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Comparison of ATP Values on Vegetables Cutting Boards before and after Alcohol Disinfection

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Abstract- Sanitary control of cutting boards in the kitchen is important to prevent food poisoning. To preventing secondary and tertiary contamination of food poisoning bacteria, it is necessary to know the hygiene status of cooking utensils. Therefore, in this study, we compared the values after cooking, washing, and spraying 70% alcohol on cutting boards for vegetables using the ATP test and microbiological test. As a result, the ATP value after spraying with alcohol was 100 or less, which was better than that after washing. Microbial test results showed that microorganisms were present on the vegetable cutting board even after spraying with 70% alcohol. Since microorganisms are present even after spraying with alcohol, it is possible that the growth of microorganisms will occur again if the vegetable cutting boardleft in a moist state at room temperature. When using a vegetable cutting board left unattended, it is necessary to wash repeatedly and spray it with alcohol.

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I. Introduction

Care should taken when cleaning vegetable cutting boards, as compared to meat and fish cutting boards, it may not be possible to wash them carefully due to the lack of sliminess[1)]. In this study, we used the ATP test and microbial test to compare the ATP value and the number of microbial bacteria immediately after cooking, washing, and spraying 70% alcohol on cutting boards for vegetables. The ATP value is preferably 100 or less, and the number of microbial bacteria is preferably free. We reported the results of the actual ATP test and the microbiological test.

II. Materials and Methods

a) Kitchen vegetable cutting board

The twelve vegetables cutting board prepared in the kitchen were stored in the sterilization storage the day before cooking. Cooking done in two places, and six cutting boards used for each.

b) ATP inspection procedure

Each of the twelve cooks carried a vegetable cutting board for the vegetable of their work and brought it to the cooking table. Still, the inspector always performed an ATP inspection before using vegetables with a cutting board. Then, each cook finished the work, washes the cutting board firmly with detergent and sponge, rinse with running water for 30 seconds or more. Then, each cook repeated this process twice (as same as the last report[1)]). The inspector performed an ATP inspection after using vegetable with a cutting board, again. Then, each cook sprayed 70% alcohol on the cutting board after washing. At last, the inspector performed an ATP inspection after using vegetables with a kitchen cutting board. The ATP test kit used manufactured by KIKKOMAN.

c) Stamp test inspection procedure

Five types of stamp test (General bacteria, Staphylococcus aureus, Escherichia coli, Salmonella, Vibrio parahaemolyticus) used. The stamp test conducted by the inspector at the same time as the ATP. The stamp test was colony-counted after culturing in an incubator at 38 degrees for three days. The stamp test by MISSUI.

d) Statistical processing

The results obtained compared using statistical methods. The data statistically processed, was subjected to an F test to determine whether to use a parametric test or nonparametric test. When there is no difference in the F test, the presence or absence of a significant difference confirmed using the student t-test with or without a correspondence. If there was a difference in the F test, the presence or absence of a significant difference was confirmed using the Wilcoxon test with a pair or the Mann-Whitney test without correlation.

III. Results

a) ATP value results before and after alcohol disinfection

Tables 1 and 2 show the results of ATP wiping tests on vegetables cutting board before and after alcohol disinfection. The ATP value was statistically significantly lower after washing than after cooking. However, the ATP value did not fall below 100. The ATP

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value after70% alcohol spraying was 100 or less. The ATP value was statistically significantly lower after 70% alcohol spraying than after cooking.

Table1. ATP test value and statistical processing result of cutting board 1.

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	176205	863	863	10
2	909793	68	68	10
3	6543	39	39	44
4	15	42	42	26
5	38244	283	283	11
6	14200	5790	5790	17
Average value	190833.3	1180.8	1180.8	19.7
SD	358322.3	2279.9	2279.9	13.4
F test	P=0.0001**		P=0.0001**	
Student-t*				
Wilcoxon	P0.046*		P-0.046:	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.046*			

*Paired Student-t test * P<0.05, ** P<0.01

Table2. ATP test value and statistical processing result of cutting board 2.

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	9194	2630	2630	18
2	1103	56	56	35
3	48126	449	449	45
4	3168	52	52	22
5	136610	259	259	3
6	3983	616	616	23
Average value	33697.3	677.0	677.0	24.3
SD	53435.9	981.9	981.9	14.4
F test	P=0.0001**		P=0.0001**	
Student-t*				
Wilcoxon	P=0.28*		P-0.028*	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.028*			

*Paired Student-t test * P<0.05, ** P<0.01

b) Stamp test results before and after alcohol disinfection

Tables 3,4,5,6,7,8.9.10.11 and 12 show the results of ATP wiping tests on vegetables cutting board before and after alcohol disinfection. The result of common bacteria, Staphylococcus aureus and Vibrio parahaemolyticus was that microorganisms could be present on the cutting board even after 70% alcohol spraying. However, the number of microorganisms reduced compared to after cooking. In the case of E. Coli and Salmonella, the number of microorganisms decreased statistically significantly after spraying with 70% alcohol.

Table 3 Number of general bacteria on cutting board 1. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	298	110	110	0
2	8	10	10	13
3	22	3	3	0
4	50	0	0	3
5	7	42	42	0
6	8	1	1	0
Average value	65.5	27.7	27.7	2.7
SD	115.1	43.3	43.3	5.2
F test	P=0.016*		0.0001**	
Student-t*				
Wilcoxon	P=0.249		P-0.345	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.046*			

*Paired Student-t test * P<0.05, ** P<0.01

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Table 4 Number of general bacteria on cutting board 2. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	87	120	120	0
2	1	2	2	18
3	9	1	1	0
4	90	14	14	0
5	200	47	47	0
6	3	0	0	3
Average value	65.0	30.7	30.7	3.5
SD	78.0	47.3	47.3	7.2
F test	P=0.124		P=0.0001**	
Student-t*	P=0.273			
Wilcoxon			P=0.345	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.138			

*Paired Student-t test * P<0.05, ** P<0.01

Table 5 Number of E. coli on cutting board 1. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	14	3	3	0
2	3	3	3	2
3	6	1	1	0
4	23	0	0	0
5	30	30	30	0
6	3	0	0	0
Average value	13.2	6.2	6.2	0.3
SD	11.3	11.8	11.8	0.8
F test	P=0.463		P=0.0001**	
Student-t*	P=0.110			
Wilcoxon			P=0.043*	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.028*			

*Paired Student-t test * P<0.05, ** P<0.01

Table 6 Number of E. coli on cutting board 2. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	7	1	1	0
2	0	0	0	0
3	21	11	11	0
4	16	4	4	4
5	200	0	0	0
6	60	0	0	0
Average value	50.7	2.7	2.7	0.7
SD	76.1	4.4	4.4	1.6
F test	P=0.0001**		P=0.0001**	
Student-t*				
Wilcoxon	P=0.043*		P=0.075	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.043*			

*Paired Student-t test * P<0.05, ** P<0.01

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Table 7 Number of Staphylococcus aureus on cutting board 1. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	28	18	18	4
2	1	2	2	3
3	100	0	0	1
4	7	0	0	0
5	4	200	200	0
6	15	1	1	0
Average value	25.8	36.8	36.8	1.3
SD	37.6	80.2	80.2	1.8
F test	P=0.044*		P=0.0001**	
Student-t*				
Wilcoxon	P=0.463		P=0.345	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.046*			

*Paired Student-t test * P<0.05, ** P<0.01

8 Number of Staphylococcus aureus on cutting board 2. and statistical processing

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	2	2	2	0
2	0	0	0	2
3	0	0	0	0
4	7	0	0	0
5	250	56	56	0
6	33	0	0	0
Average value	48.7	9.7	9.7	0.3
SD	99.4	22.7	22.7	0.8
F test	P=0.001**		P=0.0001**	
Student-t*				
Wilcoxon	P=0.109		P=0.423	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.106			

*Paired Student-t test * P<0.05, ** P<0.01

Table 9 Number of Salmonella on cutting board 1. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	210	3	3	0
2	48	0	0	27
3	3	100	100	2
4	240	35	35	8
5	1	9	9	0
6	175	0	0	0
Average value	112.8	24.5	24.5	6.2
SD	107.9	39.3	39.3	10.7
F test	P=0.013*		P=0.003**	
Student-t*				
Wilcoxon	P=-.173		P=0.281	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.028*			

*Paired Student-t test * P<0.05, ** P<0.01

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Table 10 Number of Salmonella on cutting board 2. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	378	0	0	0
2	3	2	2	0
3	8	0	0	6
4	25	0	0	0
5	1	5	5	0
6	43	0	0	0
Average value	76.3	1.2	1.2	1.0
SD	148.6	2.0	2.0	2.4
F test	P=0.0001**		P=0.335	
Student-t*			P=0.914	
Wilcoxon	P=0.075			
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.028*			

*Paired Student-t test * P<0.05, ** P<0.01

Table 11 Number of Vibrio parahaemolyticus on cutting board 1. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	11	15	15	0
2	0	1	1	1
3	20	0	0	0
4	0	15	15	0
5	61	0	0	0
6	0	92	92	0
Average value	15.3	20.5	20.5	0.2
SD	23.8	35.8	35.8	0.4
F test	P=0.172		P=0.0001**	
Student-t*	P=0.811			
Wilcoxon			P=0.109	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.144			

*Paired Student-t test * P<0.05, ** P<0.01

Table 12 Number of Vibrio parahaemolyticus on cutting board 2. and statistical processing result

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	192	31	31	0
2	40	0	0	0
3	0	0	0	0
4	0	40	40	2
5	0	100	100	1
6	28	3	3	0
Average value	43.3	29.0	29.0	0.5
SD	74.8	38.8	38.8	0.8
F test	P=-0.067		P=0.0001**	
Student-t*	P=0.706			
Wilcoxon			P=0.068	
F test	P=0.0001**			
Student-t*				
Wilcoxon	P=0.225			

*Paired Student-t test * P<0.05, ** P<0.01

IV. Discussion

On cutting boards for vegetables, hygiene tests performed on the ATP value and the number of microorganisms. For the microbiological test, a selective medium of general bacteria, Escherichia coli, Staphylococcus aureus, Salmonella, and Vibrio parahaemolyticus used. The ATP level and the number of microorganisms decreased after washing as compared with after cooking. Furthermore, after alcohol spraying, the ATP level, the number of E. Coli, and the number of Salmonella bacteria decreased statistically significantly. However, the bacteria did not disappear. Microorganisms are more likely to grow if they are moist, at the right temperature, and hove nutrients. If the cutting board is left unattended after cooking, it may be necessary to wash repeatedly and spray it with alcohol before use. The ATP test can show invisible

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microorganisms on the spot with visible numbers[1,2,3,4]. Therefore, it is used in many places and is useful for hygiene education and food poisoning prevention[5,6,7,8]. Although it takes time, it is useful for hygiene education to know the condition of food poisoning bacteria by conduction microbiological tests.

V. Conclusions

As a result of the ATP test and microbiological test performed on the cutting board for vegetables, there are surviving bacteria that even after spraying 70% alcohol, so spray 70% alcohol firmly, and the cutting board left for a while is washed repeatedly and sprayed with alcohol before cooking. We think it's better to use it.

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References Références Referencias

1. Nante N, Ceriale E, Messina G, Lenzi D, Manzi P. Effectiveness of ATP bioluminescence to assess hospital cleaning: a review. (2017) J Prev. Med. Hyg. 58(2): E177-E183.
2. Amodio E, Dubi C. Use of ATP bioluminescence for assessing h eclealiness of hospital surfaces: a review of the published literature (1990-2012).(2014) J infect Public Health 7(2): 92-98.
3. Aycieck H, Oquz U. Karci K. Comparison of results of ATP bioluminescence and traditional ygiene swabbing methods fro the deteminaton of surface cleanliness at a hospital kitchen. (2006). Int J Hyg Environ Heatth. 209(2): 203-206.
4. Osimani A, Garofalo C, Clementi F, Tavoletti S, Aquilanti L.Bioluminescence ATP monitoring for the routine assessment fo food contact surface cleanliness in a university canteen. (2014). Int J Environ Res Public Health 17; 11(10): 10824-10837.
5. Lee JH (2018) An investigation of Factors that influence Hygiene Practices at a small Day Care Center. (2018). J Food Prot. 81(1): 158-164.
6. Stanley PE. A review of bioluminescent STP techniques in papid microbiology. (1989) J Biolumin Chemilumin 4(1): 375-380.
7. Stannard CJ, Gibbs PA. Rapid microbiology: application s of bioluminescence in the food industry—a review. (1986) J Biolumin Chemilumin 1(1): 3-10.
8. Griffith CJ, Coooper RA, Gilmore J, Davies C, Lweis M. An evaluation of hospital cleaning refimes and standards. (2000) J Hosp Infect. 45(1): 19-28.

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