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To: Recipients of EP15-A3

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Subject: Errors in Sections 2.3.10 and 3.7.1 to 3.7.7 in CLSI Document EP15-A3

This notification is to inform you of errors and minor editorial corrections in CLSI document EP15-A3, *User Verification of Precision and Estimation of Bias; Approved Guideline—Third Edition*, Section 2.3.10, Worked Example: Serum Ferritin Procedure, Section 3.7.1, Worked Example 1A (pages 56 and 57); Section 3.7.2, Worked Example 1B (page 58); Section 3.7.3, Worked Example 2A (pages 58 and 59); Section 3.7.4, Worked Example 2B (pages 59 and 60); Section 3.7.5, Worked Example 3A (page 60); Section 3.7.6, Worked Example 3B (page 61); and Section 3.7.7, Worked Example 4 (page 62).

In Section 2.3.10, Table 10, the number of significant digits was adjusted to change the S_{WL} value for Sample 2 from 2.4 to 2.40, as shown in the highlighted text in the table excerpt below.

Table 10. Ferritin Example: ANOVA Results and Imprecision Estimates

$\mu\text{g/L}$	Sample 1	Sample 1*	Sample 2	Sample 3
N	25	24	25	25
MSI (between)	4.238	2.0851	15.86	626.56
$MS2$ (within)	1.3284	0.74137	3.16	113.52
n_0	5	4.79	5	5
V_B (between)	0.58192	0.28052	2.54	102.61
V_W (within)	1.3284	0.74137	3.16	113.52
$\bar{\bar{x}}$	25.7	25.5	140.1	623
S_R , $\mu\text{g/L}$ (%CV)	1.15 (4.5%)	0.86% (3.4%)	1.78 (1.3%)	10.7 (1.7%)
S_{WL} , $\mu\text{g/L}$ (%CV)	1.38 (5.4%)	1.01 (4.0%)	2.40 (1.7%)	14.7 (2.4%)

In Section 3.7.1, Worked Example 1A, the value of S_R is incorrectly given as 1.18 mg/L. The correct value is 1.78 $\mu\text{g/L}$, as shown in the equation in step 1. This transcription error resulted in errors to numerals throughout Worked Example 1A, which have been corrected as shown in the highlighted text below. (Unit-of-measure and other minor editorial changes are also highlighted; these are summarized in a separate section below.)

Paragraph 2: From Table 10 in Section 2.3.10, the user calculated a grand mean of 140.1 $\mu\text{g/L}$, an S_R of 1.78 $\mu\text{g/L}$, and S_{WL} of 2.40 $\mu\text{g/L}$.

In **step 4**, the calculated value of τ is incorrect because the value of $se_{\bar{x}}$ is shown as 0.96. The correct value is 0.80. The calculated value for τ is shown as 0.72, but the correct value is 0.86. The corrections are highlighted in the step 4 equation below:

$$\tau = \frac{se_{RM}}{se_{\bar{x}}} = \frac{0.69}{0.80} = 0.86.$$

In **step 5**, using the new τ value of 0.86, corrections were made as highlighted below:

From Table 15A, obtain df_C for 43 laboratories, with $\tau = 0.86$; $df_C = 12$ (used table entry for 50 laboratories).

In **step 6**, the correct *DF* value is 12, not nine, in the first statement and in the equation. This results in a *t*-value of 2.78, rather than 2.94, as shown below, with the corrected text highlighted.

Obtain the value of *t* for $\alpha=0.05$ with 12 *DF* and three samples: $m = t_{1-\alpha/2, nSam, v} = t_{1-\alpha/6, v} = t_{0.9917, 12} = 2.78$.

In **step 7**, the *m* value of 2.94 is replaced with the correct value of 2.78, and the verification interval is calculated as shown below, with the corrected text highlighted:

Verification Interval = $TV \pm (m \cdot se_c) = 142.5 \mu\text{g/L} \pm (2.78 \cdot 1.06 \mu\text{g/L}) = 142.5 \pm 2.95 \mu\text{g/L}$ = Verification Interval = 139.6 to 145.4 $\mu\text{g/L}$.

In addition, unit-of-measure corrections were made in Sections 3.7.1, 3.7.2, 3.7.3, and 3.7.5, as summarized below. Additional typographical and transcription errors were also corrected.

Section 3.7.1, Worked Example 1A

There are four instances of incorrect units: mg/L is shown; all units in the example should be $\mu\text{g/L}$. The corrections are shown in the highlighted text below.

Paragraph 1: The peer group mean value for ferritin from the survey was 142.5 $\mu\text{g/L}$, the group SD was 4.5 $\mu\text{g/L}$, and there were 43 participants.

Paragraph 2: From Table 10 in Section 2.3.10, the user calculated a grand mean of 140.1 $\mu\text{g/L}$, an S_R of 1.78 $\mu\text{g/L}$, and S_{WL} of 2.40 $\mu\text{g/L}$.

Step 8: The observed mean of 140.1 $\mu\text{g/L}$ is within the verification interval.

In addition, the subscript for *t* is incorrectly shown as $1-\alpha/2, nSam, v$. The correct subscript is $1-\alpha/2 \cdot nSam, v$. The corrected text is highlighted below.

Obtain the value of *t* for $\alpha=0.05$ with 12 *DF* and three samples: $m = t_{1-\alpha/2 \cdot nSam, v} = t_{1-\alpha/6, v} = t_{0.9917, 12} = 2.78$.

Section 3.7.2, Worked Example 1B

In **step 6**, the subscript for *t* is incorrectly shown as $1-\alpha/2, nSam, v$. The correct subscript is $1-\alpha/2 \cdot nSam, v$. The corrected text is highlighted below.

Obtain the value of *t* for $\alpha=0.05$ with six *DF*: $m = t_{1-\alpha/2 \cdot nSam, v} = t_{1-\alpha/6, v} = t_{0.9917, 6} = 3.29$.

In **step 8**, the first unit is incomplete. Also, the estimate of the bias calculation is incorrectly shown as $-1.4 \mu\text{g/L}$. The correct result is $-2.4 \mu\text{g/L}$. The corrections are highlighted in the text below:

The observed mean of 140.1 $\mu\text{g/L}$ is within the verification interval. The estimate of the bias is calculated as $\bar{x} - TV$, $140.1 - 142.5$, or $-2.4 \mu\text{g/L}$. The observed bias of $-2.4 \mu\text{g/L}$ is not statistically significant.

Section 3.7.3, Worked Example 2A

In the **first paragraph**, the observed repeatability (within-run SD) is shown as 0.4 g/L at an albumin concentration of 3.7 g/L. The correct albumin concentration is 37.0 g/L, as shown in the highlighted text below:

The observed repeatability (within-run SD) was 0.4 g/L at 37.0 g/L, and the observed within-laboratory imprecision SD was 0.6 g/L at 37.0 g/L.

In **step 2**, the units of measure for *U* should be g/L, as shown in the highlighted text below:

$$se_{RM} = \frac{U}{k} = \frac{1.2 \text{ g/L}}{2} = 0.6 \text{ g/L}.$$

In **step 5**, a factor, $df_{\bar{x}}$, was omitted, as shown in the highlighted text below:

$$df_c = df_{\bar{x}} \cdot \left(\frac{se_c}{se_{\bar{x}}}\right)^4 = 5 \left(\frac{0.63}{0.2}\right)^4 = 5(3.15)^4 = 5 \cdot 98.46 = 492.3.$$

In **step 6**, the subscript for t is incorrectly shown as $1 - \alpha/2, nSam, v$. The correct subscript is $1 - \alpha/2 \cdot nSam, v$. The corrected text is highlighted below.

Obtain the value of t for $\alpha=0.05$ with 492 DF : $m = t_{1-\alpha/2 \cdot nSam, v} = t_{0.975, 492} = 1.96$.

In **step 7**, the verification interval value is incorrectly calculated as 3.72 g/L. The correct value is 37.2 g/L, as shown in the highlighted text below:

Verification Interval = $TV \pm (m \cdot se_c) = 37.2 \text{ g/L} \pm (1.96 \cdot 0.63 \text{ g/L}) = 37.2 \text{ g/L} \pm 1.2 \text{ g/L} = 36.0 \text{ to } 38.4 \text{ g/L}$.

Section 3.7.4, Worked Example 2B

In **step 5**, an incorrect value of 3.15 is given for the ratio of $\left(\frac{se_c}{se_{\bar{x}}}\right)$. The correct value is 3.65, as shown in the highlighted text below:

$$df_c = df_{\bar{x}} \cdot \left(\frac{se_c}{se_{\bar{x}}}\right)^4 = 5 \left(\frac{0.62}{0.17}\right)^4 = 5(3.65)^4 = 5 \cdot 177 = 885.$$

In **step 6**, the subscript for t is incorrectly shown as $1 - \alpha/2, nSam, v$. The correct subscript is $1 - \alpha/2 \cdot nSam, v$. The corrected text is highlighted below.

Obtain the value of t for $\alpha=0.05$ with 885 DF (ie, essentially infinite DF): $m = t_{1-\alpha/2 \cdot nSam, v} = t_{0.975, 885} = 1.96$.

Section 3.7.5, Worked Example 3A

In **step 1**, 0.1^2 should be 0.01^2 , and the units of measure for s_R^2 should be $\mu\text{g/L}$, as shown in the highlighted text below. Also, the second radical's horizontal line was shortened to extend only as far as the closing bracket.

$$se_{\bar{x}} = \sqrt{\frac{1}{nRun} \left[s_{WL}^2 - \left(\frac{nRep - 1}{nRep}\right) s_R^2 \right]} = \sqrt{\frac{1}{5} \left[0.04^2 - \left(\frac{4}{5}\right) 0.01^2 \right]} = 0.0174 \mu\text{g/L}.$$

In **step 6**, the subscript for t is incorrectly shown as $1 - \alpha/2, nSam, v$. The correct subscript is $1 - \alpha/2 \cdot nSam, v$. The corrected text is highlighted below.

Obtain the value of t for $\alpha=0.05$ with four DF : $t_{1-\alpha/2 \cdot nSam, v} = m = t_{1-\alpha/4, v} = t_{0.9875, 4} = 3.50$.

In **step 8**, an incorrect formula is shown for the verification interval. The correction is highlighted in the formula below:

Verification Interval = $TV \pm (m \cdot se_c) = 2.00 \mu\text{g/L} \pm 0.061 \mu\text{g/L} = 1.94 \text{ to } 2.06 \mu\text{g/L}$.

Section 3.7.6, Worked Example 3B

In **step 6**, the subscript for t is incorrectly shown as $1 - \alpha/2, nSam, v$. The correct subscript is $1 - \alpha/2 \cdot nSam, v$. The corrected text is highlighted below.

Obtain the value of t for $\alpha=0.05$ with four DF : $m = t_{1-\alpha/2 \cdot nSam, v} = t_{1-\alpha/4, v} = t_{0.9875, 4} = 3.50$.

In **step 9**, the observed mean is incorrectly listed as being within the verification interval. The corrected text is highlighted in the statement below:

The observed mean of 1.96 $\mu\text{g/L}$ is **not** within the verification interval.

Section 3.7.7, Worked Example 4

In **step 1**, incorrect values are included in the equation for s_{WL}^2 and s_R^2 . The corrections are highlighted in the equation below:

$$se_{\bar{x}} = \sqrt{\frac{1}{nRun} \left[s_{WL}^2 - \left(\frac{nRep - 1}{nRep} \right) s_R^2 \right]} = \sqrt{\frac{1}{7} \left[0.042^2 - \left(\frac{4}{5} \right) 0.032^2 \right]} = 0.012 \mu\text{g/L}.$$

The above change also affects the equations in **steps 3, 7, 8, and 9**. Corrections are highlighted in the steps below:

Step 3:

$$se_c = se_{\bar{x}} = 0.012 \mu\text{g/L}.$$

Step 7:

$$m \cdot se_c = 2.97 \cdot 0.012 \mu\text{g/L} = 0.036 \mu\text{g/L}.$$

Step 8:

$$\text{Verification Interval} = \text{TV} \pm (m \cdot se_c) = 1.00 \mu\text{g/L} \pm 0.036 \mu\text{g/L} = 0.96 \text{ to } 1.04 \mu\text{g/L}.$$

Step 9:

The observed mean of 0.94 $\mu\text{g/L}$ is not within the verification interval.

The estimate of the bias is calculated as $\bar{x} - \text{TV}$, 0.94 $\mu\text{g/L} - 1.00 \mu\text{g/L}$, or -0.06 $\mu\text{g/L}$.

The observed bias of -0.06 $\mu\text{g/L}$ exceeds the user's allowable bias.

In **step 6**, the subscript for t is incorrectly shown as $1 - \alpha/2 \cdot nSam, v$. The correct subscript is $1 - \alpha/2 \cdot nSam, v$. The corrected text is highlighted below.

Obtain the value of t for $\alpha=0.05$ with eight DF : $m = t_{1-\alpha/2 \cdot nSam, v} = t_{1-\alpha/4, v} = t_{0.9875, 6} = 2.97$.

Finally, edits were made to the "Calculate the verification interval" steps in Sections 3.7.1 to 3.7.7 for simplicity and ease of use. The changes are highlighted in Worked Example 1A, step 7, below:

$$\text{Verification Interval} = \text{TV} \pm (m \cdot se_c) = 142.5 \mu\text{g/L} \pm (2.78 \cdot 1.06 \mu\text{g/L}) = 142.5 \pm 2.95 \mu\text{g/L} = \text{Verification Interval} = 139.6 \text{ to } 145.4 \mu\text{g/L}.$$

Similar changes were made to this step in Sections 3.7.2 to 3.7.7.

If you require any additional clarification regarding these corrections, please contact CLSI Customer Service (customerservice@clsi.org).

We appreciate your commitment to CLSI, and regret any inconvenience.