Hand hygiene for infection prevention against COVID-19

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Hand hygiene as a method of infection prevention

Hand hygiene is probably the most important measure that the individual person can adopt in the attempt to prevent, or at least minimise, the possibility of infection with the COVID-19 virus. However, it is essential to ensure that the method of hand hygiene adopted and the way in which it is then carried out is such that the risk of skin contact with the virus and colonisation is genuinely minimised.

It is highly likely that in our day to day life our hands will come into contact with surfaces that are contaminated with the COVID-19 virus and thus become contaminated. This then raises the possibility that we transfer the virus to the face and it is then able to enter the body and cause infection. Another consequence is that the virus can colonise the skin, without our being aware of this, with the result that we transfer it to other surfaces, or through contact with other persons directly to them, ensuring the spread of infection.

What is important, therefore, is that the hands are regularly decontaminated. Considerable experience in hand decontamination exists within the healthcare sector and this should form the basis of hand decontamination among the general public.

There are two main approaches to hand decontamination, the first being the removal of the virus, the second the inactivation of the virus such that even if transferred it can cause no harm.

Hand washing

Hand washing aims to remove the virus from the skin. To achieve this it must be done in such a manner that the removal is complete. So hand washing technique must be of a high standard. Much attention has been given to the correct application of the soap and water. Relatively little attention has been given to the process of rinsing the skin, yet if this is not done properly a soap residue will remain on the skin and contribute to skin damage. Furthermore, incomplete rinsing will result in active viruses remaining on the hands thus largely negating the whole process. The same technique as used for the application of the soap should be applied when rinsing the hands.

All soaps will tend to remove the surface layer of emulsion from the skin. This will have an adverse effect on skin barrier properties and make it easier for transient micro-organisms to colonise the skin. Thus, post hand-washing application of a moisturiser should form an integral element in any hand washing procedure in order for the skin to remain healthy.

Alcohol sanitiser

The alcohol sanitising rub, if correctly formulated, can inactivate the COVID-19 virus and studies in healthcare have shown that it can be more effective than hand washing. It is quick and simple to apply and does not require the availability of a hand wash basin. This makes it easier to use as and when needed. Personal issue applicators for alcohol sanitiser are available so that anyone can have immediate access whenever required. Furthermore, in contrast to hand washing, the alcohol sanitiser has been shown not to cause skin damage as the formulation allows the inclusion of moisturising elements. Some studies have even shown that it can actually assist in maintaining a high standard of skin condition.

However, alcohol sanitising rub has its limitations. If hands are visibly soiled with organic matter this will inactivate the alcohol, so hand washing becomes the essential alternative.

One objection to alcohol sanitiser is that it sometimes stings when applied. This is not because it is damaging the skin. If alcohol sanitiser is applied to skin that is damaged, even if this damage is not yet visible, it can reach nerves in the skin and trigger the stinging sensation. On-going use of the sanitiser will help restore skin condition so that sensation will disappear. This should be explained when someone is first starting to use the alcohol sanitiser

Some other people's comments

"The relevance of skin resident flora for the healthy skin lies in the fact that it generates an ecological system protecting from pathogens. Thus Staphylococcus epidermidis, Propioni-bacterium acnes, Corynebacteria and Pityrosporum ovale produce lipases and esterases that break triglycerides to free fatty acids leading to a lower skin pH and thereby unfavorable growing conditions for skin pathogens.
S. epidermidis and P. acnes are known to produce antibodies that may interfere with pathogenic organisms." – *Antimicrobials and the Skin, Physiological and Pathological Flora", Elsner P, Current Problems in Dermatology, 2006*

In a study on dermal and pulmonary absorption of ethanol from alcohol-based hand rubs the authors found that there was no dermal absorption detectable. There was a detectable level of alcohol in exhaled breath at 1-2 minutes after exposure, but this disappeared within 15 minutes. Urine tests were negative in all the study participants. - *Ahmed-Lecheheb, Cunat L, Hartemann, P, Hautmanière A; Dermal and pulmonary absorption of ethanol from alcohol-based rub, Journal of Hospital Infection, (2012) 81, 31-35*

"The study revealed that touching intact areas of moist skin transferred enough organisms to the nurses' hands to allow subsequent transmission to catheter material despite handwashing with plain soap and water; by contrast, alcohol-based handrubbing was effective and prevented crosstransmission to the device." – *WHO Guidelines on Hand Hygiene in Health Care, page 22*

"Numerous subsequent studies have confirmed that 60% to 70% alcohol solutions reduce bacterial counts on the hands of healthcare workers significantly better than washing hands with plain soap and water and are as effective or more effective than hand washing with anti-microbial soap." – *Boyce JM, Using Alcohol for Hand Antisepsic: Dispelling Old Myths, Infection Control and Hospital Epidemiology, July 2000*

This study evaluated the effect on the skin (dryness, irritation) of health care workers, comparing hand washing with alcohol sanitising rubs.

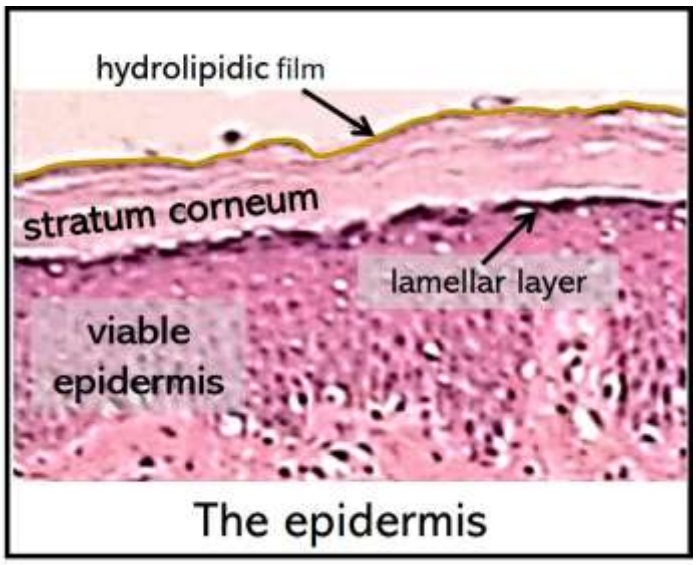
"The results from the 1932 assessments collected show that traditional handwashing is a risk factor for dryness and irritation, whereas the use of alcohol based hand rub causes no skin deterioration and might have a protective effect, particularly in intensive use." - *A prospective multicenter study evaluating skin tolerance to standard hand hygiene techniques, Chamorey E, et al, Am J Infect Control, 2011, 39, 6-13*

Maintaining a healthy skin is essential in preventing infection

In our effort to ensure that hands are properly decontaminated it is essential to ensure that they are maintained in a healthy condition. Skin that is damaged due to repeated contact with irritants, as will occur when hands are frequently washed, is less able to resist colonisation by transient irritants. Thus unless appropriate action is taken to maintain a healthy skin frequent hand washing can actually be counter-produtive. How can we wash frequently and still maintain a healthy skin?

To answer this question it is necessary first to have at least a basic knowledge about how our skin maintains an optimum barrier. The skin is comprised of two main layers, the dermis and epidermis. The illustration shows a cross-section of the epidermis. This is divided into two layers. The viable epidermis consists mainly of living cells called *keratinocytes*. These are formed in the bottom layer and migrate outwards, changing as they go until they fill with a hard protein (*keratin*) and finally lose their living nucleus to become inert, flat, horny plates that we now call *corneocytes*.

These form the outer layer, the *stratum corneum*. It is in the extremely complex and highly active *stratum corneum* that we find the barrier against loss of water and other substances and against penetration into the skin of hazardous substances and infective micro-organisms. In this layer is a range of different micro-organisms, mostly harmless to others, which help create a surface condition that hinders the colonisation of the skin by transient – potentially pathogenic – micro-organisms. Over most of the body the *stratum corneum* is about the thickness of a piece of cling-film that we wrap sandwiches in!



To function properly the cells in the *stratum corneum* must retain a certain level of water. The water comes from deeper in the skin. The amount of water that is passed into the *stratum corneum* is regulated by a microscopically thin layer of complex lipids (*lamellar* bodies). To prevent this water being lost by evaporation the surface layers of the *stratum corneum* contain what can be called a hydrolipidic film. This is an emulsion of water and *sebum*, an oily substance produced in glands in the skin itself.

This film is only a few thousandths of a millimetre thick. When hands are washed the soap will remove most, if not all, of this film. Thus the *stratum corneum* will start to lose too much water and its ability to act as a barrier will be reduced. As it takes quite some time for the skin to regenerate this layer by itself, repeated hand washing can result in a skin that is unable to function normally and less able to resist colonisation and penetration by transient micro-organisms. This damage may not be detectable visually or by feel until it becomes severe, but it will be putting us at risk. For more on this ask for our document on skin condition measurement.

So what is important in maintaining a healthy skin is for us to replace the lost hydro-lipidic film each time the hands are washed.

As we do not want to stop all moisture from escaping, we should attempt to replicate, so far as possible, the properties of the natural film. This means that we should use a moisturising lotion rather than a thick occlusive cream. The exception would be when the skin is visibly damaged. So the rule should be: Apply a moisturising lotion sparingly each time the hands are washed. Just enough should be applied to cover the skin. If after about 30 seconds the skin still feels sticky too much has been applied. So reduce the amount next time.

It should be noted that this applies to hand washing. Using an alcohol sanitiser does not have the same effect as the sanitiser can be buffered and can actually act as a moisturiser

Conclusion

Neither method of hand hygiene is exclusive. However, as damage to the skin is highly undesirable, hand washing should be limited to those situations where an alcohol sanitising rub is not suitable, i.e. where hands are visibly soiled or alcohol is ineffective against the particular micro-organism. When hand washing is carried out it is essential to limit skin damage by the use of a moisturiser each time the hands are washed.

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