CLEANING WITH VINEGAR

Note: The information contained in this document generally refers to table strength vinegar and is not intended to be inclusive and should only be used as a guide.

Vinegar is well recognized as a cleaning agent. It is especially effective in removing inorganic soils and mineral deposits such as hard water films. It is also effective against a broad range of bacteria, destroying or reducing these organisms to acceptable levels.

In a study conducted by the University of Georgia, *Shigella sonnei* on parsely was greatly reduced or eliminated after treating with vinegar.[1] Similarly, researchers at Virginia Polytechnic Institute and State University showed a reduction of *E. coli* O157:H7 on apples subjected to a wash containing acetic acid.[2] Researchers at the University of Florida investigated different physical and chemical washing treatments in the reduction of viral and bacterial pathogens (*E. coli* 0157:H7, *Salmonella* Montevideo, poliovirus 1 and certain bacteriophages) from inoculated strawberries. Solutions containing vinegar reduced the numbers of bacteria by about 90%. The vinegar wash also reduced the numbers of viruses by about 95%.[3]

Further, in a study conducted by the Instituto de la Grasa (Seville, Spain) on the survival of foodborne pathogens in aqueous extracts, vinegar reduced the counts of inoculated *L. monocytogenes*, *Salmonella* Enteritidies, *S. sonnei* and *Yersinia* sp. to levels below the detection limit and killed most of the *E. coli* and *S. aureus* cells.[4]

The efficacy of vinegar on reducing bacteria in meat products also has been studied. In Denmark, researchers undertook a study to determine whether marination of chicken meat in different food ingredients could be used to reduce populations of *Campylobacter jejuni*. The most efficient food ingredient for the marinade was wine vinegar either alone or in combination with red wine and soy sauce.[5]

Additionally, vinegar has been found to be effective as a rinse agent in reducing levels of *E. coli* on various countertop surfaces (e.g., laminate, wood, tile, concrete, stainless steel and granite).[6] In a study comparing the effectiveness of natural products and commercial disinfectants against human pathogens, researchers found that vinegar had "substantial activity" against *Pseudomonas aeruginosa* and *Salmonella choleraesuis*, but was not effective against *E. coli* O157:H7 and *Staphylococcus aureus*.[7] However, the researchers cautioned that the data, which was based on suspension tests, "may not fully evaluate the ability of these disinfectants to eliminate microorganisms dried on environmental surfaces."

Vinegar's chemical properties make it a cleaner with several important advantages:

* Biodegradable - a mild organic acid
* Easy to dispense and control
* Safe for stainless steel used by the food industry
* Relatively nontoxic and stable - safer for handlers
* Less likely to leave harmful residues
* Pleasant "clean" odor
* Considered an alternative for use in green cleaning

Where environmental compatibility and toxicity are especially important, vinegar has been used:

* To reduce microorganisms in slaughterhouses and poultry plants
* To reduce mineral and lime deposits in lavatory pipes
* To prevent milkstone buildup in tanks used by the milk industry
* To clean vehicles and equipment used in the construction industry

* To wash and rinse walls and ceilings in restaurants and food establishments

Excerpt:
In studies comparing several acids, acetic acid was preferred for its antimicrobial properties, and the inhibitory effect is apparently due to its low dissociation constant (pKa).

> Doores, S. 1983. "Organic Acids," Antimicrobials in Foods, A.L. Branen, P.M. Davidson (ed) Marcel Dekker, N.Y.

Excerpt:
Acetic acid in small amounts and at relatively high pH values proved more toxic to representative bacteria, yeast and mold than lactic or hydrochloric acid. Not only can acetic acid inhibit and destroy microorganisms when used in sufficiently high concentrations, it also aids materially in reducing thermal death rates of bacteria when present in sub-lethal concentrations.

> Levine, A.S., Fellers, C.R. 1940. "Action of acetic acid on Food Spoilage Microorganisms", Massachusetts Agricultural Experiment Station, *Journal of Bacteriology*, 39.499.

References
[1]Wu, F.M., Doyle, M.P, Beuchat, L.R., et al. 2000. "Fate of *Shigella sonnei* on Parsley and Methods of Disinfection," *Journal of Food Protection*, vol. 63, no. 5, p. 568.
[2]Wright, J.R., Sumner, S.S., Hackney, C.R., et al. 2000. "Reduction of *Escherichia coli* O157:H7 on Apples Using Wash and Chemical Sanitizer Treatments," *Dairy, Food and Environmental Sanitation*, vol. 20, no. 2, p. 120.
[3]Lukasik, J, Bradley, M.L., et al. 2003 "Reduction of Poliovirus1, Bacteriophages, *Salmonella* Montevideo and *Escherichia coli* 0157:H7 on Strawberries by Physical and Disinfectant Washes," *Journal of Food Protection*, vol. 66, no 2, p. 188.
[4]Media, E., Romero, C. et al. 2007. "Antimicrobial Activity of Olive Oil, Vinegar and Various Beverages against Foodborne Pathogens," *Journal of Food Protection*, vol. 70, No. 5, p.1194.
[5]Birk, T, GrØnlund, A.C., et al. 2010. "Effect of Organic Acids and Marination Ingredients on the Survival of *Campylobacter jejuni* on Meat," *Journal of Food Protection*, vol. 73, No. 2, p. 258.
[6]Synder, O.P. 1999. "The Reduction of *E. coli* on Various Countertop Surfaces," Hospitality Institute of Technology and Management.
[7]Rutala, W.A., Barbee, S.L., Aguiar, N.C., et al. 2000. "Antimicrobial Activity of Home Disinfectants and Natural Products Against Potential Human Pathogens," *Infection Control and Hospital Epidemiology*, vol. 21, no. 1, p.33.

For additional information on vinegar, see www.versatilevinegar.org.