

Skin Ecology

The skin is the primary external coating of the human body. In adults, skin occupies approximately 2.4 square yards (approximately two square meters). Because it is exposed to the environment, the skin is inhabited by a number of bacteria. Over much of the body there are hundreds of bacteria per square inch of skin. In more moisture-laden regions, such as the armpit, groin, and in between the toes, bacteria can number upwards of one hundred thousand per square inch.



The majority of the skin microbes are found in the first few layers of the epidermis (the outermost layer of skin) and in the upper regions of the hair follicles. The bacteria found here are mostly *Staphylococcus epidermidis* and species of *Corynebacteria*, *Micrococcus*, *Mycobacterium*, and *Pityrosporum*. These species are described as being commensal; that is, the association is beneficial for one organism (in this case the microbe) and not harmful to the other organism (the human). They are part of the natural environment of the skin and as such are generally benign.

The skin microflora can also be a protective mechanism. By colonizing the skin, the commensal microbes can restrict the colonization by other, hostile microorganisms. This phenomenon is referred to as competitive exclusion. The environment of the skin also predisposes the skin to selective colonization. Glands of the skin secrete compounds called fatty acids. Many organisms will not tolerate these fatty acids. But, the normal microflora of the skin is able to tolerate and grow in the presence of the fatty acids. As well, sweat contains a natural antibiotic known as dermicidin. The normal flora seems to be more tolerant to dermicidin than are invading microbes. Thus, their presence of a normal population of microorganisms on the skin is encouraged by the normal physiological conditions of the body.

Newborn babies do not have established skin microorganisms. Colonization occurs within hours of birth, especially following contact with parents and siblings. The resulting competitive exclusion of more hostile microbes is especially important in the newborn, whose immune system is not yet fully developed.

In contrast to the protection they bestow, skin microorganisms can cause infections if they gain entry to other parts of the body, such as through cut or during a surgical procedure, or because of a malfunctioning immune system. Bacteria and other microbes that are normal residents of the skin cause some six to ten percent of common hospital-acquired infections. For example, the yeast *Candida albicans* can cause a urinary tract infection. In another example, if the sweat glands malfunction, the resident *Propionibacterium acnes* can be encouraged to undergo explosive growth. The resulting blockage of the sweat glands and inflammation can produce skin irritation and sores. As a final example, the *Corynebacterium* can cause infection of wounds and heart valve infections if they gain entry to deeper regions of the body.

Other microorganisms that are transient members of the skin population can be a problem. *Escherichia coli*, normally a resident of the intestinal tract, can be acquired due to poor personal hygiene. Another bacterial species, *Staphylococcus aureus*, can be picked up from infected patients in a hospital setting. One on the skin, these disease-causing bacteria can be passed on by touch to someone else directly or to a surface. Fortunately, these problematic bacteria can be easily removed by normal hand washing with ordinary soap. Unfortunately, this routine procedure is sometimes not as widely practiced as it should be. Organizations such as the American Society for Microbiology have mounted campaigns to increase awareness of the benefits of hand washing.

However, hand washing is not totally benign. Particularly harsh soaps or very frequent hand washing (for example, 20–30 times a day) can increase the acidity of the skin, which can counteract some of the protective fatty acid secretions. Also the physical act of washing will shed skin cells. If washing is excessive, the protective microflora will be removed, leaving the newly exposed skin susceptible to colonization by another, potentially harmful microorganism. Health care workers, who scrub their hands frequently, are prone to skin infections and damage.

Skin Ecology Questions:

1. What are five words that pop into your head after reading the passage?
2. Why do bacteria grow so well in certain regions of the body? Be sure to identify the regions where they grow so well.
3. What is meant by the term *microflora*?
4. How does our skin influence or control which can bacteria grow there?
5. What is *commensalism*?
6. Identify 3 genus names and 3 species names from the article.

Genus	species

7. How can these bacteria cause problems?
8. We all know the pros of hand washing. What are the cons?