Overview

Useful For
Workup of cases of chronic diarrhea

Diagnosis of factitious diarrhea (where patient adds water to stool to simulate diarrhea)

Profile Information

<table>
<thead>
<tr>
<th>Test ID</th>
<th>Reporting Name</th>
<th>Available Separately</th>
<th>Always Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA_F</td>
<td>Sodium, F</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>K_F</td>
<td>Potassium, F</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>CL_F</td>
<td>Chloride, F</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>OSMOF</td>
<td>Osmolality, F</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>MG_F</td>
<td>Magnesium, F</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>OG_F</td>
<td>Osmotic Gap, F</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>POU_F</td>
<td>Phosphorus, F</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Method Name
OG_F: Calculation

NA_F, K_F, CL_F: Indirect Ion-Selective Electrode (ISE) Potentiometry

OSMOF: Freezing Point Depression

POU_F: Photometric, Ammonium Molybdate

MG_F: Colorimetric Titration

NY State Available
Yes

Specimen

Specimen Type
Fecal

Specimen Required
Collection Container/Tube: Stool container (T291)

Specimen Volume: 10 g

Collection Instructions: Collect a very liquid stool specimen.
1. **Do not send formed stool.** In the event a formed stool is submitted, the test will not be performed. The report will indicate "A formed stool specimen was submitted for analysis. This test was not performed because it only has clinical value if performed on a watery stool specimen."

2. Osmolality results will be reported as mOsm/kg regardless of collection duration.

3. Sodium, chloride, and potassium will be reported as mmol/L

4. Magnesium and phosphorus will be reported as mg/dL

**Forms**

If not ordering electronically, complete, print, and send a [Renal Diagnostics Test Request](#) (T830) with the specimen.

**Specimen Minimum Volume**

5 g

**Reject Due To**

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

**Specimen Stability Information**

<table>
<thead>
<tr>
<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
<th>Special Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal</td>
<td>Frozen (preferred)</td>
<td>14 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refrigerated</td>
<td>7 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient</td>
<td>48 hours</td>
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</table>

**Clinical and Interpretive**

**Clinical Information**

The concentration of electrolytes in fecal water and their rate of excretion are dependent upon 3 factors:

- Normal daily dietary intake of electrolytes

- Passive transport from serum and other vascular spaces to equilibrate fecal osmotic pressure with vascular osmotic pressure

- Electrolyte transport into fecal water due to exogenous substances and rare toxins (eg, cholera toxin)

Fecal osmolality is normally in equilibrium with vascular osmolality, and sodium is the major afferent of this equilibrium. Fecal osmolality is normally 2 x (sodium + potassium) unless there are exogenous factors inducing a change in composition, such as the presence of other osmotic agents (magnesium sulfate, saccharides) or drugs inducing secretions, such as phenolphthalein or bisacodyl.

Osmotic diarrhea is caused by ingestion of poorly absorbed ions or sugars and can be characterized by the following:

- Stool volume typically decreased by fasting
Test Definition: EFPO
Electrolyte and Osmolality Panel, F

- Fecal fluid usually has an elevated osmotic gap

- Osmotic agents such as magnesium, sorbitol, or polyethylene glycol may be the cause through the intentional or inadvertent use of laxatives

- Carbohydrate malabsorption due most commonly to lactose intolerance

- Carbohydrate malabsorption can be differentiated from other osmotic causes by a low stool pH (<6)

Secretory diarrhea is caused by disruption of epithelial electrolyte transport and can be characterized by the following:

- Stool volume is usually unaffected by fasting

- **Fecal fluid usually has elevated electrolytes (primarily sodium and chloride) and a low osmotic gap (<50 mOsm/kg)**

- Common causes include bile acid malabsorption, inflammatory bowel disease, endocrine tumors, and neoplasia

- Secretory agents such as anthraquinones, phenolphthalein, bisacodyl, or cholera toxin should also be considered

- Infection is a common secretory process; however, it does not typically cause chronic diarrhea (defined as symptoms >4 weeks)

**Reference Values**
No established reference values

**Interpretation**

**Osmotic Gap:**

- Osmotic gap is calculated as 290 mOsm/kg-(2[Na]+2[K]). Typically, stool osmolality is similar to serum since the gastrointestinal (GI) tract does not secrete water.(1)

- An osmotic gap >50 mOsm/kg is suggestive of an osmotic component contributing to the symptoms of diarrhea.(1-3)

- Magnesium-induced diarrhea should be considered if the osmotic gap is >75 mOsm/kg and is likely if the magnesium concentration is >110 mg/dL.(1)

- An osmotic gap < or =50 mOsm/kg is suggestive of secretory causes of diarrhea.(1-3)

- **A highly negative osmotic gap or a fecal sodium concentration greater than plasma or serum suggests the possibility of either sodium phosphate or sodium sulfate ingestion by the patient.**(4)

**Phosphorus:**

- Phosphorus elevation >102 mg/dL is suggestive of phosphate-induced diarrhea.(4)

**Sodium:**

- Sodium is typically found at lower concentrations (mean 30 +/- 5 mmol/L) in patients with osmotic diarrhea caused by magnesium-containing laxatives, while typically at higher concentrations (mean 104 +/- 5 mmol/L) in patients known to be taking secretory laxatives.(5)
Osmolality:

- Stool osmolality <220 mOsm/kg indicates dilution with a hypotonic fluid.(1)
- Stool osmolality >330 mOsm/kg in the absence of increased serum osmolality indicates improper storage.(1)

Sodium and Potassium:

- High sodium and potassium in the absence of an osmotic gap indicate active electrolyte transport in the GI tract that might be induced by agents such as cholera toxin or hypersecretion of vasointestinal peptide.(1)

Chloride:

- Markedly elevated fecal chloride concentration in infants (>60 mmol/L) and adults (>100 mmol/L) is associated with congenital and secondary chloridorrhea.(6)
- Fecal chloride may be elevated (>35 mmol/L) in phenolphthalein- or phenolphthalein plus magnesium hydroxide-induced diarrhea.(3)
- Fecal chloride may be low (<20 mmol/L) in sodium sulfate-induced diarrhea.(3)

**Clinical Reference**


**Performance**

**Method Description**

Osmotic Gap:

Calculated result = 290 mOsm/kg - 2(stool Na [mmol/L] + stool K [mmol/L])

Osmolality:
The depression of the freezing point of serum or other fluid is used to measure osmolality using an Advanced Instruments osmometer. The extent of lowering below 0 degrees C (the freezing point of water) is a function of the concentration of substances dissolved in the serum. By definition, 1 milliosmole per kilogram lowers the freezing point 0.001858 degrees C. (Murphy JE, Henry JB: Evaluation of renal function, and water, and electrolyte, and acid base balance. In Todd-Sanford-Davidsohn Clinical Diagnosis and Management by Laboratory Methods. 16th edition. Edited by JB Henry. Philadelphia, WB Saunders Company, 1979, pp 135-152)

Sodium, Potassium, and Chloride:

The Roche Cobas c 501 analyzer dilutes samples 1:31 and makes use of the unique properties of certain membrane materials to develop an electrical potential (electromotive force: EMF) for the measurements of ions in solution. The electrode has a selective membrane in contact with both the test solution and an internal filling solution. The internal filling solution contains the test ion at a fixed concentration. The membrane EMF is determined by the difference in concentration of the test ion in the test solution and the internal filling solution. The EMF develops according to the Nernst equation for a specific ion in solution. (Package insert: Roche ISE reagent. Roche Diagnostics Corp, 2009-09, V8)

Phosphorus:

In the presence of sulfuric acid, inorganic phosphate and ammonium molybdate form an ammonium phosphomolybdate complex. The concentration of phosphomolybdate formed is measured photometrically and is directly proportional to the inorganic phosphate concentration. (Package insert: Roche Phosphorus reagent. Roche Diagnostics Corp., Indianapolis, IN, 2010-10, V5)

Magnesium:

In an alkaline solution, magnesium forms a purple complex with xylidyl blue, a diazonium salt. The magnesium concentration is measured photometrically via the decrease in the xylidyl blue absorbance. (Package insert: Magnesium reagent. Roche Diagnostics Corp., Indianapolis, IN, 2012-04, V2)

**PDF Report**

No

**Day(s) and Time(s) Test Performed**

Monday, Wednesday, Friday; Evening

**Analytic Time**

Same day/1 day

**Maximum Laboratory Time**

3 days

**Specimen Retention Time**

7 days

**Performing Laboratory Location**

Rochester

**Fees and Codes**

Fees
Test Definition: EFPO
Electrolyte and Osmolality Panel, F

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their Regional Manager. For assistance, contact Customer Service.

Test Classification
This test has been modified from the manufacturer's instructions. Its performance characteristics were determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the U.S. Food and Drug Administration.

CPT Code Information
82438-Chloride
83735-Magnesium
84302-Sodium
84100-Phosphorus
84999 x 2-Osmolality, Potassium

LOINC® Information

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<td>Electrolyte and Osmolality Panel, F</td>
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<th>Test Result Name</th>
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