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Effect of Alcohol Disinfection on the Handle and Blade of Vegetables Knives by using ATP Inspection and Microbial Stamp Test

Naomi Katayama[1], Akemi Ito[2], Mayumi Hirabayashi[3], Natuki Sasaki[4] and Moe Inuzuka[5]

[1] Nagoya Women?s University

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Abstract

To prevent food poisoning, we focused on kitchen vegetable knives, which are likely to cause secondary contamination, and conducted hygiene inspections to obtain results. The values after cooking and after washing, and after washing and after 70

Index terms— ATP test, microbial stamp test, the handle of the knife, the blade of the knife, alcohol disinfection.

1 Introduction

leaning and disinfecting cooking utensils, and cleaning and disinfecting hands, avoid the risk of food poisoning. Cleaning and disinfecting kitchen knives, which often come into contact with food, helps prevent secondary contamination. Many researchers have achieved hygiene management in hospitals and other kitchens through hygiene education 1,2,3,4) . In particular, hygiene management using the ATP wiping test made it possible to create an easy-to-understand and hygienic environment by expressing invisible microorganisms as ATP values 5,6,7,8) . In the past, we also reported the results of hygiene tests on kitchen utensils using ATP wiping test 9,10,11) . Since it is impossible to know what kind of bacteria are present in the ATP wiping test, a more detailed hygiene test can obtain by examining food poisoning bacteria using a microbial II.

2 Materials and Methods

3 a) Hygiene tests on Kitchen knife

Hygiene tests on six vegetable knives performed using the ATP test kit (KIKKOMAN CO., Ltd.) and the microbial stamp test kit (NISSUI Co., Ltd.).

4 b) ATP wiping tests

ATP wiping tests performed on the handles and blades of 6 meat and fish knives. The ATP test was performed by the inspector three times immediately after cooking, after washing, and after 70%spraying alcohol. The inspector recorded the ATP test results.

5 c) Microbial stamp test

And the inspector performed a microbial stamp test as same as ATP tests (three times: after cooking, after washing, and after spraying alcohol). The microbial stamp was then cultured in an incubator at 38 degrees for three days. After culturing, microbial stamps were counted and recorded by the inspector.

6 d) Statistical processing

The results obtained compared using statistical methods. Compared data were 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 was 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.

7 III.

8 Results

9 a) Vegetable knife: ATP results and microorganisms stamp test results of Alcohol disinfection i. ATP test results of vegetable kitchen knife handle and blade

The ATP test values were lower on both the handle and blade of vegetable knives after washing than after cooking, and after spraying 70% alcohol than after washing. After spraying alcohol, the ATP value of both the handle and blade of the knife was 100 or less. It judged that the handle and blade of the vegetable knife were in a hygienic condition (See Table **??** and Table 2).

10 b) Microbial stamp test results of vegetable kitchen knife handle and blade

i. General bacteria A microbial stamp test (general bacteria) performed on the handle and blade of a vegetable knife. The results are shown in Tables 3 and 4. Bacterial counts decreased after washing than after cooking and after 70%alcohol sprayings than after washing, not all were statistically significant. The number of microorganisms after spraying with 70%alcohol was not sufficiently reduced as compared with that after washing. (D D D D) ii. Escherichia Coli (E Coli)

The number of E. coli performed on the handle and blade of a vegetable knife. The results shown in Tables 5 and 6. Bacterial counts decreased after washing than after cooking and after 70%alcohol sprayings than after washing, not all were statistically significant. The number of microorganisms on the handle of the kitchen vegetable knife did not decrease statistically significantly.

11 iii. Staphylococcus aureus

Tables 7 and 8 show the results for Staphylococcus aureus. There was no statistically significant difference between the knife blade after cooking and after cleaning and after cleaning and after70% spraying alcohol. However, the number of bacteria is decreasing. The number of bacteria on the handle of the kitchen vegetable knife is statistically significantly reduces after washing and after spraying with 70%alcohol.

12 iv. Salmonella

The results of Salmonella shown in Tables 9 and 10. The number of bacteria decreased after washing than after cooking and after spraying 70%alcohol than after washing. However, the number of Salmonella was not statistically significantly reduced in the handle of the kitchen vegetable knife. With the knife blade, the number of Salmonella bacteria after70% alcohol spraying was statistically significantly lower than that after cooking. (D D D D) K v. Vibrio parahaemolyticus

The results of Vibrio parahaemolyticus shown in Tables 11 and 12. The number of bacteria decreased after washing than after cooking and after spraying 70%alcohol than after washing, but there was no statistically significant difference.

IV.

13 Discussion

This time, the ATP value became 100 or less after spraying 70%alcohol, and the handle and blade of the knife became hygienic. However, the results of the microbial stamp test using the selective medium showed that the number of bacteria did not decrease sufficiently even after spraying with 70%alcohol. The bactericidal effect of alcohol spray differed depending on the type of bacteria. After cleaning, wipe off the water sufficiently and spray 70%alcohol, and we think it is better to spray 70%alcohol multiple times instead of once. In the future, we would like to count the number of microorganisms by sterilizing by increasing the number of 70%alcohol sprays. aureus, Salmonella, Vibrio parahaemolyticus) on the handle and blade of vegetable knives for the use of hygienic cooking utensils in the kitchen went. As a result, the ATP value after washing after cooking and after spraying70% alcohol was statistically significantly lower than after washing. However, although each bacterium in the selective medium decreased, not all of them were statistically significant. In the future, after cooking,

we would like to wipe off the water from the kitchen vegetable knife and then spray70%alcohol, and then spray 70%alcohol multiple times instead of once before conducting a microbiological test. [1] [2]

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[2] Effect of Alcohol Disinfection on the Handle and Blade of Vegetables Knives by using ATP Inspection and Microbial Stamp Test

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Table1. ATP test value and statistical processing result of Kitchen knife Handle

		No alcohol treatment	
	For vegetables	Before washing	After washing After washing
	1	159550	4828
	2	2294	558
	3	37952	6919
	4	12836	3691
	5	13009	4260
	6	2531	2813
	Average value	38028.7	3844.8
	SD	60934.6	2120.4
	F test	P=0.0001**	
Year	Student-t* Wilcoxon F test Student-t*	P=0.046*	P=0.0001** P=0.028*
2020	Wilcoxon		
2		*Paired Student-t test * P<0.05, ** P<0.01	

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

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	Average value	33.0	9.8
	SD	21.2	8.5
	F test	P=0.021*	
	Student-t*		
	Wilcoxon	P=0.028*	
	F test		P=0.018*
	Student-t*		
	Wilcoxon		P=0.028*
		*Paired Student-t test * P<0.05, ** P<0.01	

Figure 1: Table 3

4

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	49	1	1	4
2	0	13	13	26
3	8	17	17	2
4	41	59	59	0
5	198	48	48	21
6	0	44	44	0
Average value	49.3	30.3	30.3	8.8
SD	75.8	23.1	23.1	11.6
F test		P=0.021*	P=0.473	
Student-t*			P=0.206	
Wilcoxon		P=0.028*		
F test		P=0.0001**		
Student-t*				
Wilcoxon		P=0.138		

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

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	8	14	14	3
2	1	3	3	0
3	34	0	0	11
4	1	0	0	0
5	0	1	1	0
6	0	0	0	0
Average value	7.3	3.0	3.0	2.3
SD	13.4	5.5	5.5	4.4
F test				
Student-t*				
Wilcoxon				
F test				
Student-t*				
Wilcoxon				

Figure 2: Table 4

5

	P=0.024*		P=0.301	
			P=0.826	
	P=0.787			
		P=0.008**		
		P=0.068		
	*Paired Student-t test * P<0.05, ** P<0.01			
	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	35	0	0	4
2	2	21	21	2
3	66	78	78	0
4	4	1	1	0
5	55	3	3	1
6	1	1	1	0
Average value	27.2	17.3	17.3	1.2
SD	29.0	30.8	30.8	1.6
F test				
Student-t*				
Wilcoxon				
F test				
Student-t*				
Wilcoxon				

Figure 3: Table 5

6

P=0.444	P=0.0001**
P=426	
	P=0.173
P=0.0001**	
P=0.043*	
Paired Student-t test * P<0.05, ** P<0.01	

Figure 4: Table 6

7

	processing result			
	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	65	42	42	0
2	70	12	12	0
3	6	64	64	3
4	1	3	3	0
5	9	1	1	0
6	70	2	2	0
Average value	36.8	20.7	20.7	0.5
SD	34.6	26.3	26.3	1.2
F test	P=0.259		P=0.0001**	
Student-t*	P=0.425			
Wilcoxon			P=0.028	
F test		P=0.0001**		
Student-t*				
Wilcoxon		P=0..028*		
	*Paired Student-t test * P<0.05, ** P<0.01			
	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	40	39	39	0
2	17	3	3	11
3	3	15	15	0
4	1	3	3	0
5	45	0	0	6
6	1	6	6	52
Average value	17.8	11.0	11.0	11.5
SD	20.1	14.7	14.7	20.3
F test				
Student-t*				
Wilcoxon				
F test				
Student-t*				
Wilcoxon				

Figure 5: Table 7

8

	processing result			
	P=0.231		P=0.223	
	P=0.453		P=0.957	
		P=0.488		
		P=0.660		
	*Paired Student-t test * P<0.05, ** P<0.01			
	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	9	0	0	4
2	1	0	0	0
3	1	0	0	0
4	0	0	0	0
5	0	3	3	0
6	0	0	0	0
Average value	1.8	0.5	0.5	0.7
??	3.5	1.2	1.2	1.6
F test				
Student-t*				
Wilcoxon				
F test				
Student-t*				
Wilcoxon				

Figure 6: Table 8

9

P=0.010*		P=0.251
		P=0.862
P=0.465		
P=0.041*		
P=0.109		
Paired Student-t test * P<0.05, ** P<0.01		

Figure 7: Table 9

10

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	35	94	94	0
2	1	0	0	0
3	1	0	0	0
4	5	0	0	0
5	130	1	1	1
6	1	0	0	0
Average value	28.8	15.8	15.8	0.2
??	51.3	38.3	38.3	0.4
F test	P=0.247		P=0.0001**	
Student-t*	P=0.629			
Wilcoxon			P=3.17	
F test		P=0.0001**		
Student-t*				
Wilcoxon			P=0.028*	

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

	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	1	0	0	0
2	71	0	0	1
3	28	22	22	3
4	1	0	0	2
5	0	3	3	7
6	0	0	0	0
Average value	16.8	4.2	4.2	2.2
??	28.7	8.8	8.8	2.6
F test				
Student-t*				
Wilcoxon				
F test				
Student-t*				
Wilcoxon				

Figure 8: Table 10

11

	processing result			
	P=0.006**		P=0.005**	
	P=0.225		P=0.715	
		P=0.0001**		
		P=0.418		
	*Paired Student-t test * P<0.05, ** P<0.01			
	No alcohol treatment		Alcohol treatment	
For vegetables	Before washing	After washing	After washing	After alcohol
1	0	0	0	1
2	0	3	3	0
3	0	0	0	0
4	1	0	0	0
5	40	3	3	0
6	0	2	2	0
Average value	6.8	1.3	1.3	0.2
??	16.3	1.5	1.5	0.4
F test				
Student-t*				
Wilcoxon				
F test				
Student-t*				
Wilcoxon				

Figure 9: Table 11

12

P=0.001**			P=0.003**
P=1.000			P=0.144
P=0.0001**			
P=0.423			
Paired Student-t test * P<0.05, ** P<0.01			

Figure 10: Table 12

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