



RUTGERS

New Jersey Agricultural
Experiment Station

Myths and Facts About the Five Second Rule and Handwashing

Don Schaffner

Distinguished Professor and Extension Specialist

Food Science, Rutgers University

5-sec summary of 5-sec rule...

- Jillian Clarke, University of Illinois, 2003
 - Tile inoculated with *E. coli*, transfer to cookies and gummy bears in <5 s
- Mythbusters weighs in, 2005
 - No conclusive difference between contact times of 2 and 6 s
- Finally some peer review, 2007
 - Dawson lab at Clemson, Longer contact times (5-60 s) did increase *Salmonella* transfer from wood, tile, or carpet to bologna or bread, but only >8 h after the surface was inoculated
- Aston University press release, 2014
 - Contact time significantly affected the transfer of *E. coli* and *Staph* on carpet, laminate, and tile to toast, pasta, biscuit, and a sticky sweet

AEM results

- Miranda and Schaffner, AEM, 2016
- 4 foods
- 4 surfaces
- 4 times
- 2 matrices
- 20 reps each
- 5,120 total

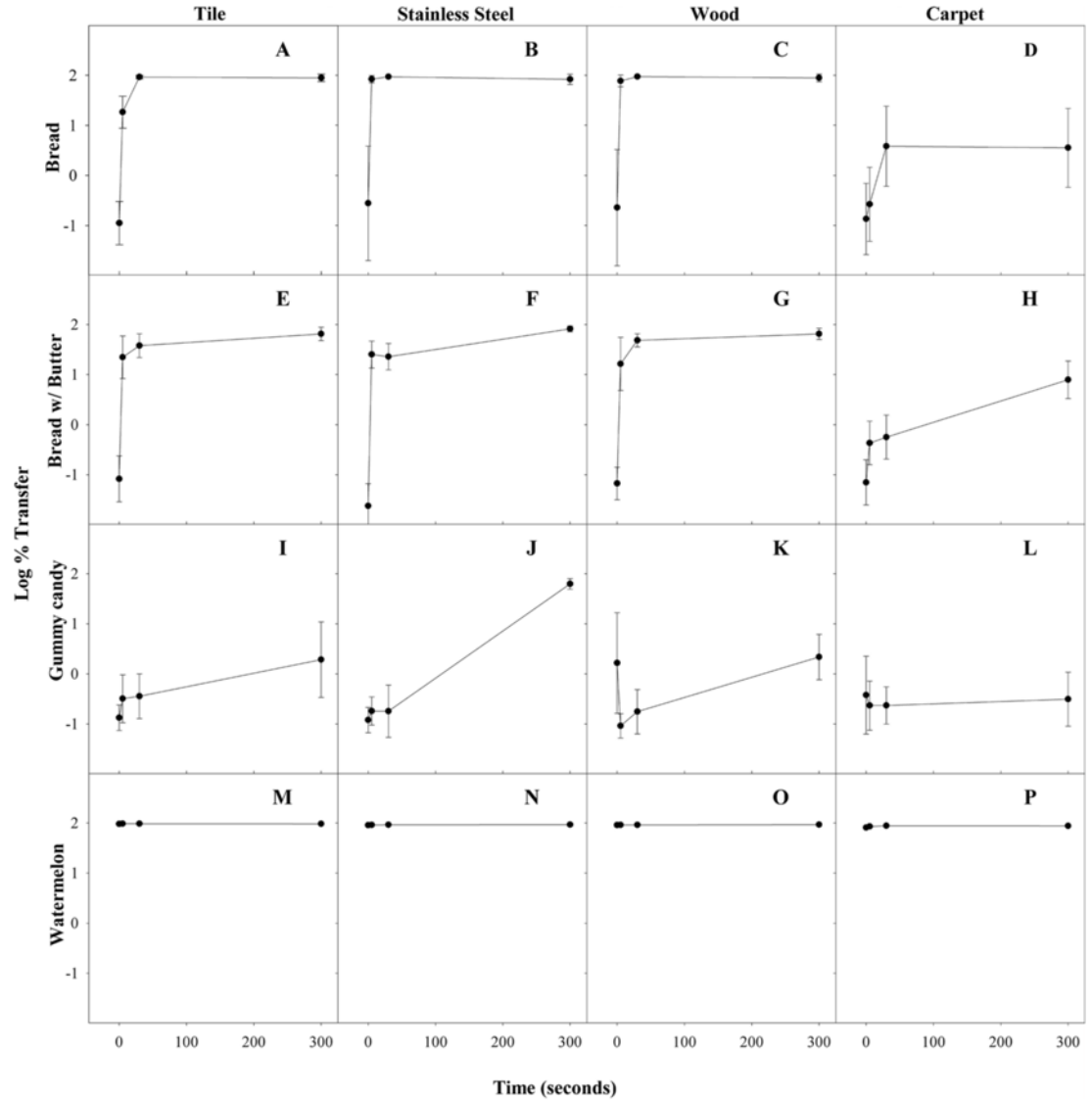
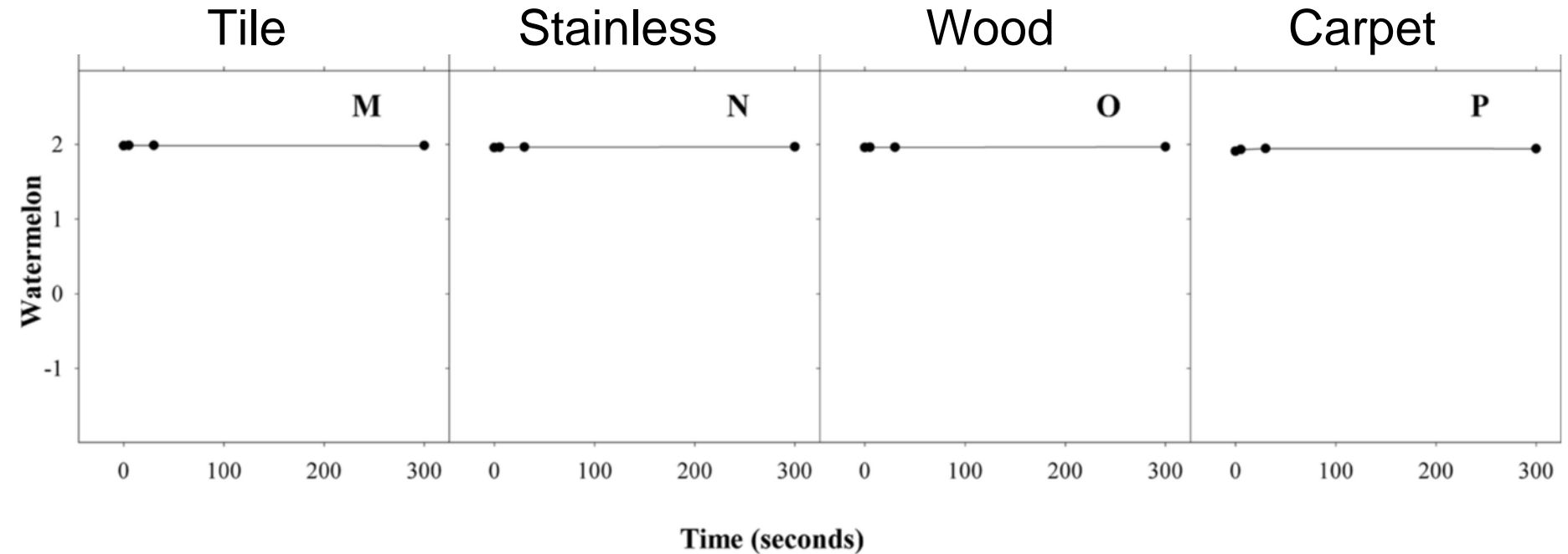


FIG 1 Effect of contact time on log percent transfer of *E. aerogenes* inoculated onto four household surfaces in a TSB matrix to four foods.

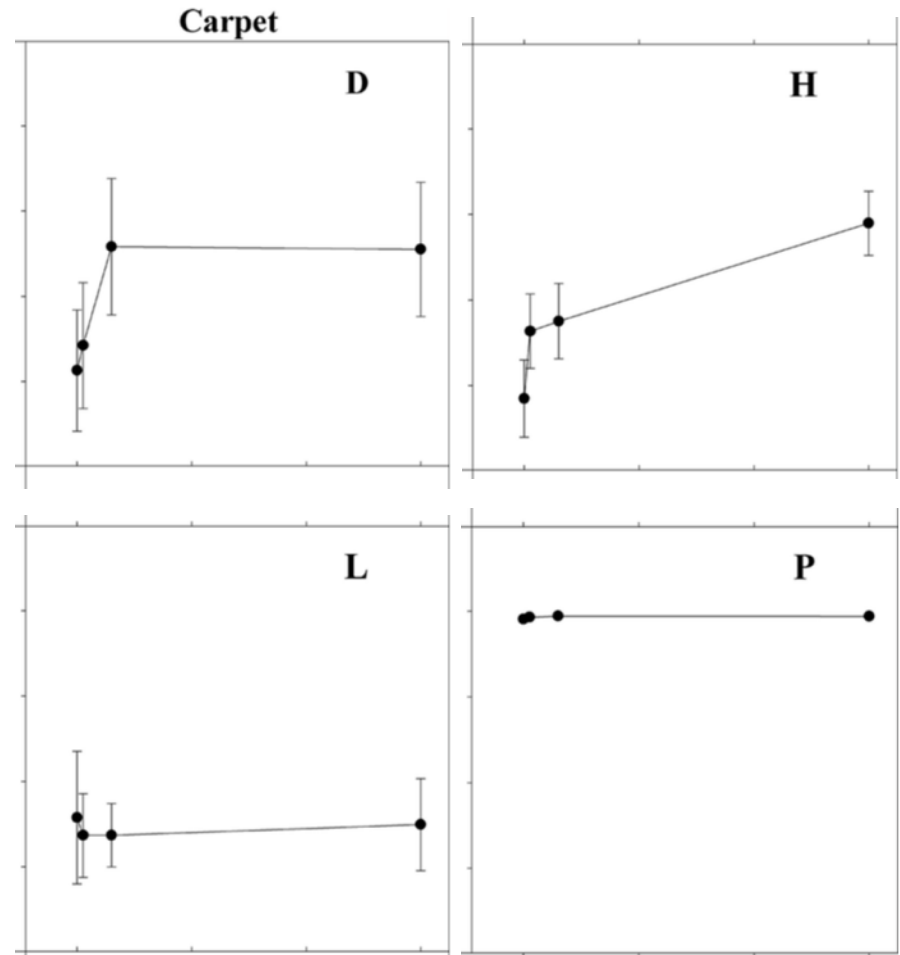
Moisture matters (Watermelon)



- Y axis is log percent
- So 2 = 100%

Carpet has less transfer!

- Bread (D)
- Bread w/butter (H)
- Gummy candy (L)
- Watermelon (P)



Is the 5-second rule true?

- No
 - No matter which surface, which food or which time, there was at least one replicate where some transfer occurred.
- Yes
 - In some situations the contact time can have a profound effect on the number of bacteria transferred
- PS: Do not carpet your kitchen

Handwashing is confusing, FPT 2015



**Quantitative Analysis of
Recommendations Made
in Handwashing Signs**

No wonder people are confused

- Which steps? How long is each step?

Table 2. Summary of handwash duration instructions in 81 handwashing signs

	Signs Indicating This Step			Average (s)	Median (s)	Min (s)	Max (s)
	Step	Number	Percent				
All Signs	Lather	37	45.68%	18.4	20	10	20
	Rinse	3	3.60%	13.3	10	10	20
	Overall	58	71.60%	22.2	20	10	60
	No time Indicated	23	28.40%	-	-	-	-

Antibacterial soaps, small but real difference

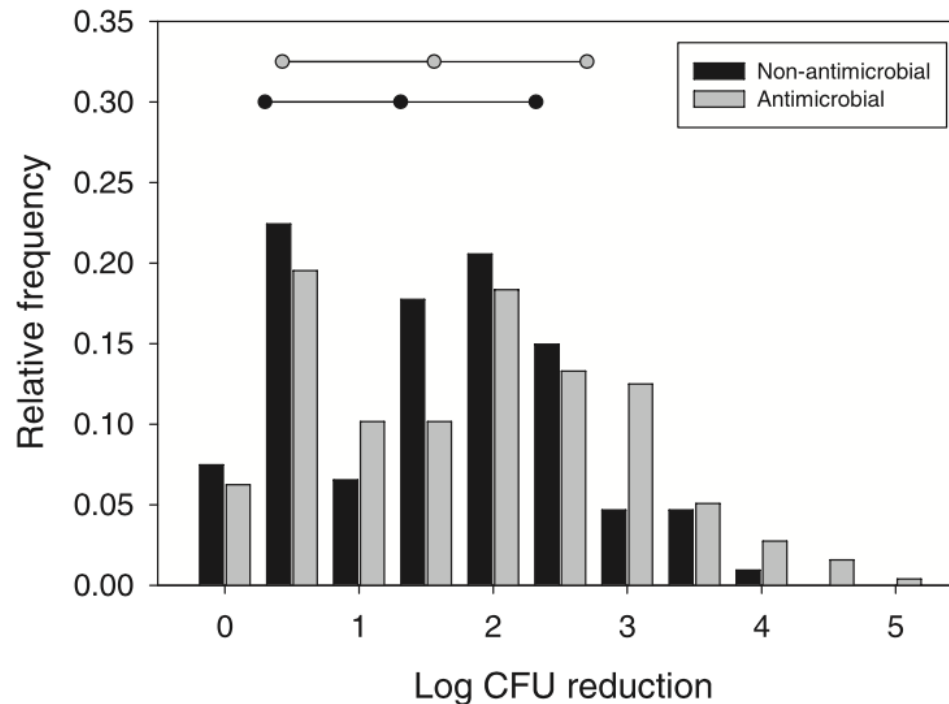


FIGURE 1. *Efficacy of nonantimicrobial soap (black) versus antimicrobial soap (grey), where relative frequency is a proportion of the number of times a particular log reduction was observed of the total number of observations. Error bars shown at the top of the figure represent means and standard deviations.*

No zero risk

- A and B (bland), C (triclosan), D (CHG), E (EtOH)

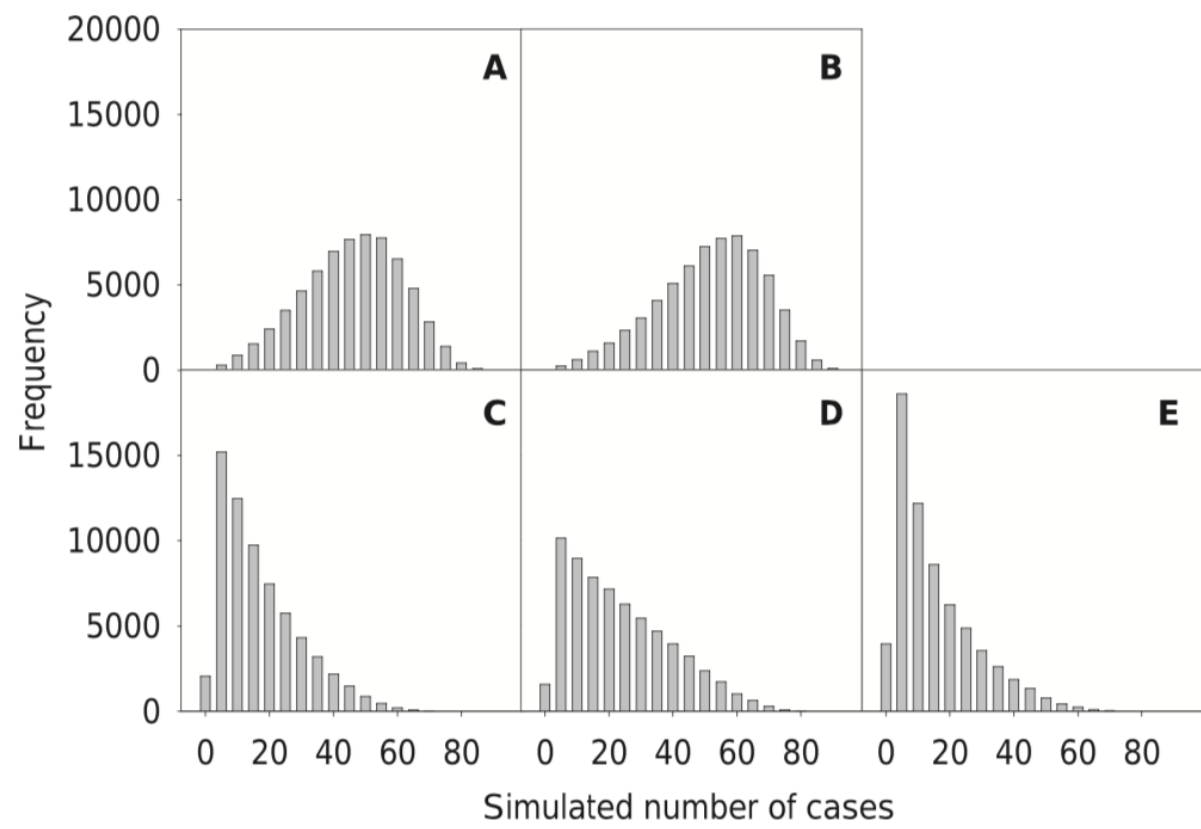


FIGURE 4. *Simulation modeling results, assuming starting concentration of 1 million Shigella bacteria on the hands, and number of cases arising from 10,000 iterations in which the food service workers' hands are exposed to each of the five treatments: (A) Tone foaming hand wash, (B) Kiss My Face hand wash, (C) triclosan-containing hand wash, (D) chlorhexidine gluconate-containing hand wash, (E) ethyl alcohol hand sanitizer.*

Splash and dash vs. "real" handwash

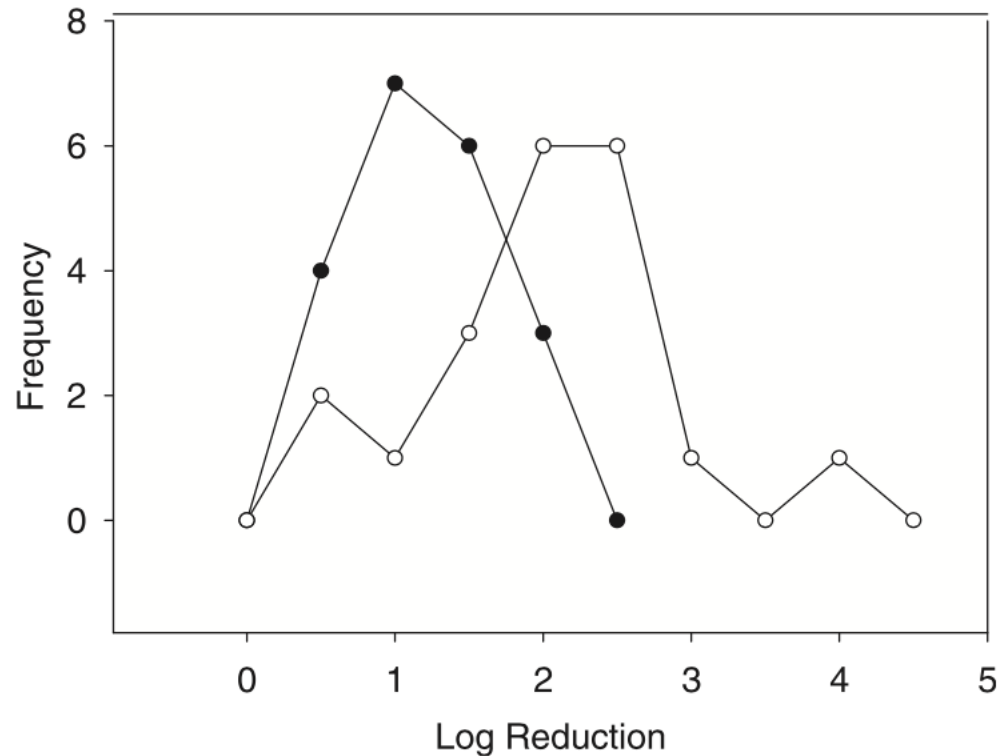


FIGURE 1. *Reduction of Enterobacter aerogenes, comparing a minimal hand wash (5-s wash, no soap; ●) and the U.S. FDA Model Food Code-recommended wash (20-s wash, with soap; ○). In both scenarios, the hands were air dried.*

Benefit (and risk) of paper towels

- Using a paper towel to dry hands resulted in a 1.9 ± 0.9 CFU reduction
- Versus air drying, 1.4 ± 0.4 CFU reduction
- $P=0.03$

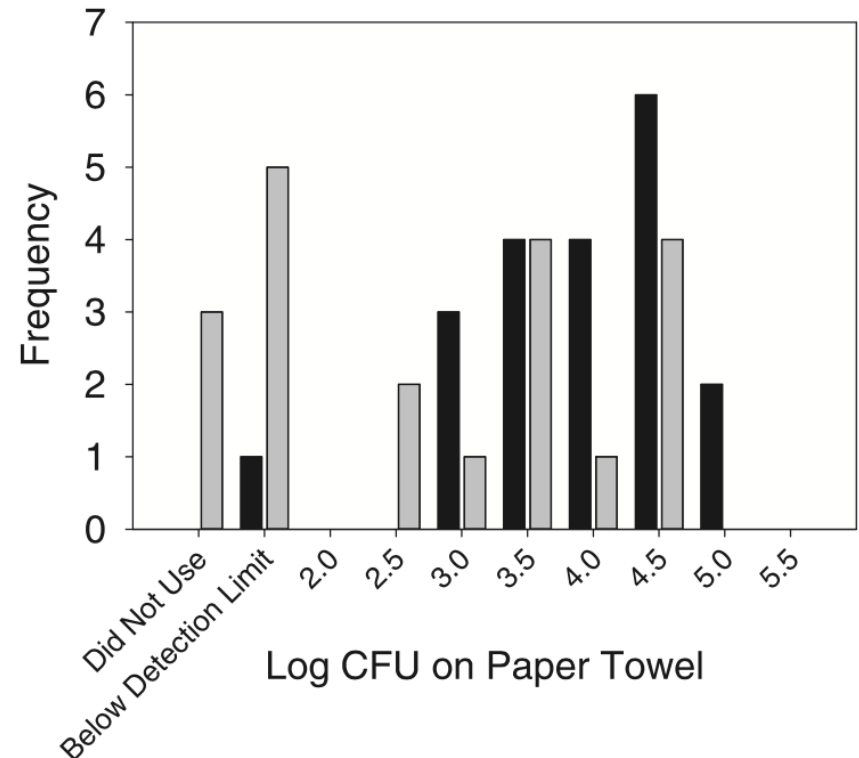


FIGURE 4. Recovery of *Enterobacter aerogenes* from the first (black) and second (gray) paper towels used to dry hands after a 20-s hand wash. In some cases, a volunteer did not use a second paper towel; no volunteer used more than two towels.

Bulk soap, JFP 2018, 81(2), 218–225

- Two hundred ninety-six samples of bulk soap were collected from food service establishments in Arizona, New Jersey, and Ohio.
- More than 85% of the soap samples tested contained no detectable microorganisms, but when a sample contained any detectable microorganisms, it was most likely contaminated at a very high level (~7 log CFU/mL).
- *Klebsiella oxytoca*, *Serratia liquefaciens*, *Shigella sonnei*, *Enterobacter gergoviae*, *Serratia odorifera*, and *Enterobacter cloacae*

Water temperature, JFP 2017, 80, 1022–31

- Water temperature as high as 38 C (100 F) and as low as 15C (60 F) did not have a significant effect on the reduction of bacteria during hand washing
- energy usage did differ between temperatures

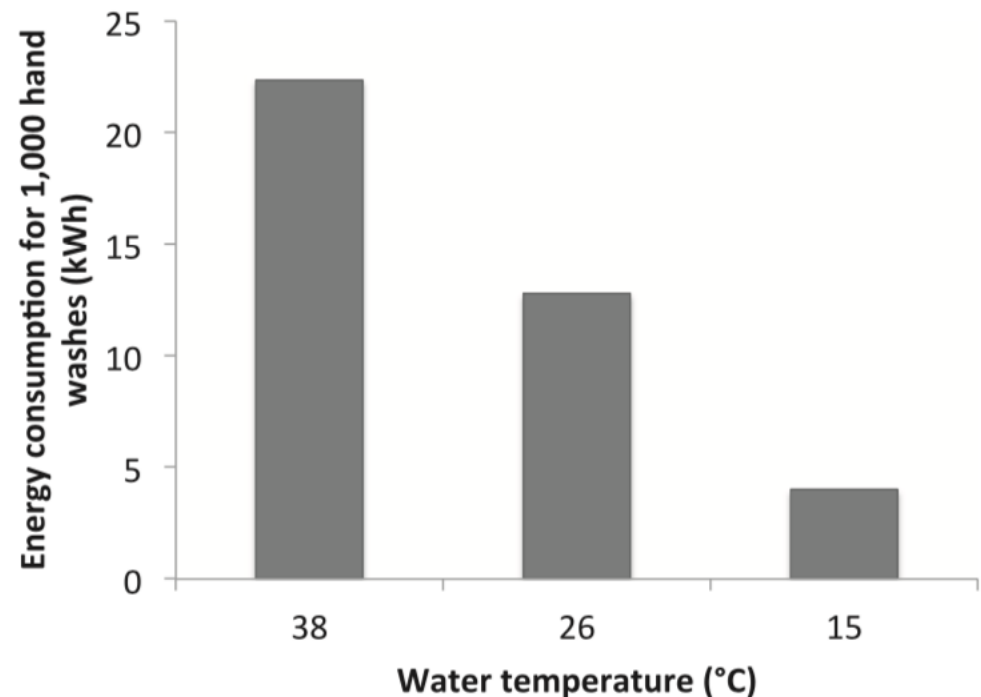


FIGURE 1. *Energy consumption related to water heating for hand washing.*

How should you wash your hands?

- Anything is better than nothing
 - 90% reduction with splash and dash
- Hand sanitizer is better than nothing
 - Maybe better than soap in some cases
- Using soap is better than no soap
- Antibacterial soap is better than bland soap
- Paper towels remove bacteria and help dry hands
- Avoid bulk refillable soap
- Water temperature does not matter

- **Handwashing is not magic (99% or 2 log reduction)**
 - **Keep sick workers away from food**

Which hat are you wearing today?

- (Quantitative) Risk Assessment
 - How big is the risk, what factors control the risk?
 - Scientific process
- Risk Management
 - What can we do about the risk?
 - Societal, practical and political process
- Risk Communication
 - How can we talk about the risk with affected individuals?
 - Social and psychological process

