

Skin bacteria – what lives upon us?

Our skin acts as both a barrier and an interface with the world around us. It helps us maintain our temperature, electrolyte and fluid balance, whilst allowing us to collect information about our surroundings through the sensation of touch. It is a visible indicator of our age, ethnic background and general state of health. Perhaps most obviously, skin protects our internal organs from physical, chemical and microbiological assaults. If breached, microbes can enter the body, causing infection at the site of the wound or more general illness.

Whilst healthy, intact, skin is important for our wellbeing, it is necessary to appreciate that vast numbers of microbes also depend on it as a safe haven. Most of these are bacteria, and they live and multiply on the surface of the skin, within the pores and hair follicles, and under the finger and toe nails. Many different types of bacteria are present, some preferring damp areas such as the armpits, others at home in the relatively arid areas where sweat glands are sparse. Whether or not the bacteria need oxygen helps determine whether they are mostly found on the surface layers of the skin or deeper within the pores. The numbers of bacterial cells typically found on the skin varies between different body sites, but can range from a few hundred cells per cm² on the fingertips to several million per cm² on moist areas such as the forehead. This situation is perfectly normal – indeed we benefit from the arrangement. In return for providing a sheltered niche for these organisms to live in, plus a supply of food via skin secretions, they help to block other, potentially harmful, organisms from taking up residence. They may also help to keep our immune systems on alert.

The bacteria commonly living and multiplying on the skin are part of what is known as our 'commensal microflora'. Most types are harmless to us, others can cause problems only under certain conditions. The [propionibacteria](#) are a type of skin bacteria associated with acne, whilst the [staphylococci](#) can cause infections if there is a breach in the skin. Some types of skin bacteria are associated with body odour, because of the chemical by-products formed when they break down substances within sweat. There are even yeasts that live on skin, which can contribute to the formation of dandruff.

Traditional studies on the commensal microflora of the skin have focussed on species that can readily be grown and identified within a laboratory. Modern DNA-based techniques are now revealing that there are considerably more types of bacteria colonising our skin than previously thought. In a recent study, [Fierer et al., \(2008\)](#) examined the palms of the dominant and non-dominant hands of 51 healthy young adults. By analysing bacterial DNA sequences they found that **each palm had**

over 150 different species residing on it. Whilst a few species were found on the skin of all the volunteers, there was a large amount of variation between individuals. Surprisingly, on average, the two hands of the same person had only 17% of strains in common. This research also made headlines when it showed that **women's hands have 50% more bacterial species on them than men's hands.** The reasons for this difference are not yet clear, but it may relate to a tendency for men's skin to be more acidic. Many types of bacteria are unable to grow in acidic conditions, and the skin normally has a slightly acidic pH, which is another key defence against unwanted microbes. Use of moisturising skin care products may also influence the range of bacteria living on the hands.

To read more about this study, [click here](#).

Hands and the spread of pathogens

The bacteria that have adapted to living on normal healthy skin rarely cause illness. However, more pathogenic species can colonise the skin if it is damaged. For example, *Staphylococcus aureus*, a pathogen sometimes found in the nose, can colonise the skin of eczema patients, exacerbating the symptoms of this condition.

Items that we touch and handle during a normal day are rarely sterile. Our hands are constantly coming into contact with microbes coating inert surfaces, the skin of others, or floating through the air. Some of these will reside on the skin for only a few minutes, others may persist for many hours, before they die, or are washed off, or are transferred onto another surface. Depending on their origin, a small proportion of these microbes can cause disease. Hands can thus act as a route of transmission for pathogens by transferring them to our mouths, food items, surfaces that others will subsequently touch etc. The transmission to another person can also be via direct skin contact, e.g. when shaking hands.

Anyone who has visited a hospital recently will have seen the major efforts that are being made to control hospital acquired infections (HAIs) by encouraging staff, visitors and patients to wash their hands more, or use innovations such as alcohol gel dispensers. Numerous studies have shown that by improving compliance with handwashing guidelines and protocols, the incidence of HAIs can be reduced. This is important because even in developed countries as many as one in ten patients will acquire an infection whilst staying in the hospital. These can complicate their treatment, prolong their stay, and in some cases even be fatal. Good hand hygiene is thus at the forefront of current efforts to reduce the spread of such pathogens as MRSA and *Clostridium difficile*.

In October 2004 the World Health Organisation (WHO) launched the [World Alliance for Patient Safety](#). The Alliance works to raise awareness and gain political commitment to improve the safety of healthcare in all WHO Member States. One of the focuses of the first Global Patient Safety Challenge has been improving handwashing as a means of reducing HAIs via the ['Clean Care is Safer Care'](#) campaign. Comprehensive [guidelines for hand hygiene](#) have been developed, with the assistance of an international team of infection control experts.



In the UK, the National Patient Safety Agency is working with the World Alliance for Patient Safety and has been running the [Cleanyourhands campaign](#) to promote and improve hand hygiene in the healthcare setting. Further information on this, including training videos can be accessed from <http://www.npsa.nhs.uk/cleanyourhands/>

References

[Aiello AE, Coulborn RM, Perez V, Larson EL. Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. Am J Public Health. 2008 Aug;98\(8\):1372-81.](#)

[Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. Lancet Infect Dis. 2003 May;3\(5\):275-81.](#)

[Fierer N, Hamady M, Lauber CL, Knight R. The influence of sex, handedness, and washing on the diversity of hand surface bacteria. PNAS published November 12, 2008, doi:10.1073/pnas.0807920105](#)

[Luby SP, Agboatwalla M, Painter J, Altaf A, Billhimer WL, Hoekstra RM. Effect of intensive handwashing promotion on childhood diarrhea in high-risk communities in Pakistan: a randomized controlled trial. JAMA. 2004 Jun 2;291\(21\):2547-54.](#)

Dr Anna Snelling
Senior Lecturer in Microbiology
Bradford Infection Group & the Centre for Skin Sciences
University of Bradford