| **Acetaminophen** |
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| **Purpose** | This procedure provides instructions for performing ACETAMINOPHEN on ABBOTT ALINITY INSTRUMENTATION for the IN VITRO quantitative measurement of acetaminophen in serum, lithium heparin plasma and sodium heparin plasma. Measurement of acetaminophen is used in the diagnosis and treatment of acetaminophen overdose toxicity. |
| **Policy Statements** | This procedure applies to all personnel responsible for operating the Abbott Alinity ci or Alinity c at Children’s Minnesota Laboratory. |
| **Principle** | The enzyme, acyl amidohydrolase, cleaves the amide bond of the acetaminophen molecule, leaving p-aminophenol and acetate. The p-aminophenol is reacted with 2,5-dimethylphenol in the presence of manganese ions to form a colored compound, 4-(4-iminophenol)-2,5-dimethylcyclohexadiene-1-one. The increased absorbance at 605 nm due to the formation of 4-(4-iminophenol)-2,5- imethylcyclohexadiene-1-one is directly proportional to the concentration of acetaminophen in the sample. **Methodology:** Enzymatic, colorimetric*For additional information on system and assay technology, refer to the Alinity ci-series Operations Manual, Section 3.* |
| **Clinical Significance** | Acetaminophen (paracetamol) is used as an analgesic in many different formulations. While therapeutic doses rarely cause adverse side effects, the effect of long term treatment with acetaminophen is unclear. Cases have been reported where chronic excessive use of acetaminophen has led to hepatotoxicity and nephrotoxicity. In cases of acute overdosage, acetaminophen can cause severe hepatic damage leading to hepatic failure if untreated.The management of acetaminophen overdose requires early recognition of the drug in the bloodstream. Toxicity is generally reported at concentrations over 200 μg/mL (1324 μmol/L). N-acetylcysteine has been used as an antidote in conjunction with intensive support care. Early diagnosis of acetaminophen-induced hepatotoxicity is important since initiation of therapy within 8 hours of ingestion lessens the potential for hepatic injury and decreases the mortality rate.The majority of methods for measuring acetaminophen are based on spectrophotometric or chromatographic principles. Chromatographic methods are specific for the parent compound; however, they are not well suited to emergency laboratories. Spectrophotometric methods are simpler and more rapid, but do not always offer the desired specificity. |
| **Analyzer** | **Minneapolis: Abbott Alinity ci (Sunquest method code: MACC)****St. Paul: Abbott Alinity c (Sunquest method code: SALIC)** |
| **Sunquest Test Codes** | ACET |
| **Specimen** | Sample: Serum or Plasma (with or without gel barrier), NO HEMOLYSIS.**Preferred:** Lithium Heparin**Alternative:** SST, Sodium Heparin**Minimum sample volume:** 0.6 mL blood, 0.2 mL serum/plasma**Stability when separated from cells/gel:** **20 to 25°C:** Not tested. Run within 4 hours of draw or refrigerate.**2 to 8°C:** 14 days (when removed from cell and/or gel barrier) **-20°C:** 45 days (when removed from cells and/or gel barrier) **Rejection criteria:** DO NOT USE HEMOLYZED SAMPLES. Request redraw. Unlabeled tube, sample type other than serum or acceptable plasma**Preparation:** 1. Whole blood specimens should be centrifuged following complete clot formation, according to Specimen Processing procedures prior to analysis.
2. Serum or plasma should be physically separated from cells as soon as possible with a maximum limit of two hours from the time of collection.
3. Specimens should be free of particulate matter.
4. Transfer serum or plasma directly to a properly labeled pilot tube.
5. Architect and Alinity systems utilize a specimen level detect mechanism, so special racks specific to tube-type are not required.
6. Minimum labeling includes sample accession ID, and/ or patient name, medical record number, collection date and time.
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| **Reagents** | **Reagent Handling** Acetaminophen L3K is a third party reagent made by Sekisui Diagnostics. The reagents are liquid and ready to use. If a reagent cartridge is dropped, place in an upright position for 1 hour before use to allow bubbles that may have formed to dissipate. * Do not use reagents beyond the expiration date.
* Do not pool reagents within a kit or between kits.
* Do not use components from one lot with components from another lot.
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| ***Product Description*** | ***Product Code*** | ***Stability and Handling*** |
| THIRD PARTY REAGENT: Acetaminophen L3K, Sekure Chemistry, made by Sekisui Diagnostics; distributed by Abbott Diagnostics. Includes: 3 x 10 mL R1 Reagent6 x 10 mL R2 Reagent1 x 5 mL Calibrator, 151 µg/mL acetaminophen concentration | 06R7701 | **Store at:** 2 to 8°C**Unopened: Until expiration Date****On-board**: 7 daysHandling: Immediately prior to loading the cartridge, gently invert each bottle to mix, avoiding bubbles. Pour one 10 mL bottle of R1 into the large cartridge of an empty, black Alinity reagent cartridge. Pour two 10 mL bottles of R2 Reagent into the smaller empty bottle of the same Alinity reagent cartridge. See [Alinity c](https://starnet.childrenshc.org/References/labsop/chem/procedure/ch5.108-abbott-alinity-c-operating-procedure.pdf) or [Alinity ci Operating Procedures](https://starnet.childrenshc.org/References/labsop/chem/procedure/ch5.109-abbott-alinity-ci-operating-procedure.pdf) for more labeling and loading instructions. |

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| **Risk and Safety** | C:\Users\CE154502\AppData\Local\Temp\SNAGHTML43bb59f5.PNG **CAUTION:** This product contains human-sourced and/or potentially infectious components\*. No known test method can offer complete assurance that products derived from human sources or inactivated microorganisms will not transmit infection. Therefore, all human-sourced materials should be considered potentially infectious. It is recommended that these reagents and human specimens be handled in accordance with the OSHA Standard on Bloodborne Pathogens. Biosafety Level 2 or other appropriate biosafety practices should be used for materials that contain or are suspected of containing infectious agents. The human-sourced material used in and has been tested and found to be nonreactive for HBsAg, HCV RNA, and HIV-1/HIV-2.Safety data sheets (MSDS/SDS) available on [Children’s Intranet](https://starnet.childrenshc.org/emergency-and-safety/) |
| **Calibration** |

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| Assay Range: | 6.0 to 377.5 µg/mL |
| Reference Material: | Acetaminophen Calibrator, included in reagent box |
| Suggested Calibration Levels: | 151 µg/mL |
| Calibration Scheme: | 1 Level |
| Calibration Frequency: | 7 days. The reagent is stable on board for 7 days and should be calibrated with each new reagent AND if quality control indicates a need for calibration. Calibration must be validated by two levels of QC immediately after calibrating.  |
| AMR | AMR is verified twice annually using Maine Standards TDM1, Product # 301b, by running all applicable levels in triplicate. Assay results are submitted to Maine Standards for compilation and comparison to peers. Results are reviewed and approved by the Technical Specialist. Questionable results are investigated and corrective actions documented. |

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| **Quality Control** | **QC Material: BioRad Liquid Unassayed Multiqual Levels 1 and 3****Frequency:** 2 Levels per day**Stability:** 7 days when stored at 2 to 8°C**Preparation**: Allow to thaw for one hour at room temperature, minimizing extra time left at room temperature. After thawing, swirl and mix gently to bring any precipitate into solution. Keep tightly capped and return promptly to 2 to 8°C when not in use. **Acceptable ranges:** * Non-Bio-Rad controls will utilize manufacturer ranges and 2 SD Westgard rules.
* New lots of Bio-Rad controls should be run for 20 days in parallel with the current lot whenever possible prior to switching to the new lot.
* Refer to the Westgard Rules in Chemistry for current Westgard rules in place for each analyte.
* **Acceptable ranges are current in Unity Real Time only.** Quality Control results must be rejected in Sunquest when the results cross the interface.
* In the event of a QC failure, refer to the [Unity Real Time QC Review, General User](https://starnet.childrenshc.org/References/labsop/chem/quality/ch-2.17-unity-real-time-qc-review-general-user.pdf) and navigate to the QC Troubleshooting section.
* Do not load or release patients until QC is acceptable in Unity Real Time.
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| **Interferences** | **Hemolysis, Icterus & Lipemia (HIL) Index Values:**

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* \***DO NOT USE HEMOLYZED SAMPLES**. Hemolysis causes significant bias with this method. Request redraw. If redraw cannot be obtained, ensure –HP comment is appended.

Icteric samples may be manually diluted 1:2 with saline in an effort to reduce the bilirubin interference. If the sample has no flags after dilution, it may be reported along with the appended comment below: -BIN for “Bilirubin Interference”. If the diluted value gives a less than linearity result, report the undiluted value, if there is one, with the above comment instead. Note: a conversation with the provider must be had if ingestion is suspected, the sample is icteric, and all results are less than linearity because icteremia causes decreased acetaminophen recovery. Ensure the sample is icteric and not hemolyzed, as this is cause for rejection and redraw.Samples containing elevated levels of Immunoglobulin M (IgM) or samples from patients with Waldenstrom’s Macroglobulinemia may produce unreliable results.Samples containing NAPQ1 (N-Acetyl-4-benzoquinoneimine) may cause elevated levels of measured acetaminophen. Samples containing >20 mg/L metamizole may cause elevated levels of measured acetaminophen. |
| **Reference Intervals** | Therapeutic Range: 10 – 25 µg/mL  |
| **Critical Values** | **>25.0 µg/mL**Call according to critical value policies. |
| **Limitations** | See interferences section. |
| **Dilutions** |

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| Max Auto Dilution: | none |
| Maximum Manual Dilution: | 1:10 |
| Diluent: | Saline |
| Manual Dilution: | First perform a 1:2 dilution, programming the dilution factor into the instrument software. Follow Abbott [Alinity Operator’s Manual](%C2%B5g/mL) instructions for programming dilutions. The system will automatically calculate the concentration of the sample and report the result. If a diluted sample result is less than the lower value of the measuring interval of 6.0 µg/mL, do not report the result. Rerun and/or investigate for other possible causes of error. |

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| **Result Reporting** | * Results between 6.0 and 25.0 without error messages are released
* Results below 6.0 without error messages are reported as < 6.0.
* Results > 377.5 should be diluted using a beginning dilution of 1:2 with saline. Release results without error messages following this dilution. If the result is still greater than linearity, dilute 1:10 with saline, ensuring it is programmed correctly in the instrument software according to the procedure referenced above.
* Results > 3775.0 following 1:10 manual dilution are reported as > 3775.0.
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| **Specimen Storage** | Promptly stopper tested specimen and store upright in a specimen rack. Every 8 hours remove specimens to refrigerator/freezer storage. Samples are retained 14 days in specimen storage freezer. |
| **References** | 1. Sekure Chemistry Acetaminophen L3K Assay Instructions for Use, Sekisui Diagnostics, CharlottetownPE C1E Canada. Revised August 30, 2019
2. Sekisui Diagnostics Assay Configuration file for Alinity ci-series Application for Acetaminophen 507, Sekisui Diagnostics. Nov 6 2019
3. Bio-Rad Liquichek Immunoassay Plus Control Package Insert, Bio-Rad Laboratories, Irvine CA USA.
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| **Historical Record** | **Version** | **Written/Revised by:** | **Effective Date:** | **Summary of Revisions** |
| 1 | Erin Bartos | October 28, 2020 | New Procedure for Abbott Alinity |
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