

Propionibacterium acnes

Propionibacterium acnes (*Cutibacterium*) is a gram-positive commensal bacterium and apart of skin flora present on most healthy adults and preadolescent human's skin. It is the major occupant of the pilosebaceous unit, accounting for up to 90% of the microbiota in sebum rich sites.

It is believed to play an important role in maintaining skin health or exacerbating disease via occupation of ecological sites that could be colonized by more pathogenic microbes; it produces molecules with inhibitory properties against such organisms and sustain the flexibility of our skin.



Propionibacterium can be divided into two groups:

One that lives on the skin, named the sores and blisters group or *P. acnes*. Another that produce the propionic acid (therefore, it called *Propionibacterium*) which colonize the gastrointestinal tract and present in dairy products, named probiotic or dairy group.

Propionibacterium acnes is an aero tolerant anaerobic bacterium that prefers to grow in low oxygen environments deep within a clogged hair follicle (comedo). It is associated with the common skin disease acne vulgaris. Colonization with *P. acnes* is thought to occur at some time

during adolescence. However, teenagers with acne have significantly higher *P. acnes* counts.

Propionibacterium acnes and *Staphylococcus epidermidis* were more prevalent in acne patients, than in the control population. *S. epidermidis* was found to prevent acne and exert antimicrobial activity.

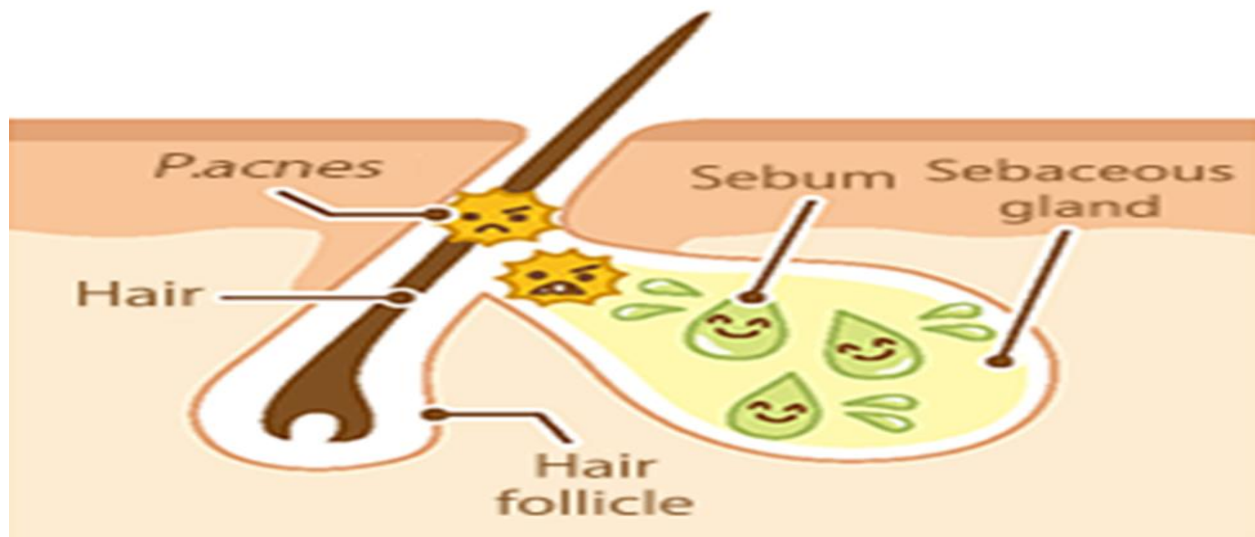
P. acnes releases lipase that produces fatty acids by digesting sebum, creating inflammation of the skin. The cellular damage can trigger inflammation characterized by swelling, pus, whiteheads, blackheads and pustules.

As a result of the inflammation, the affected tissue susceptible to colonization by opportunistic *Staphylococcus aureus* and *Corynebacterium*.

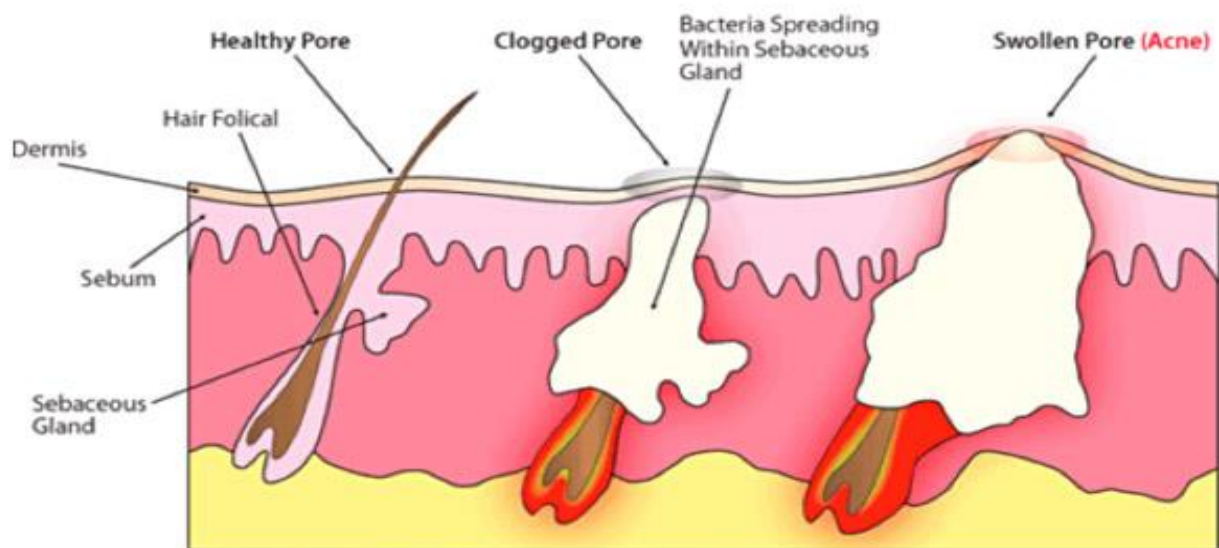
These bacteria will not trigger the formation of acne unless the specific condition or the right “environment” is created such as elevated production of sebum or blockage of pores (sebum and dead cells trapped get clogged at the pores) can make it to grow and multiply. The explanation of why some people seems more prone than others to developing acne.

1. Hair follicles are especially suffocating.
2. Inherit genes that make their skin cells more vulnerable to inflammation from the fatty acids produced by *P. acnes*.
3. Have strains of skin bacteria that make excessive amounts of the fatty acids.

It isn't passed from person to person, so you don't have to worry about "catching" this bacterium and developing acne



How Acne Develops: 3 Steps



Step 1

The Healthy Pore

Step 2

The Clogged Pore

Step 3

The Swollen Pore



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Propionibacterium acnes can also be recovered from other body sites including the mouth, gastrointestinal tract, prostate, and conjunctiva. Therefore, *Propionibacterium acnes* can cause other infections such as corneal ulcers, chronic blepharitis, endophthalmitis, endocarditis and septic arthritis. *Propionibacterium acnes* may play a role in other conditions, including inflammation of the prostate leading to cancer and sarcoidosis (Boecks disease). Sarcoidosis is a disease involving abnormal collections of inflammatory cells that form lumps known as granulomas. The disease usually begins in the lungs, skin, or lymph nodes.

Propionibacterium acnes is suggested to be an opportunistic pathogen involved in the development of diverse medical conditions but is also a proven contaminant of human clinical samples and surgical wounds causing a range of postoperative and device-related infections such as post-neurosurgical infection, joint prostheses, shunts and prosthetic heart valves.

Propionibacterium can grow on blood agar with beta hemolysis and chocolate agar.



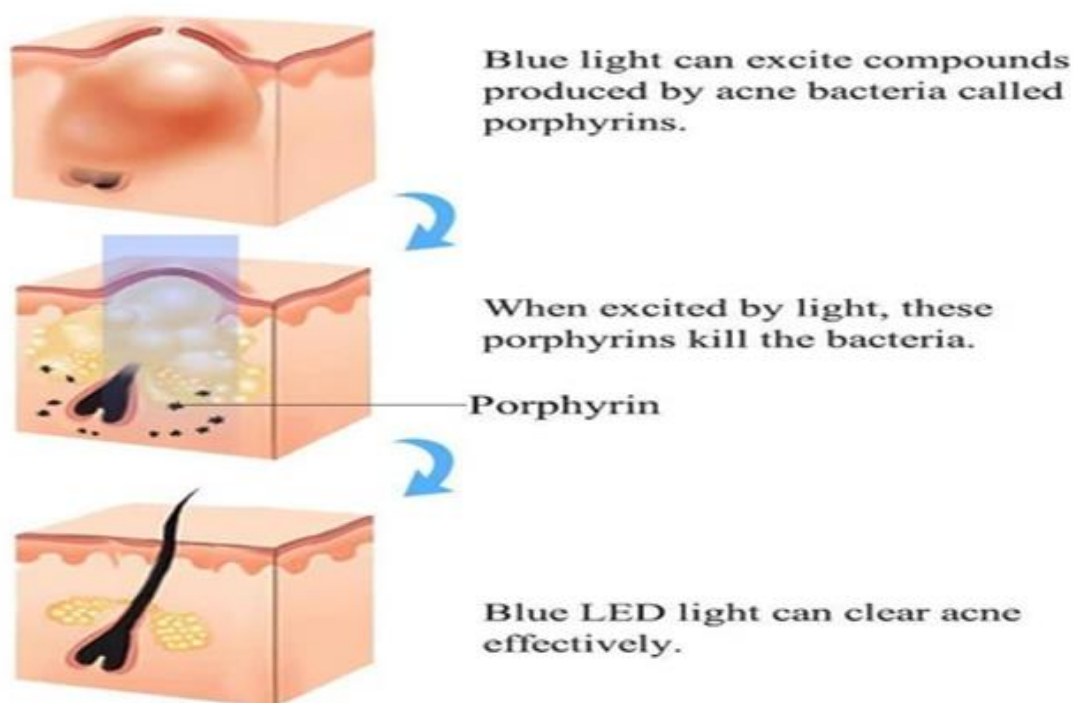
Treatment

Topical antibiotics suppress *P. acnes* and act as an anti-inflammatory agent such as topical retinoids (Adapalene) and (Spironolactone) may also decrease sebum production.

Oral antibiotics are best for moderate-to-severe acne, especially for those who fail to respond to or tolerate topical agents. Macrolides (Erythromycin, clarithromycin, and azithromycin), clindamycin, and tetracyclines (doxycycline, tetracycline, and minocycline) are the antibiotics of choice for acne. Oral retinoids (isotretinoin)

Other popular agents that directly inhibit *P. acnes* colonization include benzoyl peroxide and azelaic acid.

Blue light and diode laser can also be used for treatment of bacteria.



Chemical peel that uses repeated applications of a chemical solution, such as salicylic acid, glycolic acid or retinoic acid.

Drainage and extraction to remove whiteheads and blackheads that haven't cleared up with topical medications. This technique temporarily improves the appearance of your skin, but it might also cause scarring.

Several naturally occurring molecules and compounds are toxic to P. acnes such as rosemary, tea tree oil, clove oil, thyme oil, citrus oils, aloe vera gel, honey and certain metals like sulfur and zinc.

Diagram: Sulfur's Effect on Acne Prone

