Hand Hygiene – The Facts

Promoting proper hand hygiene in schools is an essential part of an infection control program. The best method for controlling the spread of colds and flu is to promote a hand washing program.

Antibacterial Soaps, Wipes and Washes. Our fear of germs, especially when it comes to children, has resulted in the use of antibacterial soaps instead of plain soap and soap products. Anti-bacterial products were originally developed for use by surgeons and other operating room personnel to prevent bacterial infections in hospitals and health care settings. They were then marketed to the public with claims about preventing disease.

In 2001, a study found that 76% of all liquid soaps and 29% of bar soaps now contain antibacterial agents.1 AC Nielsen, an international research company reported that Americans purchased $540 million worth of antibacterial soaps, hand-cleaners, and detergents in 2006.

Hand hygiene products come in several forms, including soaps, gels and wipes. Soaps - Two of the most commonly used ingredients in anti-bacterial soaps are Triclosan™ (TCS) and Triclocarban™ (TCC). An increasing number of studies show that these ingredients can be harmful to hormone development in humans and to other organisms2 in the environment. These substances have been incorporated into a wide range of personal care and household products, such as toothpastes, cosmetics, sponges, cutting boards, detergents and toys.

Gels and Wipes - Other common hand hygiene products such as sanitizers and wipes advertised as antibacterial or antimicrobial contain alcohol or quaternary ammonium compounds as the effective ingredient. These have not necessarily been tested for daily use with children or other sensitive populations. Some quaternary ammonium compounds have been associated with asthma and with fertility problems in mice.3 4 5 6

Most Effective Methods of Hand Hygiene in Schools

1. Vigorously wash hands with soap and water for 15 to 20 seconds (or the time it takes to sing the ABC song). Any amount of hand washing is beneficial, but the longer time is optimum.

2. When sinks are not available, use a wet hand wipe that is not labeled as an anti-bacterial or antimicrobial product.

3. In the case of a flu outbreak, use alcohol-based (greater than 60% alcohol) non-scented hand sanitizer.

Frequently Asked Questions

What does “antimicrobial” or “antibacterial” mean?
Antimicrobial means the product contains a chemical that can kill or suppress the multiplication or growth of microorganisms such as bacteria, viruses or fungi.

Antibacterial means the chemical in the product kills bacteria and some, but not all viruses. Colds and flu are caused by viruses, not bacteria. This is why antibacterial soaps, gels and wipes are a limited form of hand hygiene.

What role do bacteria play in human health?
“Bacteria are microorganisms that are found on our skin, in our digestive tract, in the air, in soil, and on almost all the things we touch every day. Most are harmless (non-pathogenic). Many are helpful because they
occupy ecological niches (both within our bodies and in the external environment) that could be occupied by harmful (pathogenic) bacteria. These helpful strains keep harmful microorganisms in check. They also help our digestion to function effectively and stimulate the development of a healthy immune system.“

**Don’t we need to control germs on our hands?**

Yes, removing germs from our hands is an important part of disease control. Hand washing with friction, soap and water is the best way to remove germs. A hand sanitizer can kill the germs that are currently on the hands, if the hands are already clean, but if the hands are dirty, the sanitizer will just move that dirt around, not remove it and not necessarily be effective against the germs. The use of hand sanitizers without washing the hands first, provides a false sense of security.

**If I want to really clean my hands, what is the best method?**

Vigorously washing our hands with liquid soap and water removes most germs. The Centers for Disease Control and Prevention guidelines call for washing hands with warm water and soap for 15 to 20 seconds to effectively prevent infection.

A Federal Drug advisory panel concluded in 2005 that, for general use, **antibacterial soaps are no more effective than regular plain soap at removing germs.** This conclusion was confirmed by a literature review of 27 publications on this topic conducted by Allison E. Aiello et al. There is no benefit in using antibacterial soaps in settings other than healthcare.

**Where should these products be used and who should use them?**

Antibacterial or antimicrobial products should be restricted for use in high risk settings such as hospitals, clinics, nurse’s offices, and other health care settings, prisons and by those with weakened immune systems. In case of a pandemic flu, **antimicrobial products may be appropriate.** They should not be used indiscriminately in our homes, schools and offices for routine hand hygiene.

The American Public Health Association proposed a resolution to ban the non-medical use of Triclosan™ in February of 2009.

**What about using antibacterial hand sanitizers in schools where students don’t have access to soap and water?**

Whenever possible, all students should have access to soap and water. One of the best life skills we can teach children is the proper way to wash their hands.

Even if a sanitizer were the only option available, their potential effectiveness is limited by the fact that they don’t necessarily remove the dirt on children’s hands, which compromises the effectiveness of the antibacterial products. Since the sanitizer may not remove the dirt, it may not kill all of the microbes.

In cases of allergies to nuts, a study found that liquid and bar soaps and commercial wipes removed proteins (the allergenic component of peanuts) from hands at the same rate, while alcohol based hand sanitizers and plain water were not as effective.

**What are the common ingredients in antibacterial products?**

Triclosan™ and Triclocarban™ in soaps and alcohol and quaternary ammonium compounds in gels and wipes.

**What are the problems with Triclosan™ and Triclocarban™?**

**Measurable amounts in our bodies**

Triclosan™ can be absorbed through the skin and has been detected in human breast milk, urine and blood. Animal studies in rats and frogs have demonstrated the capacity of Triclosan™ to interfere with thyroid and metabolism which indicates a risk for
effects on human thyroid function. Triclosan™ can combine with chlorine in water to form chloroform, which the EPA classifies as a human carcinogen.\textsuperscript{17,18}

Research has also shown that Triclocarban™ can amplify the effect of the testosterone hormone\textsuperscript{19} and other studies have linked these products to hormone disruption\textsuperscript{20}.

Hormone disruption may result in early puberty, reproductive issues and breast cancer.

Contaminating Our Rivers, Streams and Wildlife
The residue left after using an antimicrobial/antibacterial soap, goes down the drain and ends up in our wastewater treatment plants or septic tanks. Although some of the residue is filtered out, a U.S. Geological Survey study found that Triclosan™ is one of the major contaminants of US streams\textsuperscript{21}. A Johns Hopkins University study reached the same conclusion for the compound Triclocarban™\textsuperscript{22}.

Triclosan™ affects aquatic ecosystems. Studies show it to be highly toxic to algae\textsuperscript{23}. Algae are the primary food source for aquatic organisms. Disturbing their food source can have a negative impact on the whole aquatic ecosystem\textsuperscript{24}.

Contaminating Our Land
The Triclosan™ and Triclocarban™ that are filtered out during the wastewater treatment process end up in the residue called municipal sludge. The sludge is sold as fertilizer, which is spread on agricultural land, thereby distributing the chemicals throughout the environment. It is also used to cap landfills\textsuperscript{25,26}. Exposure to sunlight can cause TCS and TCC to break down into the toxic by-product dioxin\textsuperscript{27}.

What are the problems with alcohol and quaternary ammonium compound based hand sanitizers?
Alcohol – Alcohol-based products do not necessarily kill all types of viruses (some of which cause colds and flu), and they do not remove dirt and other organic matter as well as soap and water. Thus, they are not an adequate form of hand hygiene when used alone.

Alcohol-based products also pose several safety hazards. Children in some schools have ingested these hand sanitizers. The Iowa Statewide Poison Control Center fact sheet, \textit{Children and Ethanol-Based Hand Sanitizers (EBHS)}, states that a single swallow of ethanol-based hand sanitizer could produce a blood alcohol level high enough to create ethanol intoxication symptoms in a 2-year-old child weighing 27 pounds.\textsuperscript{28}

In addition, location and dispensing of these products is a fire safety issue.\textsuperscript{29} The wall units containing the alcohol sanitizer are referred to as “bombs on the wall” because they are flammable. Fire Departments have been concerned about having these incendiary products spread throughout school buildings.

Quaternary Ammonium Compounds-Benzalkonium chlorides, a group of quaternary ammonium compounds, are listed on the Association of Occupational and Environmental Clinics (AOEC) database as capable of causing or exacerbating asthma. Initial research shows quaternary ammonium compounds may cause infertility in mice.\textsuperscript{30}

Are there any preferable alternatives when students do not have access to sinks for hand washing purposes?
Yes, environmentally preferable products are available to replace those in current use. Look for products that do not contain added fragrances and that use bio-based ingredients. Wet wipes that are not labeled as antimicrobial or antibacterial are preferred.

How can we avoid antibacterial chemicals?
When shopping, read the labels and avoid purchasing:
Antibacterial Soaps (contain Triclosan™, Triclocarban™ and/or quaternary ammonium compounds)

- Other products that contain these ingredients. See below.

Appendix A: Check product labels for these synonyms:

**Triclosan**
- CH 3635
- CH-3565
- DP-300
- Irgasan
- Lexol 300
- Microban
- Ster-Zac
cloxfenolom
- Irgasan CH 3635
- Irgasan DP 300
- trichloro-2'-hydroxydiphenylether
- 2'-hydroxy-2,4,4'-trichlorodiphenyl ether
- 2,4,4'-trichloro-2'-hydroxydiphenyl ether
- 5-chloro-2-(2,4-dichlorophenoxy)phenol

**Triclocarban**
- 3, 4, 4’-trichlorocarbanilide
- Trichlorocarbanilide
- -(4-chlorophenyl)-N’-(3, 4-dichlorophenyl) urea
- Trichlorocarbanilide Cusiter
- Cusiter
- Cutisan
- Genoface
- Procutene
- Solubacter
- NSC-72005
- ENT 26925

**Quaternary Ammonium Compounds:**
- Quaternium-18 hectorite
- Cocoamidopropyl hydroxysultaine
- C12-22 quaternary ammonium compounds
- Cocoamidopropylbetaine
- Benzalkonium chloride
- Mixed dialky (C8-C10) dimethyl ammonium chloride
- (C14-C18) Dialkyldimethylammonium methyl sulfate
- Alkyl (C12-C18) dimethyl ammonium chloride
- Soethyldimonium ethosulfate
- Quaternary ammonium compounds, Di-(C14-C18 Alkyl), Methyl sulfate surfactant blend
- Alkyl(C12-18) dimethyl ethylbenzyl ammonium chloride
- Alkyl(C12-16)dimethylbenzylammonium chloride
- Quaternary ammonium montmorillonite
- Dimethyl ditallow ammonium chloride
- Quaternium-18 bentonite
- Tallowtrimonion chloride
- Soytrimonion chloride
- Quaternium-18
- Coco-betaine

Consult the following websites to find the ingredients in products:
Beyond Pesticides Triclosan Campaign
http://www.beyondpesticides.org/antibacterial/triclosan.htm
Skin Deep: Cosmetic Safety Database
http://www.cosmeticsdatabase.com
The Good Guide
http://www.goodguide.com/

Soaps and Hand Sanitizers that do not contain Triclosan™ and Triclocarban™:
Cleanwell Botanical Hand Sanitizer

For more information, contact:
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7 Alliance For the Prudent Use of Antibiotics (APUA) http://www.tufts.edu/med/apua/Ecology/EIA.html (August 28, 2008)


10 Aiello AE, Larson EL, Levy SB. Consumer antibacterial soaps: effective or just risky? *Clinical Infectious Disease* 2007;45:S137–47


12 Tamara T Perry, MDa, Mary Kay Conover-Walker, CRNPa, Anna Pomés, PhDb, Martin D Chapman, PhDb, Robert A Wood, MD. Distribution of peanut allergen in the environment. The *Journal of Allergy and Clinical Immunology.* Volume 113, Issue 5, Pages 973-976 May 2004


products on natural freshwater algal assemblages. 
*Environmental Science Technology.* 2003;37(9):1713-1719


