

Using Hand Sanitizers



A 2010 shigellosis outbreak originating in an Illinois fast food restaurant infected 21 people and hospitalized 7. Health investigators suggested the source was an ill food handler who worked while sick and did not practice proper handwashing after visiting the restroom.

In another Illinois outbreak, a fast-food worker who prepared food while ill was likely the cause of 20 infections of hepatitis A. The worker reported the disease to her manager, but was still allowed to work.

Public Health Reasons

Using hand sanitizers, here after called alcohol-based hand rubs (ABHRs), in place of handwashing is recommended by some and questioned by others. In 2010, Jabbar et al. conducted research comparing the effectiveness of ABHRs to handwashing with water and soap for removal of *Clostridium difficile* spores from hands. They concluded that handwashing with soap and water was more effective at removing *C. difficile* spores from the hands of participants than were ABHRs. The results were not surprising as current formulations of ABHRs are not effective against bacterial spores (i.e. *C. difficile*), protozoan oocysts, and certain non-enveloped (nonlipophilic) viruses (i.e. noroviruses). However, ABHRs can be effective against a number of bacteria, fungi, and viruses, but the activity is affected by concentration and type of alcohol included and by preservatives and other ingredients. Alcohol concentrations usually range from 60-70%, and higher concentrations of alcohol are generally associated with greater *in vitro* antimicrobial activity. Isopropanol has slightly greater activity than ethanol against bacteria, but N-propanol, which is present in some products sold outside the United States, appears to have the greatest *in vitro* activity against bacteria. For antiviral activity ethanol has greater activity against viruses than isopropanol. Many ABHRs are likely to be effective against enveloped viruses such as herpes simplex virus, human immunodeficiency virus, hepatitis B virus, and respiratory syncytial virus, while non-enveloped viruses such as norovirus, rhinoviruses, adenovirus and rotavirus tend to be somewhat more resistant to alcohols. At present, there are no ABHRs available in the U.S. market that can make claims against noroviruses on their labels.

The U.S. Food Code also prohibits the use of ABHRs as an alternative to hand washing in foodservice settings because it is believed that ABHRs will not adequately reduce important foodborne pathogens on food workers' hands. Therefore, food workers in child-care settings *cannot* use ABHRs in place of hand washing.

On the other hand, in child-care classrooms, there are times when ABHRs can be used. Sometimes adults and children need to clean their hands quickly, but they may not have the time to stop what they are doing to engage in a full hand wash. The use of ABHRs might be an acceptable alternative to full hand washing under certain circumstances, such as when the hands have come in contact with a contaminated surface, but there is no visible soil on the hands. In a randomized clinical trial of over 6,000 elementary school students, groups using hand sanitizers were paired with control groups receiving no intervention. The data showed a 19.8% reduction in infection-related absenteeism among the intervention group. It is important to note, that while ABHRs can be used under certain circumstances, they must not be used in place of hand washing when there is visible dirt on the hands. If the hands have soil on them, one *must* engage in a thorough hand washing.

Another concern regarding the use of ABHRs is whether they are safe for use with children. Therefore, special care must be given when children use them. In 2011, Joseph et al. reported an acute ethanol poisoning in a 6-year-old girl that was caused by ingesting ABHRs. The child was brought to the emergency department with hypothermia, altered mental status, periods of hypoventilation, and vomiting. Further investigation revealed that the child had gone frequently to the class restroom for ingestion of unknown quantities of ABHRs during the day. The patient was admitted for one day for intravenous fluid hydration and close observation of her mental status. Because of this, concerns were raised over the safety of ABHRs because they can contain up to 90% ethanol. However, one study showed that normal use of hand sanitizer by children (3.5 to 7.2 years) did not cause any significant change in their blood alcohol levels. To insure proper use, children *must* be supervised when using the ABHRs and they must be assisted in following the manufacturer's directions.

Practices

Alcohol-based hand rubs reduce the number of microorganisms on the hands, but they do not kill all types of microorganisms. According to the Centers for Disease Control and Prevention, alcohol-based hand rubs with at least 60% alcohol must be used.

Hand Sanitizers and Adults

- Only use hand sanitizers when there is no visible debris on the hands.
- Always review the directions on the product being used as there are slight variations in suggested procedures for different products.
- Apply the required volume of the product to the palm of one hand and rub hands together. The required volume must keep the hand surfaces wet for at least 15 seconds or as indicated by the manufacturer.
- Be sure to rub all surfaces of the hands and fingers.
- Allow hands to air-dry. Do not use paper towels to dry hands.

Assisting Children with Use of Hand Sanitizers

Children must be constantly supervised when using hand sanitizers to avoid over dispensing, consumption, or eye contact with the sanitizer.

- Have children hold out their hand or place hands under the dispenser and then dispense the appropriate amount of hand sanitizer into the child's hands.
 - Have the child rub hands together. The required volume must keep the hand surfaces wet for at least 15 seconds or as indicated by the manufacturer.
 - Be sure that the child rubs all surfaces of the hands and fingers.
 - Allow the child's hands to air-dry before dismissing them; do not use paper towels to dry hands.

Hand Sanitizer Equipment

Check the dispenser systems on a regular basis to ensure they contain the hand-hygiene rub, deliver the required volume of the product, and do not become clogged or malfunction.

References

1. Aronson A. S, & Shope, S. T. (ed.). 2009. *Managing infectious diseases in child care and schools: A quick reference guide* (2nd ed.). Elk Grove Village, IL: American Academy of Pediatrics.
2. Dyer, D. L., Shinder, A., & Shinder, F. 2000. Alcohol-free instant hand sanitizer reduces elementary school illness absenteeism. *Family Medicine-Kansas City* 32 (9): 633-638.
3. Centers for Disease Control. 2011. Handwashing: Clean hands save lives. <http://www.cdc.gov/handwashing/> (accessed February 16, 2012).
4. Jabbar, U., Leischner, J., Kasper, D., Gerber, R., Sambol, S. P., Parada, J. P., Johnson, S., & Gerding, D. N. 2010. Effectiveness of alcohol-based hand rubs for removal of *Clostridium difficile* spores from hands. *Infection Control and Hospital Epidemiology* 31 (6): 565-570.
5. Liu, P., Macinga, D. R., Fernandez, M. L., Zapka, C., Hsiao, H. M., Berger, B., Arbogast, J. W., & Moe, C. L. 2011. Comparison of the activity of alcohol-based handrubs against human noroviruses using the fingerpad method and quantitative real-time PCR. *Food and Environmental Virology* 3 (1): 35-42.
6. Selecting the right alcohol-based hand rub for your healthcare facility. www.handhygiene.org/downloads/HH_Picka_Handrub111003.doc (accessed October 5, 2012).
7. Todd, E. C. D., Michaels, B. S., Holah, J., Smith, D., Greig, J. D., & Bartleson, C. A. 2010. Outbreaks where food workers have been implicated in the spread of foodborne disease. Part 10. Alcohol-based antiseptics for hand disinfection and a comparison of their effectiveness with soaps. *Journal of Food Protection* 73 (11): 2128-2140.

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