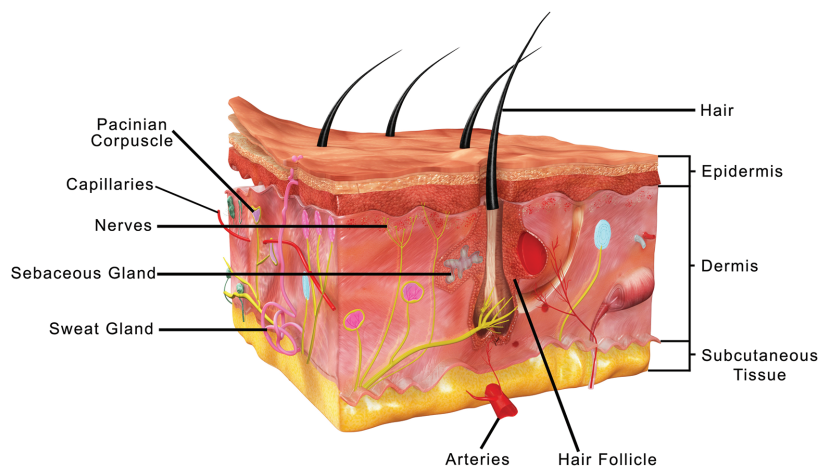


What *Really* Causes Acne? No, It's Not Eating Chocolate

Morgan was concerned. Those annoying zits on his face were not going away. In fact, they seemed to be getting worse. Some of his friends had pretty clear skin, so Morgan asked his friends what to do to clear up his skin. One friend told him it would clear up if he just washed his face more often. Someone suggested an ointment they had used that helped. Their friend, Ode, even suggested seeing a doctor. "Yeah," said Ode, "acne might actually be caused by a bacterial infection."

Over 80% of the human population experiences living with acne at some point in their lives. Some of us are likely more familiar with this condition than others and know it can be extremely frustrating. You may have even been to visit a doctor and tried medications to treat it with or without success. Despite the larger number of people who experience acne, scientists are still working to understand why acne occurs and also how to stop it. The likely culprits are, you guessed it, bacteria.



A diagram showing the structures within human skin.

The skin's microbiome

The human skin, which is the largest organ of the human body, plays host to millions of bacteria. These bacteria grow normally on all people and most of them actually help keep our skin healthy. The skin microbiota (community of micro-organisms) is made up of around 1,000 different species of bacteria and fungi. Scientists have found that pretty much all of our skin is covered in bacteria all of the time. Most are found in the top layers of the epidermis (top layers of skin cells) and the upper parts of the hair follicles that cover our bodies.

Almost all of the bacteria found on the skin are either commensal (nonharmful to the host) or mutualistic (offer a benefit). The mutualist bacteria have important roles in keeping our skin healthy. Some prevent harmful (pathogenic) bacteria from colonizing, either by competing for nutrients or secreting chemicals that kill the pathogenic bacteria.

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Different types of bacteria colonize different areas of the skin. The table below shows the most common types of bacteria in different areas.

Area of the skin	Most common types of bacteria found
Moist areas	<i>Corynebacterium</i> and <i>Staphylococcus</i>
Dry areas	β -Proteobacteria and Flavobacteriales
Sebaceous (oily) areas	<i>Propionibacterium</i> and <i>Staphylococcus</i>

Do all bacteria cause acne?

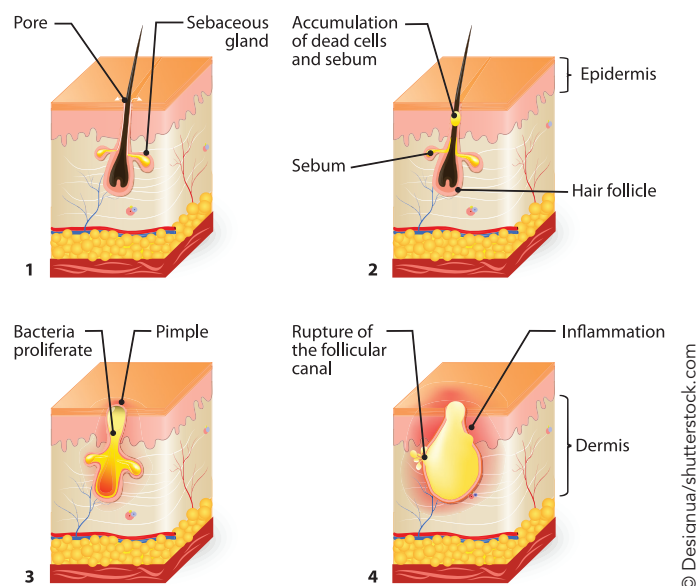
So if all of us are walking around with a constant layer of bacteria on our bodies, why do only some of us experience breakouts? Most of us have a large amount of *Propionibacterium* on our skin all of the time. Scientists have found that the skin surface concentrations of *Propionibacterium* do not differ between people with and those without acne. And within hair follicles there does not appear to be any correlation between the number of bacteria and the degree to which people experience breakouts.



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Bacterial cells on the surface of a human skin cell.

However, a 2016 study showed that if the *Propionibacterium* strain, *Propionibacterium acnes* (*P. acnes*), which is normally harmless, and is found on almost all human skin, gets trapped in airless and oily conditions, like those found near our hair follicles, then they can trigger breakouts. Scientists also found that people with acne tend to have more *P. acnes* (specifically) in their follicles compared to those who don't. Small differences in the shape or activity of the hair follicles may help to explain why some people continue to get breakouts, while others rarely experience them.



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The process by which acne occurs.

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Not all hair follicles are exactly the same, and some may provide a better environment for the growth and reproduction of *P. acnes* than others. Sebum is the oily, waxy substance produced by the body's sebaceous glands. Sebum is sticky and traps sweat, dead skin cells, and tiny particles of dust and dirt in our hair follicles. For some people a small amount of sebum production leads to the hair follicle becoming completely sealed off. *P. acnes* consumes sebum. This completely sealed-off environment filled with a food source becomes an ideal environment for *P. acnes* growth and reproduction. After *P. acnes* consumes sebum it produces fatty acids that irritate our skin cells, leading to those red and painful acne spots. Acne spots can become more serious, and may cover large areas of the skin in some people, and they can interfere with the healthy functioning of the skin.

These new findings showing how *P. acnes* uses sebum to produce fatty acids could help explain why teenagers are so prone to acne. During puberty, hormonal changes cause increases in sebum, giving *P. acnes* even more nutrients to thrive on. Once enough *P. acnes* organisms colonize a hair follicle, they begin to form highly structured communities called biofilms, which allow the bacteria to stick together and stick to your skin. This explains why washing your face over and over doesn't lead to much relief or improvement of acne.

So how do we get rid of these little creatures?

So if washing our faces doesn't work and many medications don't seem to help, what's the good news? Now that scientists have a better understanding of how *P. acnes* colonizes our follicles and causes the issue in the first place, they will be better able to develop treatments that tackle the cause of the problem instead of just treating the symptoms. Researchers are currently investigating additional questions to determine exactly why some people are most susceptible to *P. acnes* causing acne. Once scientists can answer this question, they will be able to develop treatments and potentially prevent acne spots from developing altogether.

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