LITHIUM

NOTE: This package insert must be read carefully prior to product use. Package insert instructions must be followed accordingly. Reliability of assay results cannot be guaranteed if there are any deviations from the instructions in this package insert.

NOTE: Changes Highlighted

INTENDED USE

The MULTIGENT Lithium assay is intended for the quantitation of lithium in serum and plasma using the ARCHITECT c Systems.

SUMMARY AND EXPLANATION OF TEST

Lithium is used in the treatment of manic depressive psychosis. Lithium acts on the neurotransmitters and produces a sedative effect on the central nervous system. Elated lithium levels can cause toxicity. Early symptoms of toxicity include apathy, slowness, drowsiness, lethargy, speech difficulties, tremor, muscle weakness, and ataxia. Long-term lithium therapy has been reported to cause hyperparathyroidism in some individuals, with resulting hypercalcemia.1

PRINCIPLES OF PROCEDURE

The MULTIGENT Lithium assay (Lith) uses a spectrophotometric method. Lithium present in the sample reacts with a substituted porphyrin compound at an alkaline pH, resulting in a change of absorbance which is directly proportional to the concentration of lithium in the sample.

Methodology: Colorimetric

REAGENTS

Reagent Kit

8L25-30 MULTIGENT Lithium is supplied as a liquid, ready-to-use, single reagent kit which contains:

- 2 x 20 mL

Extracted tests per kit: 154

Calculation is based on the minimum reagent fill volume per kit.

Reactive Ingredients

Concentration

- EDTA (0.05 mmol/L)
- Substituted Porphyrin (0.2 mmol/L)

Nonreactive Ingredients

- stabilizer
- sodium azide (0.1%)

REAGENT HANDLING AND STORAGE

Reagent Handling

• Ready for use.
• Remove air bubbles, if present in the reagent cartridge, with a new applicator stick. Alternatively, allow the reagent to sit at the appropriate storage temperature to allow the bubbles to dissipate. To minimize volume depletion, do not use a transfer pipette to remove the bubbles.

CAUTION: Reagent bubbles may interfere with proper detection of reagent level in the cartridge, causing insufficient reagent aspiration that could impact results.

Reagent Storage

- Unopened reagents are stable until the expiration date when stored at 2 to 8°C and protected from light. Store MULTIGENT Lithium reagent in the box.
- Reagent stability is 18 days if the reagent is uncapped and onboard.

Indications of Deterioration

- Instability or deterioration should be suspected if there are visible signs of leakage, turbidity, microbial growth, or if calibration does not meet the appropriate package insert and/or ARCHITECT System Operations Manual criteria.

- The reagent should be clear and dark orange to red.

- Discard reagent if it is turbid or light purple.

WARRANTS AND PRECAUTIONS

Precautions for Users

- For in vitro diagnostic use.
- Do not use beyond the expiration date.
- Do not use materials from different kit lot numbers.
- Protect reagent from light.

This product contains sodium azide; for a specific listing, refer to the REAGENTS section of this package insert. Contact with acids liberates very toxic gas. This material and its container must be disposed of in a safe way.

NOTE: Refer to Section 6 of the ARCHITECT System Operations Manual for proper handling and disposal of reagents containing sodium azide.

CAUTION: This product requires the handling of human specimens. It is recommended that all human sourced materials be considered potentially infectious and be handled in accordance with the OSHA Standard on Bloodborne Pathogens.2 Biosafety Level 2 or other appropriate biosafety practice3,4 should be used for materials that contain or are suspected of containing infectious agents.

The following warnings and precautions apply to:

- LITHIUM

DANGER: Contains sodium azide.
PROCEDURE (Continued)

Manual Dilution Procedure
- Use saline (0.95% to 0.90% NaCl) to dilute the sample.
Example: A manual 1:4 dilution that is run using the Standard dilution will result in an approximate 1:16 dilution of the sample.
- The operator must enter the manual dilution factor in the patient or control order screen. The system uses this dilution factor to automatically correct the concentration by multiplying the result by the entered factor.
- If the operator does not enter the dilution factor, the result must be multiplied by the appropriate manual dilution factor before reporting the result.

NOTE: If the diluted sample result is flagged indicating it is less than the linear low limit, do not report the result. Recom using an appropriate dilution.

For detailed information on ordering dilutions, refer to Section 5 of the ARCHITECT System Operations Manual.

CALIBRATION
Calibration is stable for approximately 5 days (120 hours) and is required with each reagent cartridge change. Verify calibration with at least two levels of controls according to the established quality control requirements and potential corrective actions:

- Two levels of controls (normal and abnormal) are to be run 24 hours.
- If more frequent control monitoring is required, follow the established quality control procedures for your laboratory. Recalibration may be necessary.

If quality control results do not meet the acceptance criteria defined by your laboratory, patient values may be suspect. Follow the established quality control procedures for your laboratory. Recalibration may be necessary.

Review quality control results and acceptance criteria following a change of reagent or calibrator lot.

RESULTS
Refer to Appendix C of the ARCHITECT System Operations Manual for information on results calculations.
Results for the MULTIGENT Lithium assay are reported in mmol/L, which are numerically equivalent to mEq/L.
Representative performance data are given in the EXPECTED VALUES and SPECIFIC PERFORMANCE CHARACTERISTICS sections of this package insert. Results obtained in individual laboratories may vary.

LIMITATIONS OF THE PROCEDURE
Refer to the REAGENT HANDLING AND STORAGE, SPECIMEN COLLECTION AND HANDLING, and SPECIFIC PERFORMANCE CHARACTERISTICS sections of this package insert.
Reagent cross-contamination testing for the MULTIGENT Lithium assay was performed on an ARCHITECT c8000 System. No ARCHITECT c Systems assays are affected by MULTIGENT Lithium.

EXPECTED VALUES

<table>
<thead>
<tr>
<th>Reference Range</th>
<th>Range (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 hour post dose (tough)</td>
<td>1.0 to 1.2</td>
</tr>
</tbody>
</table>

Values greater than 1.5 mmol/L 12 hours post dose indicate a significant risk of toxicity.
SPECIFIC PERFORMANCE CHARACTERISTICS

Linearity

MULTIGENT Lithium is linear from 0.10 to 3.51 mmol/L. Eleven levels of lithium linearity material were run in triplicate using the MULTIGENT Lithium assay. A mean of the replicates for each sample was determined and percent bias calculated. Representative results are shown below.

Acceptance criteria: ± 5% or 0.075 mmol/L, whichever is greater.

\[ \text{%Bias} = \frac{\text{Mean measured concentration} - \text{Theoretical concentration}}{\text{Theoretical concentration}} \times 100 \]

Theoretical Concentration (mmol/L) | Mean Measured Concentration (mmol/L) | Bias* (mmol/L) | %Bias* |
--- | --- | --- | --- |
0.100 | 0.095 | -0.005 | 0.005 |
0.483 | 0.487 | 0.004 | 0.8 |
0.913 | 0.950 | -0.037 | 4.1 |
1.843 | 1.980 | -0.137 | 7.5 |
2.393 | 2.333 | 0.060 | 2.5 |
2.634 | 2.583 | 0.051 | 1.1 |
3.064 | 3.030 | -0.034 | -1.1 |
3.448 | 3.400 | 0.048 | 1.4 |
3.924 | 3.767 | -0.158 | -4.0 |

Bias and %Bias were calculated prior to rounding Theoretical Concentration and Mean Measured Concentration values.

Limit of Quantification (LOQ)

The LOQ for MULTIGENT Lithium is 0.10 mmol/L. The LOQ is the analyte concentration at which the CV ≤ 20% or the bias is within ± 5% or 0.075 mmol/L, whichever is greater.

Interfering Substances

The following compounds, when tested with the MULTIGENT Lithium assay, at the concentrations indicated, resulted in less than 5% or 0.075 mmol/L error (whichever is greater) in detecting lithium.

Interfering Substance | Concentration (mmol/L) | Interferent Concentration (mmol/L) | Bias (%) | Recovery (%)
--- | --- | --- | --- | ---
Bilirubin | 1.290 | 40 mg/dL (684 μmol/L) | 0.070 | 105.4 |
Hemoglobin | 1.012 | 100 g/L (10.0 g/dL) | 0.019 | 101.9 |
Insulin | 1.150 | 1,500 mg/dL (264 μmol/L) | 0.033 | 102.9 |
Calcium | 1.139 | 24 mg/dL (1.25 mmol/L) | 0.049 | 104.3 |
Copper | 1.139 | 1,464 μg/dL (230 μmol/L) | 0.049 | 104.3 |
Iron | 1.139 | 1,117 μg/dL (15 g/L) | 0.049 | 104.3 |
Magnesium | 1.139 | 6.0 mg/dL (1.5 mmol/L) | 0.049 | 104.3 |
Potassium | 1.139 | 350 mEq/L (350 mmol/L) | 0.049 | 104.3 |
Zinc | 1.139 | 1,290 mg/dL (220 μmol/L) | 0.049 | 104.3 |

Precision

The precision of the MULTIGENT Lithium assay is a 5% Total CV or ≤ 0.075 SD, whichever is greater.

Studies were performed using Clinical and Laboratory Standards Institute (CLSI) protocol NCCLS EP9-A. Representative results are summarized below.

<table>
<thead>
<tr>
<th>Control</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>80</td>
<td>90</td>
<td>80</td>
</tr>
<tr>
<td>Mean (mmol/L)</td>
<td>0.023</td>
<td>0.038</td>
<td>0.027</td>
</tr>
<tr>
<td>Within Run SD</td>
<td>0.015</td>
<td>0.016</td>
<td>0.009</td>
</tr>
<tr>
<td>Between Run %CV</td>
<td>0.06</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Between Day %CV</td>
<td>0.06</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Total %CV</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Method Comparison

Correlation studies were performed using CLSI protocol NCCLS EP9-A protocol.

Results from the MULTIGENT Lithium assay on an ARCHITECT System were compared with the results from the commercially available colorimetric methodology.

Results from the MULTIGENT Lithium assay on an ARCHITECT System were compared with the results from atomic absorption spectrophotometry (AAS).

Representative results using linear regression analysis are summarized below.

<table>
<thead>
<tr>
<th>System vs.</th>
<th>Comparative Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>cSystem vs. cSystem</td>
<td>AAS</td>
</tr>
<tr>
<td>Y - Intercept</td>
<td>-0.005</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>0.999</td>
</tr>
<tr>
<td>Slope</td>
<td>1.109</td>
</tr>
<tr>
<td>Range (mmol/L)</td>
<td>0.29 to 2.61</td>
</tr>
</tbody>
</table>

BIBLIOGRAPHY


TRADEMARKS

The ARCHITECT cSystem family of instruments consists of c8000, c8000i, c16000, and c18000 Systems. ARCHITECT, c8000, c8000i, c16000, cSystem, MULTIGENT, and SmartWash are trademarks of Abbott Laboratories in various jurisdictions.

All trademarks are property of their respective owners.
**Lithium Serum/Plasma—Conventional and SI Units**

**Configure assay parameters — General**

- **Assay:** Lith
- **Type:** Photometric
- **Version:** †
- **Number:** 2976
- **Run controls for onboard reagents by:** ††

**Configure assay parameters — Reaction definition**

- **Reaction mode:** End down
- **Wavelength:** 524 / 476
- **Main:** 8 – 8
- **Secondary Read times:** 8 – 8
- **Absorbance range:** 0.0000 – 2.5000
- **Color correction:** __ – __
- **Sample blank type:** None

**Configure assay parameters — Calibration**

- **Calibration method:** Linear
- **Calibrator set:** CCC-S
  - **Blank:** Water
  - **Cal 1:** CCC-S1
  - **Replicates:** 3

**Configure assay parameters — SmartWash**

**Configure assay parameters — Results**

- **Low-Linearity:** 0.005
- **High-Linearity:** 0.174

**Configure result units**

- **Result units:** mmol/L
- **Decimal places:** 3

---

1. Due to differences in instrument systems and unit configurations, version numbers may vary.
2. Parameter is available in ARCHITECT software version 7.00 and above.
3. Displays the number of decimal places defined in the decimal place field.
4. Refer to the concentration specified on calibrator labeling or value sheet. In ARCHITECT software version 5.00 and above, these values are defined on the Configure calibrator set screen.
5. The linear low value (Low-Linearity) is LOD divided by the Standard dilution factor, then rounded up to the number of decimal places defined in the decimal places parameter field.
6. The linear high value (High-Linearity) is Linearity divided by the Standard dilution factor, then rounded down to the number of decimal places defined in the decimal places parameter field.
7. User defined.
8. Three decimal places are required to provide accurate calculation of linear limits due to the decimal places in the dilution factor.