Hand Hygiene Product Selection: It’s Personal, Not Personnel

MARILYN MICHELS MSN RN CRRN CIC FAPIC

Outline

- Overview
- Hand hygiene product choices
  - Infrastructure
  - Soap
  - Alcohol
- Safety
- It’s personal
- Changing products

Terminology

Detergent (surfactant) - Commonly referred to as soap.

Compounds that possess a cleaning action. They are composed of a hydrophilic and a lipophilic part and can be divided into four groups:

1. anionic
2. cationic
3. amphoteric
4. non-ionic.

Terminology

Antimicrobial (medicated) soap

Soap (detergent) containing an antiseptic agent at a concentration sufficient to inactivate microorganisms and/or temporarily suppress their growth.

The detergent activity of such soaps may also dislodge transient microorganisms or other contaminants from the skin to facilitate their subsequent removal by water.

Terminology

Antiseptic agent

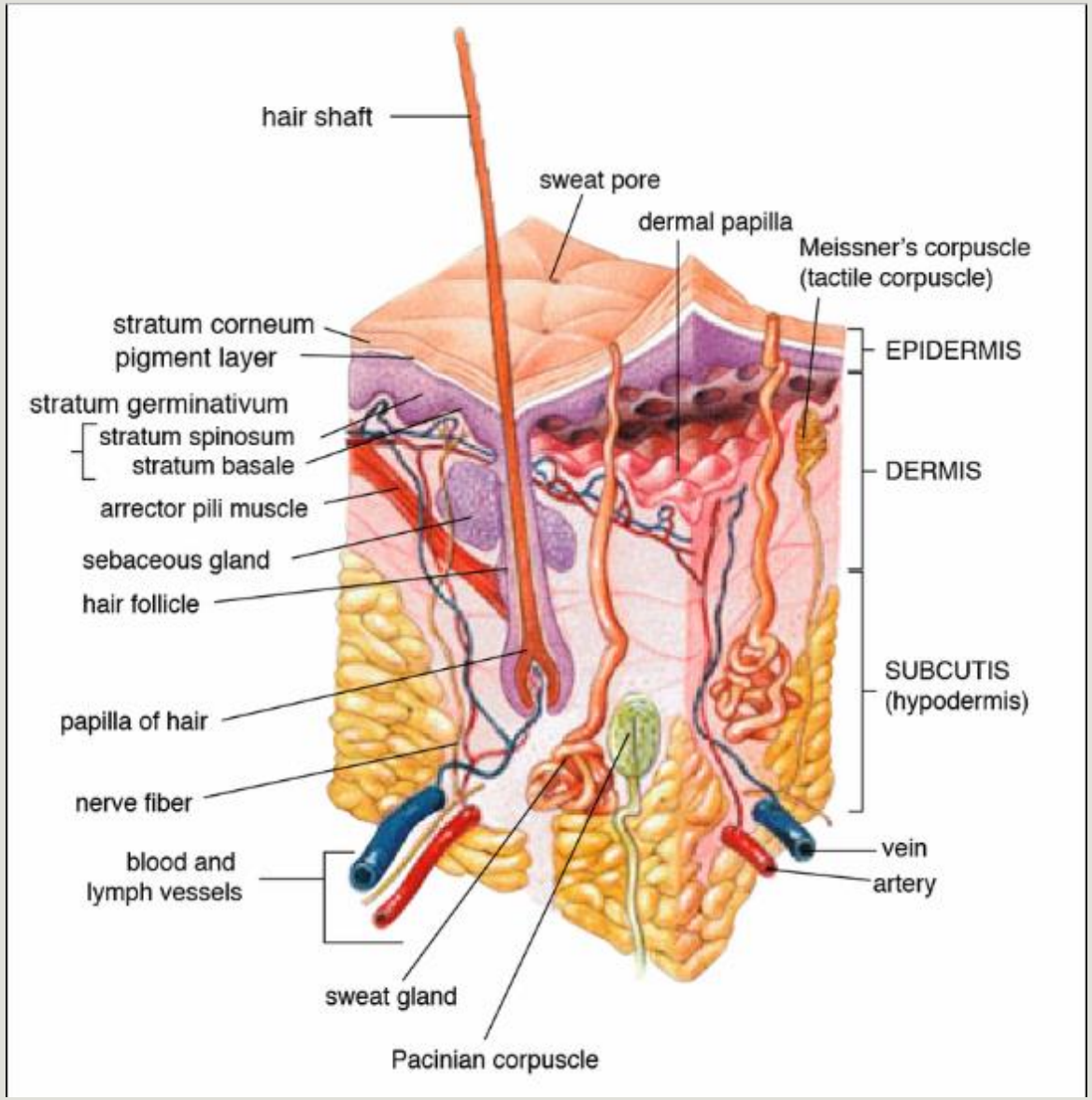
An antimicrobial substance that inactivates microorganisms or inhibits their growth on living tissues. Examples include:

- Alcohols
- Chlorhexidine gluconate (CHG)
- Iodine
- Chloroxylenol (PCMX)
- Triclosan
- Chlorine derivatives
- Quaternary ammonium compounds

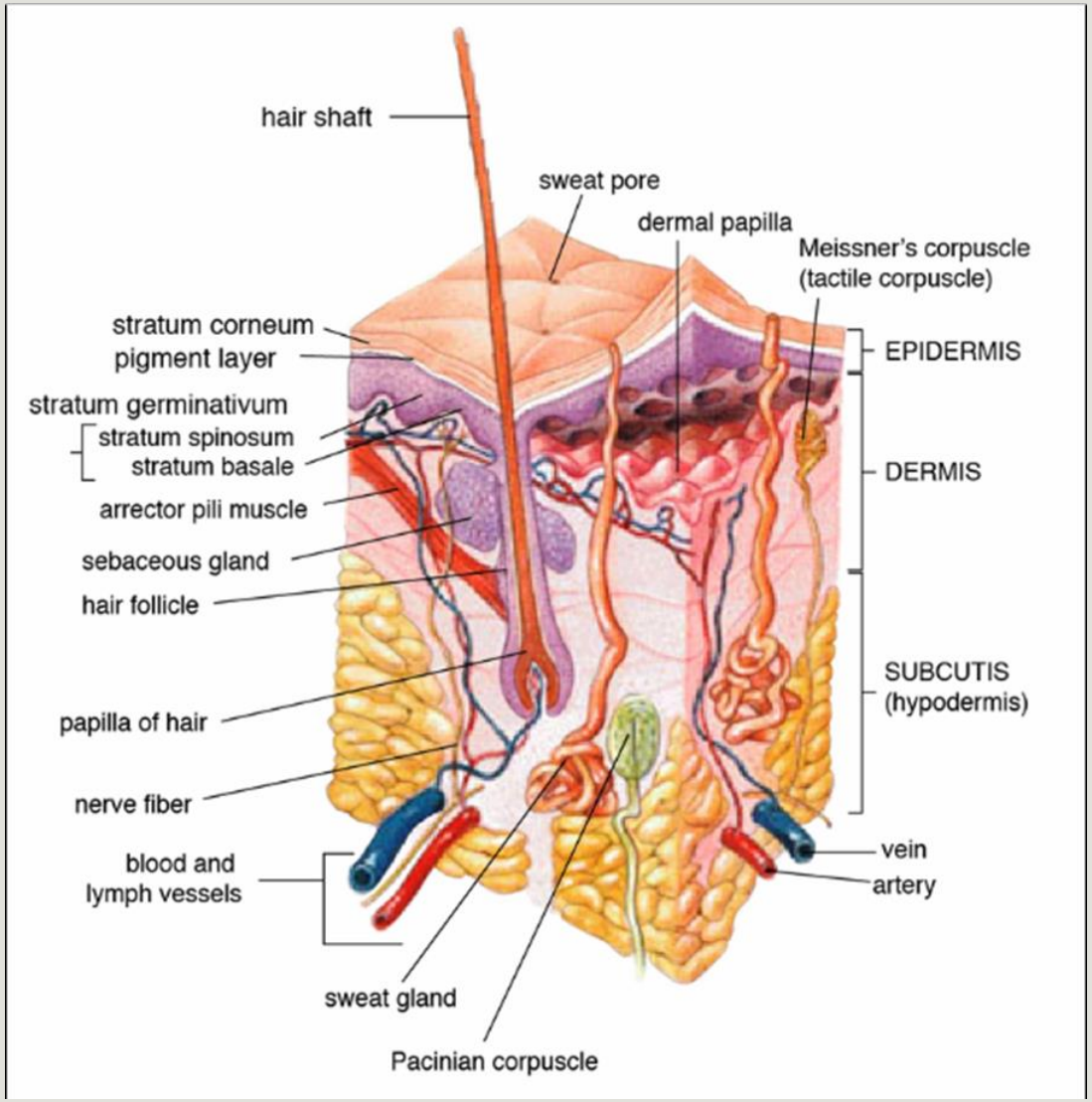
Terminology

Alcohol based hand rub

An alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to reduce the growth of microorganisms. Such preparations may contain one or more types of alcohol with excipients, other active ingredients and humectants.



Physiology of normal skin – protecting the skin barrier



External substances can interact with the skin in three ways:

They can interact with the cells directly;

they can penetrate the interstices of the cells;

or they can gain entrance through the pilosebaceous and sweat gland orifices.

Causes of occupational dermatoses

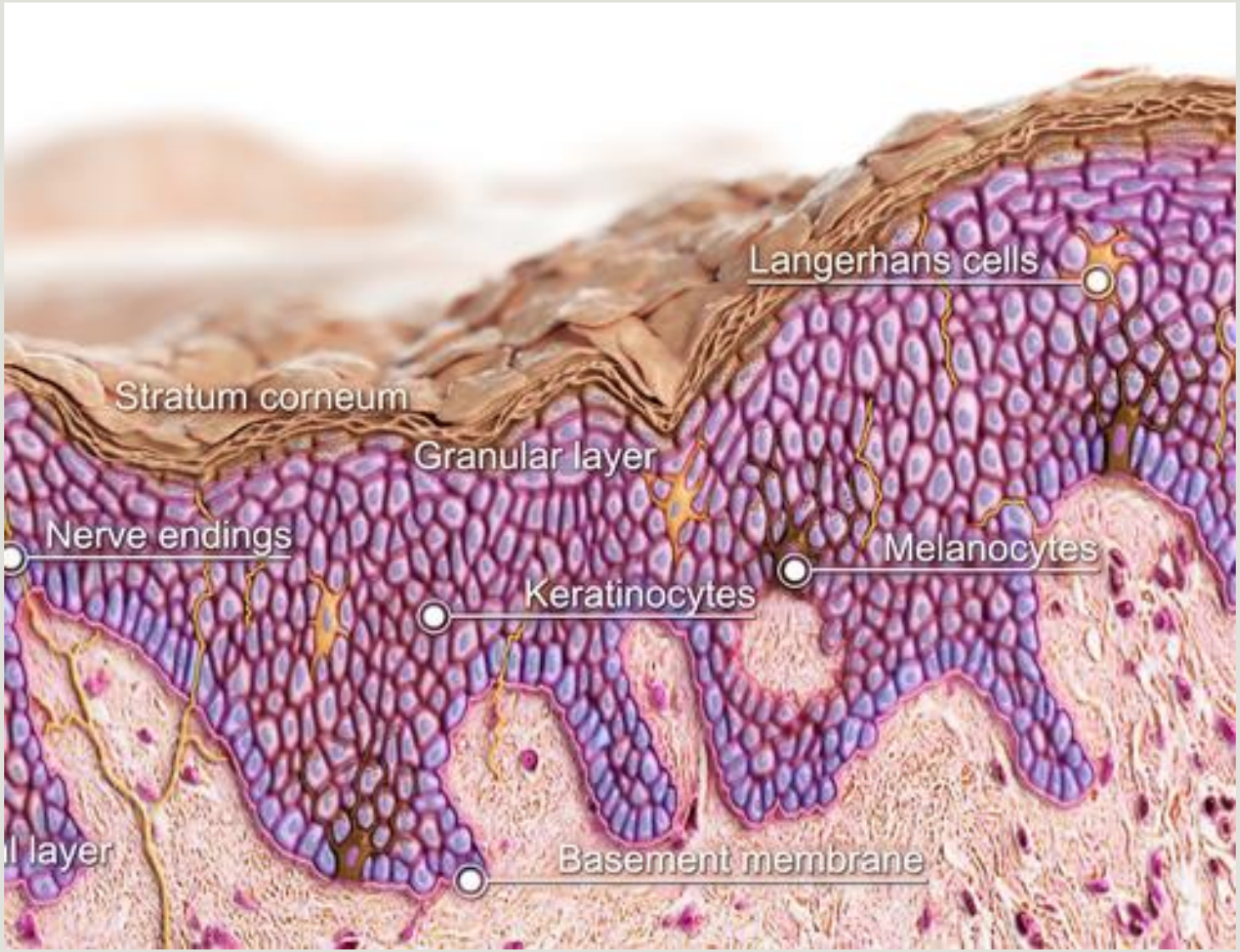
Chemical

Mechanical

Physical

Biological.

In one study, approximately 25% of nurses reported symptoms or signs of dermatitis on their hands, and 85% gave a history of skin problems,
Larson E, Friedman C, Cohran J, Treston-Aurand J, Green S. Prevalence and correlates of skin damage on the hands of nurses. Heart Lung 1997;26:404-12.



Acid Mantle

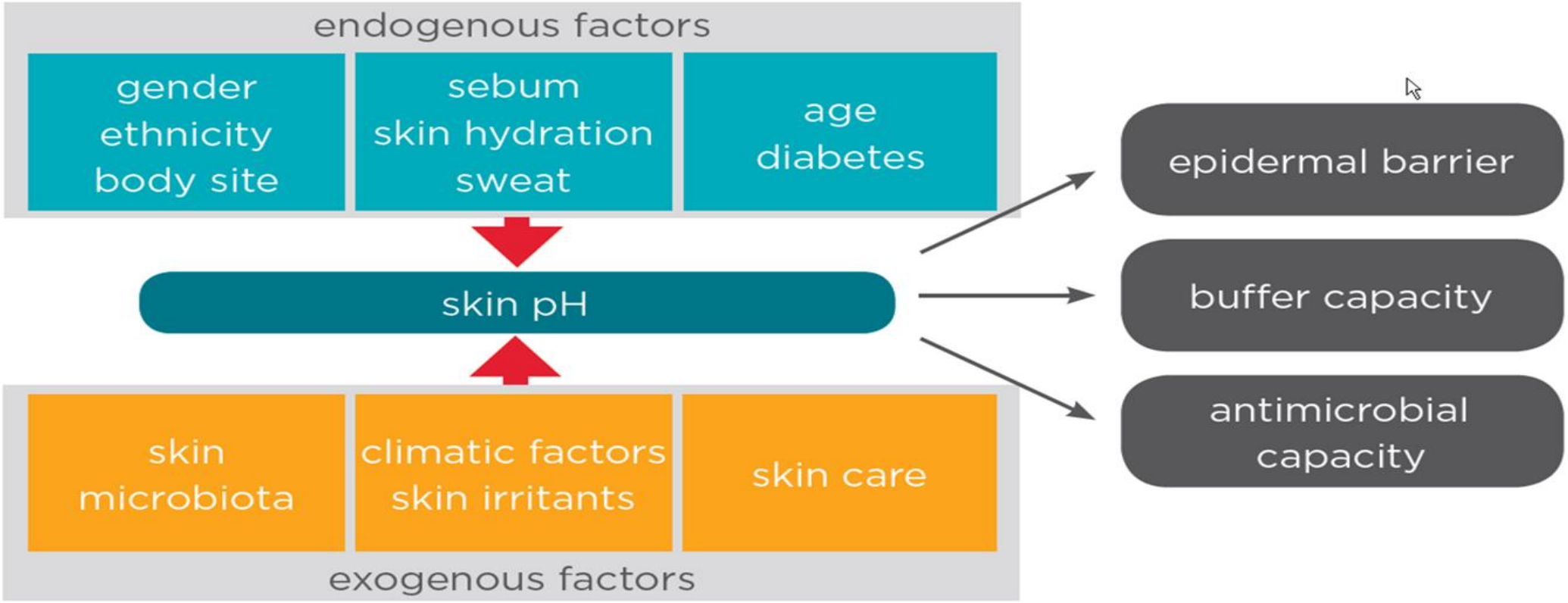
Protects from microorganisms, injury, and invasion. Traps water in body.

Sebum protects the outer skin from external factors.

Acid mantle is made up of sebum, lipids, sweat, and water to form a hydrolipidic film.

Acid mantle has a pH average of 5.5.

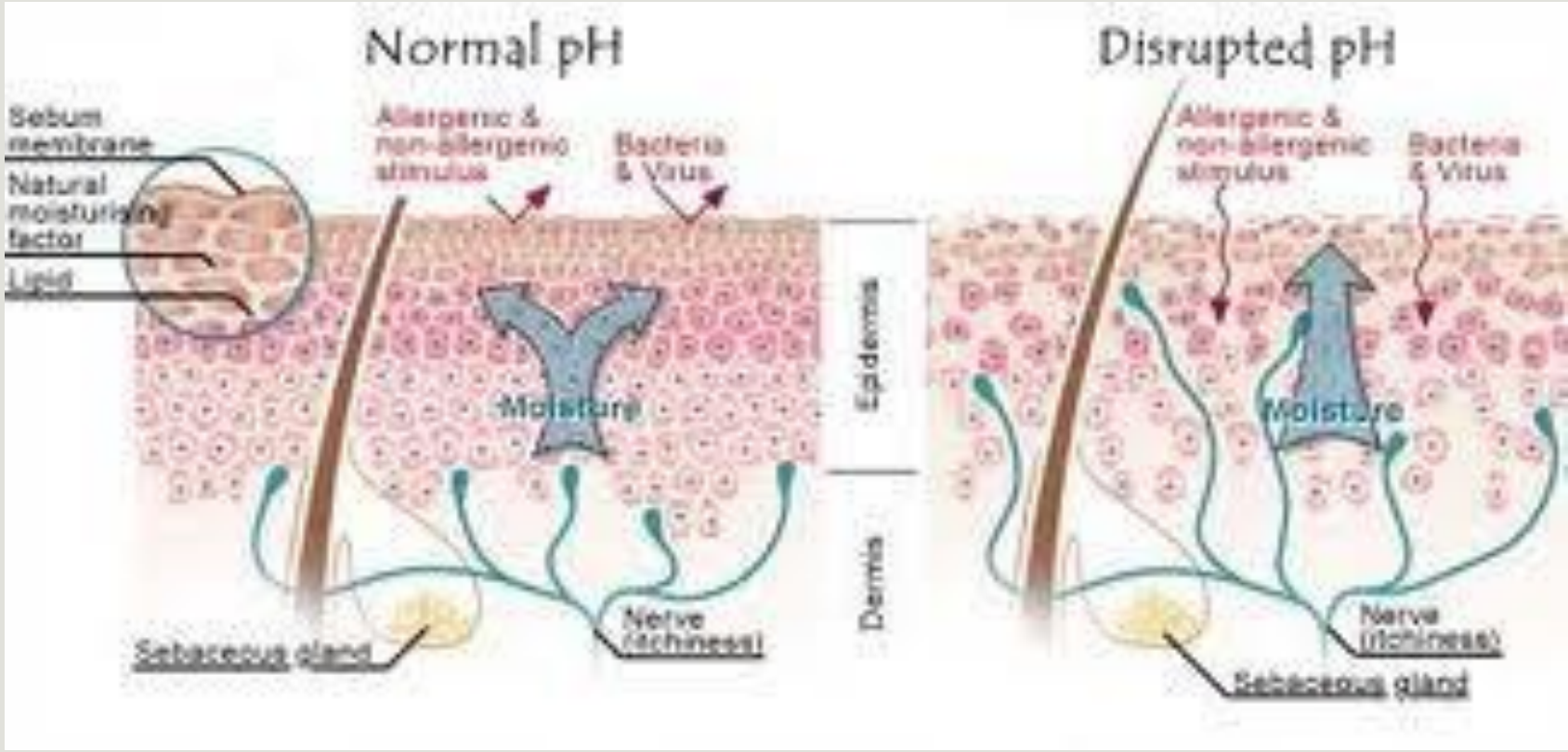
Acid Mantle



EMJ Dermatol. 2014;2:86-94. Schreml, Stephan, Michael Kemper, and Christoph Abels. "Skin pH in the elderly and appropriate skin care." *Eur Med J Dermatol* 2 (2014): 86-94.

Transepidermal water loss (TEWL)

– water loss caused by the evaporation on the skin's surface



https://www.pinterest.co.uk/pin/361554676315500576/visual-search/

Volume 8, Issue 5, May 2008, Pages 289-301

Transmission of pathogens by hands

Health-care workers: source, vector, or victim of MRSA?
Volume 8, Issue 5, May 2008, p289-301

Albrich, Werner C., and Stephan Harbarth. "Health-care workers: source, vector, or victim of MRSA?."

Review

Health-care workers: source, vector, or victim of MRSA?

Werner C Albrich, Stephan Harbarth

There is ongoing controversy about the role of health-care workers in transmission of meticillin-resistant *Staphylococcus aureus* (MRSA). We did a search of the literature from January, 1980, to March, 2006, to determine the likelihood of MRSA colonisation and infection in health-care workers and to assess their role in MRSA transmission. In 127 investigations, the average MRSA carriage rate among 33 318 screened health-care workers was 4·6%; 5·1% had clinical infections. Risk factors included chronic skin diseases, poor hygiene practices, and having worked in countries with endemic MRSA. Both transiently and persistently colonised health-care workers were responsible for several MRSA clusters. Transmission from personnel to patients was likely in 63 (93%) of 68 studies that undertook genotyping. MRSA eradication was achieved in 449 (88%) of 510 health-care workers. Subclinical infections and colonisation of extranasal sites were associated with persistent carriage. We discuss advantages and disadvantages of screening and eradication policies for MRSA control and give recommendations for the management of colonised health-care workers in different settings.

Lancet Infect Dis 2008; 8: 289–301

Respiratory and Meningeal Pathogens Research Unit, Chris Hani Baragwanath Hospital, University of the Witwatersrand, Johannesburg, South Africa, and Institute for Infectious Diseases, University Hospital Bern, Bern, Switzerland (W C Albrich MD); and Infection Control Program, Geneva University Hospitals, Geneva, Switzerland (S Harbarth MD)

Correspondence to: Dr Stephan Harbarth, Infection

Introduction

Hospitals worldwide are increasingly concerned by

workers in MRSA transmission. 127 investigations, published in 120 articles, provided the number of

Ong, Peck Y. "Recurrent MRSA skin infections in atopic dermatitis." The Journal of Allergy and Clinical Immunology: In Practice 2.4 (2014): 396-399.

Recurrent MRSA Skin Infections in Atopic Dermatitis

Peck Y. Ong, MD[a,b] *Los Angeles, Calif*

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a frequent cause of recurrent skin and soft tissue infections. For patients with atopic dermatitis, recurrent skin infections with MRSA often lead to eczema exacerbation. There currently is no standard practice in the prevention of recurrent MRSA soft tissue infections in the general and the atopic dermatitis populations. The current article reviews recent data on *S aureus* decolonization treatments for the prevention of recurrent MRSA soft tissue infections in the community setting. © 2014 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2014;2:396-9)

Key words: *Eczema; Community-associated MRSA; USA300; Skin and soft tissue infection; Decolonization; Household contact; Chlorhexidine; Hibiclens; Hypochlorite; Bleach; Clorox*

Atopic dermatitis (AD) is a common chronic skin disease that is associated with elevated IgE, food and/or respiratory allergies, and recurrent skin infections. More than 90% of patients with AD are colonized with *Staphylococcus aureus* compared with only 10% in healthy individuals (reviewed in Ong and Leung[1]). *S* with those isolated from a general population of AD patients with AD.[4] Other potential mechanisms by which *S aureus* triggers AD include the production of α- and δ-toxins, which cause keratinocyte toxicity and mast cell activation, respectively.[1,5]

Community-associated (CA) MRSA skin and soft tissue infections (SSTI) have become a common reason for visits to outpatient clinics and emergency departments in the United States.[6] These infections have mainly been associated with the emergence of MRSA clone USA300. For patients with AD, eczema exacerbation caused by MRSA SSTI has also become a significant clinical problem in recent years.[7] The percentage of MRSA in patients with *S aureus*—colonized AD has been reported to range from 11% to 34%.[8-11] Suh et al[9] reported that 13% of all patients with AD are colonized with MRSA, this is significantly higher than the 1% to 3% of MRSA colonization reported in the general population.[9] Lo et al[10] also found that patients with AD and with MRSA colonization are more likely to develop SSTI than those with methicillin-sensitive *S aureus* colonization. AD constitutes a risk factor for colonization, recurrent infection, and transmission of MRSA.[12-14] Infection with MRSA leads to a vicious cycle of AD

http://mom2my6pack.blogspot.com/2007/07/july-3.html

Murphy's Law

ANYTHING THAT CAN GO WRONG WILL GO WRONG

Refillable soap dispensers

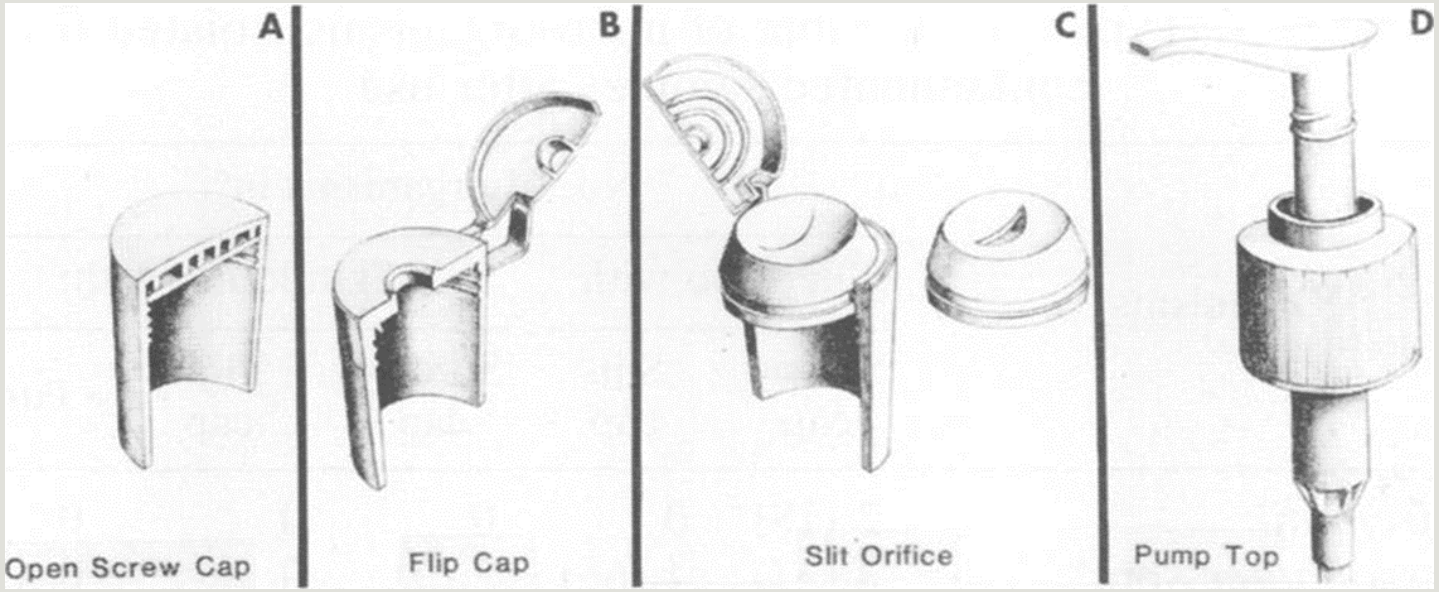
Do not add soap to a partially empty soap dispenser.

If soap dispensers are reused, follow recommended procedures for cleansing (IA)

Defective products

Solution

Delivery system – pump, battery, refillable, types of pumps, amount, monitoring systems, wipes



Cosmetic and closure	No. of subjects	Avg amt used (g)	Avg no. of uses	% Samples contaminated
Shampoo				
Screw-cap	28	96]	17]	29 (8/28)]
Slit-cap	25	131]	14	21 (6/25)]
Flip-cap	25	98]	14]	0 (0/25)]
Skin lotion				
Screw-cap	21	32]	18]	71 (14/21)]
Flip-cap	18	36	23	39 (7/18)]
Pump	21	35]	22]	10 (2/21)]

[a] Bracketed values are not significantly different ($\alpha = 0.05$).

Brannan, Daniel K., and J. C. Dille. "Type of closure prevents microbial contamination of cosmetics during consumer use." Appl. Environ. Microbiol. 56.5 (1990): 1476-1479.

TABLE 3. Types and number of microorganisms isolated from contaminated samples after use

Organisms	No. of organisms in[a]:				
	Shampoo with:		Skin lotion with:		
	Screw-cap	Slit-cap	Screw-cap	Flip-cap	Pump
C. freundii	2 (18)	0	0	0	0
Enterobacter spp.[b]	4 (37)	4 (66)	2 (9)	0	0
Klebsiella spp.[c]	1 (9)	1 (17)	2 (9)	0	1 (33)
Pseudomonas spp.[d]	1 (9)	1 (17)	5 (21)	1 (12.5)	1 (33)
Serratia spp.[e]	2 (18)	0	1 (4)	0	0
GNR[f] (nonfermentative)	0	0	1 (4)	1 (12.5)	0
GNR (fermentative)	1 (9)	0	0	0	0
CDC serotype IVC2	0	0	1 (4)	0	0
Bacillus sp.	0	0	1 (4)	0	0
Staphylococcus epidermidis	0	0	1 (4)	0	1 (33)
Propionibacterium sp.	0	0	1 (4)	0	0
Sarcina sp.	0	0	1 (4)	0	0
Diphtheroid	0	0	1 (4)	0	0
Yeasts and molds	0	0	7 (29)	6 (75)	0

[a] Values in parentheses are the percentages of each isolate in the total number of isolates recovered from that particular product. In some cases, several isolates were recovered from a single product and cap.

[b] *E. aerogenes*, *E. agglomerans*, and *E. cloacae*.

[c] *K. pneumoniae* and *K. oxytoca*.

[d] *P. putida*, *P. fluorescens*, *P. paucimobilis*, *P. aeruginosa*, and *P. maltophilia*.

[e] *S. liquefaciens*, *S. odorifera*, and *S. rubidaea*.

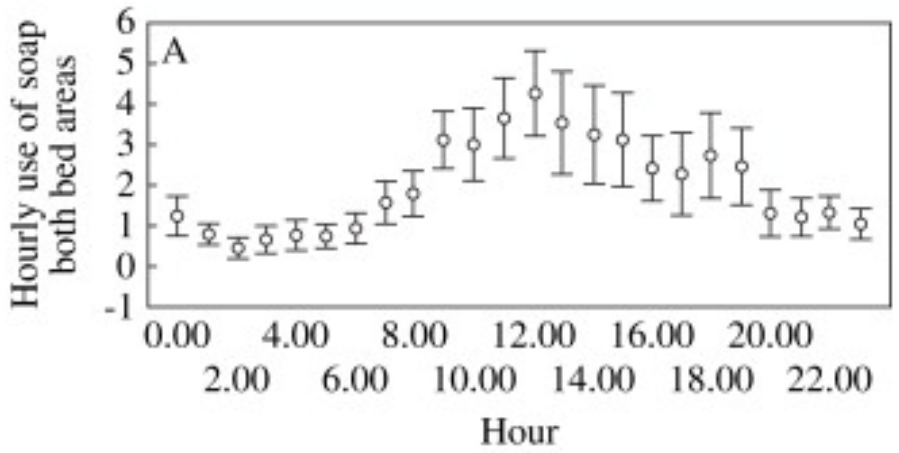
[f] GNR, Gram-negative rod.

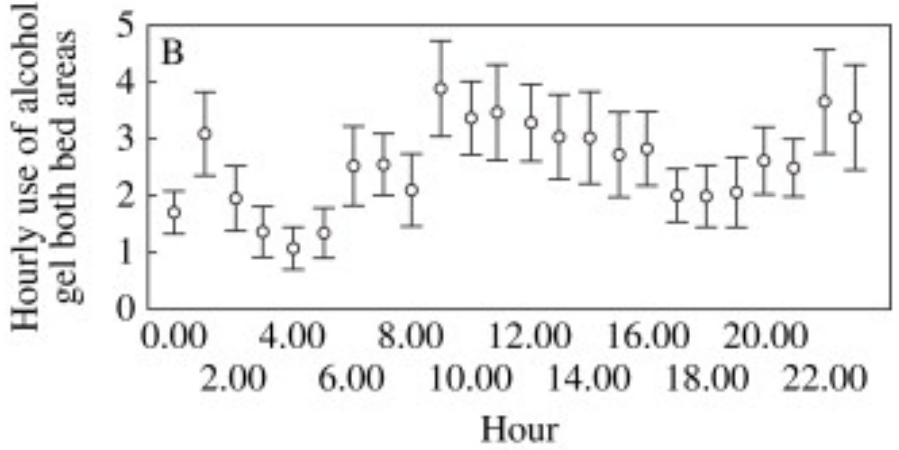
Brannan, Daniel K., and J. C. Dille. "Type of closure prevents microbial contamination of cosmetics during consumer use." Appl. Environ. Microbiol. 56.5 (1990): 1476-1479.

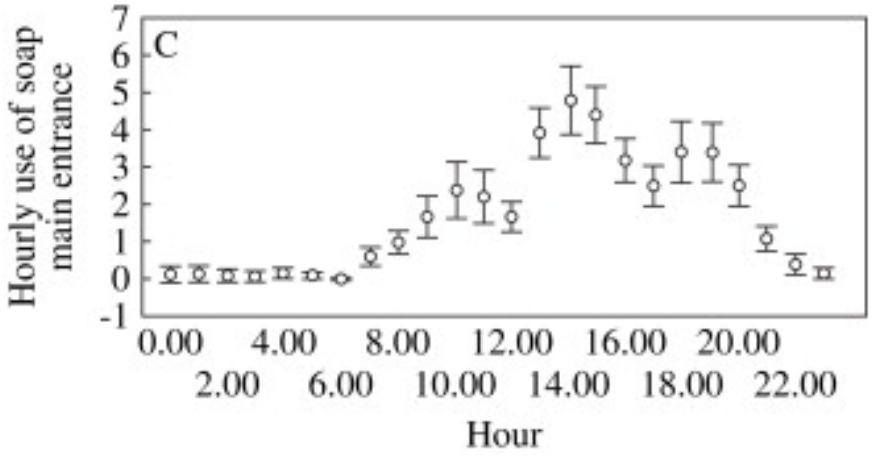
Electronic Surveillance Options

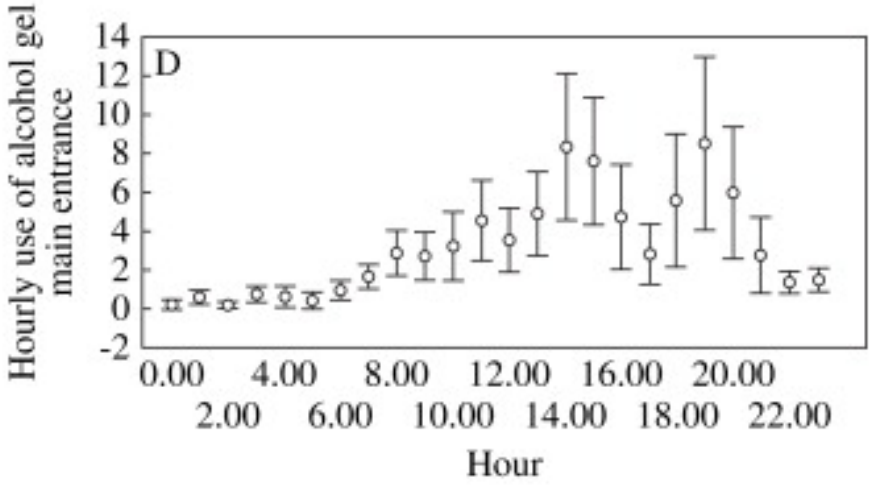
Figure 2

Timings of soap and alcohol gel use for the bed areas and main entrance during all 24 h periods (dispensations per hour). (A) Bed areas soap use. (B) Bed areas alcohol gel use. (C) Entrance soap use. (D) Entrance alcohol gel use.









Kinsella, G., A. N. Thomas, and R. J. Taylor. "Electronic surveillance of wall-mounted soap and alcohol gel dispensers in an intensive care unit." Journal of Hospital Infection 66.1 (2007): 34-39.

Review of hand hygiene fixtures

Water

- Temperature control
- Contaminants
- Flow
- Automated

Sinks/Plumbing

Faucet Aerators

Numerous outbreaks associated with faucet aerators.

Purpose of aerators:

- Conserve water while maintaining high pressure
- Saves $
- Reduce splashing

Replace or clean your faucet aerators, as they can become clogged with silt and biofilm.

The Impact of Aerator on Water Contamination by Emerging Gram-Negative Opportunists in At-Risk Hospital Departments. ICHE. Feb. 2014

Shallow sink bowl enables potentially contaminated water to splash onto patient care items, healthcare worker hands, and into patient care spaces more than four feet from the sink itself.

Annual Conference of the Association for Professionals in Infection Control and Epidemiology (APIC) 2019

Sinks in the Future

Ozonated water

Laminar flow

Self flushing

Motion activated

Cleans without soap

Prevents bacterial growth and biofilm

Disinfects drain and trap

Integrates with hand hygiene monitoring programs

That sinking feeling: eradicating *Pseudomonas* and *Candida auris* from a sink drain system using ozonated water

Scott Livingston, BA[1,2]; Jennifer L. Cadnum, BS [1]; Annette L. Jencson BSMT, CIC[1]; Scott Gestrich, MD[1]; & Curtis J. Donskey, MD[1,2]

[1] Research Service, Cleveland VA Medical Center, Cleveland, Ohio

[2] Case Western Reserve University School of Medicine, Cleveland, Ohio

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Poster# 236

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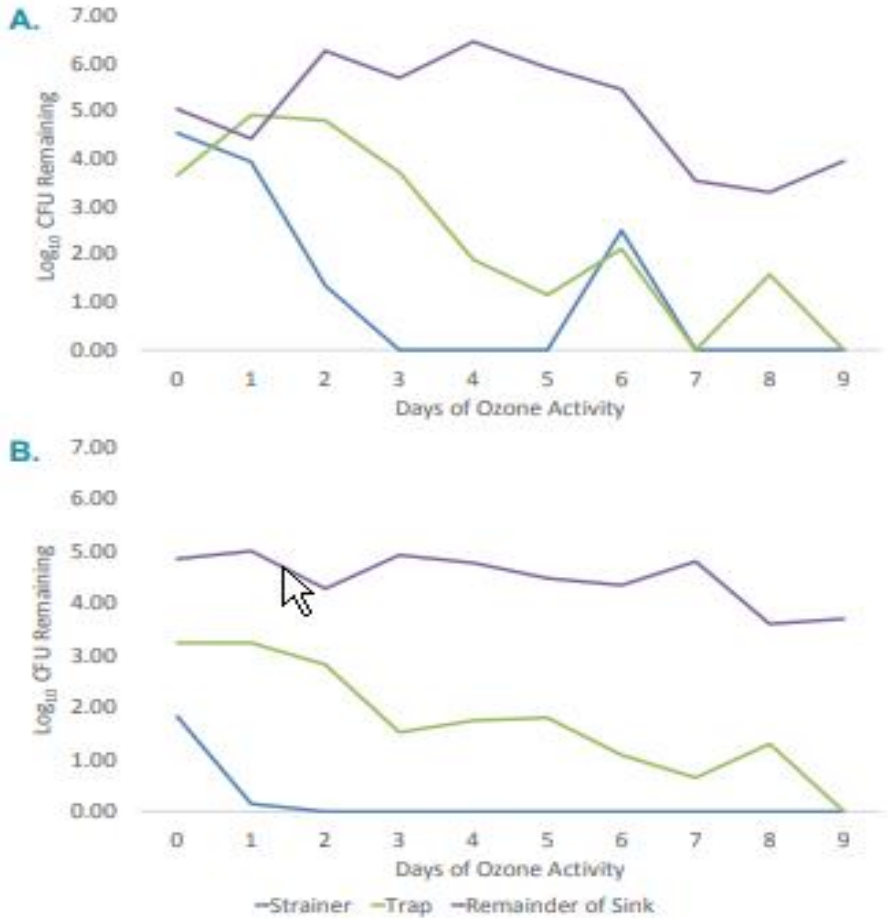
Introduction

- Contaminated sinks and drains are rapidly emerging as a cause of healthcare-associated infections, particularly in intensive care units (ICUs)
- Drain contamination is particularly difficult to eradicate due to the propensity for biofilm formation in piping
- We tested the benefit of introducing ozone into the water supply for decolonization of sinks and sink plumbing

Methods

- We evaluated the efficacy of ozonated water for reduction of methicillin-resistant *Staphylococcus aureus* (MRSA), *Pseudomonas* sp, and *Candida auris* on steel disks
- On steel disks, organisms were exposed to ozonated water with concentration ≥0.9 ppm for 10 minutes
- We also evaluated activity of ozonated water in a sink model deliberately colonized with *Pseudomonas* sp and *C. auris*
- Ozonated water was added to the system via the faucet

Figure 1. A) Elimination of *Pseudomonas sp.* from the ozone sink B) Elimination of *C. auris*



Results

- On steel discs, MRSA, *Pseudomonas*, and *C. auris* were reduced by ≥3 $\log_{10}$ colony-forming units (CFUs) with 10 minutes of exposure to ozonated water
- In the sink model, we demonstrated total elimination of *C. auris* and *Pseudomonas sp* at the strainer within 2 days of ozone activity (figure 1, 2)
- We also demonstrated total elimination of both organisms at the trap within 9 days of ozone activity (figure 1, 2)
- Beyond the trap there was no significant decolonization (figure 1, 2)

Conclusions and Acknowledgements

- Our data suggest that ozonated water can effectively kill MRSA, *C. auris*, and *Pseudomonas spp.*
- An ozone generating sink can self-clean, reducing the burden of *C. auris* and *Pseudomonas*
- This device has the potential to reduce the number of sink-associated infections in hospitals, and merits further investigation

- Class 1 Inc. & FRANKE provided the testing apparatus and had no role in the design

Soap

Bland soap

. Available in various forms:

- bar soap
- liquid
- leaf

Occasionally, plain soaps have become contaminated

FDA

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Antibacterial Soap? You Can Skip It, Use Plain Soap and Water

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Antimicrobial Soaps: Active Ingredients

- Chlorhexidine (CHG)
- Chloroxylenol
- Hexachlorophene
- Iodine and iodophors
- Quaternary ammonium
- Triclosan

Table III.1

Antimicrobial activity and summary of properties of antiseptics used in hand hygiene

Antiseptics	Gram-positive bacteria	Gram-negative bacteria	Viruses enveloped	Viruses non-enveloped	Myco-bacteria	Fungi	Spores
Alcohols	+++	+++	+++	++	+++	+++	-
Chloroxylenol	+++	+	+	±	+	+	-
Chlorhexidine	+++	++	++	+	+	+	-
Hexachlorophene[a]	+++	+	?	?	+	+	-
Iodophors	+++	+++	++	++	++	++	±[b]
Triclosan[d]	+++	++	?	?	±	±[e]	-
Quaternary ammonium compounds[c]	++	+	+	?	±	±	-

https://www.who.int/gpsc/5may/tools/who_guidelines-handhygiene_summary.pdf

Chlorhexidine gluconate (CHG)

Has a strong persistent effect if not counteracted
Increased effectiveness with repeat applications
Incompatible with some non-ionic inorganic chemicals and some anions
Do not use near mucous membranes
Toxicity to ears and eyes reported
Do not use in open wounds
More effective for gram (+) organisms than gram (-)

Chloroxylenol - para-chloro-meta-xylenol (PCMX)

Halogen-substituted phenolic compound

Activity of chloroxylenol is apparently attributable to the inactivation of bacterial enzymes and alteration of cell walls

Relatively few articles dealing with the efficacy of chloroxylenol-containing preparations

Chloroxylenol is not as rapidly active as chlorhexidine gluconate or iodophors

Minimally affected by the presence of organic matter, but is neutralized by non-ionic surfactants

Iodine Based

Rapidly neutralized in presence of organic materials such as blood or sputum.
Wide range of activity but requires sufficient contact time.

Residual effect is minimal if wiped off or rinsed.

The antimicrobial activity of iodophors also can be affected
by pH, temperature, exposure time, concentration of total available iodine and the amount and type of organic and inorganic compounds present (e.g. alcohols and detergents).

Iodophor antiseptics have become contaminated with Gram-negative bacilli as a result of poor manufacturing processes

Triclosan

Triclosan enters bacterial cells and affects the cytoplasmic membrane and synthesis of RNA, fatty acids, and proteins.

Has persistent activity on the skin. Its activity in hand-care products is affected by pH, the presence of surfactants or humectants, and the ionic nature of the formulation.

Most formulations containing less than 2% triclosan are well tolerated and seldom cause allergic reactions.

Quaternary ammonium compounds

Large group of compounds:

- Alkyl benzalkonium chloride
- Benzethonium chloride,
- Cetrimide
- Cetylpyridium chloride

Hexachlorophene

Hexachlorophene is a bisphenol composed of two phenolic groups and three chlorine moieties.

In the 1950s and early 1960s, emulsions containing 3% hexachlorophene were widely used for hygienic handwashing, as surgical scrubs, and for routine bathing of infants in hospital nurseries.

Infants bathed with hexachlorophene sometimes developed neurotoxicity (vacuolar degeneration)

WHO GUIDELINES ON HAND HYGIENE IN HEALTH CARE

When alcohol-based handrub is available in the health-care facility for hygienic hand antisepsis, the use of antimicrobial soap is **not** recommended (II).

What went wrong here?

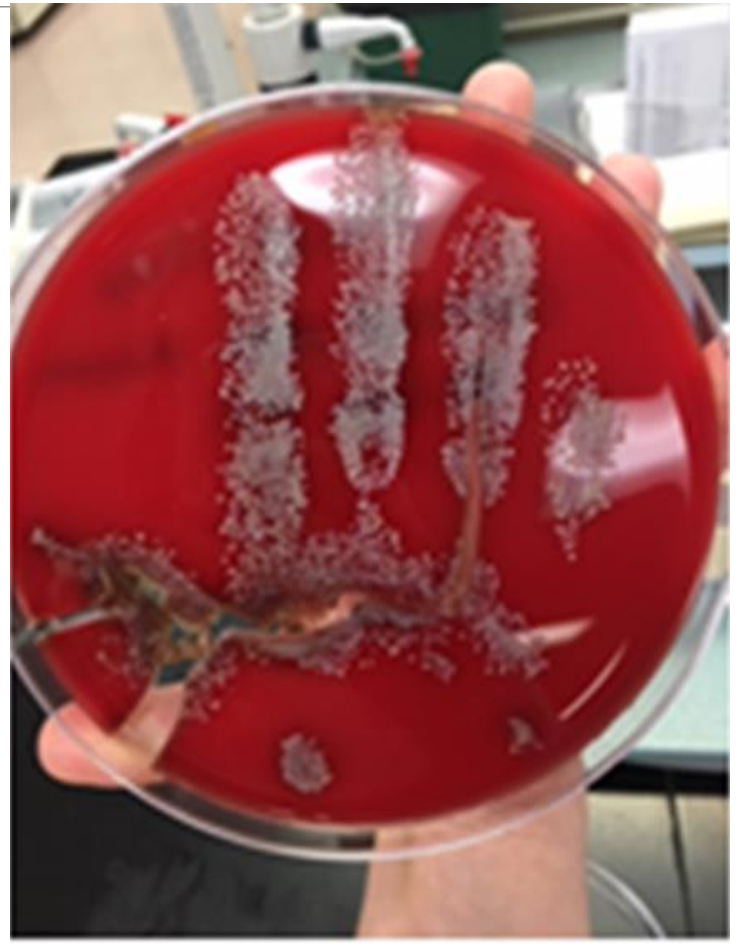
Gloved before brief patient contact

Removed gloves

Plated hand

Used alcohol gel

Plated hand



Antimicrobials Are Dose + Time Dependent

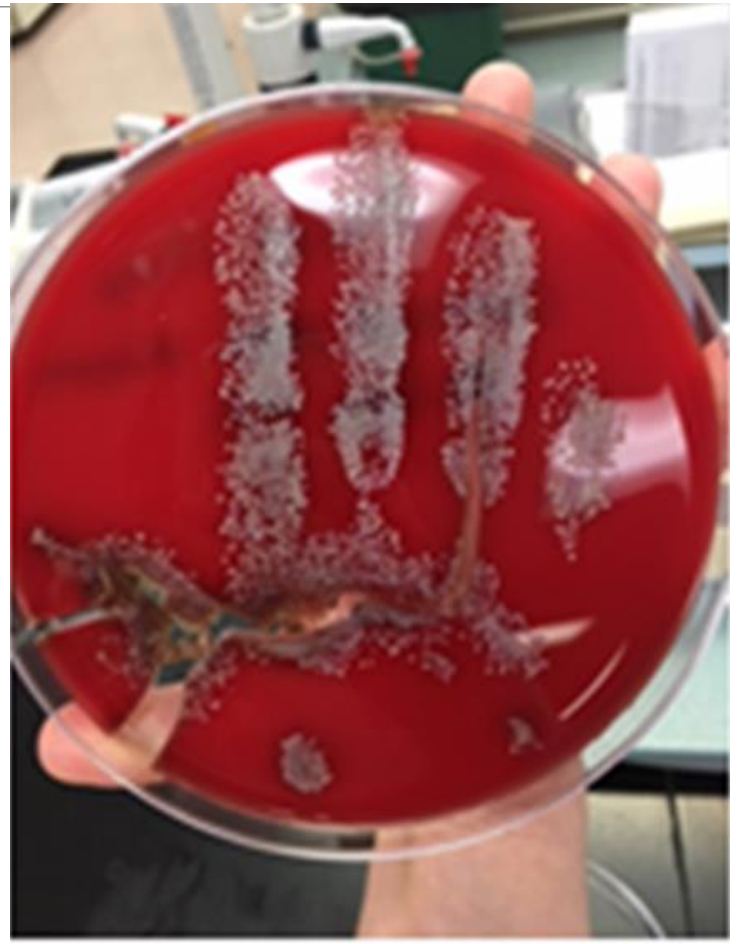
Gloved before brief patient contact

Removed gloves

Plated hand

Used alcohol gel

Plated hand



G. Kampf, J. Gray
Dose considerations for alcohol-based hand rubs
Journal of Hospital Infection, Volume 95, Issue 2, 2017, pp. 183-184

Journal of Hospital Infection 95 (2017) 183–184

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Commentary

Dose considerations for alcohol-based hand rubs

Wilkinson *et al.* address an important topic in a very systematic way.[1] They found that in hygienic hand disinfection an application time of alcohol-based hand rub (ABHR) of 20–30 s is considered acceptable among volunteers depending on the formulation, that it requires on average 1.5–2 mL to keep hands wet for this application time, and that the application of such a small volume usually fails to meet the EN 1500 efficacy criteria. Based on their findings they propose an additional test using volumes and times that are acceptable to the user. Products that fulfil the requirements of EN 1500 would be subjected to a further test using the same methodology but with the manufacturer's recommended volume and time of application (not less than 30 s), with the test product compared with the reference alcohol applied in the same manner. This additional test would establish that a given product that passes EN 1500 also performs at least as well as the reference alcohol when compared at realistic contact times and volumes. We do agree that realistic contact times are critical for a product that is provided at the point of care, only a few seconds away from the patient, but how realistic is the recommendation of a specific dose for an AHBR?

The proposal of Wilkinson *et al.* is to perform additional testing to show that a specific volume (e.g. 1.5 mL) of an ABHR that has passed the EN 1500 testing is non-inferior to the application of the same volume of the reference alcohol of EN 1500.[1] We have two concerns in that respect:

1. The EN 1500 efficacy test can be performed in many different ways as well as 2×3 mL in 30 s, 2×2 mL in 2×15 s, or 2×3 mL in 2×20 s. There is no restriction on volume as long as the application time is between 30 and 60 s. The additional testing for formulations which are not effective enough with 3 mL for 30 s would be possible and would place these formulations on the same level as more efficacious AHBRs as long as the additional testing reveals non-inferiority to the small volume of reference alcohol.
2. The practical implications of the additional data are not entirely clear. For example, if an AHBR fulfils the EN 1500 efficacy requirement with 3 mL in 30 s and 'fulfils' the additional testing with 1.5 mL, what shall be the conclusion? Shall it be a general recommendation to use a volume of 1.5 mL on all hand sizes? Another example might be where an AHBR fails to fulfil the EN 1500 efficacy requirement with 3 mL, but fulfils it with 6 mL in 30 s. If it is then found to 'fulfil' the additional testing with 1.5 mL, what shall be the conclusion? Is the formulation now safe to be used with, for example, 1.5 mL after the additional testing?

Alcohol

Additives/Combo

Isopropyl alcohol appears to be more toxic than ethanol.

The efficacy of alcohol-based hand hygiene products is affected by a number of factors, including the type of alcohol used, the concentration of alcohol, the contact time, the volume of alcohol used, and whether the hands are wet when the alcohol is applied.

To clean or kill?

Use an alcohol-based handrub as the preferred means for routine hand antisepsis if hands are not visibly soiled. (IA)

If alcohol-based handrub is not obtainable, wash hands with soap and water (IB).

Before handling medication or preparing food perform hand hygiene using an alcohol-based handrub or wash hands with either plain or antimicrobial soap and water (IB).

Soap and alcohol-based handrub should not be used concomitantly (II)

Brushes

Toweling/Hand Dryers

Transmission of bacteria is more likely to occur from wet skin than from dry skin.

The hygienic efficacy of hand drying includes drying efficiency.

Paper towels are superior to electric air dryers.

Drying hands thoroughly with single-use, disposable paper towels is the preferred method of hand drying in health care.

Huang C, Ma W, Stack S. The hygienic efficacy of different hand-drying methods: a review of the evidence. Mayo Clin Proc. 2012;87(8):791–798. doi:10.1016/j.mayocp.2012.02.019

Lotions

PRACTICE FORUM

Pseudomonas aeruginosa outbreak in a neonatal intensive care unit: A possible link to contaminated hand lotion

Victoria E. Becks, RN, BSN
Nancy M. Lorenzoni, RN, CIC
Green Bay, Wisconsin

This article describes a prolonged outbreak of *Pseudomonas aeruginosa*. The attack rate of this outbreak was 8.5%, with no associated mortality. Hand lotion contaminated with *P. aeruginosa* was implicated in the transmission of organisms; removal of this hand lotion ended the outbreak. Contaminated hand lotion applied to clean hands of health care workers may have led to direct inoculation of infants at high risk for infection.
(AJIC Am J Infect Control 1995;23:396-8)

Becks, Victoria E., and Nancy M. Lorenzoni. "Pseudomonas aeruginosa outbreak in a neonatal intensive care unit: a possible link to contaminated hand lotion." American journal of infection control 23.6 (1995): 396-398.

Compatibility

Glove Compatible

Mineral oil and petrolatum, common emollients in skin-care formulations, have been shown to contribute to latex glove deterioration.

Following the use of powdered gloves, some alcohol-based handrubs may interact with residual powder, resulting in a gritty feeling on hands.

CHG Compatible

Lotion

Alcohol hand rub

Handwipes

American Journal of Infection Control 45 (2017) 959-63

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Can improving patient hand hygiene impact *Clostridium difficile* infection events at an academic medical center?

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Key Words:
Clostridium difficile
Hand hygiene
Patient hand hygiene

Background: Hand hygiene plays an important role in the prevention of *Clostridium difficile* (CD) infection (CDI). Patient hand hygiene (PHH) may be a potentially underused preventative measure for CDI. Patient mobility and acuity along with a lack of education present obstacles to PHH for the hospitalized patient. Surveys of patients at our institution showed a need for increased PHH opportunities. The objective of this study was to increase PHH and to examine if PHH affected CDI at our hospital.

Methods: A biphasic, quasi-experimental study was performed to increase PHH through education for staff and to provide education, assistance, and opportunities to the patient for hand cleaning. PHH practice was assessed by patient surveys and analyzed by χ^2 test. PHH effect on CDI was determined by following health care facility–onset CD laboratory–identified events data analyzed by National Healthcare Safety

Pokrywka, Marian, et al. "Can improving patient hand hygiene impact Clostridium difficile infection events at an academic medical center?." AJIC 45.9 (2017): 959-963.

Handwipes

AJIC major articles

Revisiting the hand wipe versus gel rub debate: Is a higher-ethanol content hand wipe more effective than an ethanol gel rub?

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Background: The Centers for Disease Control and Prevention's guidelines for hand hygiene state that the use of alcohol-based hand wipes is not an effective substitute for the use of an alcohol-based hand rub or handwashing with an antimicrobial soap and water. The objective of this study was to determine whether a hand wipe with higher ethanol content (65.9%) is as effective as an ethanol hand rub or antimicrobial soap in removing bacteria and spores from hands.
Methods: In two separate experiments, the hands of 7 subjects were inoculated with a suspension of *Serratia marcescens* or *Geobacillus stearothermophilus*. Subjects washed with each of 3 different products: 65.9% ethanol hand wipes (Sani-Hands ALC), 62% ethanol gel rub (Purell), and antimicrobial soap containing 0.75% triclosan (Kindest Kare).
Results: A total of 56 observations were analyzed for *S marcescens* removal and 70 observations were analyzed for *G stearothermophilus* removal. The rank order of product efficacy for both bacteria and spore removal was antibacterial soap > 65.9% ethanol hand wipes >62% ethanol hand rub. Mean *S marcescens* log reductions (±SD) for the 65.9% ethanol alcohol wipe, 62% ethanol alcohol rub, and antimicrobial foam soap were 3.44 ± 0.847, 2.32 ± 1.065, and 4.44 ± 1.018, respectively ($P < .001$). Mean *G stearothermophilus* log reductions for the 65.9% ethanol wipe, 62% ethanol rub, and antimicrobial foam soap were 0.51 ± 0.26, −0.8 ± 0.32 increase over baseline, and 1.72 ± 0.62, respectively ($P < .001$).
Conclusion: The alcohol-based hand wipe containing 65.9% ethanol was significantly more effective than the 62% ethanol rub in reducing the number of viable bacteria and spores on the hands.
Key Words: Hand hygiene; waterless; hand sanitizer; alcohol; antimicrobial.

Wilkinson, M. A. C., et al. "Assessment of the efficacy of a patient hand wipe: development of a test method." Journal of Hospital Infection 98.4 (2018): 339-344.

Palm to palm

Right palm over back of left hand

Left palm over back of right hand

Rotational rubbing of thumb[a]

Rotational rubbing of index finger[a]

Rotational rubbing of middle finger[a]

Rotational rubbing of ring finger[a]

Rotational rubbing of little finger[a]

Rotational rubbing while scrunched between fingertips

[a]Perform for both hands.

Criteria	Requirement
Hand rub solution	Must not exceed 95% alcohol content by volume. (The Centers for Disease Control and Prevention recommends that ABHS contain at least 60% alcohol.)
Maximum dispenser fluid capacity	1.2 liters (41 ounces, 0.32 gal) for dispensers in rooms, corridors, and areas open to corridors. 2.0 liters (67 ounces, 0.53 gal) for dispensers in suites of rooms separated from corridors.
Maximum quantity in aerosol containers	18 oz., limited to Level 1 aerosols as defined by NPFA 30 B.
Maximum quantity of ABHS allowed in-use (i.e., in dispensers)	Ten gallons (37.8 L) in-use outside of a storage cabinet within a single smoke compartment. (Smoke compartment: A space within a building enclosed by smoke barriers on all sides, including the top and bottom.[5]) One dispenser per room off corridors is NOT included in the calculation.
Minimum corridor width	Six feet (1830 mm) wide

ABHS dispenser distance from ignition sources	One-inch (25 mm) distance (horizontal or vertical) above, to the side, or beneath an ignition source. (Sources of ignition: Appliances or equipment that, because of their intended modes of use or operation, are capable of providing sufficient thermal energy to ignite flammable gas-air mixtures.5 Examples include wall outlets, thermostats, and appliances.) Note: While one-inch is acceptable, a more conservative approach is to ensure a distance of no less than 6 inches (12.7 mm; horizontal or vertical, measured from the center of the dispenser) between ABHR dispensers and source of ignition.

Operation of the dispenser	The dispenser shall: • Not release its contents except when the dispenser is activated, either manually or automatically by touch-free activation. • Not dispense more solution than the amount required for hand hygiene consistent with label instructions. • Be designed, constructed and operated in a manner that ensures accidental or malicious activation is minimized. • Be tested in accordance with the manufacturer's care and use instructions each time a new refill is installed. Any activation of the dispenser shall only occur when an object is placed within 4 inches (100mm) of the sensor. An object placed within the activation zone and left in place shall not cause more than one activation.

Storage outside of dispensers	In each smoke compartment, do not store outside of dispensers more than 5 gal (18.9 L) or an amount of ABHR that exceeds that which is necessary for normal maintenance of the area, whichever is less.
Maximum quantity for storage in a warehouse	Up to 120 gal (460 L). If need to exceed storage of 120 gal (460 L), consult with fire official.[4]

*Smoke compartment: A space within a building enclosed by smoke barriers on all sides, including the top and bottom.[5]
**Sources of ignition: Appliances or equipment that, because of their intended modes of use or operation, are capable of providing sufficient thermal energy to ignite flammable gas-air mixtures.[5] Examples include wall outlets, thermostats, and appliances.

Individual User Issues

Hand hygiene process and prevention of dermatitis

Dermatitis

Age

Allergies – alcohol

Antabuse

Foams

CDC report calls attention to hand sanitizer risk in children

Hand sanitizers are everywhere. They are cheap, effective disinfectants, and many are easy to carry around. But lately, these products have been scrutinized for the potential harm they can have on children.

"Many caregivers are unaware of the very high alcohol content present in alcohol-based hand sanitizers, which can contain up to 60% to 95% alcohol," said Cynthia Santos, MD, from CDC's National Center for Environmental Health. "Young children may inadvertently consume these hand sanitizers because of their appealing scents, like apple, vanilla, and citrus."

In a new report from CDC,[1] researchers analyzed data reported to the National Poison Data System (NPDS) from 2011–14 on exposures to alcohol- and non-alcohol-based hand sanitizers in children who were 12 years old or younger. A total of 70,669 hand sanitizer exposures in this age group were reported to NPDS, including 65,293 (92%) alcohol-based exposures and 5,376 (8%) non-alcohol-based exposures. Adverse health effects were more likely to be reported for alcohol-based hand sanitizer exposures, and they tended to be worse than those for non-alcohol-based hand sanitizer exposures.

"Younger kids are more susceptible to adverse effects [from these products] because there is not as much glycogen in their liver," said Greene Shepherd, PharmD, clinical professor at the University of North Carolina Eshelman School of Pharmacy.

The most common type of adverse

based sanitizers—no NPDS reported calls about co-exposures to other agents were included in the analysis.

Most exposures—91%—occurred in children aged 5 years or younger. Children aged 6 to 12 years had more intentional exposures, a finding the

report authors said could indicate that these products are being abused among older children. Shepherd said that abuse of alcohol-based hand sanitizers can be equivalent to consuming roughly 120-proof liquor.

Besides emphasizing the knowledge health care providers can pass along about safety precautions, the report authors took the opportunity to recommend washing hands with soap and water when available, which is currently the recommended method of hand hygiene in non-health-care settings. If soap and water are not available, use of a hand sanitizer that contains at least 60% alcohol is recommended, or a non-alcohol-based hand sanitizer or wipe can be used.

FDA made the same recommendation about using soap and water (in a non-health-care setting) in 2016 when it banned 19 active ingredients in antibacterial soaps and body washes, including triclosan and triclocarban—the two most commonly used ingredients.

Most exposures—91%—occurred in children aged 5 years or younger. Children aged 6 to 12 years had more intentional exposures, which could indicate that these products are being abused among older children.

In an article *Pharmacy Today* published about the announcement, an FDA spokesperson said that emerging research showed that some antibacterial ingredients could pose health risks in people.

"Short-term animal studies suggest

Selection And Handling Of Hand Hygiene Agents

A. Provide HCWs with efficacious hand hygiene products that have low irritancy potential (IB)

B. To maximize acceptance of hand hygiene products by HCWs, solicit their input regarding the feel, fragrance, and skin tolerance of any products under consideration. In some settings, cost may be a primary factor (IB)

C. When selecting hand hygiene products: determine any known interaction between products used to clean hands, skin care products, and the types of gloves used in the institution (II) solicit information from manufacturers about the risk of contamination (IB)*;* ensure that dispensers are accessible at the point of care (IB)*;* ensure that dispensers function adequately and reliably and deliver an appropriate volume of the product (II); ensure that the dispenser system for alcohol-based formulations is approved for flammable materials (IC); solicit information from manufacturers regarding any effect that hand lotions, creams, or alcohol-based handrubs may have on the effects of antimicrobial soaps being used in the institution (IB).

Factors to be taken into consideration for product selection include:

Nursing tasks – food prep, aseptic procedures,

Resident use – before meals, bathing, sensitive skin

Cost/contract

Fragrance - less is more

Consistency (consider plumbing, flooring, walls, etc.)

Lotion soap

Alcohol

- Gel
- Foam
- Solutions

Foam or Liquid Soap

Foam

- Use less product
- Spreads easier
- Easier to handle
- Easier to rinse off (10% less water)
- Easier to plumbing fixtures

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Brief Report

Foam soap is not as effective as liquid soap in eliminating hand microbial flora

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Table 1
Bacterial growth on agar plates was enumerated using semiquantitative method, determining the number of colonies in each quadrant, and assigning a number of 1+, 2+, 3+, or 4+ growth

Soap form	Baseline colony count	Postwash colony count	Pre vs Post *P* value
Foam (n = 5)	3.6 ± 0.4	2.6 ± 1.4	.3
Liquid (n = 5)	3.8 ± 0.4	1.2 ± 0.9	.01

NOTE. Values are presented as mean ± standard deviation.

Foam Soap Effectiveness

Soap Dispenser Installation

What to do with current product & dispensers?

Installation issues

Vendor support – not only in the beginning

Installation

Training

Free dispensers

Ongoing support

Pilot

Timing

Duration

How to evaluate

Product

Outcome on skin

Correct application

Table 1. Example: Hand skin self-assessment tool

On a scale of 1-7, rate the current condition of the skin on your hands								
Appearance								
Abnormal: red, blotchy, rash	1	2	3	4	5	6	7	Normal: no redness, blotching, or rash
Intactness								
Many abrasions or fissures	1	2	3	4	5	6	7	Completely intact. No abrasions or fissures
Moisture content								
Extremely dry	1	2	3	4	5	6	7	Normal amount of moisture
Sensation								
Extreme itching, burning, or soreness	1	2	3	4	5	6	7	No itching, burning, or soreness

Larson, Elaine, et al. "Skin reactions related to hand hygiene and selection of hand hygiene products." American journal of infection control 34.10 (2006): 627-635.

Employee Number_____ **Date**_____

Age _____ **FTE** _____

Please identify how often you used the following hand hygiene agents.

	Never used	No longer use*	1-30 recent hand-hygiene episodes	Consistently for past month
Bactifoam (new foam soap from Huntington/Ecolab)				
Hand & Body Wash (pink soap from Steris/Calgon)				
Medicated lotion soap (white cream soap from Steris)				
Brown liquid soap (PVP 7.5%), Povidone-Iodine				
2% CHG (clear bottle w/ foot pump)				
Alcohol foam (Alcare foam from Steris)				
Other - specify				

Visual Scoring of Skin Scale

Using a magnifying glass, visually inspect the skin on the dominant hand using the following scale:
Circle one number below.

0	**Normal** - No observable scale or irritation of any kind.
1	**Very slightly scaly** – Occasional scale that is not necessarily uniformly distributed.
2	**Slightly scaly** – Scale in sulci and on plateaus. More visible scale that is more uniformly distributed, but no widespread uplifting.
3	**Scaly** – Visible scale giving the overall appearance of the skin surface a whitish appearance. Definite uplifting of edges or scale-sections. Hand is rough to the touch.
4	**Scaly to Very Scaly** - More scale and pronounced separation of scale edges from skin, although they may still be lying flat on the skin surface. Some evidence of cracking in sulci and plateaus. Also, skin may appear irritated with some reddening.
5	**Very scaly** – Extensive cracking of skin surface. In some cases, scales are very large, but some individuals never develop large scales. The skin may appear to be very irritated, with widespread reddening and/or occasional bleeding.

Hand Skin Assessment Form

On a scale of 1-7 rate the current condition of the skin of your hands.

Appearance						
Abnormal: red, blotchy, rash						Normal: No redness, blotching, rash
1	2	3	4	5	6	7
Intactness						
Many abrasions or fissures						Completely intact
1	2	3	4	5	6	7
Moisture content						
Extremely dry						Normal moisture
1	2	3	4	5	6	7
Sensation						
Extreme itching, burning or soreness						No itching, burning or soreness
1	2	3	4	5	6	7

Comments regarding products on current skin condition:

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Larson, Elaine, et al. "Skin reactions related to hand hygiene and selection of hand hygiene products." *American journal of infection control* 34.10 (2006): 627-635.

Fire Safety and Alcohol-Based Hand Sanitizer (ABHS)

Hand Hygiene and Fire Safety in Healthcare Facilities Go Hand in Hand. Available from: https://www.cdc.gov/handhygiene/firesafety/index.html