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Hand washing and sanitizer and COVID-19 infection risk

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As we deal with the effects of the COVID-19 pandemic, hand washing and hand sanitizers have been key for infection prevention. This article explores the effects of hand washing and hand sanitizer on skin and how this prevents infection, and explores methods to promote skin health while maintaining the maximum possible degree of infection prevention.

With many viruses, including coronavirus, the virus is a self-assembled nanoparticle in which the most vulnerable structure is the outer lipid bilayer. Soaps dissolve the lipid membrane and the virus breaks apart, inactivating it; they are also alkaline surfactants that pick up particles – including dirt, bacteria, and viruses – which are removed from the surface of the skin when soaps are rinsed off. In the process of washing, the alkalinity of the soap (pH approximately 9-10), compared with the normal outer skin pH of approximately 5.5 or lower, also can affect the skin barrier as well as the resident skin microflora. In a study by Lambers et al., it was found that an acid skin pH (4-4.5) keeps the resident bacterial flora attached to the skin, whereas an alkaline pH (8-9) promotes the dispersal from the skin.

With regard to the effectiveness of hand washing against viruses, the length of time spent hand washing has been shown to have an impact on influenza-like illness. In a recent study by Bin Abdulrahman et al., those who spent only 5-10 seconds hand washing with soap and hand rubbing were at a higher risk of more frequent influenza-like illness (odds ratio, 1.37), compared with those who washed their hands for 15 seconds or longer. Moreover, hand washing with soap and rubbing after shaking hands was found to be an independent protective factor against frequent influenza-like illness (adjusted OR, 0.59). Previous studies on the impact of hand washing on bacterial and parasitic illnesses also found similar results: Hand washing for 15-20 seconds or longer reduces infection.

Alcohol has been recommended for disinfecting the hands since the 1880s. Most alcohol-based hand antiseptics contain isopropanol, ethanol, N-propanol, or a combination of two of these products. The antimicrobial activity of alcohols can be attributed to their ability to denature and coagulate proteins, thereby lysing microorganisms' cells, and disrupting their cellular metabolism.

Alcohol solutions containing 60%-95% alcohol are the most effective. Notably, very high concentrations of alcohol are less potent because less water is found in higher concentrations of alcohol and proteins are not denatured easily in the absence of water. Alcohol-based hand sanitizers also often contain humectants, such as glycerin and/or aloe vera, to help prevent skin dryness and replace water content stripped by the use of alcohol on the skin surface.

Other topical disinfectants can be used to inactivate coronaviruses from surfaces, including the skin. A recently published analysis of 22 studies found that human coronaviruses – such as severe acute respiratory syndrome (SARS) coronavirus, Middle East respiratory syndrome (MERS) coronavirus, or endemic human coronaviruses (HCoV) – can persist on inanimate surfaces such as metal, glass, or plastic for up to 9 days (COVID-19 was found in a study to persist on metal for up to 2-3 days), but can be efficiently inactivated by surface disinfection procedures with 62%-71% ethanol, 0.5% hydrogen peroxide, or 0.1% sodium hypochlorite within 1 minute. Other biocidal agents, such as 0.05%-0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate, are less effective.

In the case of SARS, treatment of SARS-CoV with povidone-iodine products for 2 minutes reduced virus infectivity to below the detectable level, equivalent to the effect of ethanol, in one study. Formalin fixation of the infected cells and heating the virus to 56° C, as used in routine tissue processing, were found to inactivate several coronaviruses as well. Based on this information, ethanol-based hand sanitizers, typically containing ethanol content of 60% or higher, can be used to inactivate coronaviruses on the skin, including COVID-19.

In patients with influenza-virus infections, whether pathogens were in wet or dried mucus played a role in whether hand washing or rubbing with hand sanitizer was more effective. In a study that examined the effects of hand washing versus antiseptic hand rubbing with an ethanol-based hand disinfectant on inactivation of influenza A virus adhered to the hands, investigators showed that the effectiveness of the ethanol-based disinfectant against influenza A virus in mucus was reduced, compared with influenza A virus in saline. Influenza A in mucus remained active, despite 120 seconds of hand rubbing with hand sanitizer; however, influenza A in saline was completely inactivated within 30 seconds.

Interestingly, rubbing hands with an ethanol-based disinfectant inactivated influenza A virus in mucus within 30 seconds with mucus that had dried completely because the hydrogel characteristics had been eliminated. Hand washing rapidly inactivated influenza A virus whether in mucus form, saline, or dried mucous.

It is important to note that in COVID-19 infections, a productive cough or rhinorrhea are not as common compared with dry cough. Regardless, the findings of the study described above should be considered if mucous symptoms develop during a COVID-19 infection when determining infection control. Luckily, with COVID-19, both hand washing and use of an ethanol-based hand sanitizer are seemingly effective in inactivating the virus or removing it from the skin surface.

After frequent hand washing, we all can experience dryness and potentially cracked skin. With hand sanitizer, the alcohol content can also cause burning of skin, especially compromised skin. Nails are affected as well with frequent hand washing and/or application of hand sanitizer and can become cracked or brittle. Contact dermatitis, both irritant and allergic, can occur with increased use of disinfectants, particularly household cleaners without proper barrier protection.

Maintaining the skin microflora and barrier is an important component of skin health for preventing both dermatitis and infection.

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We've previously mentioned the effect of hand washing disrupting the resident skin microflora. Maintaining the skin microflora and barrier is an important component of skin health for preventing both dermatitis and infection. To maintain skin health and the skin barrier, applying lotion or cream after hand washing is recommended. It is recommended to avoid scrubbing hands while washing, since this causes breaks in the skin. Using water that is too hot is not recommended as it can inflame the skin further and disrupt the skin barrier.

Wearing gloves, if possible, is recommended when using household disinfectant products to decrease skin irritation, barrier disruption, and risk of contact dermatitis. I have found hand emollients that contain ceramides or ingredients higher in omega 6 fatty acids, such as borage seed oil or other oils high in linoleic acid content, to be helpful. In addition to improving the skin barrier, emollients and perhaps those with topical pre- or probiotics, may help restore the skin microflora, potentially improving infection control further. Application of hand moisturizer each time after hand washing to maintain better infection control and barrier protection was also recommended by the recent consensus statement of Chinese experts on protection of skin and mucous membrane barrier for health care workers fighting against COVID-19.

We and our patients have remarked how it seems like our hands have aged 20-50 years. No one is complaining, everyone understands that protecting themselves and others against a potentially lethal virus is paramount. Maintaining healthy skin is of secondary concern, but it may also protect the skin barrier, another important component of potential infection control. ■

Resources

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