

Rethinking Hand Sanitizers

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Hand sanitizers represent a new category of skin care products that present both benefits and challenges for dermatologists. It is amazing to think that in 2007 *USA Today*¹ included the first hand sanitizer, along with cell phones, on its list of 25 inventions that changed our lives since the early 1980s. Hand sanitizers are commonly found in hotel lobbies, school cafeterias, purses, glove compartments, and on key chains. In hospitals, it is a standard practice for physicians to use hand sanitizer between patients and even visitors often are required to use hand sanitizer in the lobby before entering the facility.

Hand sanitizers are considered over-the-counter drugs and are regulated by the US Food and Drug Administration (FDA). What is the composition of hand sanitizers? How do they work? Do they decrease the spread of disease? What are the limitations of hand sanitizers? Why do hand sanitizers contribute to hand dermatitis? These are some common questions that this article will explore.

What is the composition of hand sanitizers?

Hand sanitizers are categorized based on their composition, namely alcohols, quaternary ammonium compounds, and triclosan. Each of these ingredients possesses different antimicrobial properties and acts through a different mechanism. It is worthwhile to explore these different ingredients to better understand product efficacy.

Alcohols

Alcohol-based products make up the largest category of hand sanitizers. Alcohols have been used as disinfectants for more than 100 years and are highly effective because they nonspecifically denature proteins. The most effective

alcohol that is used in hand sanitizers is ethanol, which is generally regarded as safe and effective by the FDA. (Substances that are generally regarded as safe and effective also are known as GRASE ingredients.) Ethanol is highly effective in killing both gram-positive and gram-negative bacteria as well as fungal organisms; however, it is not effective against bacterial spores and has variable efficacy in killing enveloped viruses.

Quaternary Ammonium Compounds

Another category of hand sanitizers is based on quaternary ammonium compounds such as benzalkonium chloride or benzethonium chloride. Ethanol-based hand sanitizers are flammable but those containing quaternary ammonium compounds are not and can be used in circumstances that involve exposure to flames or other flammable substances. Quaternary ammonium compounds absorb to the cytoplasmic membrane of microbes, causing leakage of cytoplasmic contents. They are bacteriostatic against gram-positive bacteria and some gram-negative bacteria, and also are fungistatic. They are not active against nonenveloped viruses. It is interesting to note that some species of *Staphylococcus aureus* carry a gene that promotes resistance to quaternary ammonium compounds; these organisms also are more likely to be antibiotic resistant. Quaternary ammonium compound-based hand sanitizers may not be the best choice when methicillin-resistant *S aureus* is a concern.

Triclosan

Triclosan commonly is used as an antibacterial agent in a wide variety of products, including deodorant soaps, toothpastes, and mouthwashes. Chemically known as 2,4,4'-trichloro-2'-hydroxydiphenyl ether, triclosan is a chlorinated phenolic compound that also is used as a surgical scrub. It kills organisms by damaging the cell membrane but has weak activity against gram-negative bacteria such as *Pseudomonas*. The FDA has expressed concerns regarding the widespread use of triclosan and its impact on the environment as well as the possibility of bacterial resistance.²

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COSMETIC CONSULTATION

Do hand sanitizers decrease the spread of disease?

There is no doubt that hand hygiene is considered by the Centers for Disease Control and Prevention to be a mainstay in the prevention of worldwide disease transmission.³ Endorsed by the World Health Organization as part of its patient safety initiative,⁴ alcohol-based hand sanitizers have become an international standard for hand hygiene. Hand sanitizers promote compliance with hand hygiene practices because they do not require water and dry quickly on the skin; they also can be used anywhere by both adults and children and do not require a visit to a restroom.⁵ Diseases are most commonly transmitted via hand-to-hand contact between people as well as personal hand-to-mouth or hand-to-nose contact; therefore, proper hand hygiene is key to disease prevention. Hand sanitizers have been credited with reducing the impact of several worldwide epidemics involving influenza and other infections.

What are the limitations of hand sanitizers?

Although hand sanitizers have played an important part in limiting the spread of contagious diseases, they also possess some notable limitations. Hand sanitizers cannot kill all organisms. They are not effective against anthrax, which was of great concern several years ago, and they also are not effective against *Clostridium difficile*, which has become resistant to antibiotics. Hand sanitizers also are not suitable for removing visible dirt from the hands; they are best used on clean hands that might contain non-visible dirt.

Why do hand sanitizers cause hand dermatitis?

Hand sanitizers are a known cause of recalcitrant hand dermatitis. However, a study of irritation and dryness in nurses' hands revealed better skin condition following the use of hand sanitizers as opposed to frequent hand washing.⁶ Ethanol-based hand sanitizers effectively solubilize components of intercellular lipids. After repeated use of these products, the skin barrier eventually is compromised and dermatitis ensues. Because dermatitis causes fissures that can result in bleeding, many patients may become even more aggressive in their use of hand sanitizer because they are concerned about infection and spreading blood to others; however, continued use of the product further worsens the dermatitis, leading to a cycle of increasing

problems. It is difficult for barrier restoration to occur amid frequent ethanol application.

One solution to this problem is to minimize or eliminate hand sanitizer use, unless absolutely necessary. Topical corticosteroids should be applied twice daily to reduce inflammation, recognizing that most of the barrier repair will occur at night when the hands are inactive. In addition to a topical corticosteroid, patients also should apply a glycerin-based occlusive hand cream, which is an important component in creating an environment for barrier repair. Healing usually occurs within 2 weeks, and then the topical corticosteroid can be discontinued; however, patients should continue nightly application of hand cream indefinitely. Nighttime repair is the key to offsetting the damaging effects of hand sanitizer used during the day.

Summary

Hand sanitizers have become an important part of hand hygiene for both health care professionals and consumers. The spread of infectious diseases from patient to patient via a physician's hands can be minimized with the use of hand sanitizer as well as the spread of diseases among the general population. Currently, ethanol-based hand sanitizers seem to dominate the marketplace because of their quick drying time, low cost, and high efficacy. Unfortunately, ethanol also is a strong solvent and can rapidly damage the intercellular lipids in the skin. Daytime use of hand sanitizers must be balanced with nighttime use of a glycerin-based occlusive hand cream to restore skin barrier function.

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