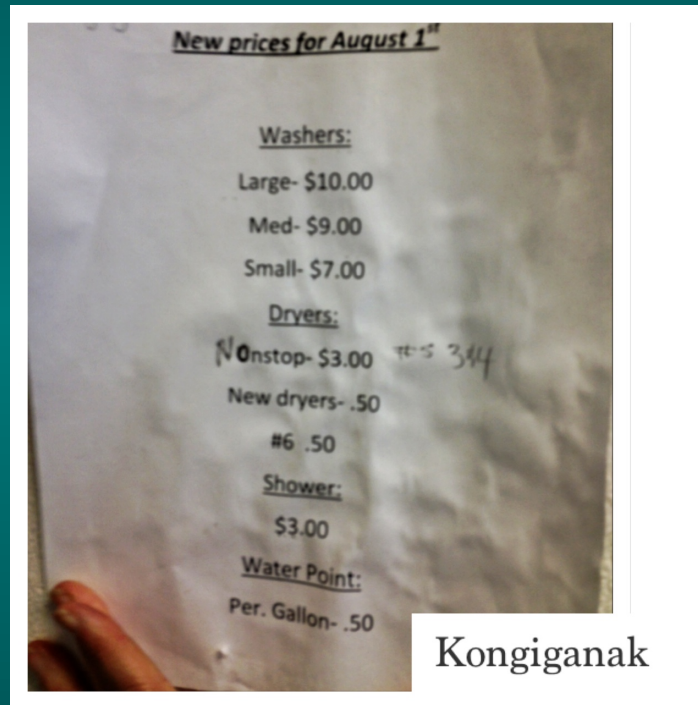
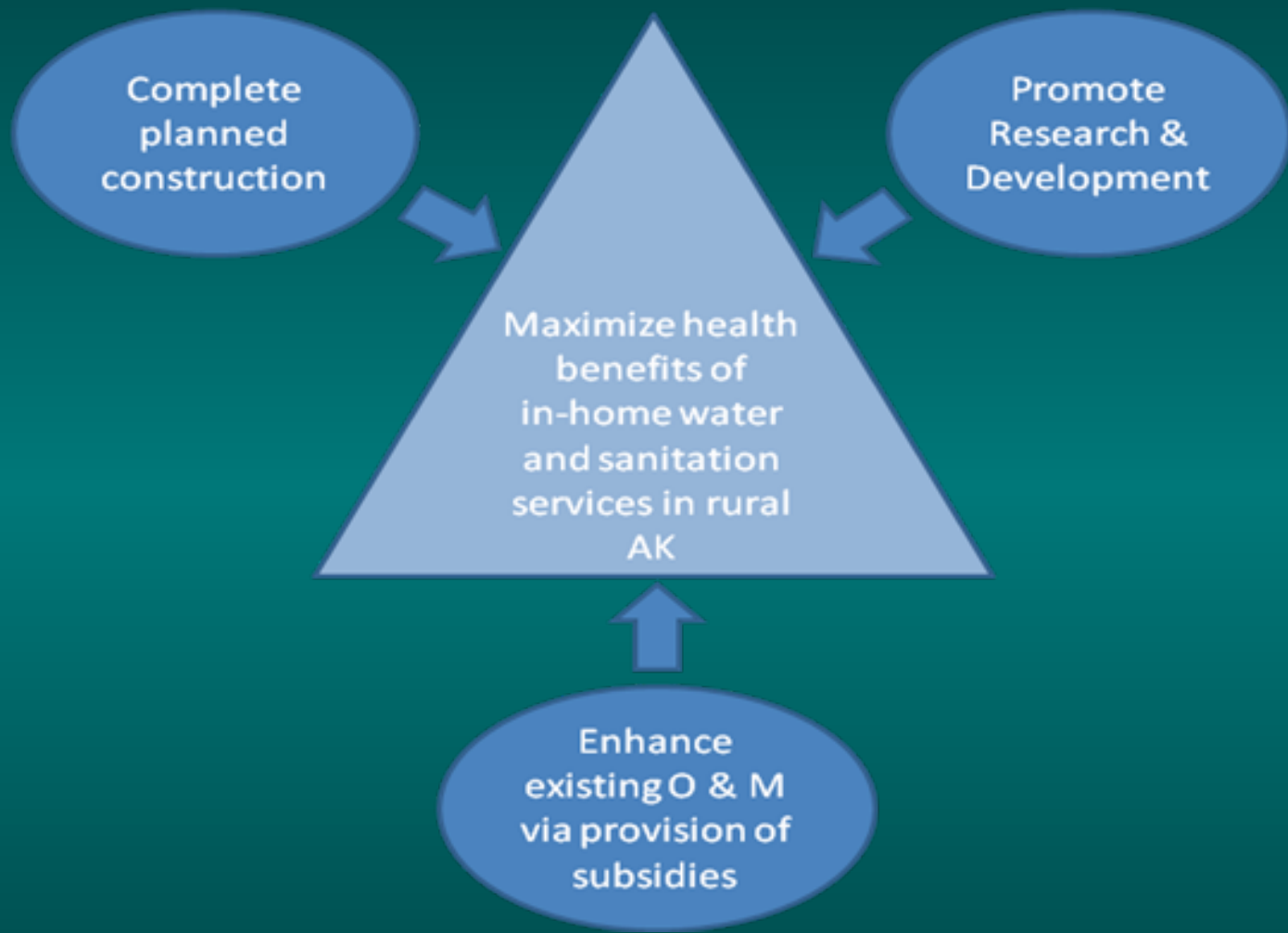


Maximizing Sanitation and Hygiene in Washeterias



Kongiganak

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Deputy Director, United States Arctic Research Commission
January, 30, 2014



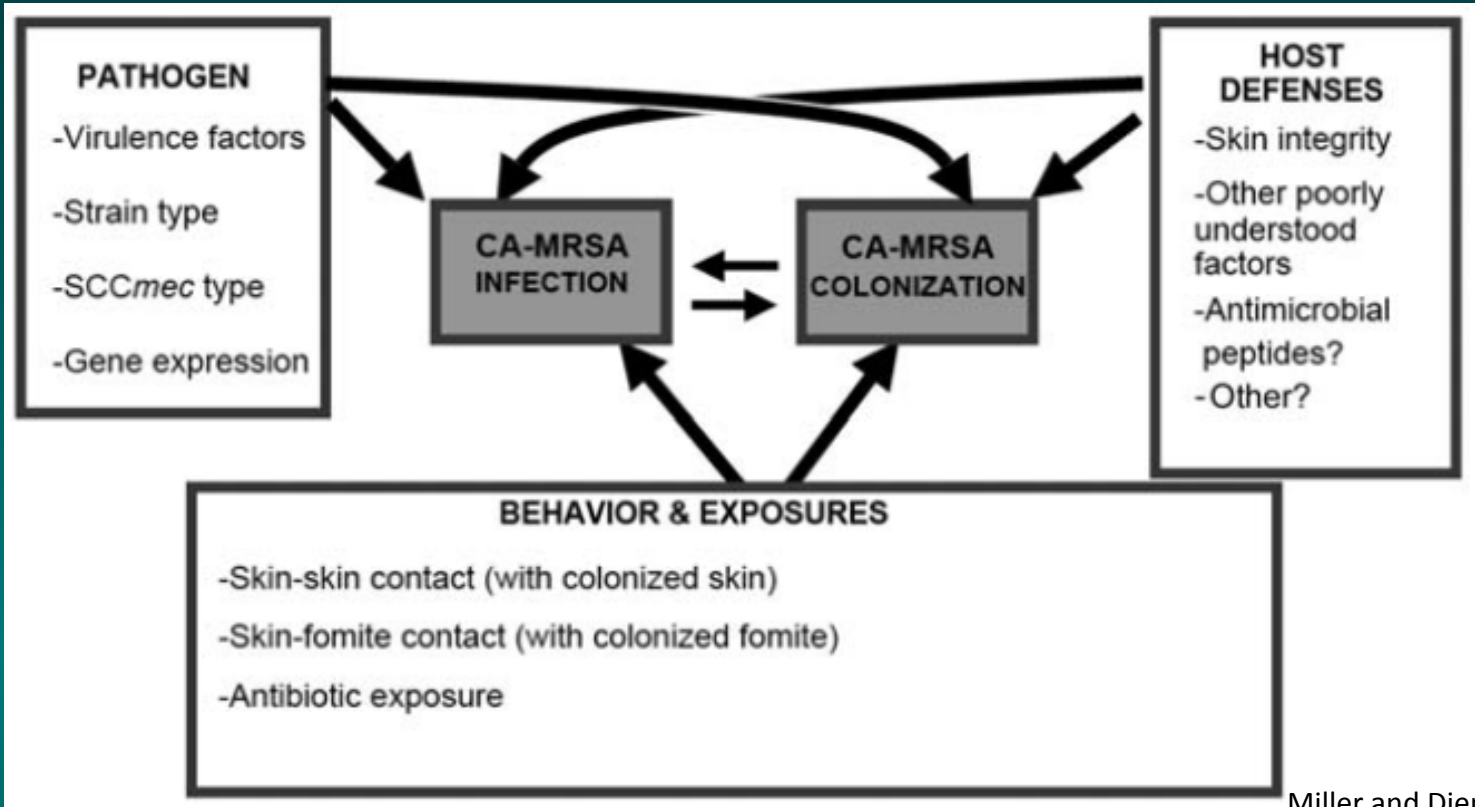
Outline

- Brief intro on MRSA
- MRSA and bacterial hotspots
- Sanitation: toilets, showers
- Laundry disinfection
- Saunas



MRSA: Methicillin-resistant *Staphylococcus aureus*

- Beta-lactam antibiotic resistance = difficult to treat
- People are very commonly colonized with CA-MRSA and are completely asymptomatic – nose colonization
- Simple skin infections, such as impetigo, boils, abscesses, folliculitis, and cellulitis
- Rarer, but more serious necrotizing fasciitis and pyomyositis (most commonly found in the tropics), necrotizing pneumonia, infective endocarditis



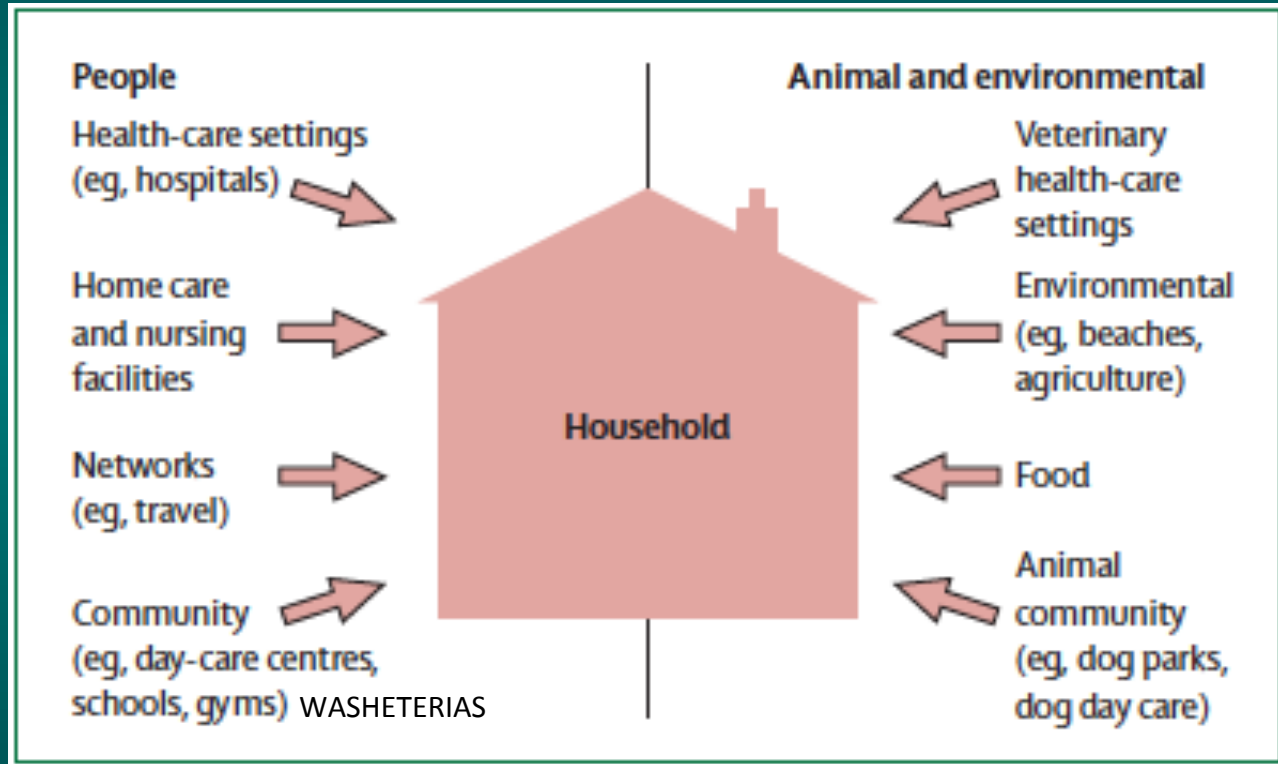
Miller and Diep 2008

Stepwise progression of exposure to MRSA, ~~followed~~ by colonization, followed by infection:
NO

CA-MRSA acquisition may arise from a variety of forces that may result in either colonization or infection (without preceding colonization). In turn, colonization may lead to infection or infection to colonization



MRSA: Environmental factors



Davis et al. 2012



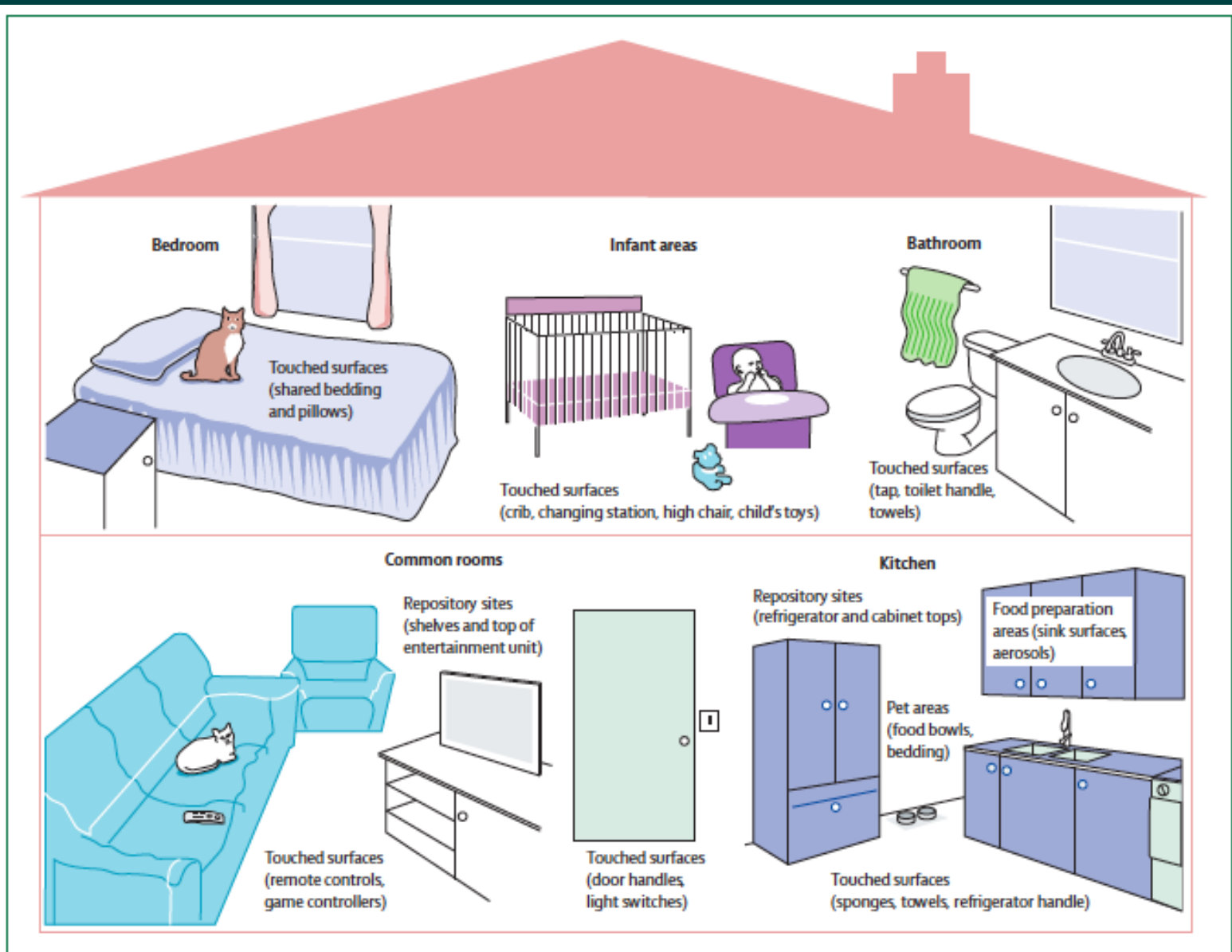
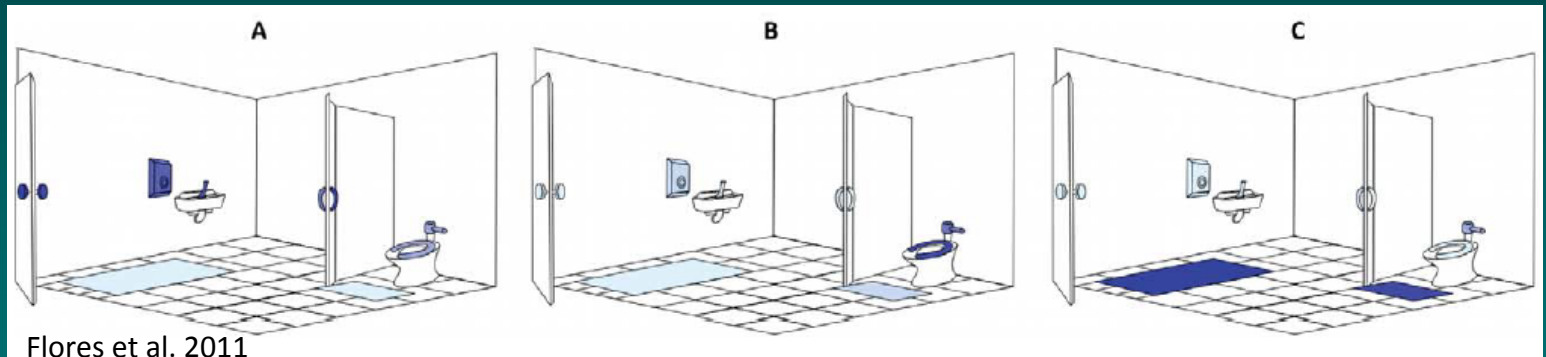


Figure 2: Potential points of transmission of staphylococci within households



Hot spots: Bacteria (in general)



Flores et al. 2011

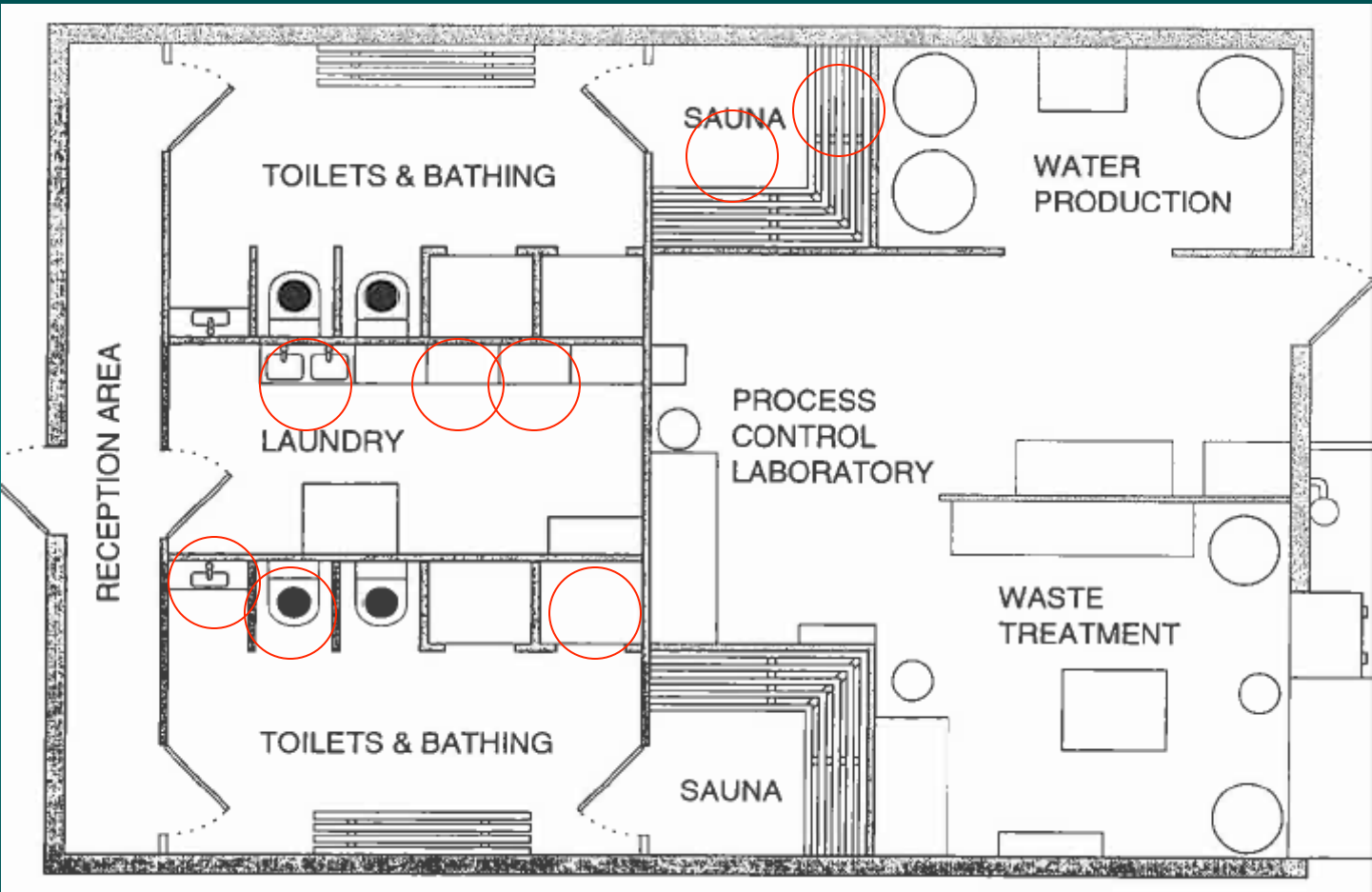
Light blue indicates low abundance while dark blue indicates high abundance of taxa. (A) skin-associated taxa; (B) Gut-associated taxa; and (C) soil-associated taxa.



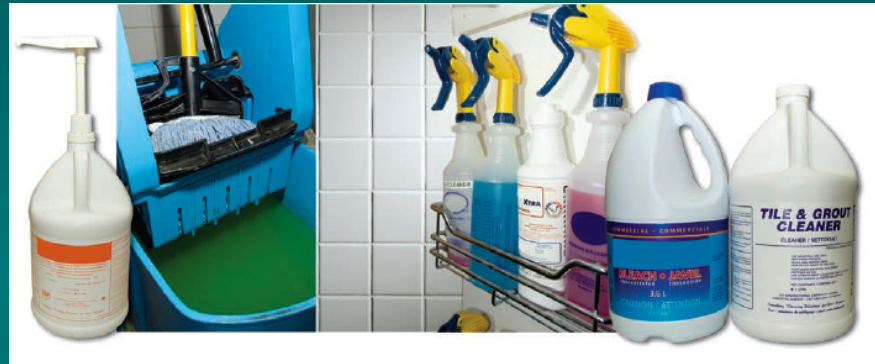
<http://www.cosmosmagazine.com/news/showers-can-be-bad-your-health/>



<http://microbewiki.kenyon.edu/>



HYGIENE: Clean first, then disinfect



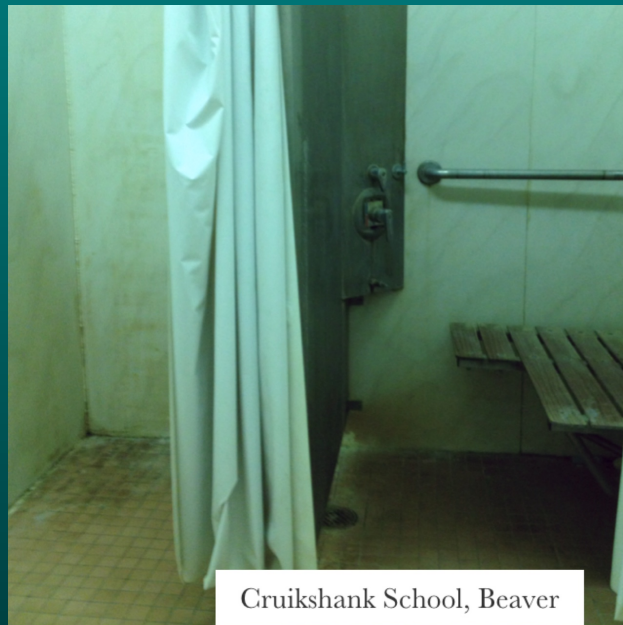
Pine Sol \$7.29
Bleach \$17.51





Washeteria toilet.

Women's shower \$1 for 10 minutes. One stall has a shower curtain.
3-4 people a week shower, as steams are the preferred method of cleaning.

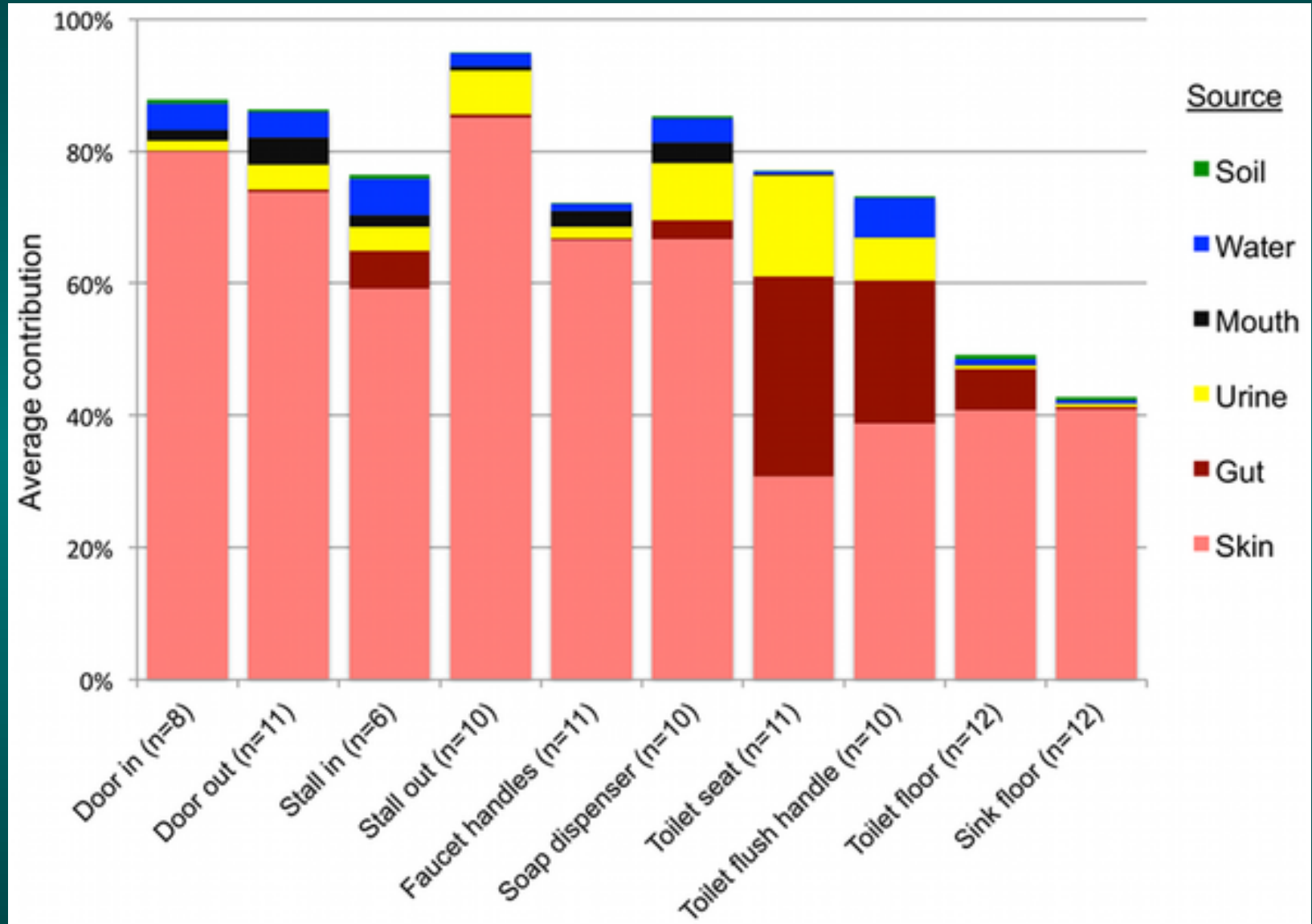


Cruikshank School, Beaver



Washeteria sink.

Average contributions of different sources to the surface-associated bacterial communities in twelve public restrooms.



Showerhead disinfection procedure

Clean/De-scale

Disinfect

Flush

NAV-CO₂ systems use liquid carbon dioxide (CO₂) as a propellant to dispense a 58% isopropyl alcohol solution in a heated stream of CO₂ liquid. This technique allows alcohol to be used in an atomized vapor, capable of reaching nooks, crannies and crevices that would normally be beyond the reach of other disinfecting methods.

- Because CO₂ is gas at room temperature, liquid alcohol evaporates off of contact surfaces within minutes after application
- Surfaces do not require wiping, thus reducing the spread of pathogens on cloths
- “Alcohol and CO₂ are also inexpensive and supplies are readily available” ** unlikely to be the case in rural AK

ervigivik

LAUNDRY



AC Quickmart. Washers.



Washers and dryers.



Laundry Contamination

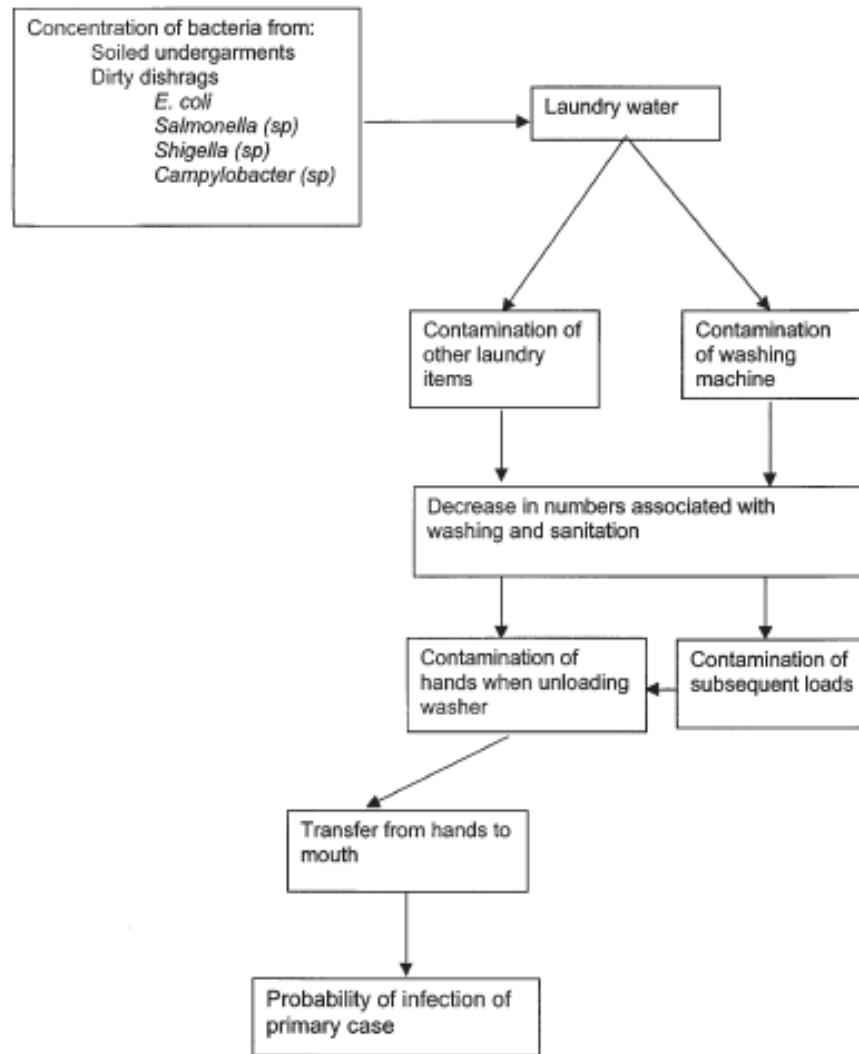


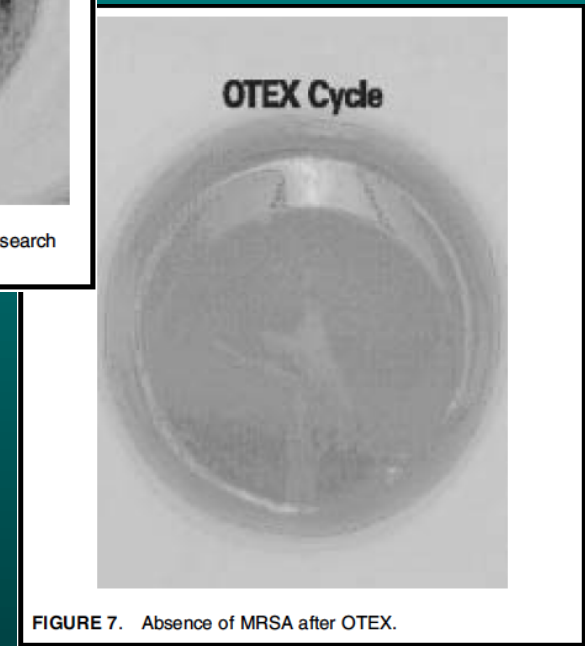
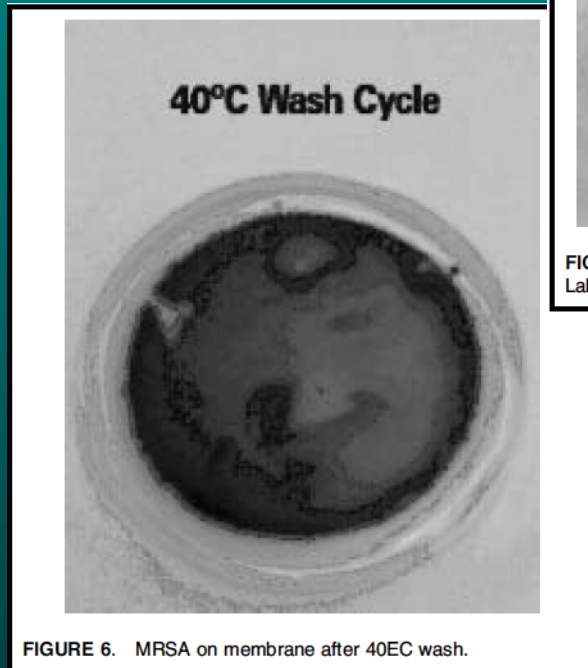
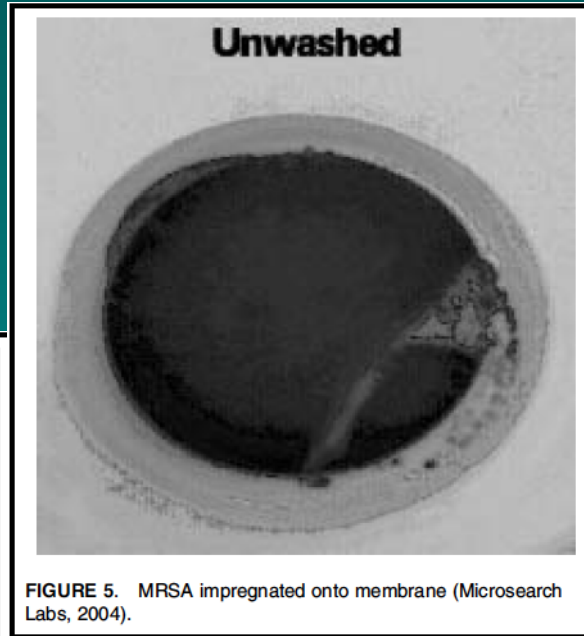
Fig 1. Framework for the transmission of microbial pathogens through contaminated laundry.

Gibson, Rose, and Haas, 1999

Ozone

- Reduces Energy Use—Ozone enhances the effectiveness of the actions of chemicals, reducing the need for high temperature washing.
- Reduces Water Use—Ozone wash systems normally require fewer rinse steps, thus reducing water usage by an estimated 30–45%.
- Reduces Chemical Use—Ozone makes existing chemicals work better
 - Ozone in water solution performs the function of chlorine bleach, without producing by-products.
- Purifies and Disinfects—Ozone is very effective against bacteria, viruses and other microorganisms.
- Improves Textile Life and Quality—Shorter cycle times and cooler temperature water
- Improves Effluent Quality – Fewer chemicals needed, ozone oxidizes bacteria/microorganisms and some dissolved organic compounds

Laundry disinfection: MRSA and Ozone



Ozone Laundry Systems

Three types:

1) Recirculation injection (RI)

(water drawn from, ozone added to the wash water)

2) Direct water-injection

(ozone added directly to water during fill)

3) Air injection

(similar to direct injection, but involving a storage tank/pressure)

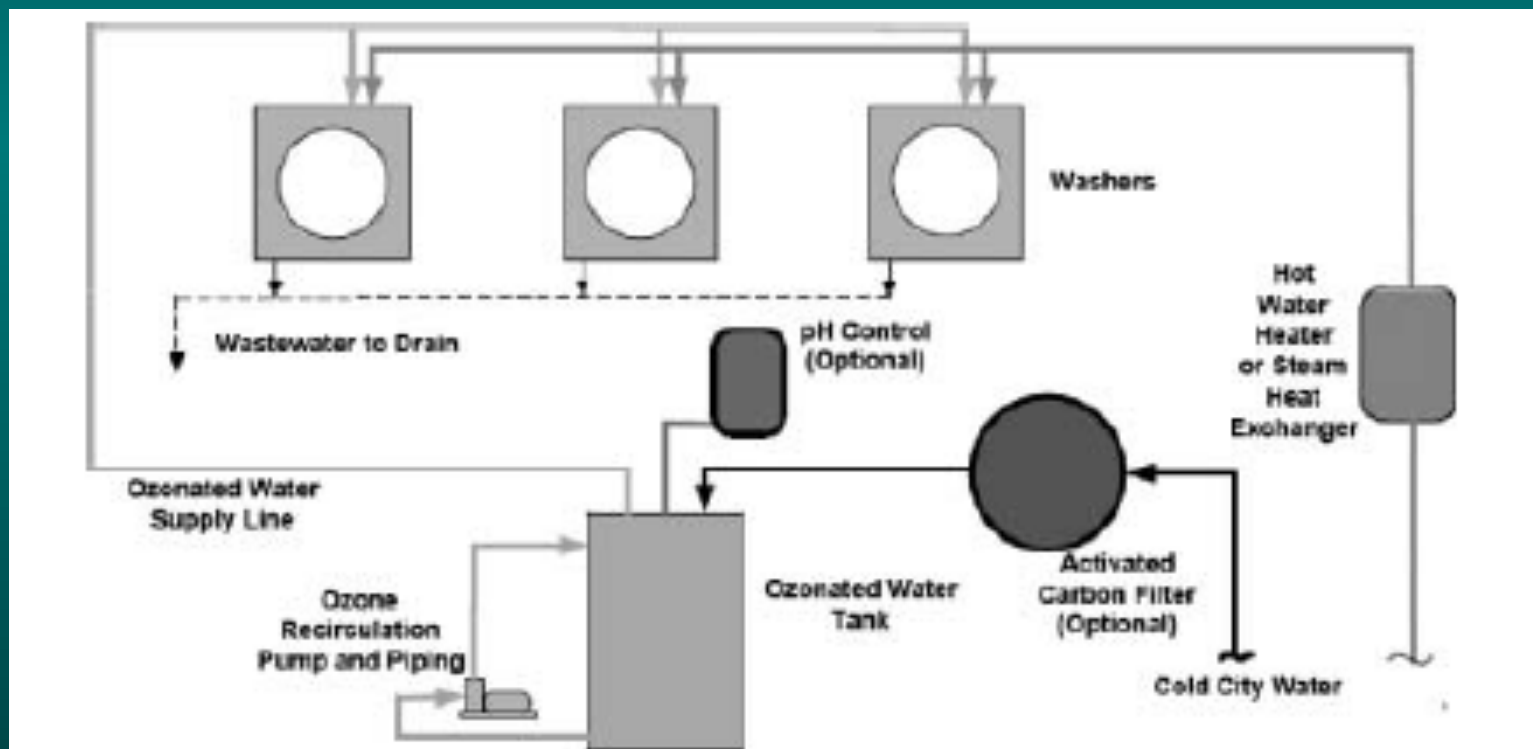


FIGURE 1. Ozone laundry systems (California Urban Water Conservation Council, 2006).



For 3 years residents have filled the washing machines manually with well water because plumbing is broken and machines underfill.

Danby Washer. 1.7 cubic feet (11 pounds) per load. Water may be reused to conserve water.



Danby washers?

Better than nothing? Can their use be made more hygienic?

Copper: Microbicidal/germicidal/ antimicrobial/antibacterial action



<http://fennsheetal.wordpress.com/2012/10/12/anti-bacterial-materials/>



COST???



<http://www.scienceonthenet.eu/content/article/copper-kills-bacteria-end-hospital-acquired-infections>





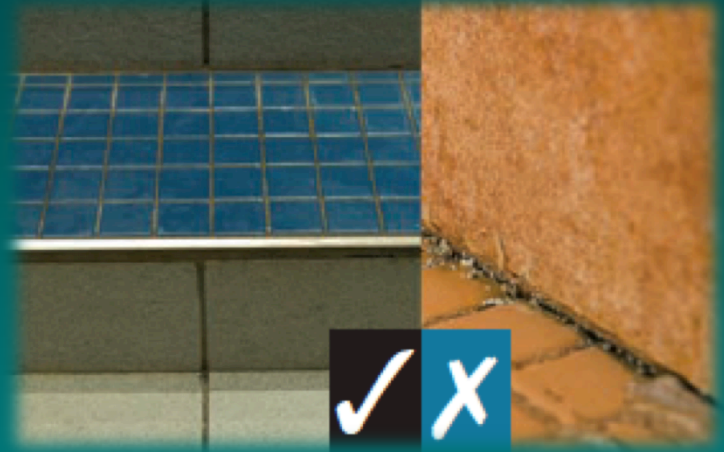
Chefnak: Inside a private steam sauna. Photo credit: Village Water, ADEC



SAUNA/STEAM ROOM

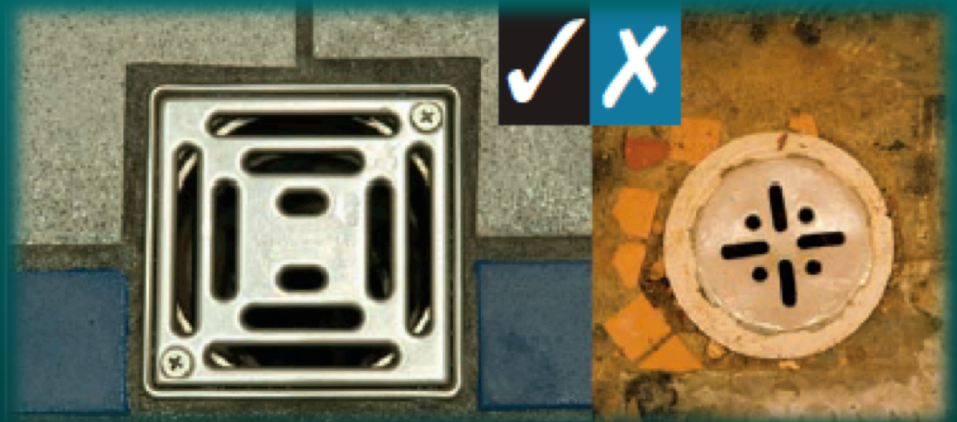
Cleaning Floor, Benches, Stones, Other surfaces





Tips for Design / Operation

SAUNA/STEAM ROOM



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- Photo credits: Village Safe Water, Alaska Dept. of Environmental Conservation -- Unless specified otherwise.

