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Body Fluid Testing-Troy Chemistry

Document Type: Procedure

I. PURPOSE AND OBJECTIVE:

This procedure describes the process for testing body fluids in the Chemistry department.

II. CLINICAL SIGNIFICANCE:

Clinical laboratory testing of nonstandard body fluids is an important part of diagnosis and management for a variety of diseases. These nonstandard body fluids are not derived from blood or urine but include fluids such as cerebrospinal fluid (CSF), drain fluid, wound fluids, and essentially any other body fluid that is typically not cited by the manufacturer of a Food and Drug Administration (FDA)-cleared method in the “Intended Use” portion of the product’s package insert. Most body fluids (pleural, peritoneal, pericardial) are collected by ultrasound-guided aspiration while others such as synovial fluid or amniotic fluid collection employ visually guided needle aspiration. Formation of excessive fluid occurs pathologically for a variety of reasons. Extravascular fluid contained in serous cavities is continually being produced at low levels (~1% of plasma) as the fluid is filtered by capillaries and either reabsorbed locally or transported back into the circulation by lymphatic drainage. Pathologic increases in extravascular fluid volume occur due to amplification in either production of the fluid or reduction in the rate of fluid absorption. Increased fluid production may be caused by increases in intravascular hydrostatic pressure (congestive heart failure, kidney disease), decreased oncotic pressure (malnutrition, severe burns, nephrotic syndrome, liver cirrhosis), increased capillary permeability (inflammation, infection, burns, nephritis), or trauma. Decreased fluid absorption may occur due to lymphatic obstruction, often secondary to malignancy or impaired drainage due to elevations in systemic venous pressures (for example, congestive heart failure). See Abbott Architect Chemistry Operations Procedure attachment I for additional information.

Fluid pH testing is used to assist in the monitoring of non-specific physiologic changes in the body.

Inflammation or infections affecting the peritoneal, pleural and pericardial cavities cause fluid to accumulate that has an abnormal pH. Urinary pH is monitored to determine the existence of systemic acid-base disorders and management of urinary contditions that require the urine to be maintained a a specific pH. Tests for gastric acidity are used to screen for the ability of peietal cells in the stomach to produce hydrochloric acid.

The serum-ascites albumin concentration gradient is a more reliable procedure in differentiating transudates from exudates. The gradient is calculated by subtracting the ascitic fluid albumin concentration from a serum albumin drawn at a similar time.
Interpretation to separate all transudates from all exudates in every patient based on a single criterion is very difficult, especially in those patients during diuresis.

III. SPECIMEN COLLECTION AND HANDLING:

A. Body fluids should be handled as if capable of transmitting infections diseases.
B. All body fluids are collected and transported ot the laboratory as soon as possible.
C. Due to the difficulty in collecting body fluids, they should be considered irreplaceable.
D. **Pleural, pericardial or peritoneal fluid samples** should be collected anaerobically in a heparinized syringe, placed on ice and delivered to the laboratory immediately.
E. Serum Ascites Gradient Specimens:
    1. This test requires serum and ascites fluid.
    2. Simultaneous collection of fluid and serum specimens is preferred.
    3. Serum specimens collected within 2 hours of fluid collection is acceptable.
    4. Consult the pathologist when the collection of fluid and serum samples differs by more than two hours

IV. REAGENTS:

A. ABBOTT Architect c16000 reagents for the desired test
B. pH strips
C. pH buffers
D. Radiometer ABL 825 testing reagents

V. EQUIPMENT

A. ABBOTT Architect c16000
B. Radiometer 825 blood gas instrument

VI. QUALITY CONTROL (QC):

A. Body Fluid Chemistry Testing:
    1. See Abbott Architect Chemistry Operations Procedure for Quality Control

information.

2. See Attachment I for testing available at each campus.

B. pH body fluid testing

1. Assay two pH buffers once per day on the strip used to verify performance of the test strips.
2. If both the 0.0-6.0 and the 5.0-10.0 strips are used, both will need to be tested.
    a. pH strip 0.0-6.0: Use the 4.0 and the 5.0 buffer.
    b. pH strip 5.0-10.0: Use the 5.0 and 7.0 buffer.
    c. pH strip 0-14.0: Choose two levels of buffers.
    d. Log results on the pH log.

C. Pleural fluid pH

1. One level of Qualichek® quality control supplied by radiometer is tested each shift.
2. Each shift tests a different level of QC.
3. The instrument automatically tests the QC solution at a pre-determined schedule.

VII. PROCEDURE:

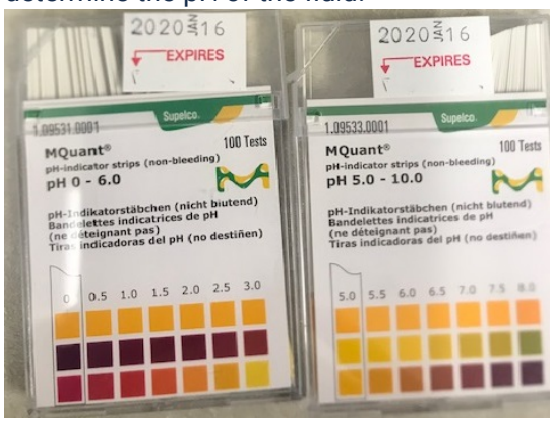
A. Body Fluid Chemistry Testing

1. Body fluids other than urine and cerebrospinal fluid are to be tested as serum.
2. Urine and CSF specimens have been validated and reference ranges verified for our instrument systems and testing configuration.
3. Place fluid in an aliquot tube with the appropriate aliquot label on it.
4. Body fluids including Urine and CSF may be tested on the Architect after centrifugation to remove any cellular or particulate matter.
5. Commonly ordered tests for body fluids are: Albumin, Amylase, Urea Nitrogen, Creatinine, Bilirubin, Lipase, Triglycerides, Cholesterol, Lactate Dehydrogenase(LDH) and Total Protein.
6. If additional tests are requested, consult with pathologist prior to releasing results, it may be necessary to send testing to Royal Oak or to another reference laboratory for appropriate testing.
7. Validation of testing has been performed to the extent possible, including method comparison, precision and interference analysis. The serum analytical measurement range(AMR) will be used until appropriate specimens are available to validate the AMR for fluids.

B. Body Fluid pH Testing:

1. Determine what body fluid you have received.
2. Pleural fluid is tested on the Radiometer ABL 825. See Radiometer ABL 800 Series Operations Procedure.

3. All other fluid will be tested with pH strips.
    a. Check for sufficient fluid for testing.
    b. Manually dip pH strip into liquid/solution and match to the color chart on the package immediately.
    c. Use the 5.0-10.0 pH strip first to test the body fluid.
    d. If fluid is at the extreme low end of the 5.0-10.0 strip, use the 0-6.0 strip to determine the pH of the fluid.



    e. If the pH appears to be >10.0, use the 0-14.0 pH strip. This strip only has gradations of 1.0 and should only be used if the result on the other strips is >10.0. These strips are located in or near the hood in Chemistry.
    f. Log results on the pH log.

C. Serum Ascites Gradient:
    1. The ascites fluid is poured into a properly labeled tube and centrifuged prior to testing.
    2. Albumin testing is performed on serum and ascites fluid and the LIS performs a calculation for the final result.

        Expected Values for Serum Ascites Gradient:
        Transudate = >1.1
        Exudate = 0.2-1.0

VIII. CALCULATIONS AND INTERPRETATIONS:

A. Any required calculations will be performed by the laboratory computer system.

B. See Abbott Architect Chemistry Operations Procedure for further information.

C. Pleural Fluid: a pluid pH lower than 7.2 can indicate the need for chest tube and antibiotics in cases of pneumonia. A pH of 7.4 or greater is typically seen in the cases of malignancy. A finding of a pH of as low as 6.0 indicates esophageal rupture allowing gastric fluid to accumulate.

IX. EXPECTED VALUES:

A. Expected values when available will be included in the patient report.

B. Many fluids are considered pathologic and, normal specimens are not generally obtainable.

C. For those fluids such as, Pericardial, Peritoneal and Pleural fluids, a comment will be added to the report that states
"This test has been validated by Beaumont Laboratory. It has not been FDA-approved for this specimen type".

D. See Abbott ARCHITECT Chemistry System Analyzer Operation procedure for expected values for various fluids.

1. pH testing:

    a. Urine: 5.0-8.0

    b. Pleural, peritoneal, and other fluids: No reference ranges have been determined.

X. REPORTABLE RANGES:

A. Body Fluid Chemistry tests:

1. Reportable range is dependent on the individual test ordered.
2. Serum AMR ranges will be used to determine whether dilution is necessary to obtain results.
3. See Abbott Architect Chemistry Operations Procedure attachment I for reportable ranges for individual tests.

B. pH fluid testing: pH 0.0-14.0

XI. LIMITATIONS:

A. Due to the variation in composition of body fluids, elevated protein or other substances may interfere with the analysis.

B. Specimens that are too viscous to be aspirated by the chemistry analyzer may be treated as described in the Specimen Handling Procedure - Viscous Fluid Specimens.

C. If reliable results cannot be obtained, the following comment will be added: “unable to perform-sample to viscous to analyze”.

XII. INTERFERING SUBSTANCES:

A. Hemolysis, Icterus and Lipemia can affect results of testing. Due to the sensitive nature of these fluids testing will be performed with appropriate comments for specimen integrity attached if necessary.

B. See Abbott Architect Chemistry Operations Procedure attachment F for a list of interferences.

XIII. REFERENCES:

Radiometer 800 Series Operations Procedure

Abbott Architect Chemistry Operations Procedure

Kjeldsberg and Knight, Body Fluids, 3rd ed., Chicago American Society of Clinical Pathologists, 2015.

Strasinger, Urinalysis and Body Fluids, 3rd ed., Philedelphia, F.A. Davis Company, 1994.

Approval Signatures

Step Description	Approver	Date
	Vaishali Pansare: Chief, Pathology	3/6/2023
Policy and Forms Steering Committee (as needed)	Gail Juleff: Project Mgr Policy	2/23/2023
Policy and Forms Steering Committee (as needed)	Kristin Russell: Supv, Laboratory	2/22/2023
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> Corrected heading II and amended typo

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