สถาบันอาหาร
กระทรวงอุตสาหกรรม

PROFICIENCY TESTING

LABORATORY ACCREDITATION
BLA-DSS

PTP
No.0002

Microbiological Analysis

NFI-PTM 02-2019: Detection of *Vibrio cholerae* (per 25 g) in Lyophilized Cultures

January 2019

LABORATORY SERVICES DEPARTMENT

national food institute
ministry of industry

Proficiency Testing Report

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SUMMARY

This summarizes the microbiological proficiency testing program of NFI-PTM 02-2019: Detection of *Vibrio cholerae* (per 25 g) in Lyophilized Cultures. There were 126 laboratories participating in this program. The test materials were quality controlled to ensure that consistent levels were achieved throughout the batch by conducting homogeneity test prior to dispatch. Stability testing was conducted at the end of shelf life which was the deadline for all laboratories to run the test – to ensure the integrity of the test materials.

The participant's results were 126 laboratories which were assessed by comparison with assigned values for performance evaluation for each laboratory. The assigned values were assigned as positive or negative by homogeneity testing's result. Each laboratory received 2 samples for testing. For criterion of laboratory performance evaluation, laboratory attained satisfactory performance if both sample's results complied with the assigned values.

The overall competency evaluation was that there were 122 laboratories (96.8%) attained satisfactory performance while 4 laboratories (3.2%) received not satisfactory performance.

This proficiency testing program accomplished with smooth operation as expected, and every participating laboratory benefits and acquires valuable information for advancement whatever the performance result is.

1. INTRODUCTION

1.1 Proficiency Testing

Proficiency testing (PT) is a valuable tool for quality assurance of testing and measurement. It is a requirement of accreditation to ISO/IEC 17025 that laboratories take part in proficiency testing schemes. PT involves the use of interlaboratory comparisons for determination of laboratory performance with the purpose of producing laboratory results of greater reliability. Whatever the performance result is, every participating laboratory benefits and acquires valuable information for further advancement in all degree of their current performance.

For the improvement and satisfaction to the requirement of ISO/IEC 17025 of laboratories, hence the Division of Proficiency Testing Laboratory, Department of Laboratory Services, National Food Institute (NFI) provides PT program to follow the international standard ISO/IEC 17043: 2010, Conformity Assessment – General Requirements for Proficiency Testing. This program was named "Microbiological Analysis NFI-PTM 02-2019: Detection of *Vibrio cholerae* (per 25 g) in Lyophilized Cultures" with the focus on *Vibrio cholerae* since it is one of the important pathogenic bacteria on food safety monitoring program.

To ensure performance confidentiality of all participants, a series of Laboratory Number is used in place of participant's name. A unique Laboratory Number is assigned to each laboratory.

NFI offers Internet access for proficiency testing at 'http://pt.nfi.or.th' for fast, convenient and easy access for participants to register, submit form/ data/ test result/ request, view other information, and communicate with the provider. All participants are encouraged to utilize all on-line features and more for complete and clear action for their own advantage.

1.2 *Vibrio cholerae*

Vibrio cholerae is Gram-negative, comma-shaped bacterium. Some strains of *V. cholera* cause the disease cholera. *V. cholerae* is facultative anaerobic and has a single polar flagellum when grown in liquid medium. It can produce oxidase and catalase, and ferment glucose without producing gas. *V. cholerae* pathogenicity genes code for proteins directly or indirectly involved in the virulence of the bacteria. During infection, *V. cholerae* secretes cholera toxin, a protein that causes diarrhea.

2. TEST MATERIALS

2.1 Sample Preparation

Test materials were produced in glass vials by adding 1-milliliter solution of skim milk and microorganisms of either (1) target microorganism and background flora, or (2) only background flora (as shown in Table 1). After freeze drying, the vials were then sealed with rubber cap topped with aluminium-crimp seal. Each was labeled with ID numbers and stored at 2-8°C for homogeneity test and further steps. The test material per vial was equivalent to 100 grams of initial sample after adding 100 milliliters of 0.85% NaCl and mixing well to rehydrate the sample before laboratory testing.

The test materials were labeled in two sets:

1. Positive sample set was labeled with a serial sample code of "A 281 up to A 300" and "B 151 up to B 280".
2. Negative sample set was labeled with a serial sample code of "A 001 up to A 130" and "B 131 up to B 150".

Table 1 Target microorganism and background flora

Test Material	Target Microorganism	Background Flora
Positive Sample	- *Vibrio cholerae* non O1, non O139 (DMST 2873) (contamination level about 3 CFU/g)	- *Vibrio parahaemolyticus* (DMST 21243) (contamination level about 40 CFU/g) - *Enterococcus faecalis* (DMST 4736) (contamination level about $7.3x10^2$ CFU/g)
Negative Sample	None	- *Vibrio parahaemolyticus* (DMST 21243) (contamination level about 40 CFUg) - *Enterococcus faecalis* (DMST 4736) (contamination level about $8.2x10^2$ CFU/g)

2.2 Homogeneity

To insure that consistent levels of organisms were achieved throughout the batch of test materials, homogeneity test was conducted on 8 January 2019 for the negative sample and 9 January 2019 for the positive sample. The random number generator from the website 'random.org' was used to randomize the order of the samples. Ten out from each set of the positive and negative samples were randomly picked for homogeneity test by carrying out detection of *V. cholerae* per 25 g prior to dispatch. The homogeneity data were shown in Table 3 and 4 in the Appendix.

2.3 Stability

To ensure the constancy of the test, materials not being diminished over time and the transport effect, stability testing was conducted at the end of shelf life. Therefore, five sets of the test materials of positive sample at NFI were packaged using the same types of materials (boxes, ice packs, etc.) and conditions (temperature, length of time, etc.) as those delivered; leaving the selected-randomly sample in the box for 24 hours, and then keeping at 2-8°C until the final test or after this date. On 31 January 2019, the test materials were examined for detection of *V. cholerae* per 25 g. The stability data were shown in Table 5 in the Appendix.

The work on homogeneity and stability tests was conducted by the supporting laboratory – Division of Microbiological Laboratory, National Food Institute (ISO/IEC 17025: 2005: DMSC Acc. No. 1005/42).

2.4 Sample Distribution

Upon completion of homogeneity test, foam boxes of test materials with ice packs, and documents were dispatched on 22 January 2019 to each participant by an express logistics company with 24-hour guaranteed delivery. Documents enclosed in the box were as follows:

1) Letter of Introduction
2) Test Instruction Sheet
3) Receipt Form
4) Results Form
5) Technical Form

6) On-line Instruction Sheet

Note:

- Filling on-line preferred for 3), 4) and 5).
- Using test methods (materials, procedures, conditions, etc.) consistent with each laboratory routine practice.
- Two vials of test material delivered for each participant.

Participants were required to report and submit their result of the test material as either 'Detected' or 'Not Detected' per 25 g by the closing date – "11 February 2019".

3. REPORTING

Having finished the testing, each participating laboratory, then submitted its test result by the closing date for the summary report to be made. All these data were compared with assigned values. The assigned values were assigned as positive or negative by homogeneity testing's result.

The summary results are given in Table 2. Technical data of methods used by each laboratory in relation to accreditation, reference, and others were summarized in Table 6 in the Appendix.

Interim report and final report could be uploaded to the website pt.nfi.or.th within two weeks and one month, respectively. After the closing date, while hard copies of interim and final report could be sent to participants with no Internet access by registered mail.

4. LABORATORY PERFORMANCE EVALUATION

This proficiency testing program is qualitative testing. The testing results of each laboratory were compared with assigned value for performance evaluation.

As for criterion of laboratory performance evaluation, laboratories attained satisfactory performance if only both sample's results complied with the assigned values.

5. REFERENCES

ISO/IEC 17043: 2010. Conformity assessment – general requirements for proficiency testing.

Charles, A. K. and A. DePaola, Jr. 1998. Chapter 9 – *Vibrio*, in the Bacteriological Analytical Manual – *Online* (May 2004), Food and Drug Administration. http://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm070830.htm (March 2019).

6. RESULTS

Table 2 Result summary of participants' performance evaluation for *V. cholerae* (per 25 g) in lyophilized cultures

Test Sample	*V. cholerae* (per 25 g)			Serological Test	
	A	B		A	B
Assigned Value	**Not Detected**	**Detected**		**-**	**non O1, non O139**
Laboratory Number	**Result**	**Result**	**Satisfactory/ Not Satisfactory**	**Result**	**Result**
1	Not Detected	Detected	S	-	-
2	Not Detected	Detected	S	-	-
3	Not Detected	Detected	S	-	-
4	Not Detected	Detected	S	-	-
5	Not Detected	Detected	S	-	nonO1 nonO139
6	Not Detected	Detected	S	-	-
7	Not Detected	Detected	S	-	-
8	Not Detected	Detected	S	-	-
9	Not Detected	Detected	S	-	nonO1/ nonO139
10	Not Detected	Detected	S	-	-
11	Not Detected	Detected	S	-	-
12	Not Detected	Detected	S	-	-
13	Not Detected	Detected	S	-	-
14	Not Detected	Detected	S	-	-
16	Not Detected	Detected	S	-	-
17	Not Detected	Detected	S	-	-
18	Not Detected	Detected	S	-	-
19	Not Detected	Detected	S	-	-
20	Not Detected	Detected	S	-	-
21	Not Detected	Detected	S	-	-
22	Not Detected	Detected	S	-	-
24	Not Detected	Detected	S	-	non O1, O139

Note: S indicates 'Satisfactory', and NS indicates 'Not Satisfactory'.
Serological test information was not considered here.

Table 2 Result summary of participants' performance evaluation for *V. cholerae* (per 25 g) in lyophilized cultures (continued)

Test Sample	*V. cholerae* (per 25 g)			Serological Test	
	A	B		A	B
Assigned Value	**Not Detected**	**Detected**		**-**	**non O1, non O139**
Laboratory Number	**Result**	**Result**	**Satisfactory/ Not Satisfactory**	**Result**	**Result**
25	Not Detected	Detected	S	-	O139
26	Not Detected	Detected	S	-	-
27	Not Detected	Detected	S	-	-
28	Not Detected	Detected	S	-	-
29	Not Detected	Detected	S	-	-
30	Detected	Not Detected	NS	-	-
31	Not Detected	Detected	S	-	-
32	Not Detected	Detected	S	-	Non 01 Non 0139
33	Not Detected	Detected	S	-	-
34	Not Detected	Detected	S	-	-
35	Not Detected	Detected	S	-	-
37	Not Detected	Detected	S	-	-
39	Not Detected	Detected	S	-	Non O1, Non O139
40	Not Detected	Detected	S	-	non01, non0139
41	Not Detected	Detected	S	-	-
42	Not Detected	Detected	S	-	-
43	Not Detected	Detected	S	-	nonO1, nonO139
44	Not Detected	Detected	S	-	-
45	Not Detected	Detected	S	*V. parahae molyticus*	*V. cholerae*, *V. parahae molyticus*

Note: S indicates 'Satisfactory', and NS indicates 'Not Satisfactory'.
Serological test information was not considered here.

Table 2 Result summary of participants' performance evaluation for *V. cholerae* (per 25 g) in lyophilized cultures (continued)

Test Sample	*V. cholerae* (per 25 g)			Serological Test	
	A	B		A	B
Assigned Value	**Not Detected**	**Detected**		**-**	**non O1, non O139**
Laboratory Number	**Result**	**Result**	**Satisfactory/ Not Satisfactory**	**Result**	**Result**
47	Not Detected	Detected	S	NT	NT
48	Not Detected	Detected	S	-	-
49	Not Detected	Detected	S	-	-
51	Not Detected	Detected	S	-	non 01, non 0139
52	Not Detected	Detected	S	-	-
53	Not Detected	Detected	S	-	non 01/139
54	Not Detected	Detected	S	-	-
55	Not Detected	Detected	S	non	non
56	Not Detected	Detected	S	-	-
58	Not Detected	Detected	S	-	non O1, non O139
59	Not Detected	Detected	S	-	-
61	Not Detected	Detected	S	-	nonO1, nonO139
63	Not Detected	Detected	S	-	-
64	Not Detected	Detected	S	-	nonO1
65	Not Detected	Detected	S	-	non O1 และ non O139
67	Not Detected	Detected	S	-	-
68	Not Detected	Detected	S	-	-
69	Not Detected	Detected	S	-	-
70	Not Detected	Detected	S	-	-
71	Not Detected	Detected	S	-	non O1/ non O139
72	Detected	Detected	NS	-	-
73	Detected	Not Detected	NS	-	-

Note: S indicates 'Satisfactory', and NS indicates 'Not Satisfactory'.
Serological test information was not considered here.

Table 2 Result summary of participants' performance evaluation for *V. cholerae* (per 25 g) in lyophilized cultures (continued)

Test Sample	*V. cholerae* (per 25 g)			Serological Test	
	A	B		A	B
Assigned Value	**Not Detected**	**Detected**		**-**	**non O1, non O139**
Laboratory Number	**Result**	**Result**	**Satisfactory/ Not Satisfactory**	**Result**	**Result**
74	Not Detected	Detected	S	-	-
75	Not Detected	Detected	S	Not test	Not test
77	Not Detected	Detected	S	-	-
78	Not Detected	Detected	S	-	non O1, non O139
79	Not Detected	Detected	S	-	-
81	Not Detected	Detected	S	negative	positive
82	Not Detected	Detected	S	-	nonO1, non0139
83	Not Detected	Detected	S	-	non 01, non 0139
84	Not Detected	Detected	S	-	-
85	Not Detected	Detected	S	-	nonO1 nonO139
86	Not Detected	Detected	S	-	-
87	Not Detected	Detected	S	-	-
88	Not Detected	Detected	S	-	-
89	Not Detected	Detected	S	-	*V. cholerae* non O139
90	Not Detected	Detected	S	-	-
91	Not Detected	Detected	S	-	Non O1 , O139
92	Not Detected	Detected	S	NA	NonO1, NonO139
93	Not Detected	Detected	S	-	-
94	Not Detected	Detected	S	-	-
95	Not Detected	Detected	S	-	-

Note: S indicates 'Satisfactory', and NS indicates 'Not Satisfactory'.
Serological test information was not considered here.

Table 2 Result summary of participants' performance evaluation for *V. cholerae* (per 25 g) in lyophilized cultures (continued)

	***V. cholerae* (per 25 g)**			**Serological Test**	
Test Sample	**A**	**B**		**A**	**B**
Assigned Value	**Not Detected**	**Detected**		**-**	**non O1, non O139**
Laboratory Number	**Result**	**Result**	**Satisfactory/ Not Satisfactory**	**Result**	**Result**
96	Not Detected	Detected	S	-	non O1, non O139
97	Not Detected	Detected	S	-	non O1 & O139
99	Not Detected	Detected	S	-	-
100	Not Detected	Detected	S	-	-
101	Not Detected	Detected	S	-	Non O1/ Non O139
102	Not Detected	Detected	S	-	nonO1/ nonO139
103	Not Detected	Detected	S	-	-
104	Not Detected	Detected	S	-	non O1, non O139
106	Not Detected	Detected	S	-	-
107	Not Detected	Detected	S	None	None
109	Not Detected	Detected	S	-	-
110	Not Detected	Detected	S	-	-
111	Not Detected	Detected	S	-	-
112	Not Detected	Detected	S	-	-
113	Not Submitted	Not Submitted	-	-	-
114	Not Detected	Detected	S	-	-
115	Not Detected	Detected	S	-	-
116	Detected	Not Detected	NS	-	-

Note: S indicates 'Satisfactory', and NS indicates 'Not Satisfactory'.
Serological test information was not considered here.

Table 2 Result summary of participants' performance evaluation for *V. cholerae* (per 25 g) in lyophilized cultures (continued)

Test Sample	*V. cholerae* (per 25 g)			Serological Test	
	A	B		A	B
Assigned Value	**Not Detected**	**Detected**		**-**	**non O1, non O139**
Laboratory Number	**Result**	**Result**	**Satisfactory/ Not Satisfactory**	**Result**	**Result**
117	Not Detected	Detected	S	-	-
118	Not Detected	Detected	S	-	-
119	Not Detected	Detected	S	-	-
120	Not Detected	Detected	S	-	-
121	Not Detected	Detected	S	-	-
122	Not Detected	Detected	S	-	-
123	Not Detected	Detected	S	-	-
124	Not Detected	Detected	S	-	-
125	Not Detected	Detected	S	-	-
126	Not Detected	Detected	S	-	-

Note: S indicates 'Satisfactory', and NS indicates 'Not Satisfactory'.
Serological test information was not considered here.

Table 2 Result summary of participants' performance evaluation for *V. cholerae* (per 25 g) in lyophilized cultures (continued)

	***V. cholerae* (per 25 g)**			**Serological Test**	
Test Sample	**A**	**B**		**A**	**B**
Assigned Value	**Detected**	**Not Detected**		**non O1, non O139**	**-**
Laboratory Number	**Result**	**Result**	**Satisfactory/ Not Satisfactory**	**Result**	**Result**
15	Detected	Not Detected	S	-	-
23	Detected	Not Detected	S	-	-
36	Detected	Not Detected	S	-	-
38	Detected	Not Detected	S	-	-
46	Detected	Not Detected	S	-	-
50	Detected	Not Detected	S	-	-
57	Detected	Not Detected	S	non O1/ non O139	-
60	Detected	Not Detected	S	non O1, non O139	-
62	Detected	Not Detected	S	nonO1 nonO139	no test
66	Detected	Not Detected	S	-	-
76	Detected	Not Detected	S	-	-
80	Detected	Not Detected	S	-	-
98	Detected	Not Detected	S	nonO1/ nonO139	-
105	Detected	Not Detected	S	-	-
108	Detected	Not Detected	S	-	-

Note: S indicates 'Satisfactory', and NS indicates 'Not Satisfactory'.
Serological test information was not considered here.

7. METROLOGICAL TRACEABILITY

The provider requires participants to report their test results in Detected/ Not Detected. The traceability of a measurement result in microbiological testing as made available from standard method and reference strains of microorganisms obtained directly from a recognized national or international culture collection.

The laboratory shall have a program for calibrating, verifying the performance of all critical equipment and certified reference standards, traceable to national standards.

8. TECHNICAL COMMENTS

Participants having not satisfactory performance are recommended to find errors and correct them. For this proficiency testing program, there are two main viewpoints to be considered by those in need of improvement:

8.1 Sample identification and the data transfer

For the laboratory No. 30, 73 and 116 must be careful not to mixing up the two test materials during the testing process, and data transfer; ensure complete traceability and sample-tracking system.

8.2 Analytical technique

For the laboratory No. 72 must be careful to all details in the testing process, such as enrichment, plating, screening, confirming, and biochemical test. Furthermore, high attention must be careful contaminated between two samples that it shows false positive.

NFI is pleased to provide further detail, and welcome any discussion regarding the proficiency testing.

9. CONTACT DETAILS

Upon receiving the final report, if there is any question, complaint and appeal regarding the proficiency testing assessment incurs, written notification should be submitted to the project coordinator within thirty day by one of the following channels:

Mail: Miss Tanaporn Borisut (Project coordinator)
Division of Proficiency Testing Laboratory,
Department of Laboratory Services, National Food Institute,
2008 Soi Arun Ammarin 36, Arun Ammarin Rd., Bangyeekhan, Bangphlat, Bangkok 10700 THAILAND.

Fax number: 0 2422 8554

E-mail: pt@nfi.or.th

Website: Contact-Us Form at http://pt.nfi.or.th

10. APPENDIX

Table 3 Homogeneity data of positive sample

Sample No.	*V. cholerae* Results (per 25 g)	Serological Test
1	Detected	non O1, non O139
2	Detected	non O1, non O139
3	Detected	non O1, non O139
4	Detected	non O1, non O139
5	Detected	non O1, non O139
6	Detected	non O1, non O139
7	Detected	non O1, non O139
8	Detected	non O1, non O139
9	Detected	non O1, non O139
10	Detected	non O1, non O139

Note: FDA-BAM *Online*, 2004 (Chapter 9)

Table 4 Homogeneity data of negative sample

Sample No.	*V. cholerae* Results (per 25 g)	Serological Test
1	Not Detected	-
2	Not Detected	-
3	Not Detected	-
4	Not Detected	-
5	Not Detected	-
6	Not Detected	-
7	Not Detected	-
8	Not Detected	-
9	Not Detected	-
10	Not Detected	-

Note: FDA-BAM *Online*, 2004 (Chapter 9)

Table 5 Stability data of positive sample

Sample No.	*V. cholerae* Results (per 25 g)	Serological Test
1	Detected	non O1, non O139
2	Detected	non O1, non O139
3	Detected	non O1, non O139
4	Detected	non O1, non O139
5	Detected	non O1, non O139

Note: FDA-BAM *Online*, 2004 (Chapter 9)

Table 6 Technical information in relation to the methods

Accredited	Laboratory Number
Yes	1 3 5 9 12 20 21 22 23 24 34 36 37 38 39 41 45 46 47 50 51 53 54 55 56 57 61 62 63 65 66 68 71 73 75 77 78 80 82 85 86 88 92 95 96 97 98 101 102 103 104 106 108 112 119 122 124
No	2 4 6 7 8 10 11 13 14 15 16 17 18 19 25 26 27 28 29 30 31 32 33 35 40 42 43 44 48 49 52 58 59 60 64 67 69 70 72 74 76 79 81 83 84 87 89 90 91 93 94 99 100 105 107 109 110 111 114 115 116 117 118 120 121 123 125 126

Table 6 Technical information in relation to the methods (continued)

Reference	Laboratory Number
AOAC Certificate No. 050902, BAX Real-Time PCR	46
AOAC RI Certificate No. 050902	45 80
FDA-BAM	1 2 3 4 6 7 10 11 12 13 14 15 16 18 19 20 23 24 25 26 27 28 30 31 32 33 34 35 36 37 38 39 40 42 43 44 47 48 49 50 52 53 54 56 57 58 59 60 63 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 82 84 85 86 87 88 89 91 92 93 94 95 96 97 98 99 101 104 106 107 108 109 111 114 115 116 117 118 119 120 122 123 124 125 126
FDA-BAM Chapter 9, MALDI-TOF MS	22
ISO/TS 21872-1	5 8 9 17 29 41 51 55 61 62 64 81 83 90 100 102 103 105 110 112 121
Real-Time PCR	21

Table 6 Technical information in relation to the methods (continued)

Media: Enrichment	Laboratory Number
Alkaline Peptone Water (APW)	1 2 3 4 6 7 10 11 13 14 15 16 18 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 42 43 44 45 46 47 48 49 50 52 53 54 55 56 57 58 59 60 63 65 67 68 69 70 71 72 73 74 75 76 77 78 79 80 82 84 85 86 87 88 89 91 92 93 94 95 96 97 98 99 101 104 106 107 108 109 111 114 115 116 117 118 119 120 122 123 124 125 126
Alkaline Saline Peptone Water (ASPW)	5 8 9 12 17 19 41 51 61 62 64 66 81 83 90 100 102 103 105 110 112 121

Table 6 Technical information in relation to the methods (continued)

Media: Selective Plating	**Laboratory Number**
BAX® System Real-Time PCR Assay	80
TCBS Agar	1 2 4 6 7 10 11 13 14 15 16 18 19 20 22 23 25 26 27 28 29 30 31 32 33 35 38 39 40 42 43 44 47 48 49 50 52 54 57 58 59 63 64 67 68 69 70 72 73 74 75 76 78 79 81 82 83 84 85 86 87 88 89 91 93 94 95 96 97 98 99 100 101 104 105 106 107 108 109 110 111 112 114 115 116 117 118 119 120 121 122 123 124 125 126
TCBS Agar, CC Agar	12 24 60 65 66 92
TCBS Agar, CHROMagar	3 5 8 9 17 36 37 41 51 55 61 62 71 77 102 103
TCBS Agar, mCPC Agar	34 53 56
TCBS Agar, *Vibrio* Agar	90
Unused	21 45 46

COMMITTEE

Technical Consultants

1. Mrs. Nitaya Pirapatrungsuriya	Executive Vice President, Food Industry Laboratory Service Center
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3. Mrs. Prachern Nakpan	Manager, Division of Microbiological Laboratory

Statistician Consultant

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2. Miss Kuntida Duangsee	Senior Analyst, Division of Proficiency Testing Laboratory
3. Miss Thatsanee Kansan	Analyst, Division of Proficiency Testing Laboratory

Project Coordinator

1. Miss Tanaporn Borisut	Manager, Division of Proficiency Testing Laboratory

Proficiency Testing Provider Accreditation

ISO/IEC 17043: 2010: BLA-DSS Acc. No. PTP-0002

Approved by

(Miss Preeyaporn Jaengkarnkit**)**

Technical Manager

12 March 2019

สถาบันอาหาร
กระทรวงอุตสาหกรรม

ติดต่อสอบถามเพิ่มเติมได้ที่

แผนกทดสอบความชำนาญ ฝ่ายบริการห้องปฏิบัติการ

สถาบันอาหาร
National Food Institute

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