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Results of Hygiene Education of Kitchen Cutting Board by using ATP Inspection - Comparison of Vegetable Cutting Board and Meat Cutting Board

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Abstract- Since bacteria grow in high temperature and high humidity, bacterial food poisoning frequently occurs from the rainy season to summer. In Japan, the number of food poisoning cases is high from June to October. Maintaining a hygienic environment in the kitchen is very important for preventing food poisoning. In particular, cutting boards on which various foods are places may cause secondary pollution. Therefore, to avoid food poisoning, this study compared the ATP value of the cutting board before and after the hygiene education using the ATP wiping test and investigated the educational effect. Before hygiene education, the inspector conducted an ATP wiping test on the cutting boards for vegetables and meat that washed before and after cooking and notified the cooks of the values. The inspector conducted hygiene education while showing the cook how to clean the cutting board. The cutting board washed with detergent and sponge, rinsed with running water for 30 seconds or more, then this process was repeated twice.

Keywords: *gender; ATP wiping test, Cutting board, Hygiene education, double wash.*

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Abstract- Since bacteria grow in high temperature and high humidity, bacterial food poisoning frequently occurs from the rainy season to summer. In Japan, the number of food poisoning cases is high from June to October. Maintaining a hygienic environment in the kitchen is very important for preventing food poisoning. In particular, cutting boards on which various foods are places may cause secondary pollution. Therefore, to avoid food poisoning, this study compared the ATP value of the cutting board before and after the hygiene education using the ATP wiping test and investigated the educational effect. Before hygiene education, the inspector conducted an ATP wiping test on the cutting boards for vegetables and meat that washed before and after cooking and notified the cooks of the values. The inspector conducted hygiene education while showing the cook how to clean the cutting board. The cutting board washed with detergent and sponge, rinsed with running water for 30 seconds or more, then this process was repeated twice. The cooks cooled again, and the inspectors again checked the ATP value on the cutting boards for vegetables and meat that cleaned before and after cooking using the ATP wiping test. As a result, the ATP value of the cutting board before hygiene education was statistically significantly lower than the ATP value by washing after cooking, but it did not fall below 100. However, after the hygiene education, the ATP value was less than100, and it found that the hygiene education affected. It found that hygiene education for preventing food poisoning in the kitchen can effectively performed by making invisible bacteria visible numerically as the ATP value by the ATP wiping test.

Keywords: gender; ATP wiping test, Cutting board, Hygiene education, double wash.

I. Introduction

In Japan, bacterial food poisoning frequently occurs from the hot and humid rainy season to summer. This season is because bacteria are high temperature and humid and tend to multiply. The number of past food poisoning notifications to the Japanese Ministry of Health, Labor, and Welfare tends to be high from May to October. Alao, these numbers are only those delivered to Public Health Center, so it presumed that they are higher. The number of outbreaks of salmonella, vibrio parahaemolyticus, Escherichia coli, etc., which were the representative bacteria for food poisoning has been decreasing year by year. In contrast, no decrease in bacterial food poisoning due to Campylobacter has been observed, and 60% or more of the bacterial food poisoning cases have observed. Hygienic handling of food is needed. Furthermore, to prevent cross-contamination, sanitary handling of cooking utensils, especially cutting boards on which various foods placed, must be ensured. However, the problem is that the bacteria are so small that they cannot be seen. Since the microorganisms are invisible, it is not possible to see if the cooking utensils are hygienic just by looking at them during cooking. Hospitals perform ATP wiping tests when performing hygiene management, and use the number of microorganisms as a visible ATP value to help protect the sanitary environment[1,2]. Also, the ATP wiping test can be used in kitchens to help maintain a hygienic environment[3,4]. It has also reported that it is useful to provide hygiene education for staff using the ATP wipe test[5]. Therefore, in this study, we performed an ATP wiping test on cutting boards that are susceptible to secondary contamination from various foods in the kitchen and compared the ATP values before and after hygiene education.

II. Materials and Methods

a) *Kitchen cutting board*

The 12 kitchen vegetable cutting board and 12 kitchen meat cutting board prepared in the kitchen were stored in the sterilization storage the day before the start of cooking.

b) *ATP inspection procedure*

Each of the 24 cooks carried a kitchen cutting board for vegetables or meat at the start of their work and bring it to the cooking table. Before the education of hygiene, the work start time depends on the working conditions of the cooks. Still the inspector always performed an ATP inspection before using vegetables or meat with a kitchen cutting board. Then, each cook

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finished the work, washed the kitchen cutting board by himself, and they inspected the ATP inspection by the inspector again. The value of ATP recorded. In the same way, after the education of hygiene, the work start time depends on the working conditions of the cooks. Still the inspector always performed an ATP inspection before using vegetables or meat with a kitchen cutting board. Then, each cook finished the work, washed the kitchen cutting board by himself, and inspected the ATP inspection by the inspector again. The value of ATP recorded.

c) *Hygiene education procedure*

i. *Cleaning instruction*

While showing the ATP result before the hygiene education to the cook, ATP inspector washes the cutting board firmly with detergent and sponge, rinse with running water for 30 seconds or more. Then, the inspector repeated this process twice. The cook tries to do it as same as the inspector did. Then, the cook tries to do it next cooking. After the education of ATP value was scored.

ii. *Statistical processing*

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

III. Results

a) *Before hygiene education: Vegetable cutting board and meat cutting board*

Tables 1 and 2 show the results of ATP wiping tests on cutting board for vegetables and meat before hygiene education. It can see that the average value of the ATP values measured after washing before and after cleaning, this data is significantly lowers the ATP value. However, even after washing, the ATP value did not drop below 100 for both vegetables and meat.

Table 1: ATP test result of the vegetable cutting board before cleaning instruction

Vegitable cutting board	before cleaning instruction	
	before	after
Ctting board 1	522	219
Ctting board 2	1234	20
Ctting board 3	1447	22
Ctting board 4	1548	30
Ctting board 5	1771	34
Ctting board 6	1154	18
Ctting board 7	201	146
Ctting board 8	230	194
Ctting board 9	516	128
Ctting board 10	1315	216
Ctting board 11	1554	30
Ctting board 12	1941	646
Average	1119.42	141.917
Standard deviatic	602.085	178.313
Median	1274.5	81
Maximum	1941	646
Minimum	201	18

Table 2: ATP test result of the meat cutting board before cleaning instruction

Meat cutting board	before cleaning instruction	
	before	after
Ctting board 1	798	131
Ctting board 2	928	31
Ctting board 3	1091	590
Ctting board 4	1239	617
Ctting board 5	1290	34
Ctting board 6	2613	51
Ctting board 7	528	404
Ctting board 8	578	379
Ctting board 9	682	127
Ctting board 10	964	73
Ctting board 11	2220	2781
Ctting board 12	869	281
Average	1150	458.25
Standard deviatio	642.163	761.099
Median	946	206
Maximum	2613	2781
Minimum	528	31

b) *After hygiene education: Vegetable cutting board and meat cutting board*

Tables 3 and 4 show the results of ATP wiping tests on cutting board for vegetables and meat after hygiene education. It can see that the average value of the ATP values measured after washing before and after cleaning, this data is significantly lowers the ATP value. After washing, the ATP value was drop below 100 for both vegetables and meat. Both the cutting boards was very hygienic.

Table 3: ATP test result of the meat vegetable cutting board after cleaning instruction

Vegitable cutting board	after cleaning instruction	
	before	after
Ctting board 1	566	15
Ctting board 2	116	239
Ctting board 3	1147	121
Ctting board 4	224	60
Ctting board 5	1228	25
Ctting board 6	359	75
Ctting board 7	1338	8
Ctting board 8	1323	38
Ctting board 9	1663	60
Ctting board 10	1382	108
Ctting board 11	444	158
Ctting board 12	165	133
Average	829.583	86.6667
Standard deviatio	565.556	68.1767
Median	856.5	67.5
Maximum	1663	239
Minimum	116	8

Table 4: ATP test result of the meat cutting board after cleaning instruction

Meat cutting board	after cleaning instruction	
	before	after
Ctting board 1	282	76
Ctting board 2	283	33
Ctting board 3	404	6
Ctting board 4	1451	10
Ctting board 5	546	29
Ctting board 6	565	51
Ctting board 7	167	28
Ctting board 8	1573	51
Ctting board 9	247	146
Ctting board 10	1527	69
Ctting board 11	900	436
Ctting board 12	465	89
Average	700.833	85.3333
Standard deviatio	528.527	116.985
Median	505.5	51
Maximum	1573	436
Minimum	167	6

IV. Statistical Processing Results

a) *Comparison of ATP test values of vegetable and meat cutting boards: before and after education*

Before and after hygiene education, the results of the ATP wiping test on vegetable and meat cutting boards statistically compared. The results shown in Tables 5 and 6. There was a statistically significant difference in the ATP wiping test values after hygiene education for the cutting board for vegetables and meat. Although there was a statistically significant difference even before hygiene education, the ATP wiping test values for vegetables and meat was not less than 100, so it can say that hygiene is still insufficient.

Table 5: Statistical comparison results : ATP test results of vegetable cutting board before and after cleaning instruction

Vegitable cutting board	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average ± Standard deviation	1119.4±602.1	141.9±178.3	829.6±565.6	86.7±68.2
F test	p =0.0001**		p =0.0001**	
Student-t test				
Wilcoxon test	p =0.002*		p =0.004**	

* =p<0.05 , ** =p <0.01

Table 6: Statistical comparison results : ATP test results of meat cutting board before and after cleaning instruction

Meat cutting board	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average ± Standard deviation	1150.0±642.2	458.3±761.1	700.8±528.5	85.3±117.0
F test	p =0.283		p =0.0001**	
Student-t test	p =0.008**			
Wilcoxon test			p =0.002**	

* =p<0.05 , ** =p <0.01

V. Discussion

The ATP wiping test reveals the ATP value within 1 minute, and it is possible to know the number of invisible bacteria[6,7]. For a reason, it used in facilities such as hospitals that require hygiene management[8], this time, focusing on the cutting board of the kitchen. We conducted an ATP wiping test, the ATP values measured before washing and after washing after cooking. Before hygiene education, ATP values for vegetables and meat decreased after washing but did not fall below 100. However, after the hygiene education of washing the cutting board twice, the ATP value was less than 100 when washed, and it was clean. The important thing is that the cutting board is filed with various food material many times a day, so it is necessary to clean it every time. However, since microorganisms are invisible, there is a risk of neglecting cleaning. It is time-consuming to wash twice in busy work, but it is necessary to do it. According to the Japanese Ministry of Health, Labor, and Welfare, the number of food poisoning cases was 1330 in FY2019, the number of patients was 17,282, of which 3 were fatal cases. The breakdown of the number of patients due to food poisoning by the facility was the top three, with 50.4% for restaurants 16.0% for caterers and 11.7%for business establishments. But the hospitals was 0.6%. Since food poisoning will cause many patients to occur once, it is necessary to pay close attention to hygiene management. Since hygiene education by the ATP wiping test is useful, it is need to carry out regular inspections and call attention.

VI. Conclusions

Using the ATP wipe test, the effects of hygiene education were compared by ATP value on the cutting boards, which are likely to cause secondary contamination from various foods in the kitchen. Each of the 24 cooks carried a kitchen cutting board for vegetables or meat at the start of their work and prepare it to the cooking table. The inspector conducted an ATP wipe inspection on the cutting boards for vegetables and meat. The ATP values of the cutting board washed before and after cooking before hygiene education were compared. There was a statistically significant difference even before hygiene education, the ATP wiping test values for vegetables and meat was not less than 100, so it can say that hygiene is still insufficient. The cook learned how to wash the hygienic cutting board twice according to the instructions of the auditor, and cooked again. Then, the inspector again inspected the cutting board. The results, there was a statistically significant difference in the ATP wiping test values after hygiene education for the cutting board for vegetables and meat. After washing, the ATP value was drop below 100 for both vegetables and meat. Both the cutting boards was very hygienic. It found that hygiene education for preventing food poisoning in the kitchen can effectively performed by making invisible bacteria visible numerically as the ATP value by the ATP wiping test.

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