

# **Review and analyze results of international Proficiency Testing (PT) on somatic cell count testing in raw milk during 2020 to 2023**

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## **1) Background and Problem Statement:**

Bureau of Quality Control of Livestock Products (BQCLP) is responsible for testing the raw milk, quality assurance control and work as the center of laboratory network in Thailand. The testing data used to improve milk quality for example, the number of somatic cells, which indicates mastitis in cows. The good quality of raw milk must have somatic cells less than 500,000 cell/ml. If the number of somatic cells is  $\geq 1,000,000$  cells/ml., it means that there may be dairy cows with symptomatic mastitis on the farm. Testing the number of somatic cells in the laboratory uses automatic machines. To provide reliable somatic cell counting results, ensure that the BQCLP staff have competence in laboratory testing performance and to build the customer confidence in the implementation of test results. Hence, the proficiency testing scheme is become very importance according to the technical requirement in Quality Management System (QMS). The laboratory of BQCLP has participated in the international Proficiency Testing (PT) scheme on somatic cell count in raw milk at least once a year, from 2020 -2023. Which was organized by QSE GmbH, Germany. The laboratory would like to analyze the PT results during 2020 to 2023 to evaluate the effectiveness of testing continuously in tracing back to the test performance during the past 4 years.

## **2) Project Objectives:**

1. To review and analyze the results of the international PT scheme on Somatic Cell Count testing in raw milk during 2020-2023.
2. To evaluate the effectiveness of laboratory testing performance.

## **3) Methods Used:**

1. Analysis of the PT results on Somatic Cell Count, comparing between laboratory data done by BQCLP and Reference data done by PT organizer.
  - Details of PT sample sent by QSE GmbH, Germany during 2020-2023 as shown in Table 1

Table 1 Demonstrate the details of PT samples sent by the PT provider who organized the annual PT scheme during 2020-2023.

Month/Year	Scheme name	No. of PT sample	No. of Participating laboratory
April/2020	Round10 <sup>th</sup> Multi-PT	5	25
April/2021	Round12 <sup>th</sup> Multi-PT	5	34
April/2022	Round14 <sup>th</sup> Multi-PT	5	40
April/2023	Round16 <sup>th</sup> Multi-PT	10	29

## 2. Method use for evaluate the effectiveness of laboratory testing performance.

The PT results were determined by the Z-score (ISO/IEC 17043:2010), The criteria of analysis was classified into 3 levels as follow:

$$\begin{aligned}
 |z| \leq 2 &= \text{satisfactory laboratory results} \\
 2 < |z| < 3 &= \text{questionable laboratory result} \\
 |z| \geq 3 &= \text{unsatisfactory laboratory result}
 \end{aligned}$$

The z-score is the quantitative assessment of laboratory results and calculated by following equation according to the ISO 13528: 2015.

$$z\text{-score} = \frac{X_{lab} - X_{pt}}{\sigma_{pt}}$$

Where  $X_{lab}$  is the laboratory data of somatic cell count  
 $X_{pt}$  is the assigned value or reference data  
 $\sigma_{pt}$  is the standard deviation for proficiency assessment

## 4) Results:

Results of participation in the proficiency test from 2020-2023 were summarized in Table2, Figure 1 and 2

Table 2 Demonstrate the Somatic Cell Count results of BQCLP ( $X_{lab}$ ), assigned value ( $X_{pt}$ ) and standard deviation for proficiency assessment ( $\sigma_{pt}$ ) of PT samples sent by QSE GmbH, Germany who organized the annual PT scheme during 2020-2023.

YEAR	2020					2021					2022					2023									
Sample No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10
$X_{pt}$ (*1000 cell/mL)	108.6	261.5	409.1	726.7	1007	129.6	299.9	461.9	833.4	1157	123.3	268.3	420.7	766.3	1019	113.5	125.1	248.8	260.2	405.4	405.7	753.3	755.7	1008	1079
$X_{lab}$ (*1000 cell/mL)	105.5	265	408.5	738	1023	129.5	305.5	479.5	872.5	1173	117.5	265.5	401.5	766	1013	118.5	132.5	264.5	256.5	418.5	418.5	761.5	794.5	1045	1140
$\sigma_{pt}$ (*1000 cell/mL)	6.3	9.7	20.3	24.9	39.8	7.3	15.4	18.2	40	55.7	10.5	20.9	27.8	46	70.1	7.7	11.1	12.9	14.6	22.2	18.6	33.9	35	53.3	61.9
z-score	-0.49	0.36	-0.03	0.45	0.4	-0.02	0.37	0.97	0.98	0.3	-0.55	-0.14	-0.69	-0.01	-0.09	0.65	0.66	1.22	-0.25	0.59	0.69	0.24	1.11	0.69	0.98

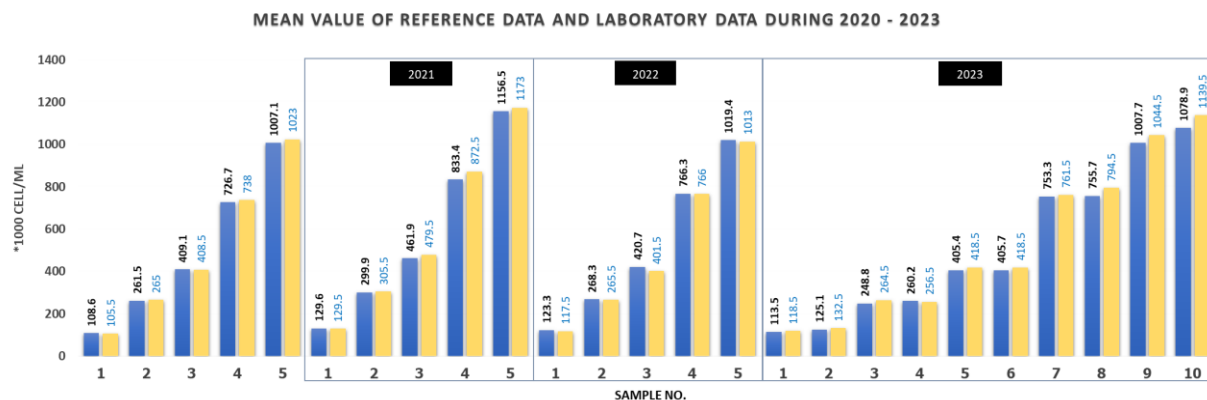


Figure 1 The PT result on Somatic Cell Count data comparing between BQCLP lab and PT Organize, QSE GmbH, Germany

- The BQCLP laboratory participated in the PT scheme on Somatic Cell Count in the past 4 year (2020-2023). The result of PT data of each year was demonstrated the similarity results as the reference data which done by QSE GmbH, Germany, as shown in Figure 1.
- Performance of the PT scheme on Somatic Cell Count assessment on z-scores. Each year BQCLP's Z-scores show satisfactory results and were still in the acceptance standard limited, as shown in Figure 2.

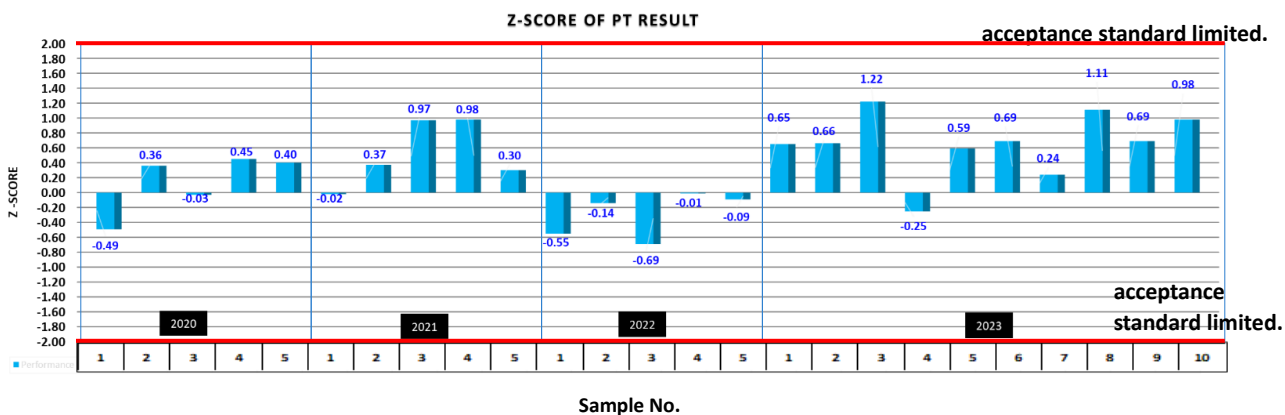


Figure 2 BQCLP Z-score of PT participation on Somatic Cell Count in raw milk from 2020 to 2023.

## 5) Conclusions and Next Steps:

### Conclusions:

- Results of international PT on Somatic Cell Count testing in raw milk during 2020 to 2023 of the BQCLP laboratory have demonstrated satisfactory level. This indicates that the laboratory has consistently met or exceeded the required standards for PT over the

past four years. This demonstrates consistent accuracy and reliability in laboratory testing performance.

- The results from the PT scheme demonstrated that the BQCLP laboratory is competent in performing Somatic Cell Count tests. This is important because Somatic Cell Count is a key indicator of milk quality.

**Next Steps:**

- Continue monitoring the laboratory's performance through regular PT participation. The PT schemes indicate good quality assurance of testing and also the laboratory staffs have competence in testing.
- Consider using the laboratory's data for milk quality analysis with confidence. Since competence is verified, we can be more confident that the Somatic Cell Count data they provide is an accurate reflection of the milk quality.

**6) Challenges identified and lesson learnt:**

- PT sample testing must follow SOPs and be performed the same as routine sample testing.
- Annual maintenance and calibration are crucial for ensuring the proper functioning of testing equipment.