food allergy is suspected, a person might be asked to record everything eaten and note any reactions. Physician-supervised food challenges (that is, the introduction of a food) following a period of food elimination may be necessary to determine if symptomatic food allergy is present. Identifying the food allergen may be difficult when a person is also being exposed to other possible allergens at the same time or symptoms may be triggered by other factors, such as infection, heat, and humidity.

Factors That Make Atopic Dermatitis Worse

Many factors or conditions can make symptoms of atopic dermatitis worse, further triggering the already overactive immune system, aggravating the itch-scratch cycle, and increasing damage to the skin. These factors can be broken down into two main categories: irritants and allergens. Emotional factors and some infections and illnesses can also influence atopic dermatitis.

Irritants are substances that directly affect the skin and, when present in high enough concentrations with long enough contact, cause the skin to become red and itchy or to burn. Specific irritants affect people with atopic dermatitis to different degrees. Over time, many patients and their family members learn to identify the irritants causing the most trouble. For example, frequent wetting and drying of the skin may affect the skin barrier function. Also, wool or synthetic fibers and rough or

poorly fitting clothing can rub the skin, trigger inflammation, and cause the itch-scratch cycle to begin. Soaps and detergents may have a drying effect and worsen itching, and some perfumes and cosmetics may irritate the skin. Exposure to certain substances, such as solvents, dust, or sand, may also make the condition worse. Cigarette smoke may irritate the eyelids. Because the effects of irritants vary from one person to another, each person can best determine what substances or circumstances cause the disease to flare.

Allergens are substances from foods, plants, animals, or the air that inflame the skin because the immune system overreacts to the substance. Inflammation occurs even when the person is exposed to small amounts of the substance for a limited time. Although it is known that allergens in the air, such as dust mites, pollens, molds, and dander from animal hair or skin, may worsen the symptoms of atopic dermatitis in some people, scientists aren't certain whether inhaling these allergens or their

Common Irritants

- Wool or synthetic fibers
- Soaps and detergents
- Some perfumes and cosmetics
- Substances such as chlorine, mineral oil, or solvents
- Dust or sand
- Cigarette smoke

actual penetration of the skin causes the problems. When people with atopic dermatitis come into contact with an irritant or allergen they are sensitive to, inflammation-producing cells become active. These cells release chemicals that cause itching and redness. As the person responds by scratching and rubbing the skin, further damage occurs.

A number of studies have shown that foods may trigger or worsen atopic dermatitis in some people, particularly infants and children. In general, the worse the atopic dermatitis and the younger the child, the more likely food allergy is present. An allergic reaction to food can cause skin inflammation (generally an itchy red rash), gastrointestinal symptoms (abdominal pain, vomiting, diarrhea), and/or upper respiratory tract symptoms (congestion, sneezing, and wheezing). The most common allergenic (allergy-causing) foods are eggs, milk, peanuts, wheat, soy, and fish. A recent analysis of a large number of studies on allergies and breastfeeding indicated that breastfeeding an infant for at least 4 months may protect the child from developing allergies. However, some studies suggest that mothers with a family history of atopic diseases should avoid eating common allergenic foods during late pregnancy and breastfeeding.

In addition to irritants and allergens, emotional factors, skin infections, and temperature and climate play a role in atopic dermatitis. Although the disease itself is not caused by emotional factors, it can be made worse by stress, anger, and frustration. Interpersonal problems or major life changes, such as divorce, job changes, or the death of a loved one, can also make the disease worse.

Treatment is more effective when a partnership develops that includes the patient, family members, and doctor.

Bathing without proper moisturizing afterward is a common factor that triggers a flare of atopic dermatitis. The low humidity of winter or the dry year-round climate of some geographic areas can make the disease worse, as can overheated indoor areas and long or hot baths and showers. Alternately sweating and chilling can trigger a flare in some people. Bacterial infections can also trigger or increase the severity of atopic dermatitis. If a patient experiences a sudden flare of illness, the doctor may check for infection.

Treatment of Atopic Dermatitis

Treatment is more effective when a partnership develops that includes the patient, family members, and doctor. The doctor will suggest a treatment plan based on the patient's age, symptoms, and general health. The patient or family member providing care plays a large role in the success of the treatment plan by carefully following the doctor's instructions and paying attention to what is or is not helpful. Most

patients will notice improvement with proper skin care and lifestyle changes.

The doctor has two main goals in treating atopic dermatitis: healing the skin and preventing flares. These may be assisted by developing skin care routines

and avoiding substances that lead to skin irritation and trigger the immune system and the itch-scratch cycle. It is important for the patient and family members to note any changes in the skin's condition in response to treatment, and to be persistent in identifying the treatment that seems to work best.

Medications: New medications known as *immuno-modulators* have been developed that help control inflammation and reduce immune system reactions when applied to the skin. Examples of these medications are tacrolimus ointment (Protopic*) and pimecrolimus cream (Elidel). They can be used in patients older than 2 years of age and have few side effects (burning or itching the first few days of application). They not only reduce flares, but also maintain skin texture and reduce the need for long-term use of corticosteroids.

Corticosteroid creams and ointments have been used for many years to treat atopic dermatitis and other autoimmune diseases affecting the skin. Sometimes over-the-counter preparations are used, but in many cases the doctor will prescribe a stronger corticosteroid cream or ointment. When prescribing a medication, the doctor will take into account the patient's age, location of the skin to be treated, severity of the symptoms, and type of preparation (cream or ointment) that will be most effective. Sometimes the base used in certain brands of corticosteroid creams and ointments irritates

*Brand names included in this booklet are provided as examples only, and their inclusion does not mean that these products are endorsed by the National Institutes of Health or any other Government agency. Also, if a particular brand name is not mentioned, this does not mean or imply that the product is unsatisfactory.

the skin of a particular patient. Side effects of repeated or long-term use of topical corticosteroids can include thinning of the skin, infections, growth suppression (in children), and stretch marks on the skin.

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When topical corticosteroids are not effective, the doctor may prescribe a systemic corticosteroid, which is taken by mouth or injected instead of being applied directly to the skin. An example of a commonly prescribed corticosteroid is prednisone. Typically, these medications are used only in resistant cases and only given for short periods of time. The side effects of systemic corticosteroids can include skin damage, thinned or weakened bones, high blood pressure, high blood sugar, infections, and cataracts. It can be dangerous to suddenly stop taking corticosteroids, so it is very important that the doctor and patient work together in changing the corticosteroid dose.

Antibiotics to treat skin infections may be applied directly to the skin in an ointment, but are usually more effective when taken by mouth. If viral or fungal infections are present,

the doctor may also prescribe specific medications to treat those infections.

Certain antihistamines that cause drowsiness can reduce nighttime scratching and allow more restful sleep when taken at bedtime. This effect can be particularly helpful for patients whose nighttime scratching makes the disease worse.

In adults, drugs that suppress the immune system, such as cyclosporine, methotrexate, or azathioprine, may be prescribed to treat severe cases of atopic dermatitis that have failed to respond to other forms of therapy. These drugs block the production of some immune cells and curb the action of others. The side effects of drugs like cyclosporine can include high blood pressure, nausea, vomiting, kidney problems, headaches, tingling or numbness, and a possible increased risk of cancer and infections. There is also a risk of relapse after the drug is stopped. Because of their toxic side effects, systemic corticosteroids and immunosuppressive drugs are used only in severe cases and then for as short a period of time as possible. Patients requiring systemic corticosteroids should be referred to dermatologists or allergists specializing in the care of atopic dermatitis to help identify trigger factors and alternative therapies.

In rare cases, when home-based treatments have been unsuccessful, a patient may need a few days in the hospital for intense treatment.

Phototherapy: Use of ultraviolet A or B light waves, alone or combined, can be an effective treatment for mild to moderate dermatitis in older children (over 12 years old) and adults. A combination of ultraviolet light therapy and a drug called psoralen can also be used in cases that are resistant to ultraviolet light alone. Possible long-term side effects of this treatment include premature

Treating Atopic Dermatitis in Infants and Children

- Give lukewarm baths.
- Apply lubricant immediately following the bath.
- Keep child's fingernails filed short.
- Select soft cotton fabrics when choosing clothing.
- Consider using sedating antihistamines to promote sleep and reduce scratching at night.
- Keep the child cool; avoid situations where overheating occurs.
- Learn to recognize skin infections and seek treatment promptly.
- Attempt to distract the child with activities to keep him or her from scratching.
- Identify and remove irritants and allergens.

skin aging and skin cancer. If the doctor thinks that phototherapy may be useful to treat the symptoms of atopic dermatitis, he or she will use the minimum exposure necessary and monitor the skin carefully.

Skin Care: Healing the skin and keeping it healthy are important to prevent further damage and enhance quality of life. Developing and sticking with a daily skin care routine is critical to preventing flares.

A lukewarm bath helps to cleanse and moisturize the skin without drying it excessively. Because soaps can be drying to the skin, the doctor may recommend use of a mild bar soap or nonsoap cleanser. Bath oils are not usually helpful.

After bathing, a person should air-dry the skin, or pat it dry gently (avoiding rubbing or brisk drying), and then apply a lubricant to seal in the water that has been absorbed into the skin during bathing. In addition to restoring the skin's moisture, lubrication increases the rate of healing and establishes a barrier against further drying and irritation. Lotions that have a high water or alcohol content evaporate more quickly, and alcohol may cause stinging. Therefore, they generally are not the best choice. Creams and ointments work better at healing the skin.

Another key to protecting and restoring the skin is taking steps to avoid repeated skin infections. Signs of skin infection include tiny pustules (pus-filled bumps), oozing cracks or sores, or crusty yellow blisters. If symptoms of a skin infection develop, the doctor should be consulted and treatment should begin as soon as possible.

Protection from Allergen Exposure: The doctor may suggest reducing exposure to a suspected allergen. For example, the presence of the house dust mite can be limited by encasing mattresses and pillows in special dust-proof covers, frequently washing bedding in hot water, and removing carpeting. However, there is no way to completely rid the environment of airborne allergens.

Changing the diet may not always relieve symptoms of atopic dermatitis. A change may be helpful, however, when the medical history, laboratory studies, and specific symptoms strongly suggest a food allergy. It is up to the patient and his or her family and physician to decide whether the dietary restrictions are appropriate. Unless properly monitored by a physician or dietitian, diets with many restrictions can contribute to serious nutritional problems, especially in children.

Atopic Dermatitis and Quality of Life

Despite the symptoms caused by atopic dermatitis, it is possible for people with the disorder to maintain a good quality of life. The keys to quality of life lie in being well-informed; awareness of symptoms and their possible cause; and developing a partnership involving the patient or caregiving family member, medical doctor, and other health professionals. Good communication is essential. (See “Tips for Working With Your Doctor” on page 26.)

When a child has atopic dermatitis, the entire family may be affected. It is helpful if families have additional support to help them cope with the stress and frustration associated with the disease. A child may be fussy and difficult and unable to keep from scratching and rubbing the skin. Distracting the child and providing activities that keep the hands busy are helpful but require much effort on the part of the parents or caregivers. Another issue families face is the social and emotional stress associated with changes in appearance caused by atopic dermatitis. The child may face difficulty in school or with social relationships and may need additional support and encouragement from family members.

Adults with atopic dermatitis can enhance their quality of life by caring regularly for their skin and being mindful of the effects of the disease and how to treat them. Adults should develop a skin care regimen as part of their daily routine, which can be adapted as circumstances and skin conditions change. Stress management and relaxation techniques may help decrease the likelihood of flares. Developing a network of support that includes family, friends, health professionals, and support groups or organizations can be beneficial. Chronic anxiety and depression may be relieved by short-term psychological therapy.

Recognizing the situations when scratching is most likely to occur may also help. For example, many patients find that they scratch more when they are idle, and they do better when engaged in activities that keep the hands occupied. Counseling also may be helpful to identify or change career goals if a job involves contact with irritants or involves frequent hand washing, such as kitchen work or auto mechanics.

Atopic Dermatitis and Vaccination Against Smallpox

Although scientists are working to develop safer vaccines, persons diagnosed with atopic dermatitis (or eczema) should not receive the current smallpox vaccine. According to the Centers for Disease Control and Prevention (CDC), a U.S. Government organization, persons who have ever been diagnosed with atopic dermatitis, even if the condition is mild or not presently active, are more likely to develop a serious complication if they are exposed to the virus from the smallpox vaccine.

People with atopic dermatitis should exercise caution when coming into close physical contact with a person who has been recently vaccinated, and make certain the vaccinated person has covered the vaccination site or taken other precautions until the scab falls off (about 3 weeks). Those who have had physical contact with a vaccinated person's unhealed vaccination site or to their bedding or other items that might have touched that site should notify their doctor, particularly if they develop a new or unusual rash.

During a smallpox outbreak, these vaccination recommendations may change. Persons with atopic dermatitis who have been exposed to smallpox should consult their doctor about vaccination.

Tips for Working With Your Doctor

- Provide complete, accurate medical information.
- Make a list of your questions and concerns in advance.
- Be honest and share your point of view with the doctor.
- Ask for clarification or further explanation if you need it.
- Talk to other members of the health care team, such as nurses, therapists, or pharmacists.
- Don't hesitate to discuss sensitive subjects with your doctor.
- Discuss changes to medical treatment or medications with your doctor.

Additional information about atopic dermatitis and smallpox vaccination is available from CDC. (See “Additional Resources” section of this booklet.)

Current Research

Researchers supported by the National Institute of Arthritis and Musculoskeletal and Skin Diseases and other institutes of the National Institutes of Health are gaining a better understanding of what causes atopic dermatitis and how it can be managed, treated, and, ultimately, prevented. Some promising avenues of research are described below.

Genetics: Although atopic dermatitis runs in families, the role of genetics (inheritance) remains unclear. It does appear that more than one gene is involved in the disease.

Research has helped shed light on the way atopic dermatitis is inherited. Studies show that children are at increased risk for developing the disorder if there is a family history of other atopic disease, such as hay fever or asthma. The risk is significantly higher if both parents have an atopic disease. In addition, studies of identical twins, who have the same genes, show that in an estimated 80 to 90 percent of cases, atopic disease appears in both twins. Fraternal (nonidentical) twins, who have only some genes in common, are no more likely than two other people in the general population to both have an atopic disease. These findings suggest that genes play an important role in determining who gets the disease.

Biochemical Abnormalities: Scientists suspect that changes in the skin’s protective barrier make people with atopic dermatitis more sensitive to irritants. Such people have lower levels of fatty acids (substances that provide

moisture and elasticity) in their skin, which causes dryness and reduces the skin's ability to control inflammation.

Other research points to a possible defect in a type of white blood cell called a monocyte. In people with atopic dermatitis, monocytes appear to play a role in the decreased production of an immune system hormone called interferon gamma (IFN- γ), which helps regulate allergic reactions. This defect may cause exaggerated immune and inflammatory responses in the blood and tissues of people with atopic dermatitis.

Faulty Regulation of Immunoglobulin E (IgE): As already described in the section on diagnosis, IgE is a type of antibody that controls the immune system's allergic response. An antibody is a special protein produced by the immune system that recognizes and helps fight and destroy viruses, bacteria, and other foreign substances that invade the body. Normally, IgE is present in very small amounts, but levels are high in 80 to 90 percent of people with atopic dermatitis.

Controlling Atopic Dermatitis

- Prevent scratching or rubbing whenever possible.
- Protect skin from excessive moisture, irritants, and rough clothing.
- Maintain a cool, stable temperature and consistent humidity levels.
- Limit exposure to dust, cigarette smoke, pollens, and animal dander.
- Recognize and limit emotional stress.

In allergic diseases, IgE antibodies are produced in response to different allergens. When an allergen comes into contact with IgE on specialized immune cells, the cells release various chemicals, including histamine. These chemicals cause the symptoms of an allergic reaction, such as wheezing, sneezing, runny eyes, and itching. The release of histamine and other chemicals alone cannot explain the typical long-term symptoms of the disease. Research is underway to identify factors that may explain why too much IgE is produced and how it plays a role in the disease.

Immune System Imbalance:

Researchers also think that an imbalance in the immune system may contribute to the development of atopic dermatitis. It appears that the part of the immune system responsible for stimulating IgE is overactive, and the part that handles skin viral and fungal infections is underactive. Indeed, the skin of people with atopic dermatitis shows increased susceptibility to skin infections. This imbalance appears to result in the skin's inability to prevent inflammation, even in areas of skin that appear normal. In one project, scientists are studying the role of the infectious bacterium *Staphylococcus aureus* (*S. aureus*) in atopic dermatitis.

Researchers believe that one type of immune cell in the skin, called a Langerhans cell, may be involved in atopic dermatitis. Langerhans cells pick up viruses, bacteria,

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allergens, and other foreign substances that invade the body and deliver them to other cells in the immune defense system. Langerhans cells appear to be hyperactive in the skin of people with atopic diseases. Certain Langerhans cells are particularly potent at activating white blood cells called T cells in atopic skin, which produce proteins that promote allergic response. This function results in an exaggerated response of the skin to tiny amounts of allergens.

Scientists have also developed mouse models to study step-by-step changes in the immune system in atopic dermatitis, which may eventually lead to a treatment that effectively targets the immune system.

Drug Research: Some researchers are focusing on new treatments for atopic dermatitis, including biologic agents, fatty acid supplements, and new forms of phototherapy. For example, they are studying how ultraviolet light affects the skin's immune system in healthy and diseased skin. They are also investigating biologic agents, including several aimed at modifying the response of the immune system. A biologic agent is a new type of drug based on molecules that occur naturally in the body. One promising treatment is the use of thymopentin to reestablish balance in the immune system.

Researchers also continue to look for drugs that suppress the immune system. In this regard, they are studying the effectiveness of cyclosporine A. Clinical trials are underway with another drug called FK506, which is applied to the skin rather than taken orally. Also, anti-inflammatory drugs have been developed that affect multiple cells and cell functions, and may prove to be an effective alternative to corticosteroids in the treatment of atopic dermatitis.

Several experimental treatments are being evaluated that attempt to replace substances that are deficient in people with atopic dermatitis. Evening primrose oil is a substance rich in gamma-linolenic acid, one of the fatty acids that is decreased in the skin of people with atopic dermatitis. Studies to date using evening primrose oil have yielded contradictory results. In addition, dietary fatty acid supplements have not proven highly effective. There is also a great deal of interest in the use of Chinese herbs and herbal teas to treat the disease. Studies to date show some benefit, but not without concerns about toxicity and the risks involved in suppressing the immune system without close medical supervision.

Hope for the Future

Although the symptoms of atopic dermatitis can be difficult and uncomfortable, the disease can be successfully managed. People with atopic dermatitis can lead healthy, productive lives. As scientists learn more about atopic dermatitis and what causes it, they continue to move closer to effective treatments, and perhaps, ultimately, a cure.

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Additional Resources

National Institute of Arthritis and Musculoskeletal
and Skin Diseases

NIAMS/National Institutes of Health

1 AMS Circle

Bethesda, MD 20892-3675

(301) 495-4484 or

(877) 22-NIAMS (226-4267) (free of charge)

TTY: (301) 565-2966

Fax: (301) 718-6366

niamsinfo@mail.nih.gov

www.niams.nih.gov

NIAMS provides information about various forms of skin diseases; arthritis and rheumatic diseases; and bone, muscle, and joint diseases. It distributes patient and professional education materials and refers people to other sources of information. Additional information and updates can be found on the NIAMS Web site. Listings of clinical trials recruiting patients who have or are at risk of developing a skin disease can be found at www.ClinicalTrials.gov.

Centers for Disease Control and Prevention

1600 Clifton Road

Atlanta, GA 30333

(888) 246-2675 (free of charge)

TTY: (866) 874-2646

E-mail: cdcresponse@ashastd.org

www.bt.cdc.gov/agent/smallpox/index.asp

This government organization is a focus for disease prevention and control, environmental health, and health promotion. It provides detailed information about smallpox and vaccination against smallpox, including

those who should not receive the vaccine, precautions vaccinated persons should take to prevent harm to those with atopic dermatitis and certain other conditions, and answers to frequently asked questions.

American Academy of Dermatology
P.O. Box 4014
Schaumburg, IL 60168
(847) 330-0230 or
(888) 462-DERM (3376) (free of charge)
Fax: (847) 330-0050
www.aad.org

This national professional association can provide referrals to dermatologists. It has published a pamphlet on atopic eczema/dermatitis, which is available on the organization's Web site or can be obtained by calling or writing to the academy. Single copies are free.

American Academy of Allergy, Asthma,
and Immunology
611 East Wells Street
Milwaukee, WI 53202
(414) 272-6071 or (800) 822-2762 (free of charge)
E-mail: info@aaaai.org
www.aaaai.org

This national professional association representing allergists and clinical immunologists publishes pamphlets about allergies and atopic dermatitis. The academy can also provide physician referrals for evaluation of allergies.



National Eczema Association for
Science and Education
4460 Redwood Highway, Suite 16-D
San Rafael, CA 94903-1953
(415) 499-3474 or (800) 818-7546 (free of charge)
Fax: (415) 472-5345
info@nationaleczema.org
www.nationaleczema.org

This is a national patient-oriented association devoted to eczema. It publishes a quarterly newsletter, provides patient brochures and provider educational materials, offers resource services to patients, and provides referrals to atopic dermatitis/eczema research centers.

Inflammatory Skin Disease Institute
P.O. Box 1074
Newport News, VA 23601
(757) 223-0795 or
(800) 484-6800, Ext. 6321 (free of charge)
Fax: (757) 595-1842

This national organization provides educational information and support and engages in advocacy. It is dedicated to improving the lives of people with inflammatory skin disease.

Food Allergy and Anaphylaxis Network (FAAN)
10400 Eaton Place
Fairfax, VA 22030
(703) 691-3179 or (800) 929-4040 (free of charge)
Fax: (703) 691-2713
faan@foodallergy.org
www.foodallergy.org

The organization provides education, emotional support, and coping strategies to individuals with food allergies. It publishes a bimonthly newsletter and has books, videos, and other educational materials pertaining to food allergy diets and to food-related issues in schools, daycare centers, and camps. FAAN also makes physician referrals.

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The mission of the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), a part of the Department of Health and Human Services' National Institutes of Health (NIH), is to support research into the causes, treatment, and prevention of arthritis and musculoskeletal and skin diseases, the training of basic and clinical scientists to carry out this research, and the dissemination of information on research progress in these diseases. The National Institute of Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse is a public service sponsored by the NIAMS that provides health information and information sources. Additional information can be found on the NIAMS Web site at www.niams.nih.gov



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National Institutes of Health

**National Institute of Arthritis and
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