Can Alcohol-Based Hand-Rub Solutions Cause You To Lose Your Driver’s License? Comparative Cutaneous Absorption of Various Alcohols

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We assessed cutaneous absorption of the two most commonly used alcohols (ethanol [ETOH] and isopropanol [ISOP]) among HCWs who used ABHRS intensely (13). (Presented in part at the 47th Interscience Conference on Antimicrobial Agents and Chemotherapy, San Francisco, CA, September 2006).

Although hand hygiene culture-change programs using alcohol-based hand-rub solutions (ABHRS) have been associated with a reduction in nosocomial infections, some health care workers (HCWs) remain concerned about potential cutaneous absorption of alcohol from ABHRS (1, 4, 10, 11, 13). In particular, some young HCWs who are required to have a zero breath alcohol level to legally drive automobiles (probationary license) and HCWs of Islamic faith may have reservations about their exposure to alcohol (1, 13). Thus, we aimed to assess the cutaneous absorption of the two most commonly used alcohols (ethanol [ETOH] and isopropanol [ISOP]) among HCWs who used ABHRS intensely (13).

Consenting HCW volunteers completed a questionnaire recording their age, height, weight, gender, ethnicity, alcohol consumption during the 24 h prior to the study, and prescribed medication usage. Participants’ heights and weights were used to calculate their body mass indexes (BMI). HCWs were excluded if they had a history of allergy to alcohol, eczema or broken/damaged skin or a history of allergy to alcohol. BMI was 26 (median, 24; range, 22 to 67 years; 14 females; ethnic distribution, 18 Caucasian, 2 Asian) participated in the study. Participants’ mean BMI was 26 ± 4 (median, 24; range, 21 to 34; acceptable BMI, n = 11; overweight BMI, n = 4; obese BMI, n = 5) (6). One HCW, who regularly used DeBug without any adverse reactions prior to this study, developed a severe cutaneous reaction to Avagard after day 1 such that she could not participate on day 3. Thus, 20 HCWs completed use of Avagard and 19 used DeBug in the study. Both ABHRS groups were sampled at

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their hands with soap and water for (3 ml) of 52.6% ISOP-containing ABHRS and did not wash (0.0005% to 0.001%). Secondly, they applied a larger volume number of their participants had very low ISOP levels. However, the assay they used had a lower limit of detection of participants after using ABHRS six times per h for 4 h (11).

Results are shown in Table 1. ETOH levels were detectable in breath analysis of 6 of the 20 HCWs (range, 0.0010% to 0.0025%) at 1 to 2 min after the final application of Avagard; all would have been recorded as undetectable by Victoria Police performing routine roadside breathalyzer testing. However, two of these six HCWs also had detectable serum ETOH levels at 5 to 7 min postexposure. All breath ETOH levels were zero at 10 to 13 min after Avagard use. Measurable ETOH levels were not associated with HCW age, sex, ethnicity, or BMI, but statistical power was limited due to the low number of participants with detectable levels. All serum ISOP levels were unrecordable at each time point.

This study mimicked clinical settings in which intensive use of ABHRS of up to 30 times per h is required, such as in intensive care units (4, 10). We limited our study to a 1-h duration, since after such periods of intense activity, HCWs frequently wash their hands in soap and water because they may not result in higher absorption or accumulation rates (4, 10, 13).

Although there are many reasons described by HCWs regarding why they exhibit poor hand hygiene compliance (3, 7, 8, 9, 12), fear of alcohol absorption and loss of one’s drivers license is no longer valid. Since ISOP appears slightly more predictable in its lack of cutaneous absorption than ETOH, ISOP-containing ABHRS may be preferred by some HCWs and religious groups.

We gratefully acknowledge the enthusiastic support of Marie O’Brien and the 20 Austin Health HCWs and medical students who participated in this study, Senior Constable Ian McGrath and Forensic Officer John Papavasiliou from Victoria Police who assisted with the alcohol breathalyzer testing, and Nonie Bridgland and Kylie King from Austin Health Pathology who performed all venepunctures.

There are no conflicts of interest. However, DeBug (a trademark for one of the hand hygiene product referred to in this article) was developed by some of the authors (employees of Austin Health) with funding in part from the Department of Human Services, Victoria, Australia. The intellectual property for this development is held by Austin Health, which handles all patent, trademark, and licensing issues. Austin Health, but no individual author, receives a small income stream from the sale of DeBug.

### Table 1. Breath and serum alcohol levels before and after intensive use of alcohol-based hand-rub solution

<table>
<thead>
<tr>
<th>Time and type of specimen</th>
<th>No. of HCWs with detectable alcohol levels/total no. of HCWs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ethanol (n = 20)</td>
</tr>
<tr>
<td>Preexposure (baseline)</td>
<td></td>
</tr>
<tr>
<td>Breath</td>
<td>0/20</td>
</tr>
<tr>
<td>Serum</td>
<td>0/20</td>
</tr>
<tr>
<td>Postexposure</td>
<td></td>
</tr>
<tr>
<td>1–2 min, breath</td>
<td>0/20</td>
</tr>
<tr>
<td>5–7 min, serum</td>
<td>2/20</td>
</tr>
<tr>
<td>10–13 min, breath</td>
<td>0/20</td>
</tr>
</tbody>
</table>

* NA, not assessable by Drager Alcotest 7110 breathalyzer.

** Specific levels for these five HCWs were 0.0010%, 0.0012%, 0.0014%, 0.0018%, and 0.0025%.

*b Specific levels for these two HCWs were 0.0006% and 0.0015%.

c No statistical difference between 2/20 versus 0/19 HCWs (P = 0.49, Fisher’s exact test).

d Exact test.

REFERENCES


