



INTENDED USE

VALIDATE Chem 20 Calibration Verification / Linearity Test Kit solutions are intended for *in vitro* diagnostic use in the quantitative determination of linearity, calibration verification and verification of reportable range in automated, semi automated, and manual instrument systems for the following analytes: blood urea nitrogen (BUN), cholesterol (CHOL), carbon dioxide (CO₂), total protein (TP), triglyceride (TRIG), uric acid (UA), calcium (CA), creatinine (CREAT), glucose (GLU), chloride (CL), potassium (K) and sodium (NA). Test kit also contains albumin (ALB) as part of total protein (TP) component.

Each test kit consists of one bottle each of Levels 1 through 5. Each bottle contains 4.0 milliliters. There exists a linear relationship among Levels 1 through 5.

SUMMARY

Each **VALIDATE** Chem 20 Calibration Verification / Linearity Test Kit contains purified chemicals in a solution of bovine albumin. Multiple levels are provided to establish the relationship between theoretical and actual performance of each of the included analytes. The **VALIDATE** Chem 20 Calibration Verification / Linearity Test Kit will assist in the documentation of linearity, calibration verification and verification of linear range required by many inspection agencies. The solutions will also provide assistance when troubleshooting instrument systems, reagent problems and calibration anomalies.

REAGENTS

Reactive Ingredients:

Purified chemicals for urea nitrogen, cholesterol, carbon dioxide, total protein, triglyceride, uric acid, calcium, creatinine, glucose, albumin, chloride, potassium and sodium in a bovine serum matrix.

Nonreactive Ingredients:

Preservatives and stabilizers.

Precautions and Warnings:

For In Vitro Diagnostic Use
Disposal of all waste material should be in accordance with local guidelines.

STORAGE AND STABILITY

VALIDATE Chem 20 Calibration Verification / Linearity Test Kits are stored at -10° to -20°C. **Do NOT store in a frost-free freezer.** Test kits are stable until the expiration date printed on the bottle and storage container when handled according to instructions.

Preparation

Prior to use, remove the **VALIDATE** Chem 20 Calibration Verification / Linearity Test Kit from

storage and allow to come to room temperature (18° to 25°C). Invert gently several times before dispensing.

To maximize stability, it is recommended that exposure to room temperature be minimized. Tightly cap opened bottles and return to -10° to -20°C immediately after dispensing.

Discard any solutions that appear to have gross bacterial contamination.

The **VALIDATE** Chem 20 Calibration Verification / Linearity Test Kit should be treated in the same manner as patient samples. If dilutions or pre-treatment are required as part of the testing procedure, follow the manufacturer's instructions.

ASSAY

Analyze each level in replicates. If following the CLSI EP6 guideline for linearity, use a random analytical sequence to assay each level.

CALCULATION OF RESULTS

VALIDATE Calibration Verification / Linearity material is prepared in a manner such that an equal distance (delta) exists between each consecutive level. This dilution scheme is consistent with the CLSI recommendation for preparing linearity sets.

Two examples for calculating the theoretical values of Levels 1 through 5 are provided below.

Example 1:

Choose two consecutive levels and calculate the delta between the recovered values. The following example demonstrates the use of the delta between Levels 2 and 3 to calculate the theoretical value for Levels 1, 4 and 5:

Mean Recovered Values

| | |
|---------|-----|
| Level 1 | 51 |
| Level 2 | 164 |
| Level 3 | 275 |
| Level 4 | 388 |
| Level 5 | 501 |

Using Level 2 and Level 3 recovered values to calculate the Delta, the above data produces the following:

Level 3 – Level 2 = Delta, or (275 – 164 = 111)

Level 1 Theoretical = Level 2 Recovered - Delta, or (164 - 111 = 53)

Level 4 Theoretical = Level 3 Recovered + Delta, or (275 + 111 = 386)

Level 5 Theoretical = Level 4 Theoretical + Delta, or (386 + 111 = 497)

Using the delta between Level 2 and Level 3, the theoretical value for each level would be:

| Level | Theoretical (x-axis) | Recovered (y-axis) |
|-------|----------------------|--------------------|
| 1 | 53 | 51 |
| 2 | 164 | 164 |
| 3 | 275 | 275 |
| 4 | 386 | 388 |
| 5 | 497 | 501 |

NOTE: The user can select the calculated delta between any two consecutive levels to calculate the theoretical values. Typically, the user should choose an area of recovery known to be linear for the method being studied.

Example 2:

Theoretical values can be determined using the recovered values for Levels 1 and 5. Using this method, the following formulas apply:

$$\text{Level 2} = 0.75 * (\text{Level 1}) + 0.25 * (\text{Level 5})$$

$$\text{Level 3} = 0.5 * (\text{Level 1}) + 0.5 * (\text{Level 5})$$

$$\text{Level 4} = 0.25 * (\text{Level 1}) + 0.75 * (\text{Level 5})$$

Using the recovered values for Level 1 (51) and Level 5 (501), the following applies:

$$\text{Level 2} = 0.75 * (51) + 0.25 * (501) = 163.5$$

$$\text{Level 3} = 0.5 * (51) + 0.5 * (501) = 276$$

$$\text{Level 4} = 0.25 * (51) + 0.75 * (501) = 388.5$$

| Level | Theoretical (x-axis) | Recovered (y-axis) |
|-------|----------------------|--------------------|
| 1 | 51 | 51 |
| 2 | 163.5 | 164 |
| 3 | 276 | 275 |
| 4 | 388.5 | 388 |
| 5 | 501 | 501 |

After the theoretical values are calculated, for each analyte plot the expected (Theoretical) value on the x-axis versus the Recovered value on the y-axis using standard linear graph paper. If the system is linear, the plot should approximate a straight line. The point at which the line is no longer straight can be used to determine the limit of linearity or the reportable range.

Data reduction is available from Maine Standards Company (see worksheet for instructions). Commercially available linear regression software may also be used. The software should provide data point display and x-y graphical presentation. Linear regression should be interpreted using standard statistical analysis and the results should be compared with the instrument manufacturer's claims for linearity or with individual laboratory performance requirements. The degree of acceptable non-linearity is an individual judgment based on methodology, clinical significance and medical decision levels of the test analyte.

LIMITATIONS

VALIDATE Chem 20 Calibration Verification / Linearity Test Kit solutions are not intended for use as routine quality control materials or as calibration materials.

EXPECTED VALUES

VALIDATE Chem 20 Calibration Verification / Linearity Test Kits are manufactured such that a linear relationship exists among Levels 1 through 5.

The following four (4) analytes are inverted in **Chem 20: CL, CHOL, CO₂ and NA.** Level 1 contains the highest concentration for these analytes and concentration decreases from Level 1 down to Level 5.

TYPICAL VALUES

Actual results obtained may vary depending on instrumentation, methodology and assay temperature. Results may also be dependent on the accuracy of the instrument/reagent system calibration. The degree of acceptable non-linearity is an individual judgment based on methodology, clinical significance and medical decision levels of the test analyte.

| Typical Values by Level Chem 20vt | | | | | | |
|-----------------------------------|--------|------|-----|-----|------|------|
| Analyte | Units | 1 | 2 | 3 | 4 | 5 |
| ALB | g/dL | - | - | - | - | - |
| BUN | mg/dL | 2 | 32 | 61 | 91 | 120 |
| CA | mg/dL | 1.0 | 4.3 | 7.5 | 10.8 | 14.0 |
| CHOL | mg/dL | 325 | 256 | 188 | 119 | 50 |
| CO ₂ | mmol/L | 40 | 31 | 23 | 14 | 5 |
| CL | mmol/L | 175 | 144 | 113 | 81 | 50 |
| CREAT | mg/dL | 0.05 | 3.5 | 7.0 | 10.5 | 14.0 |
| GLU | mg/dL | 20 | 171 | 323 | 474 | 625 |
| K | mmol/L | 1.0 | 4.3 | 7.5 | 10.8 | 14.0 |
| NA | mmol/L | 240 | 199 | 158 | 116 | 75 |
| TP | g/dL | 3.1 | 5.1 | 7.1 | 9.0 | 11.0 |
| TRIG | mg/dL | 10 | 139 | 268 | 396 | 525 |
| UA | mg/dL | 0.5 | 4.6 | 8.8 | 12.9 | 17.0 |

* As part of TP component

ORDERING INFORMATION

ORDER NO.: **200**

VALIDATE Chem 20 Calibration Verification / Linearity Test Kit 5 x 4 mL.

For technical assistance or to place an order, please call:
800-377-9684 or
207-892-1300
Fax 207-892-2266
www.maineStandards.com

Please allow 5 to 7 days for delivery.

Maine Standards Company
765 Roosevelt Trail
Windham, ME 04062