Volume 20 Issue 28
Originally issued as K5

Global Journal of Medical Research: K
Interdisciplinary
Volume 20 Issue 5 Version 1.0 Year 2020
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Results of Hygiene Education of Kitchen Knife by using ATP Inspection - Comparison of Handle and Blade

By Naomi Katayama, Akemi Ito, Mayumi Hirabayashi, Shoko Kondo, Yui Nakayama, Ayari Naka, Natuki Sasaki, Moe Inuzuka & Takashi Tamura

Nagoya Women's University

Abstract- In Japan, the number of food poisoning cases and the number of patients have been gradually decreasing in the last ten years. However, from the Japanese Ministry of Health, Labor and Welfare, the number of bacterial food poisoning cases has been approximately 41% of the total number in the past five years, which is still high. Therefore, in this study, to prevent food poisoning, we conducted hygiene education using the ATP test and confirmed the educational effect by comparing before and after education. ATP luminescence kit (Lumitester PD-10, LuciPac Pen) manufactured by Kikkoman Corporation used for the microbiological test. Before the hygiene education, the ATP of the knife handle, and the ATP of the knife blade measured before and after cooking. Twelve knives for vegetables and 12 knives for meat targeted. Before the hygiene education, the handle and the blade of the meat knife measured of ATP, that before cooking and washed after cooking. Further, the handle and blade of the kitchen knife for vegetables were also measured for ATP in the same manner as the knife for meat.

Keywords: gender; ATP test, the handle of the knife, the blade of the knife, hygiene education, double wash.

GJMR-K Classification: NLMC Code: WA 4

RESULTSOFHYGIENEEDUCATIONOFKITCHENKNIFEBYUSINGATPINSPECTIONCOMPARISONOFHANDLEANDBLADE

Strictly as per the compliance and regulations of:

© 2020. Naomi Katayama, Akemi Ito, Mayumi Hirabayashi, Shoko Kondo, Yui Nakayama, Ayari Naka, Natuki Sasaki, Moe Inuzuka & Takashi Tamura. This is a research/review paper, distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License http://creativecommons.org/licenses/by-nc/3.0/), permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Results of Hygiene Education of Kitchen Knife by using ATP Inspection - Comparison of Handle and Blade

Naomi Katayama [α], Akemi Ito [σ], Mayumi Hirabayashi [ρ], Shoko Kondo [ω], Yui Nakayama [¥], Ayari Naka [§], Natuki Sasaki [χ], Moe Inuzuka [ν] & Takashi Tamura [Θ]

Abstract- In Japan, the number of food poisoning cases and the number of patients have been gradually decreasing in the last ten years. However, from the Japanese Ministry of Health, Labor and Welfare, the number of bacterial food poisoning cases has been approximately 41% of the total number in the past five years, which is still high. Therefore, in this study, to prevent food poisoning, we conducted hygiene education using the ATP test and confirmed the educational effect by comparing before and after education. ATP luminescence kit (Lumitester PD-10, LuciPac Pen) manufactured by Kikkoman Corporation used for the microbiological test. Before the hygiene education, the ATP of the knife handle, and the ATP of the knife blade measured before and after cooking. Twelve knives for vegetables and 12 knives for meat targeted. Before the hygiene education, the handle and the blade of the meat knife measured of ATP, that before cooking and washed after cooking. Further, the handle and blade of the kitchen knife for vegetables were also measured for ATP in the same manner as the knife for meat. As a result, the ATP value was higher than that before cooking even though both the handles and blades of vegetable and meat knives washed after cooking. After the hygiene education, the handle and blade of the meat knife were measured of ATP, that before cooking and washed after cooking. Further, the handle and the blade of the kitchen knife for vegetables also measured for ATP in the same manner as the knife for meat. As a result, the ATP value was statistically significantly lower than that before cooking by cleaning the handle and blade of both knives after cooking. However, even after the hygiene education, the handle of the meat knife did not have an ATP value of less than 100. It has found that the handle of meat knives needs to be given a more thorough hygiene education before cooking to thoroughly washing.

Keywords: gender; ATP test, the handle of the knife, the blade of the knife, hygiene education, double wash.

Corresponding Author α: Nagoya Women's University, Nagoya City, Japan, Graduate School of Nagoya Women's University, Nagoya City, Japan, Department of Otorhinolaryngology, Nagoya University Graduate School of Medicine, Nagoya, Japan. e-mail: naomik@nagoya-wu.ac.jp
Author σ ρ: Graduate School of Nagoya Women's University, Nagoya City, Japan.
Author ω: Watanabe Hospital, Mihama town, Noma, Aichi, Japan.
Author ¥: Nagoya cooking School, Nagoya, Aichi, Japan.
Author § χ ν Θ: Nagoya Women's University, Nagoya City, Japan.

I. Introduction

In Japan, the number of food poisoning cases and the number of patients have been gradually decreasing in the last ten years (2009-2018). The reduction of bacterial food poisoning is implementation. Thorough hygiene management at food manufacturing plants is carried out and increased awareness of hygiene, such as hand washing at home. According to statistical data on food poisoning from the Japanese Ministry of Health, Labor and Welfare, the number of bacterial food poisoning cases has been approximately 41% of the total number in the past five years, which is still high (2014-2018). Some hospitals have already conducted hygiene tests using ATP test kits, and the results have been reported[1,2]. Throughout the hospital, surface wiping test using ATP test kits have shown effectiveness in hygiene education. Because microorganisms are invisible, it is hard to work hygienically. However, the hygiene test using the ATP test kit allows seeing the number of bacteria with our eye, thus improving the hygiene condition on the spot. The control of microorganisms at the cooking site is becoming more and more stringent due to the need to comply with HACCP[3,4]. Japan is a super-aged society. Therefore, there is a need for hygiene management and hygiene education in nursing homes. Especially, hygiene education for cooks in the kitchen emphasized. Reports on educational achievements have also made in recent years[5]. Therefore, in this study, using the ATP test kit, we focused on the kitchen knife most touched by the cooks in the kitchen before and after the hygiene education. The inspection results obtained for both the kitchen knife handle and blade, and for both vegetables and meat.

II. Materials and Methods

a) *Kitchen knife*

The 12 kitchen vegetable knives and 12 kitchen meat knives 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 knife for vegetables or meat at the start of their work and bring it

© 2020 Global Journals

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 knife. Then, each cook finished the work, washed the kitchen knife 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 knife. Then, each cook finished the work, washed the kitchen knife by himself, and they 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 wash both the knife handle and the blade firmly with detergent and sponge, wash with water for 30 seconds or more. Then, the inspector washes again both the knife handle and the blade carefully with detergent and sponge, and rinse again with water for 30 seconds or more. The cook tries to do it as same as the inspector dose. Then, the cook tries to do it next cooking. That ATP result of the after education recorded.

ii. *Statistical processing*

The results obtained compared using statistical methods. The compared data 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) Meat knife: ATP results of before hygiene education

i. *Meat knife handle and blade*

The ATP inspection result of the knife handle and blade before hygiene education shown in Table 1 and Table 2. Despite the completion of cooking and washing, the knife blade had a higher ATP average value than before using it. Since both ATP data did not fall below 100 even after cleaning, it can see that self-flow is insufficient for washing.

Table 1: ATP test result of the meat knife handle before cleaning instruction

Meat knife handle	before cleaning instruction	
	before	after
Handle 1	22	550
Handle 2	222	576
Handle 3	16464	706
Handle 4	4268	731
Handle 5	6438	783
Handle 6	723	845
Handle 7	4769	980
Handle 8	1335	1219
Handle 9	1407	2432
Handle 10	581	2438
Handle 11	5448	3084
Handle 12	4807	8123
Average	3873.6667	1872.25
Standard deviati	4581.2532	2147.5009
Median	2837.5	912.5
Maximum	16464	8123
Minimum	22	550

Table 2: ATP test result of the meat knife blade before cleaning instruction

Meatknife blade	before cleaning instruction	
	before	after
Blade 1	52	71
Blade 2	0	90
Blade 3	61	91
Blade 4	84	170
Blade 5	48	291
Blade 6	400	322
Blade 7	116	433
Blade 8	48	610
Blade 9	1982	924
Blade 10	101	1208
Blade 11	40	1468
Blade 12	5	11680
Average	244.75	1446.5
Standard deviatior	557.010221	3255.4904
Median	56.5	377.5
Maximum	1982	11680
Minimum	0	71

© 2020 Global Journals

b) Meat knife: ATP results of after hygiene education

i. *Meat knife handle and blade*

The ATP inspection result of the kitchen meat knife handles and blade after hygiene education shown in Table 3 and Table 4. Meat knives after hygiene education had lower average ATP values for both handle and blade than before cooking. In particular, the knife blade had an ATP value of less than 100. It cleaned well.

Table 3: ATP test result of the meat knife handle after cleaning instruction

Meat knife handle	after cleaning instruction	
	before	after
Handle 1	2	13
Handle 2	436	37
Handle 3	38	38
Handle 4	81	39
Handle 5	45	61
Handle 6	146	61
Handle 7	4642	66
Handle 8	2045	94
Handle 9	1221	97
Handle 10	61	158
Handle 11	887	363
Handle 12	3546	540
Average	1095.8333	130.5833
Standard devia	1549.1016	159.0469
Median	291	63.5
Maximum	4642	540
Minimum	2	13

Table 4: ATP test result of the meat knife blade after cleaning instruction

Meat knife blade	after cleaning instruction	
	before	after
Blade 1	9	0
Blade 2	28	6
Blade 3	232	6
Blade 4	232	6
Blade 5	332	6
Blade 6	49	11
Blade 7	804	13
Blade 8	208	28
Blade 9	208	28
Blade 10	2994	46
Blade 11	155	55
Blade 12	104	68
Average	446.25	22.75
Standard deviatio	829.19952	22.474733
Median	208	12
Maximum	2994	68
Minimum	9	0

c) Vegetable knife: ATP results of before hygiene education

i. *Vegetable knife handle and blade*

The ATP inspection result of the kitchen vegetable knife handles and blade before hygiene education shown in Table 5 and Table 6. Despite cleaning after cooking, the knife handle had a higher average ATP value than before cooking. It turned out that self-washing was not hygienic. The knife blade after cleaning was lower than that before cooking, but it did not fall below 100. It is not thoroughly washed.

Table 5: ATP test result of the vegetable knife handle before cleaning instruction

Vegitable knife handle	before cleaning instruction	
	before	after
Handle 1	343	248
Handle 2	88	324
Handle 3	575	424
Handle 4	472	545
Handle 5	867	559
Handle 6	1352	763
Handle 7	4119	903
Handle 8	2581	1210
Handle 9	569	1769
Handle 10	98	3002
Handle 11	402	6856
Handle 12	5163	19136
Average	1385.75	2978.25
Standard deviatior	1678.5821	5416.3923
Median	572	833
Maximum	5163	19136
Minimum	88	248

Table 6: ATP test result of the vegetable knife blade before cleaning instruction

Vegetable knife blade	before cleaning instruction	
	before	after
Blade 1	71	49
Blade 2	84	57
Blade 3	96	59
Blade 4	85	124
Blade 5	38	142
Blade 6	219	159
Blade 7	9	201
Blade 8	19	238
Blade 9	17942	239
Blade 10	68	800
Blade 11	205	1072
Blade 12	135	3582
Average	1580.9167	560.166667
Standard deviation	5152.8196	1003.56572
Median	84.5	180
Maximum	17942	3582
Minimum	9	49

© 2020 Global Journals

d) Vegetable knife: ATP results of after hygiene education

Vegetable knife handle and blade

The ATP inspection result of the kitchen vegetable knife handle and blade after hygiene education shown in Table 7and Table 8.

Vegetable knives after hygiene education had lower average ATP values for both handle and blade than before cooking. In particular, both knife handle and blade had an ATP value of less than 100. It was cleaned well more than a meat knife.

Table 7: ATP test result of the vegetable knife handle after cleaning instruction

Vegitable knife handle	after cleaning instruction	
	before	after
Handle 1	6	7
Handle 2	33	10
Handle 3	404	33
Handle 4	712	43
Handle 5	2741	53
Handle 6	63	65
Handle 7	892	92
Handle 8	28	100
Handle 9	56	103
Handle 10	10865	110
Handle 11	1190	126
Handle 12	814	192
Average	1483.667	77.83333
Standard deviation	3055.541	53.37489
Median	558	78.5
Maximum	10865	192
Minimum	6	7

Table 8: ATP test result of the vegetable knife blade after cleaning instruction

Vegetable knife blade	after cleaning instruction	
	before	after
Blade 1	222	4
Blade 2	222	4
Blade 3	42	5
Blade 4	427	6
Blade 5	202	9
Blade 6	103	14
Blade 7	138	17
Blade 8	138	17
Blade 9	51	29
Blade 10	68	31
Blade 11	185	31
Blade 12	93	48
Average	157.583333	17.9166667
Standard deviation	106.289021	14.0224387
Median	138	15.5
Maximum	427	48
Minimum	42	4

IV. Statistical Processing Results

a) Comparison of ATP test values of meat knife handle: before and after education

The results of the statistical comparison of meat knife handle before and after hygiene education shown in Table 7. It can be seen that, in the handle of the meat knife, there is no statistically significant difference in self-washing between before cooking and the cleaning of after cooking. However, there was a statistically significant difference in ATP test values between before cooking and the cleaning after cooking after hygiene education.

Table 7: Statistical comparison results : ATP test results of Meat knife handle before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	3873.7	1872.3	1095.8	130.6
Standard deviation	4581.3	2147.5	1549.1	159.0
F test	p = 0.007 * *		p = 0.0001 * *	
Student-t test				
Wilcoxon test	p = 0.388		p = 0.028 *	

* P<0.05, ** P<0.01

b) Comparison of ATP test values of meat knife blade: before and after education

The results of the statistical comparison of the meat knife blade before and after hygiene education shown in the Table 8. Both before and after hygiene education, the knife blades washed before and after cooking had a statistically significantly lower ATP value. However, the ATP value shows that the cleaning effect is more effective after hygiene education.

© 2020 Global Journals

Table 8: Statistical comparison results : ATP test results of Meat knife blade before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	244.8	1446.5	446.3	22.8
Standard deviation	557.0	3255.5	829.2	22.5
F test	p = 0.0001 * *		p = 0.0001 * *	
Student-t test				
Wilcoxon test	p = 0.034 *		p = 0.002 * *	

* P<0.05, ** P<0.01

c) *Comparison of ATP test values of the vegetable knife handle: before and after education*

The results of the statistical comparison of vegetable knife handle before and after hygiene education shown in the Table 9. It can see that, in the handle of the vegetable knife, there is no statistically significant difference in self-washing between before cooking and the cleaning of after cooking. However, there was a statistically significant difference in ATP test values between before cooking and the cleaning of after cooking after hygiene education. In particular, after hygiene education, the knife handle had an ATP value of less than 100. It cleaned well more than before cooking.

Table 9: Statistical comparison results : ATP test results of vegetable knife handle before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	1385.8	2978.3	1483.7	77.8
Standard deviation	1678.6	5416.4	3055.5	53.4
F test	p = 0.007 * *		p = 0.0001 * *	
Student-t test				
Wilcoxon test	p = 0.695		p = 0.034 *	

* P<0.05, ** P<0.01

d) *Comparison of ATP test values of vegetable knife blade: before and after education*

The results of the statistical comparison of vegetable knife blade before and after hygiene education shown in the Table 10. It can be seen that, in the blade of the vegetable knife, there is no statistically significant difference in self-washing between before cooking and the cleaning after cooking. However, there was a statistically significant difference in ATP test values between before cooking and the cleaning of after cooking after hygiene education. In particular, after hygiene education, the knife handle had an ATP value of less than 100 (less than 20). It cleaned well more than before cooking.

Table 10: Statistical comparison results : ATP test results of vegetable knife blade before and after cleaning instruction

	before cleaning instrucion		after cleaning instruction	
	before cooking	after cooking	before cooking	after cooking
Average	1580.9	560.2	157.6	17.9
Standard deviation	5152.8	1003.6	106.3	14.0
F test	p = 0.0001 * *		p = 0.0001 * *	
Student-t test				
Wilcoxon test	p = 0.209		p = 0.002 * *	

* P<0.05, ** P<0.01

© 2020 Global Journals

V. Discussion

Hygiene control points that should observed at the cooking site are three principles to prevent food poisoning: to prevent bacterial, to be fussy, and to kill. In this study, bacteria that cannot see with the naked eye are expressed by visible numbers by detecting ATP[6], and by providing hygiene education, it becomes possible to handled knives most accessible to humans in a hygienic manner. The ATP wiping test has been widely used for hygiene management in hospitals and has produced results[7]. Even during cooking, it expected that the hygiene education effect will be high because the bacteria test result can show to the cook as an ATP value within one minute[8]. This time, 24 cooks had kitchen knives for vegetables and meat and had the inspectors measure the ATP value after cleaning the knives before and after cooking. As a result, when the cooks washed their kitchen knives, the ATP value could be lower or higher, and there was no statistically significant difference in the handle of the knives. While showing the results to the cooks on the spot, they showed how to wash the kitchen knife handle and blade with a detergent, and repeated the method of cleaning with running water for 30 seconds twice. After this hygiene education, the cook again cooked using the same kitchen knife and asked the inspector to perform an ATP inspection on the kitchen knife that had washed before and after cooking. After the hygiene education, the handle and blade of vegetables knives and the handle and blade of meat knives all had statistically significantly lowered ATP values, and hygienic cleaning was possible. However, since the handle of the kitchen knife for meat did not have an ATP value of less than 100 even after washing, it was found that more careful washing is necessary. Further guidance to cook is needed.

VI. Conclusions

The purpose was to utilize the ATP test, which used for hygiene tests in hygiene education in the kitchen. An ATP wiping test performed on the kitchen knife handle and blade. Comparison of ATP test values before and after hygiene education in both meat and vegetable knives. As a result of averaging 12 ATP values for each data, and comparing them, before hygiene education, before and after cooking, we compared the handle of the kitchen knife and the blade of it, but it is not said that sufficient cleaning can done. However, after the hygiene education, the handle and blades of knives had a statistically significant lower ATP value than the handle and blades of knives, which had washed after cooking. However, the handle of the meat knife had a higher ATP value than the blade, and it did not become less than 100. On the other hand, the kitchen knife for vegetables has an ATP value of 100 or less after washing both the handle and the blade after hygiene education, confirming the sufficient washing effect. It found that the knife for meat needs to politely washed more politely than the vegetable knife. Cautions in future hygiene education.

Acknowledgments

We would like to thank all the cooks who participated in this experiment. Also, we would like to thank the inspectors who also performed the ATP inspection.

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 for the deteminaton of surface cleanliness at a hospital kitchen. (2006). Int J Hyg Environ Health. 209(2): 203-206.
4. Osimani A, Garofalo C, Clementi F, Tavoletti S, Aquilanti L. Bioluminescence ATP monitoring for the routine assessment of 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. 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
8. Stannard CJ, Gibbs PA. Rapid microbiology: application s of bioluminescence in the food industry—a review. (1986) J Biolumin Chemilumin 1(1): 3-10.

© 2020 Global Journals