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Alcohol-based Hand Sanitizer Safety

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Alcohol-based hand sanitizer safety

As cold and flu season approaches, use of alcohol-based hand sanitizers may increase. But how effective are they at preventing the spread of illness, and are they safe?

Hand washing with soap and water is an effective means of reducing skin microbes and the transmission of infectious diseases.^{1,2} However, washing is not always convenient or possible, and alcohol-based hand sanitizers (ABHS) provide an alternative to soap and water. ABHS are available as gels or foams mainly containing 60-70% ethanol, with a few containing isopropanol or n-propanol, or sometimes a combination. The germicidal mechanism of action of alcohols involves denaturation of proteins and disruption of cell membranes, and all three possess good activity at concentrations between 60 to 80% against bacteria, fungi, and viruses such as the common cold and influenza A viruses.^{1,3,4}

Despite the widespread use of ABHS, there is limited and somewhat conflicting evidence on their effectiveness in the community for infections such as the common cold. One study showed ABHS to reduce absenteeism due to respiratory and gastrointestinal illness in elementary school children,⁵ and compared to soap and water, ABHS was noted to cause less skin irritation and to be faster, cleaner, and more convenient to use in another study.⁶ Among university students, regular ABHS use reduced upper-respiratory tract illness rates by 20% and reduced days missed from work or school by 43%,⁷ and regular ABHS use also reduced coughing, fever, and cold symptoms, as well as absenteeism due to bronchitis and diarrhea among office workers.⁸

Conversely, other studies have not shown ABHS to reduce absenteeism from school due to respiratory illness or reduce transmission of respiratory illness at home in other studies (although there were reductions in absenteeism and transmission of gastrointestinal illness).^{9,10} A recent meta-analysis also found that ABHS had only moderately protective effects

against gastrointestinal illness and weak protective effects against respiratory illness, with neither reduction in illness rates being statistically significant.¹¹ Most recently, regular use of ABHS was reported not to significantly prevent the common cold or "swine flu", pointing to the limited role of hand transmission for these infections.¹²

Despite the conflicting evidence, experts and government agencies still recommend ABHS as one option to clean hands and reduce disease transmission. Note that if hands are greasy or visibly dirty, ABHS will not work - soap and water should be used instead. The BC Centre for Disease Control has more useful hand hygiene tips for the public:
<http://www.bccdc.ca/prevention/HandHygiene/default.htm>.

What are some of the safety concerns?

The good news is acquired microbial resistance is not a problem with alcohol.¹ Absorption through the skin does not lead to toxicity even with frequent use,¹³ and although specific data are lacking, inhalation of vapours is also unlikely to lead to toxicity under normal circumstances.

However, there is a small chance of toxicity from unintentional ingestion by children and a good chance for toxicity from intentional ingestion and abuse. The main toxic effects from ethanol ingestion include altered mental status (primarily CNS depression) and hypoglycemia, especially in young children. Isopropyl alcohol may be more likely to cause gastric irritation with vomiting, and it has more potent CNS effects than ethyl alcohol but does not usually cause hypoglycemia.¹⁴

Concerns regarding toxicity of ABHS in children were raised a few years ago by a couple of reports circulated on the internet of a 2-year-old and 4-year old being poisoned by ingesting alcohol-based sanitizers.¹⁵ Both children were seen at emergency departments, and both recovered.

Since then there have been a couple of studies on ABHS toxicity in children from poison control centres in the US. Out of 1846 exposures reported to one poison centre network over a two-year period (80% involving patients under 6 years), only 1% of patients had effects requiring medical evaluation; the remaining 99% of patients had either no effect or mild, self-limiting effects.¹⁶ In another report of 647 exposures involving children under 6 years old, minor effects were reported in only 4% of cases, with nothing more serious.¹⁷

These observations are similar to our local experience. The BC Drug and Poison Information Centre received over 200 reports of exposures to ABHS from 2007 to 2008, with 85% involving children. Almost 95% of all exposures were managed at home. Typically, the amount licked from hands does not usually cause intoxication. However, Engel and Spiller reported a case of significant alcohol intoxication in a 4 year-old child who consumed a citrus-scented

hand sanitizer containing 62% ethanol and 10% isopropanol.¹⁸ This child became unresponsive, hypothermic, and hypoxic and needed to be intubated with overnight monitoring in an intensive care unit, but she did recover. Based on blood alcohol levels, the amount ingested was estimated to be between 1.5 and 2 ounces - clearly an unusual situation.

As with any alcohol-based products, ABHS can be abused as highlighted by recent published reports.¹⁹⁻²² However, while about 6% of ABHS exposures reported to DPIC were intentional, 21% of rubbing alcohol exposures were intentional over the same time period. This suggests that hand sanitizers are perhaps less prone to abuse than rubbing alcohols which are cheaper, readily available and easy to mix with other beverages. Further, while only 5% of ABHS exposures were referred to a hospital, 22% of rubbing alcohol exposures were referred to a hospital for assessment and treatment.

While some concern regarding toxicity in children is valid, hand sanitizers can be used safely, with supervision, and the potential for benefits by reduced illness transmission likely outweighs potential for toxicity from accidental ingestion.¹⁷ Risks to children can be minimized by ensuring that children do not put their hands in their mouths until the alcohol has evaporated. Intentional abuse of ABHS may be a problem, as with any other alcohol-containing products.

For poisoning or overdoses including hand sanitizer ingestions or eye exposures, call your local Poison Control Centre. In British Columbia: (604) 682-5050 or 1-800-567-8911.

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