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Countertop Sanitation

Today's consumer is offered a wide range of surfacing materials for use in countertop applications. Once in service, these countertop surfaces will be exposed to a variety of contaminative substances. The key safety issue to the consumer is the degree of cleanability of the surface material, that is, how easily any contaminants can be removed using normal and reasonable cleaning practices.

The following study by Dr. O. Peter Snyder of the Hospitality Institute of Technology and Management (www.hi-tm.com) used E. coli bacteria as its contaminating agent. The findings of the report show significant cleanability advantages of natural granite countertops over almost all other commonly found countertop surface materials.

The study included 6 countertop surfaces which were washed and rinsed after exposure to the bacteria. They were later cleaned with a 10% solution of white household vinegar (1 part 5% vinegar, 9 parts water). Bacteria counts were taken after both cleaning methods.

Granite Ranked 1st in Cleanability
After washing and rinsing, the granite tops provided the greatest reduction in bacteria counts of all the countertop materials tested:

Granite:	**36,000 to 1**
Stainless Steel:	4,000 to 1
Concrete:	2,400 to 1
Tile:	900 to 1
Wood:	500 to 1
Plastic Laminate:	285 to 1

When Dilute Vinegar Solution Used: Granite 2nd Only to Stainless Steel
Counts taken after the application of the dilute vinegar solution showed the granite having a bacteria count reduction second only to stainless steel, but 160 times better than the next closest material:

Stainless Steel:	230,000,000 to 1
Granite:	**80,000,000 to 1**
Plastic Laminate:	500,000 to 1
Tile:	233,000 to 1
Concrete:	30,600 to 1
Wood:	2,000 to 1

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Technical Bulletin

***Caution**: The reader is cautioned that although vinegar was used as a disinfectant for the purpose of this test, there are some granite species that contain trace mineral groups which could be attacked by exposure to acidic solutions. Some sealers, impregnators, or other agents applied to the stone may also be subject to attack or discoloration from mild acids. Do not use vinegar as a cleaning agent without consulting your stone supplier as to the mineralogy of your particular granite as well as the compatibility of any sealer or impregnator that may have been applied to the stone. Vinegar should never be used on calcareous stones such as marble, limestone, or travertine.*

We have reprinted Dr. Snyder's report in its entirety herein for your review.

THE REDUCTION OF E. COLI ON VARIOUS COUNTERTOP SURFACES

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Introduction

The purpose of this study was to determine the cleanability of six countertop surfaces.

1. Laminate
2. Wood
3. Tile
4. Concrete
5. Stainless steel
6. Granite

These materials are commonly used in home kitchen countertop construction. Today, it is understood that many food items that we purchase are highly contaminated with pathogenic microorganisms, and it is necessary for the home cook to make these foods safe. Often, the first step in food preparation is cutting and manipulating the food to get it ready. It is essential that the countertop be cleaned after raw food has touched the surface. Otherwise, there can be cross-contamination, and the people eating the food prepared on the cross-contaminated surface can become ill. This study identifies the cleanability of these six different countertop materials.

Methods

The countertop materials were supplied by Porter Novelli (1120 Connecticut Avenue NW; Washington, DC 20036-3902). The countertop sources are as follows.

1. **Laminate**: Wilson Art #4557-60; color-dakota ridge
2. **Wood**: maple, class 65 woods
3. **Tile**: Daytona tile, grade 5 (no stock information; made in Italy); ceramic clay tile fired from 9-1,300ºC with a single glaze
4. **Concrete**: custom sample; no specific information
5. **Stainless steel**: type 304, number 4 finish
6. **Granite**: custom sample; Lelajaross, 2-cm-thick sample

The procedure for doing the experiments was as follows.

E. coli ATTC# 25922, a non-pathogenic E. coli, was used as the marker organism. It was grown overnight at 35ºC in a static culture of M broth (International Bioproducts; 14780 NE 95th Street, Redmond, WA 98052) to an inoculum of approximately 1,000,000,000 organisms per ml.

An area of 81 square inches of each countertop was inoculated with 1 ml of this culture in M broth. The cleaning procedure was as follows. First, the surface was washed with a dishcloth and 2 liters of detergent (Jefco Yellow Dishsoap; Unisource / Jefco Group, Inc.; 1040 North Halsted Street; Chicago, IL 60622) water in a stainless steel bowl. The surface was then rinsed, using a second bowl with 2,000 ml of clear water and a second dishcloth. The cleaning process entailed rubbing the dishcloth left to right over the surface, rinsing it out, then, rubbing up and down and rinsing it out. The rinse step followed

the wash step, using the same left-to-right and up-and-down strokes.

After the surfaces were washed and rinsed, they were swabbed, using a sponge swab over the entire 81 square inches of inoculated surface to find the mean reduction. The sponge swab was cultured using Violet Red Bile agar plates (International Bioproducts) and incubated overnight at 35ºC.

Following the wash and rinse, the surfaces were wiped with a 10% solution of white household vinegar (1 cup 5% vinegar in 9 cups tap water). The surfaces were allowed to dry for 15 minutes. They were then sponge-swabbed over the 81 square inches once more, and cultured, using VRB agar to determine how many E. coli had been destroyed by the vinegar.

Results

The results of the experiment are shown in **Table 1** as logarithms of counts per 81 square inches of surface. In the column, "Real number," the logarithms of the average are converted to real numbers. In each experiment, the first column presents the log mean count of the organisms recovered. The second column under each experiment shows the log reduction in bacteria due to the wash-and rinse process or due to the vinegar application. The results are also shown in **Figure 1**.

The retention of the E. coli was from most retained to most removed as follows.

1. Laminate
2. Wood
3. Tile
4. Concrete
5. Stainless steel
6. Granite

For the **laminate**, washing and rinsing reduced the bacterial counts by about 285 to 1, as shown in the summary column. When the vinegar was applied, the overall reduction was increased to about 500,000 to 1.

For the **wood**, washing and rinsing reduced the bacterial counts by about 500 to 1, as shown in the summary column. When the vinegar was applied, the overall reduction was increased to about 2,000 to 1.

For the **tile**, washing and rinsing reduced the bacterial counts by about 900 to 1, as shown in the summary column. When the vinegar was applied, the overall reduction was increased to about 233,000 to 1.

For the **concrete**, washing and rinsing reduced the bacterial counts by about 2,400 to 1, as shown in the summary column. When the vinegar was applied, the overall reduction was increased to about 30,600 to 1.

For the **stainless steel**, washing and rinsing reduced the bacterial counts by about 4,000 to 1, as shown in the summary column. When the vinegar was applied, the overall reduction was increased to about 230,000,000 to 1.

For the **granite**, washing and rinsing reduced the bacterial counts by about 36,000 to 1, as shown in the summary column. When the vinegar was applied, the overall reduction was increased to about 80,000,000 to 1.

Discussion

This experiment has shown that every countertop will have a different cleanability. This experiment was done with new samples. When some of these samples become worn, the reduction will probably not be as significant, except for stainless steel, which should change the least.

While granite showed the greatest reduction in washing, overall, after the vinegar sanitizing, the stainless steel had the greatest reduction.

Conclusion

It is very important in food safety for the designer to consider the countertop material. In this case, the stainless steel counter showed the greatest overall reduction after the wash, rinse, and sanitize processes.

Table 1. Log Reduction Comparison of Non-pathogenic *Escherichia coli* on Surfaces [CFU / 81 sq. in.] as Affected by Surface Composition, Washing and Rinsing, and Sanitizing with Vinegar

		Expt. 1		Expt. 2		Expt. 3		Expt. 4		Expt. 5		Summary		
Material	Trmt.	Mean	Rdtn.	Mean	Rdtn.	Mean	Rdtn.	Mean	Rdtn.	Mean	Rdtn.	Log avg. rdtn.	Numerical value	Std. dev. of log av. rdtn.
Innoculum		9.18		9.33		9.34		9.25		9.26		9.27	1,862,087,137	0.07
Laminate	W & R	4.85	4.33	6.38	2.95	6.25	3.09	8.35	0.90	8.25	1.01	2.46	286	1.32
	Vinegar	3.65	5.53	3.43	5.90	3.25	6.09	3.84	5.41	3.70	5.56	5.70	498,884	0.25
Wood	W & R	6.38	2.80	6.89	2.44	6.76	2.58	6.62	2.63	6.55	2.71	2.63	429	0.12
	Vinegar	5.82	3.36	6.00	3.33	5.98	3.36	6.04	3.21	5.93	3.33	3.32	2,080	0.06
Tile	W & R	6.23	2.95	6.19	3.14	6.41	2.93	6.34	2.91	6.39	2.87	2.96	912	0.09
	Vinegar	4.33	4.85	3.28	6.05	2.30	7.04	4.51	4.74	4.60	4.66	5.47	293,765	0.94
Concrete	W & R	5.81	3.37	5.89	3.44	6.29	3.05	5.80	3.45	5.69	3.57	3.38	2,377	0.18
	Vinegar	4.28	4.9	4.73	4.60	4.85	4.49	4.92	4.33	5.00	4.26	4.52	32,810	0.23
Granite	W & R	4.86	4.32	4.26	5.07	4.76	4.58	4.78	4.47	4.93	4.33	4.55	35,810	0.28
	Vinegar	0	9.18	1.24	8.09	0	9.34	2.88	6.37	2.74	6.52	7.90	79,432,823	1.26
Stain.Stl.	W & R	5.22	3.96	6.28	3.05	5.84	3.5	5.48	3.77	5.55	3.71	3.60	3,963	0.31
	Vinegar	0	9.18	1.30	8.03	3.26	6.08	0	9.25	2.15	7.11	7.93	85,113,804	1.22

Rdtn = reduction 0 = <100

Figure 1. Comparison of Reduction of *Escherichia coli* on Surfaces as Affected by Surface Composition, Cleaning with Detergent and Water, and Sanitizing with Vinegar