

Acne

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Acne (*acne vulgaris*) is a dermatologic condition characterized by lesions that most often appear on the face and neck, but also develop on the chest, back, shoulders and upper arms. Approximately 80 percent to 95 percent of adolescents develop some degree of acne, but its prevalence declines over subsequent years until middle age, when it still affects about 12 percent of women and 3 percent of men (Cordain L et al 2002; Rossen MH et al 1993). Acne can be a significant source of misery, and it is difficult to treat. A galaxy of over-the-counter (OTC) medications and washes are sold and marketed for acne (many with harmful chemicals), along with strong prescription medications.

Acne is characterized by pimples, cysts and abscesses. It occurs when the pores in the skin are blocked, trapping oil, dead skin and bacteria in the hair follicles. Under normal circumstances, glands (called sebaceous glands) attached to hair follicles secrete an oily substance known as sebum. This sebum typically travels up the hair follicle and onto the skin. However, if the hair follicle is blocked, the sebum can't get out, sometimes causing the formation of a blackhead. This is the result of the blocked oil oxidizing, causing inflammation and an influx of white blood cells. Meanwhile, normally present bacteria (*Propionibacterium acnes*) begin to break down the trapped sebum within the hair follicle. This results in further inflammation, as white blood cells attack the bacteria. Pus forms as the lesion enters the whitehead stage. In more severe stages, an abscess—a pus-filled pocket within the skin—may form. Although most pimples won't leave lasting scars, anything that damages the dermis (the layer of skin just underneath the epidermis) can leave a permanent scar.

Types of Acne Lesions

- Open comedones (blackheads): These are dilated hair follicles that are filled with sebum, dead cells and bacteria, and which have central, dark, solid plugs. The follicles are not completely blocked; the black appearance is caused by oxidation, not dirt.
- Closed comedones (whiteheads): These form when skin cells and oil completely block the opening of a hair follicle, usually after a blackhead has formed.
- Nodules: These are solid, dome- or irregularly shaped, inflamed lesions that extend deep into the skin, sometimes causing tissue damage and scarring if not treated. Nodular acne, which can be painful, is the most severe form of the disease.
- Papules: This type of whitehead (5 mm or less) is one that has become swollen, red and inflamed
- Cysts: These sac-like lesions contain white blood cells, bacteria and dead cells in a liquid or semi-liquid state. They can result in scarring, and may be very painful and severely inflamed. Cysts and nodules often appear together to form nodulocystic acne, also very severe.
- Pustules: This whitehead is pus-filled and inflamed. Once they rupture into the skin, they form pustular heads.

Acne can be caused by environmental and genetic factors, but genetics seems to predominate. In one large twin study, for example, 81 percent of disease variance—that is, the difference from what would normally be expected—was attributed to genetic effects, and the remaining 19 percent to environmental factors. The study also showed that having a family history of acne is significantly associated with increased personal risk (Bataille V et al 2002).

The role of hormones in the development of acne is apparent at puberty, when there is a surge in the production of male hormones (which are present in both males and females), enlarging the sebaceous glands in the skin. This results in increased sebum production, which leads to the aforementioned plug formation, creating as well a fertile environment in which bacteria can multiply. Unlike male-hormone androgens, female-hormone estrogens have a beneficial effect on acne, which is why some doctors recommend birth control pills for women who have acne. But when a woman's estrogen levels decline, as they do just before the beginning of a menstrual cycle, acne may worsen (Russell JJ 2000).

Acne or acne-like lesions can develop in response to various substances, including corticosteroids, lithium (Yeung CK et al 2004), and some psychotropic drugs. Other causes include exposure to tobacco smoke, coal tar derivatives, industrial oils, and chlorinated hydrocarbons. Further, oils in aerosol sprays, as well as excessive washing or scrubbing of the skin, can exacerbate acne because these cause increased skin-oil production. Use of many types of cosmetics, oil-based hair products, and suntan lotions can block oil glands and worsen acne; hypoallergenic, oil-free, water-based products that do not clog pores are better choices (Russell JJ 2000). Despite popular opinion, the conventional medical view is that acne is not caused by poor hygiene or by eating specific foods, such as chocolate, pizza, and soda (although the evidence is mixed; see "The Role of Diet in Acne," below).

CONVENTIONAL TREATMENT OPTIONS

Many people who have mild-to-moderate cases of acne choose to treat themselves, using topical and/or systemic (oral) products that are available over-the-counter. More severe acne requires a professional approach designed by a physician (usually a dermatologist), and typically includes topical and/or systemic prescription medications.

Topical treatment. When choosing a topical product, the type of vehicle—the cream, gel, lotion, or solution that contains the active ingredient—may be as important as the medicinal agent. For example, creams are appropriate for sensitive or dry skin, and gels and solutions can be helpful for oily skin. Lotions can be used with any skin type and are easily spread over hairy skin surfaces. Most topical treatments dry the skin to some degree and cause minor peeling that loosens oil-gland plugs. In turn, peeling smoothes facial skin and helps resolve old and new lesions. On the downside, topical medications can cause minor irritation. For mild acne, self-treatment with OTC topical products may be sufficient, while more severe or resistant cases may respond to prescription products.

The active ingredients found in commonly-used OTC and prescription topical preparations include benzoyl peroxide (which kills bacteria), salicylic acid (slows shedding of cells), alpha hydroxy acid, sulfur (which breaks down blackheads and whiteheads), azelaic acid (an antibacterial agent), retinoids (suppressing skin oil production), antioxidants, and antibiotics. Combination therapy is used for people who have comedones (clogged pores) and inflammatory acne. Once topical treatment begins, it often takes four to six weeks for any significant improvement to become evident, and treatment should continue until no new lesions appear. As with most medical treatment, it is very important that medication be used consistently. This can be especially challenging when the patient is an adolescent.

Topical retinoids (e.g., Retin-A®, or tretinoin) are available as creams, gels, and solutions. Retinoids are naturally occurring or synthetic compounds that are chemically similar to vitamin A (retinol), which is necessary for skin growth, differentiation, and maintenance. Mild acne responds well to tretinoin, which acts on oil glands and reduces clogged pores. Further, long-term use of tretinoin increases collagen synthesis and the shedding of dead skin, and can produce a more even skin tone. Side effects include burning, stinging, itching, peeling, scaling, dryness, tightness, and reddened skin, sensations which are most noticeable with solutions and least with gels. Topical retinoids are sometimes used with antibiotics; combination therapy is faster acting and less irritating than single therapies (Weiss JS et al 2004).

The retinoid Tazorac® (tazarotene) is available in gel and cream and often used along with a topical antibiotic. It is more effective than tretinoin and Accutane® (isotretinoin) (Guenther LC 2003). Yet another topical medication is adapalene, a “designer” topical retinoid agent that acts rapidly, but has been found to be less effective than tazarotene in a comparison study (Webster GF et al 2002).

Systemic treatment. Oral medications are usually reserved for severe cases of acne, and may include antibiotics, oral retinoids, and anti-androgens. Antibiotics may be used to prevent formation of new blemishes by killing bacteria present in the skin (Layton AM 2001). Accutane®, a chemical look-alike of retinoic acid, inhibits sebaceous gland function and keratinization (accumulation of dead skin cells). Another oral retinoid, acitretin, is also used for severe acne. However, caution is necessary: Oral retinoids are associated with liver damage and a high risk of fetal deformity if taken during pregnancy. They are absolutely contraindicated in women who might become pregnant.

Anti-androgens block the action of androgens, which cause increased sebum secretion by stimulating the sebaceous gland. In women, birth control pills are often prescribed (Lemay A et al 2002). Women who have more resistant acne and excess androgens may be prescribed 5-alpha-reductase inhibitors (e.g., finasteride or Avodart®), which block the metabolism of testosterone to dihydrotestosterone (DHT), or flutamide, which blocks testosterone receptor sites on cell membranes (Carmina E et al 2002). Two other drugs that may have anti-androgen action are isotretinoin (Karlsson T et al 2003) and the anti-acne antibiotic roxithromycin (Inui S et al 2001).

New drugs. Several new drugs are being studied. They include steroid sulfatase inhibitors, which block production of sex steroids (Nussbaumer P et al 2004), glycyglycine antibiotics (tigecycline) (Zhanel GG et al 2004), and lipoxygenase inhibitors for inflammation (Smolinski KN et al 2004).

NUTRITIONAL AND ALTERNATIVE THERAPIES

Nutritional and alternative therapies for acne can help reduce inflammation, and infection, and may be used alone or to complement conventional medical treatment, especially in cases of severe or difficult-to-treat acne.

Vitamins A and E. The benefits of vitamins A and E in acne was highlighted in a recent study in which investigators identified plasma vitamin A and E concentrations in 100 untreated patients with acne, compared with 100 healthy controls. Plasma concentrations of both vitamins in patients with acne were significantly lower than those of the controls, and a strong relationship between a decline in vitamin A and E levels and an increase in the severity of acne was noted (El-Akawi Z et al 2006).

This study supports previous work in which researchers found that supplementation with vitamin A is beneficial in inflammatory conditions, including acne, and conversely that vitamin A deficiency induces inflammation and aggravates existing inflammatory conditions (Reifen R 2002). In fact, vitamin A in retinoid form has long been an important treatment for acne.

Lipoic acid. Research into the efficacy of lipoic acid in the treatment of acne goes back several decades. Reportedly, lipoic acid activates a factor in the body known as AP-1, which produces enzymes that digest damaged collagen and helps erase scars, including acne scars (Kovalev VM 1981a,b). Lipoic acid is an ingredient in several topical acne remedies, but it can be taken as an oral supplement as well.

Zinc. This mineral appears to perform a threefold role in the treatment of acne. It helps reduce inflammation; kills *Propionibacterium acnes*, the main bacteria associated with the disease, and produces changes in the skin environment that make it more hostile to this bacterium for a longer time. A two-month study of the efficacy of zinc gluconate (30 mg once daily) in 30 patients with inflammatory acne showed a reduction in the number of inflammatory lesions after the treatment period, and improved effectiveness of the antibiotic erythromycin among patients with antibiotic-resistant organisms (Dreno B et al 2005). In a double-blind study, a combination of 1.2 percent zinc and 4 percent erythromycin in a topical lotion was used by 14 individuals with acne. The combination significantly reduced secretion of sebum after six weeks of treatment (Pierard-Franchimont C et al 1995). Further, a topical preparation of zinc acetate was found to prolong the duration of erythromycin on skin, potentially overcoming some mechanisms of erythromycin resistance (van Hoogdalem EJ et al 1996).

In addition, clinical trials of zinc preparations have demonstrated their equivalence to antibiotics, with the added benefit of more convenient dosing schedules. A study that compared a cream containing chloroxylenol and zinc oxide showed no difference in efficacy compared with 5 percent benzoyl peroxide, but it did find significantly less skin drying and irritation with the zinc-containing cream (Papageorgiou PP et al 2000). Finally, a 2005 study demonstrated that a gel containing clindamycin plus zinc, applied once or twice daily, achieved the same benefit obtained by clindamycin lotion alone used twice daily (Cunliffe WJ et al 2005).

Niacinamide (nicotinamide). One of the two principle forms of niacin, niacinamide is effective when applied topically to acne. In a State University of New York study, a 4 percent nicotinamide gel was compared to a 1 percent clindamycin gel for the treatment of moderate inflammatory acne in 76 patients. Treatment was applied twice daily for eight weeks. At the end of treatment, 82 percent of the nicotinamide patients and 68 percent of the clindamycin patients were improved. The fact that the use of topical clindamycin is also associated with the development of resistant microorganisms makes niacinamide even more preferred (Shalita AR et al 1995). Nicotinamide cream has also been shown to reduce the amount of sebum present on the skin (Draelos ZD et al 2006).

Essential Fatty Acids. The omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are well-known anti-inflammatories that have been shown in dozens of studies to reduce inflammation. Although they have not been extensively studied in acne or skin inflammation, their ability to reduce inflammation in general suggests a role in the treatment of acne. Several studies have found that omega-3 fatty acids are absorbed through the skin and can reduce inflammation in a particular area (Puglia C et al 2005; Shahbakhti H et al 2004).

Tea Tree Oil. Tea tree oil is derived from the leaves of the tea tree (*Melaleuca alternifolia*), an evergreen that grows in Australia and Asia. The oil contains chemicals known as terpenoids which kill bacteria, including some bacteria that are resistant to antibiotics. In a double-blind study in which 5 percent tea tree oil was compared with 5 percent benzoyl peroxide in the treatment of acne, the oil was more effective overall and had far fewer side effects, although it was slower in action than the benzoyl peroxide (Bassett IB et al 1990). In a subsequent study, researchers determined that the major components of tea tree oil are active against *Propionibacterium acnes*, lending further support to its use in the treatment of acne (Raman A et al 1995).

Herbal Therapy. Herbal therapy is often suggested for acne, but few controlled scientific studies have been conducted to verify any claims. In a double-blind, placebo-controlled clinical trial of Ayurvedic (ancient Hindu) herbal preparations, researchers randomly assigned either placebo or one of four Ayurvedic formulas to 82 people with moderate acne. One formulation, Sunder Vati, significantly reduced the number of inflammatory and noninflammatory acne lesions. Sunder Vati consists of ginger (*Zingiber officinale*), *Holarrhena antidysenterica*, and *Embelia ribes* (Paranjpe P et al 1995).

Several other herbs have anti-inflammatory properties that may be helpful in the treatment of skin conditions, although no scientific studies have been performed with acne. The herbs include calendula (*Calendula officinalis*), German chamomile (*Matricaria recutita*), witch hazel (*Hamamelis virginiana*), and licorice root (*Glycyrrhiza glabra*) (Brown DJ et al 1998). These are found in some natural skin-care products, and may be effective on an individual basis.

Light-based therapies. Numerous studies have shown that laser and other light-based therapies are safe and effective in the treatment of acne. In a study in which 45 patients with mild-to-moderate acne were treated with high-intensity pure blue light (two 20-minute treatments per week for four to eight weeks), 50 percent were highly satisfied with the treatment, 20 percent had complete clearing at eight weeks, and no side effects were reported (Tremblay JF et al 2006). Similarly, researchers in Japan reported a 64.7 percent improvement in acne lesions among 28 adults who were treated with a total of eight biweekly 15-minute treatments (Omi T

et al 2004), while in yet another study investigators reported that 85 percent of acne had cleared two months after eight pulsed-light and heat-energy treatments (Elman M et al 2004).

In addition, a combination of topical medication and light therapy has also proved effective. Santos and colleagues found that topical 5-aminolevulinic acid, along with intense pulsed light, is superior to light treatment alone in the treatment of acne, and may be used with other acne treatment methods (Santos MA et al 2005).

THE ROLE OF DIET IN ACNE

Diet has long been suspected as a contributor to acne. Many people strongly believe that such foods as greasy pizza, chocolate and refined sugars cause acne. Meanwhile, the conventional dermatological community is adamant that diet does not contribute to acne, dismissing most dietary concerns as myths.

According to the few well-designed scientific studies, the truth is probably somewhere between these two extremes. There is some very preliminary evidence that a diet with a high glycemic index—that is, one contributing to glucose in the blood—may contribute to acne. In one small study, researchers noted that, by avoiding glycemia-inducing foods, “some results appeared promising,” but that the small sample size (11 young men aged 15 to 20) was not enough to draw significant conclusions (Smith R et al 2004). Another study conducted at the Harvard School of Public Health, Department of Nutrition, examined the role of dairy consumption in acne. Researchers studied questionnaires submitted by more than 47,000 high-school-age women, and found a “positive association” between acne and total milk and skim milk consumption. They speculated that the association may be due to hormones and bioactive molecules found in dairy milk (Adebamowo CA et al 2005). Other studies have confirmed that the Western diet in general, which is high in fats, refined carbohydrates, and sugar, is conducive to acne. In one survey, researchers did not find one single case of acne among sample natives on the Pacific island of Kitava, Papua New Guinea, or Ache hunter-gatherers in Paraguay, in contrast to the 79 percent to 95 percent of American adolescents who are afflicted with acne (Cordain L et al 2002). Researchers concluded that these remarkable differences could not be attributed to genetics alone.

Although more research is needed to fully understand the interaction between diet and acne, Life Extension recommends that people who suffer from acne should strive for the “cleanest” diet possible, concentrating on fresh, organic fruits and vegetables, and reducing their intake of saturated fat and processed sugar. Patients with acne should also drink organic, hormone-free dairy products, which may reduce the presence of hormones that cause acne. Finally, acne patients should drink plenty of clean, filtered water.

Natural Topical Products

A wide range of natural products, from facial scrubs and moisturizers to antiseptics and facial masks, are available for acne and skin care. Note that many of these products contain ingredients with claims that are supported by anecdotal reports but not scientific research. Results may vary based on individual skin sensitivities and severity of acne.

- **Skin healing:** Gels contain some of the following: lipoic acid, carnosine, dimethylaminoethanol (DMAE), collagen, protein, and vitamins A, C, and E. These ingredients reportedly repair damaged tissue and mitigate free-radical damage.
- **Inflammation and redness:** Creams contain chamomile, cat's claw, and geranium extract to reduce inflammation from infection or irritating topical medications.
- **Cleansers:** Facial washes contain fruit and vegetable extracts such as lemon, apricot, and cucumber, and herbal extracts such as ginseng, green tea, and ginkgo for deep pore cleansing. Remember that excessive scrubbing or washing with any product increases sebum production and can aggravate acne.
- **Antibacterial/antifungal:** Tea tree oil, echinacea and white willow bark contain antiseptics that kill microbes. Calendula and marigold possess antibacterial activity.
- **Astringents:** Witch hazel, herbal extracts, citrus seed extracts, and calendula remove excess facial oil.
- **Facial masks:** Seaweed extract and bentonite clay (a combination of montmorillonite and volcanic ash) pull oils and toxins from the skin.

LIFE EXTENSION FOUNDATION RECOMMENDATIONS

Lifestyle Modifications

- Avoid the sun. Overexposure to the sun can worsen acne.
- Use cosmetics sparingly. Use only hypoallergenic, oil-free cosmetics.
- Wash face gently with unscented, oil-free cleansers and keep skin clean. Remember: Acne is not caused by dirt. Scrubbing inflamed skin makes acne worse.

- Resist the urge to squeeze, scratch or pick at acne lesions. Let them drain when they are ready.
- Try products that contain benzoyl peroxide for mild-to-moderate acne.
- Young men with moderate to severe acne should use a new razor blade every time they shave to lessen risk of infection.
- Avoid alcohol-based aftershaves. Instead, use herbal alternatives that include essential oils of lavender, chamomile, or tea tree oil.
- Eliminate foods high in fat, hormones, and iodine.
- Eat a range of whole, natural foods, especially raw foods. Avoid processed foods with additives and trans-fatty acids.
- Drink adequate liquids, especially pure water and green tea.

In addition, the following nutrients may be considered:

- **Vitamin A**—5000-10,000 international units (IU) daily
- **Vitamin E**—400 IU, with 200 milligrams (mg) gamma tocopherols daily
- **R-Lipoic acid**—150 to 300 mg daily
- **Zinc**—50 mg daily
- **EPA/DHA**—1400 mg EPA and 1000 mg DHA daily
- **Niacinamine**—As a topical gel
- **Tea tree oil**—Topical oil, as needed

For people who cannot find relief with the above recommendations, prescription medications may be warranted. Consult a medical professional if acne does not respond to self-treatment. Your physician may consider several drug therapies including Retin-A®, Accutane®, antibiotics, or anti-androgens.

Oral and topical antibiotics help prevent new blemishes by killing bacteria and breaking down sebum into free fatty acids. Prescription-strength antibiotics must be obtained from a physician. However, some lesser-strength antibiotics are available as over-the-counter preparations. For women who do not respond to other therapies, birth control pills may be prescribed.

PRODUCT AVAILABILITY

All the nutrients and supplements discussed in this section are available through the Life Extension Foundation Buyers Club, Inc. For ordering information, call anytime toll-free 1-800-544-4440, or visit us online at www.LifeExtension.com.

The blood tests discussed in this section are available through Life Extension National Diagnostics, Inc. For ordering information, call anytime toll-free 1-800-208-3444, or visit us online at www.LifeExtension.com.

Acne Safety Caveats

An aggressive program of dietary supplementation should not be launched without the supervision of a qualified physician. Several of the nutrients suggested in this protocol may have adverse effects. These include:

EPA/DHA

- Consult your doctor before taking EPA/DHA if you take warfarin (Coumadin). Taking EPA/DHA with warfarin may increase the risk of bleeding.
- Discontinue using EPA/DHA 2 weeks before any surgical procedure.

Lipoic Acid

- Consult your doctor before taking lipoic acid if you have diabetes and glucose intolerance. Monitor your blood glucose level frequently. Lipoic acid may lower blood glucose levels.

Tea Tree Oil

- Tea Tree can cause contact dermatitis (skin irritation).

Vitamin A

- Do not take vitamin A if you have hypervitaminosis A.

- Do not take vitamin A if you take retinoids or retinoid analogues (such as acitretin, all-trans-retinoic acid, bexarotene, etretinate, and isotretinoin). Vitamin A can add to the toxicity of these drugs.
- Do not take large amounts of vitamin A. Taking large amounts of vitamin A may cause acute or chronic toxicity. Early signs and symptoms of chronic toxicity include dry, rough skin; cracked lips; sparse, coarse hair; and loss of hair from the eyebrows. Later signs and symptoms of toxicity include irritability, headache, pseudotumor cerebri (benign intracranial hypertension), elevated serum liver enzymes, reversible noncirrhotic portal high blood pressure, fibrosis and cirrhosis of the liver, and death from liver failure.

Vitamin E

- Consult your doctor before taking vitamin E if you take warfarin (Coumadin).
- Consult your doctor before taking high doses of vitamin E if you have a vitamin K deficiency or a history of liver failure.
- Consult your doctor before taking vitamin E if you have a history of any bleeding disorder such as peptic ulcers, hemorrhagic stroke, or hemophilia.
- Discontinue using vitamin E 1 month before any surgical procedure.

Zinc

- High doses of zinc (above 30 milligrams daily) can cause adverse reactions.
- Zinc can cause a metallic taste, headache, drowsiness, and gastrointestinal symptoms such as nausea and diarrhea.
- High doses of zinc can lead to copper deficiency and hypochromic microcytic anemia secondary to zinc-induced copper deficiency.
- High doses of zinc may suppress the immune system.

For more information see the Safety Appendix

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