i-STAT 6+ Cartridge

Intended for use with the i-STAT Alinity Instrument

NAME

i-STAT 6+ Cartridge – REF 03P80-25

INTENDED USE

The i-STAT 6+ cartridge with the i-STAT Alinity System is intended for use in the *in vitro* quantification of sodium, potassium, chloride, glucose, blood urea nitrogen and hematocrit in arterial, venous or capillary whole blood.

Analyte	Intended Use
Sodium (Na)	Sodium measurements are used for monitoring electrolyte imbalances.
Potassium (K)	Potassium measurements are used in the diagnosis and monitoring of diseases and clinical conditions that manifest high and low potassium levels.
Chloride (Cl)	Chloride measurements are primarily used in the diagnosis, monitoring, and treatment of electrolyte and metabolic disorders including, but not limited to, cystic fibrosis, diabetic acidosis, and hydration disorders.
Glucose (Glu)	Glucose measurements are used in the diagnosis, monitoring, and treatment of carbohydrate metabolism disorders including, but not limited to, diabetes mellitus, neonatal hypoglycemia, idiopathic hypoglycemia, and pancreatic islet cell carcinoma.
Blood Urea Nitrogen (BUN/Urea)	Blood urea nitrogen measurements are used for the diagnosis, monitoring, and treatment of certain renal and metabolic diseases.
Hematocrit (Hct)	Hematocrit measurements can aid in the determination and monitoring of normal or abnormal total red cell volume status including, but not limited to, conditions such as anemia, erythrocytosis, and blood loss related to trauma and surgery.

SUMMARY AND EXPLANATION/CLINICAL SIGNIFICANCE

Measured:

Sodium (Na)

Tests for sodium in the blood are important in the diagnosis and treatment of patients suffering from hypertension, renal failure or impairment, cardiac distress, disorientation, dehydration, nausea and diarrhea. Some causes of increased values for sodium include dehydration, diabetes insipidus, salt poisoning, skin losses, hyperaldosteronism and CNS disorders. Some causes for decreased values for sodium include dilutional hyponatremia (cirrhosis), depletional hyponatremia and syndrome of inappropriate ADH.

Potassium (K)

Tests for potassium in the blood are important in the diagnosis and treatment of patients suffering from hypertension, renal failure or impairment, cardiac distress, disorientation, dehydration, nausea and diarrhea. Some causes of increased values for potassium include renal glomerular disease, adrenocortical insufficiency, diabetic ketoacidosis (DKA), sepsis and in vitro hemolysis. Some causes of decreased values for potassium include renal tubular disease, hyperaldosteronism, treatment of DKA, hyperinsulinism, metabolic alkalosis and diuretic therapy.

Chloride (Cl)

Tests for chloride in the blood are important in the diagnosis and treatment of patients suffering from hypertension, renal failure or impairment, cardiac distress, disorientation, dehydration, nausea and diarrhea. Some causes of increased values for chloride include prolonged diarrhea, renal tubular disease, hyperparathyroidism and dehydration. Some causes for decreased values for chloride include prolonged vomiting, burns, salt-losing renal disease, overhydration and thiazide therapy.

Glucose (Glu)

Glucose is a primary energy source for the body and the only source of nutrients for brain tissue. Measurements for determination of blood glucose levels are important in the diagnosis and treatment of patients suffering from diabetes and hypoglycemia. Some causes for increased values of glucose include diabetes mellitus, pancreatitis, endocrine disorders (e.g., Cushing's syndrome), drugs (e.g., steroids, thyrotoxicosis), chronic renal failure, stress, or I.V. glucose infusion. Some causes of decreased values of glucose include insulinoma, adrenocortical insufficiency, hypopituitarism, massive liver disease, ethanol ingestion, reactive hypoglycemia, and glycogen storage disease.

Blood Urea Nitrogen (BUN/Urea)

An abnormally high level of urea nitrogen in the blood is an indication of kidney function impairment or failure. Some other causes of increased values for urea nitrogen include prerenal azotemia (e.g., shock), postrenal azotemia, GI bleeding and a high protein diet. Some causes of decreased values for urea nitrogen include pregnancy, severe liver insufficiency, overhydration and malnutrition.

Hematocrit (Hct)

Hematocrit is a measurement of the fractional volume of red blood cells. This is a key indicator of the body's state of hydration, anemia or severe blood loss, as well as the blood's ability to transport oxygen. A decreased hematocrit can be due to either overhydration, which increases the plasma volume, or a decrease in the number of red blood cells caused by anemias or blood loss. An increased hematocrit can be due to loss of fluids, such as in dehydration, diuretic therapy, and burns, or an increase in red blood cells, such as in cardiovascular and renal disorders, polycythemia vera, and impaired ventilation.

TEST PRINCIPLE

The i-STAT System uses direct (undiluted) electrochemical methods. Values obtained by direct methods may differ from those obtained by indirect (diluted) methods. [1]

vivo

Measured:

Sodium (Na), Potassium (K) and Chloride (Cl)

The respective analyte is measured by ion-selective electrode potentiometry. In the calculation of results, concentration is related to potential through the Nernst equation.

Glucose (Glu)

Glucose is measured amperometrically. Oxidation of glucose, catalyzed by the enzyme glucose oxidase, produces hydrogen peroxide (H_2O_2). The liberated H_2O_2 is oxidized at the electrode to produce a current proportional to the sample glucose concentration.

$$\beta\text{-D-glucose} + H_2O + O_2 \xrightarrow{\textit{glucose oxidase}} \text{D-gluconic acid} + H_2O_2$$

$$H_2O_2 \longrightarrow 2H^+ + O_2 + 2e^-$$

BUN/Urea

Urea is hydrolyzed to ammonium ions in a reaction catalyzed by the enzyme urease.

$$\text{Urea} + H_2O + 2H^+ \xrightarrow{\text{urease}} 2NH^+_4 + CO_2$$

The ammonium ions are measured potentiometrically by an ion-selective electrode. In the calculation of results, concentration is related to potential through the Nernst Equation.

Hematocrit (Hct)

Hematocrit is determined conductometrically. The measured conductivity, after correction for electrolyte concentration, is inversely related to the hematocrit.

Calculated:

Hemoglobin (Hb)

The i-STAT System provides a calculated hemoglobin result which is determined as follows:

hemoglobin (g/dL) = hematocrit (% PCV) x 0.34

hemoglobin (g/dL) = hematocrit (decimal fraction) x 34

To convert a hemoglobin result from g/dL to mmol/L, multiply the displayed result by 0.621. The calculation of hemoglobin from hematocrit assumes a normal MCHC.

See below for information on factors affecting results. Certain substances, such as drugs, may affect analyte levels in vivo.[2] If results appear inconsistent with the clinical assessment, the patient sample should be retested using another cartridge.

REAGENTS

Contents

Each i-STAT cartridge contains one reference electrode sensor, sensors for the measurement of specific analytes, and a buffered aqueous calibrant solution that contains known concentrations of analytes and preservatives. A list of reactive ingredients for the 6+ cartridge is shown below:

Sensor	Reactive Ingredient	Biological Source	Minimum Quantity
Na	Sodium (Na^+)	N/A	121 mmol/L
K	Potassium (K^+)	N/A	3.6 mmol/L
Cl	Chloride (Cl^-)	N/A	91 mmol/L
Glu	Glucose	N/A	7 mmol/L
	Glucose Oxidase	*Aspergillus niger*	0.002 IU
BUN/Urea	Urea	N/A	4 mmol/L
	Urease	*Canavalia ensiformis*	0.12 IU

Warnings and Precautions

- For *in vitro* diagnostic use.
- Cartridges are intended for single-use only. Do not reuse.
- Refer to the i-STAT Alinity System Operations Manual for all warnings and precautions.

Storage Conditions

- Refrigeration at 2–8 ºC (35–46 ºF) until expiration date.
- Room Temperature at 18–30 ºC (64–86 ºF). Refer to the cartridge box for room temperature storage requirements.

INSTRUMENTS

The i-STAT 6+ cartridge is intended for use with the i-STAT Alinity Instrument (Model No. AN-500).

SPECIMEN COLLECTION AND PREPARATION FOR ANALYSIS

Specimen Types

Arterial, venous or capillary whole blood.

Sample volume: 65 µL

Blood Collection Options and Test Timing (time from collection to cartridge fill)

As higher heparin-to-blood ratios may affect results, fill blood collection tubes and syringes to capacity, following manufacturers' instructions.

6+ Sample Collection	
Syringe	**Without anticoagulant** • Mix sample immediately before filling cartridge. • Fill cartridge within 3 minutes of sample collection. **With balanced heparin anticoagulant** • Mix sample immediately before filling cartridge. • Fill cartridge within 30 minutes of sample collection.
Evacuated Tube	**Without anticoagulant** • Mix sample immediately before filling cartridge. • Fill cartridge within 3 minutes of sample collection. **With lithium heparin anticoagulant** • Mix sample immediately before filling cartridge. • Fill cartridge within 30 minutes of sample collection.
Capillary Tube	**With balanced heparin anticoagulant** • Mix sample immediately before filling cartridge. • Fill cartridge within 3 minutes of sample collection. **With lithium heparin anticoagulant** - If labeled for measurement of electrolytes. • Mix sample immediately before filling cartridge. • Fill cartridge within 3 minutes of sample collection.
Fill cartridge directly from skin puncture	While a sample can be transferred directly from a skin puncture to a cartridge, a capillary tube is preferred.

PROCEDURE FOR CARTRIDGE TESTING

Preparation for Use:

1. Individual cartridges may be used after standing five minutes at room temperature. An entire box of cartridges should stand at room temperature for one hour.
2. All cartridges should be used immediately after opening pouch.

3. If the pouch has been punctured, the cartridge should not be used.
4. Do not return cartridges to the refrigerator after bringing them to room temperature.

How to Perform Patient Testing

1. From the Home screen, touch "**Perform Patient Test**". This initiates the patient testing pathway.
2. To begin, follow instructions on the screen to "**Scan or Enter OPERATOR ID**"
3. Follow instructions on the screen to "**Scan or Enter PATIENT ID**"
4. Continue to follow prompts on the screen to proceed with patient testing. "**Scan (CARTRIDGE POUCH) Barcode**", Scanning is required. Information cannot be entered manually.
5. The screen for selecting sample type will display if more than one sample type is applicable; select sample type if applicable.
6. Follow instructions on the screen to "**Close and Insert Filled Cartridge**". The action buttons at the bottom of the screen allow forward, backward and pause functionality.
7. Once the cartridge is inserted, "**Contacting Cartridge**" will display followed by the countdown bar. The following alerts are also displayed: "**Cartridge locked in instrument. Do not attempt to remove the Cartridge**" and "**Testing - Instrument Must Remain Level**".
8. When the test is complete, the test results are displayed.

Analysis Time

Approximately 130–200 seconds.

Quality Control

The i-STAT Alinity System quality control regimen comprises various aspects, with a system design that reduces the opportunity for error, including:

1. The i-STAT Alinity System automatically runs a comprehensive set of quality checks of analyzer and cartridge performance each time a sample is tested. This internal quality system will suppress results if the analyzer or cartridge does not meet certain internal specifications.
2. Aqueous-based control solutions are available for verifying the integrity of newly received cartridges.
3. In addition, the instrument performs internal electronic checks and calibration during each test cycle, and the Electronic Simulator test provides an independent check on the ability of the instrument to take accurate and sensitive measurements of voltage, current and resistance from the cartridge. The instrument will pass or fail this electronic test depending on whether or not it measures these signals within limits specified in the instrument software.

For additional information on Quality Control, refer to the i-STAT Alinity System Operations Manual located at www.pointofcare.abbott.

Calibration Verification

Standardization is the process by which a manufacturer establishes "true" values for representative samples. A multi-point calibration is derived for each sensor by this standardization process. These calibration curves are stable over many lots.

A one-point calibration is performed each time a cartridge requiring calibration is used. During the first part of the testing cycle, the calibrant solution is automatically released from its foil pack and is positioned over the sensors. The signals produced by the sensors' responses to the calibrant solution are measured. This one-point calibration adjusts the offset of the stored calibration curve. Next, the instrument automatically moves the sample over the sensors and the signals produced by the sensors' responses to the sample are measured. While coefficients are used rather than graphic calibration curves, the calculation of the result is equivalent to reading the sample's concentration from an adjusted calibration curve.

EXPECTED VALUES

TEST	UNITS *	REPORTABLE RANGE	REFERENCE RANGE *arterial*	REFERENCE RANGE *venous*
MEASURED				
Na	mmol/L (mEq/L)	100–180	138–146 [3]	
K	mmol/L (mEq/L)	2.0–9.0	3.5–4.9** [3]	
Cl	mmol/L (mEq/L)	65–140	98–109 [3]	
Glu	mmol/L	1.1–38.9	3.9–5.8 [4]	
	mg/dL	20–700	70–105 [4]	
	g/L	0.20–7.00	0.70–1.05 [4]	
BUN/Urea Nitrogen	mg/dL	3–140	8–26 [3]	
Urea	mmol/L	1–50	2.9–9.4 [3]	
	mg/dL	6–300	17–56 [3]	
	g/L	0.06–3.00	0.17–0.56 [3]	
Hematocrit/Hct	% PCV ***	15–75	38–51**** [3]	
	Fraction	0.15–0.75	0.38–0.51 [3]	
CALCULATED				
Hemoglobin/Hb	g/dL	5.1–25.5	12–17**** [3]	
	g/L	51–255	120–170 [3]	
	mmol/L	3.2–15.8	7–11 [3]	

***** The i-STAT System can be configured with the preferred units. Not applicable for pH test.

****** The reference range for potassium has been reduced by 0.2 mmol/L from the range cited in Reference 3 to account for the difference in results between serum and plasma.

******* PCV, packed cell volume.

******** The reference ranges for hematocrit and hemoglobin span both female and male populations.

Unit Conversion

- **Glucose (Glu):** To convert mg/dL to mmol/L, multiply the mg/dL value by 0.055.
- **BUN/Urea**: To convert a BUN result in mg/dL to a urea result in mmol/L, multiply the BUN result by 0.357. To convert a urea result in mmol/L to a urea result in mg/dL, multiply the mmol/L result by 6. To convert a urea result in mg/dL to a urea result in g/L, divide the mg/dL result by 100.
- **Hematocrit (Hct):** To convert a result from % PCV (packed cell volume) to fraction packed cell volume, divide the % PCV result by 100. For the measurement of hematocrit, the i-STAT System can be customized to agree with methods calibrated by the microhematocrit reference method using either K_3EDTA or K_2EDTA anticoagulant. Mean cell volumes of K_3EDTA anticoagulated blood are approximately 2–4% less than K_2EDTA anticoagulated blood. While the choice of anticoagulant affects the microhematocrit method to which all hematocrit methods are calibrated, results from routine samples on hematology analyzers are independent of the anticoagulant used. Since most clinical hematology analyzers are calibrated by the microhematocrit method using K_3EDTA anticoagulant, the i-STAT System default customization is K_3EDTA.

i-STAT Alinity does not have default reference ranges programmed into the instrument. The reference ranges shown above are intended to be used as guides for the interpretation of results. Since reference ranges may vary with demographic factors such as age, gender and heritage, it is recommended that

reference ranges be determined for the population being tested.

METROLOGICAL TRACEABILITY

The measured analytes in the i-STAT 6+ cartridge are traceable to the following reference materials or methods. The i-STAT System controls and calibration verification materials are validated for use only with the i-STAT System and assigned values may not be commutable with other methods.

Sodium (Na), Potassium (K) and Chloride (Cl)
The respective analyte values assigned to i-STAT System controls and calibration verification materials are traceable to the U.S. National Institute of Standards and Technology (NIST) standard reference material SRM956.

Glucose (Glu)
The i-STAT System test for glucose measures glucose amount-of-substance concentration in the plasma fraction of arterial, venous, or capillary whole blood (dimension mmol L^{-1}) for *in vitro* diagnostic use. Glucose values assigned to i-STAT System controls and calibration verification materials are traceable to the U.S. National Institute of Standards and Technology (NIST) standard reference material SRM965.

Blood Urea Nitrogen (BUN/Urea)
The i-STAT System test for blood urea nitrogen/urea measures blood urea nitrogen/urea amount-of substance concentration in the plasma fraction of arterial, venous, or capillary whole blood (dimension mmol L^{-1}) for *in vitro* diagnostic use. BUN/urea values assigned to i-STAT System controls and calibration verification materials are traceable to the U.S. National Institute of Standards and Technology (NIST) standard reference material SRM909.

Hematocrit (Hct)
The i-STAT System test for hematocrit measures packed red blood cell volume fraction in arterial, venous, or capillary whole blood (expressed as the % packed cell volume) for *in vitro* diagnostic use. Hematocrit values assigned to i-STAT System working calibrators are traceable to the Clinical and Laboratory Standards Institute (CLSI) H7-A3 procedure for determining packed cell volume by the microhematocrit method. [5]

Additional information regarding metrological traceability is available from Abbott Point of Care Inc.

PERFORMANCE CHARACTERISTICS

The performance data summarized below was collected at Abbott Point of Care. Representative cartridges were used to collect the data.

Precision*
A multiday precision study was performed with aqueous calibration verification materials in representative cartridges. Duplicates of each aqueous fluid were tested twice a day for 20 days.

Test	Units	Aqueous Cal Ver	n	Mean	SD (Standard Deviation)	CV (%) [Coefficient of Variation (%)]
Na	mmol/L or mEq/L	Very Low Abnormal	80	99.5	0.32	0.3
		Low Abnormal	80	121.2	0.32	0.3
		Normal	80	133.7	0.34	0.3
		High Abnormal	80	160.8	0.38	0.2
		Very High Abnormal	80	180.2	0.56	0.3

Test	Units	Aqueous Cal Ver	n	Mean	SD (Standard Deviation)	CV (%) [Coefficient of Variation (%)]
K	mmol/L	Very Low Abnormal	80	2.31	0.010	0.4
		Low Abnormal	80	2.90	0.015	0.5
		Normal	80	3.81	0.023	0.6
		High Abnormal	80	6.16	0.026	0.4
		Very High Abnormal	80	7.81	0.039	0.5
Cl	mmol/L	Very Low Abnormal	80	63.3	0.59	0.9
		Low Abnormal	80	72.9	0.71	1.0
		Normal	80	91.7	0.75	0.8
		High Abnormal	80	112.4	0.90	0.8
		Very High Abnormal	80	124.1	1.08	0.9
Glu	mg/dL	Very Low Abnormal	80	26.9	0.42	1.6
		Low Abnormal	80	41.0	0.34	0.8
		High Abnormal	80	125.0	0.32	0.3
		Very High Abnormal	80	286.7	0.77	0.3
		Highest Abnormal	80	600.6	3.47	0.6
BUN	mg/dL	Very Low Abnormal	80	4.6	0.19	4.1
		Low Abnormal	80	6.6	0.15	2.3
		Normal	80	11.5	0.19	1.6
		High Abnormal	80	54.3	0.66	1.2
		Very High Abnormal	80	108.4	1.07	1.0
Hct	%PCV	Very Low Abnormal	80	16.9	0.46	2.7
		Low Abnormal	80	33.9	0.51	1.5
		High Abnormal	80	55.2	0.49	0.9
		Very High Abnormal	80	65.0	0.39	0.6

*Note: Representative data, individual laboratories may vary from these data.

Method Comparison

Method comparison was demonstrated in a study comparing the i-STAT Alinity to the i-STAT 1 Wireless (i-STAT 1W) using representative cartridges. The studies were based on CLSI guideline EP9-A3.[6] Whole blood samples anticoagulated with lithium heparin were evaluated. Samples were analyzed in duplicate on both systems. A weighted Deming regression analysis was performed using the first replicate result from the i-STAT Alinity versus the mean of the duplicates from the i-STAT 1W.

In the method comparison table, n is the number of specimens, and r is the correlation coefficient.

Test	Units		Comparative Method i-STAT 1W
Na	mmol/L	n	174
		Slope	1.0
		r	0.999

Test	Units		Comparative Method i-STAT 1W
		intercept	-1
		X_{min}	115
		X_{max}	173
K	mmol/L	n	195
		Slope	1.00
		r	1.00
		intercept	-0.01
		X_{min}	2.0
		X_{max}	9.0
Cl	mmol/L	n	189
		Slope	1.01
		r	0.999
		intercept	-0.76
		X_{min}	66
		X_{max}	140
Glu	mg/dL	n	188
		Slope	1.00
		r	1.000
		intercept	1.17
		X_{min}	24
		X_{max}	671
Urea	mg/dL	n	194
		Slope	1.01
		r	0.999
		intercept	-0.02
		X_{min}	3
		X_{max}	137
Hct	%PCV	n	229
		Slope	1.02
		r	0.993
		intercept	-0.36
		X_{min} (%PCV)	18
		X_{max} (%PCV)	70

FACTORS AFFECTING RESULTS

The following substances were evaluated in plasma for relevant analytes at the test concentrations recommended in CLSI guideline EP7-A2 [7] unless otherwise noted. For those identified as an interferant the interference is described.

Substance	Test Concentration (mmol/L)	Analyte	Interference (Yes/No)	Comment
Acetaldehyde	0.045 [8]	Glu	No	
Acetaminophen	1.32	Na	No	

Substance	Test Concentration (mmol/L)	Analyte	Interference (Yes/No)	Comment
		K	No	
		Cl	No	
		Glu	Yes	Increased results
		BUN	No	
Acetaminophen (therapeutic)	0.132 [8]	Glu	No	
Acetoacetate	2.0	Glu	No	
Acetylcysteine	10.2	Na	No	
		K	No	
		Cl	Yes	Increased results
		Glu	Yes	Decreased results
		BUN	No	
Acetylcysteine (therapeutic)	0.30 [9 10]	Cl	No	
		Glu	No	
Ascorbate	0.34	Na	No	
		K	No	
		Cl	No	
		Glu	No	
		BUN	No	
Bromide	37.5	Na	Yes	Increased results. Use another method.
		K	Yes	Increased results and rate of star (***) outs. Use another method.
		Cl	Yes	Increased results. Use another method.
		Glu	Yes	Decreased results. Use another method.
		BUN	Yes	Decreased result and increased rate of star (***) outs. Use another method.
		Hct	Yes	Increased rate of star (***) outs
Bromide (therapeutic)	2.5 [11 12 13]	Na	No	
		K	No	
		Cl	Yes	Increased results. Use another method.
		Glu	Yes	Decreased results
		BUN	No	
		Hct	No	
Dopamine	0.006	Glu	No	
Formaldehyde	0.133 [8]	Glu	No	
β-Hydroxybutyrate	6.0 [14]	Na	No	
		K	No	
		Cl	No	
		Glu	No	
		BUN	No	
Hydroxyurea	0.92	Glu	Yes	Increased results. Use another method.
		BUN	Yes	Increased results
Iodide	2.99	Cl	Yes	Increased results
	0.4	Cl	No	
Lactate	6.6	Na	No	

Substance	Test Concentration (mmol/L)	Analyte	Interference (Yes/No)	Comment
		K	No	
		Cl	No	
		Glu	No	
		BUN	No	
Magnesium Chloride	1.0	Na	No	
		K	No	
Maltose	13.3	Glu	No	
Nithiodote (Sodium thiosulfate)	16.7 [15]	Na	Yes	Increased results
		K	Yes	Decreased results
		Cl	Yes	Increased results
		Glu	Yes	Decreased results
		BUN	Yes	Decreased results
Pyruvate	0.31	Glu	No	
Salicylate	4.34	Na	No	
		K	No	
		Cl	Yes	Increased results. Use another method.
		Glu	No	
		BUN	No	
Salicylate (therapeutic)	0.5 [16]	Cl	No	
Thiocyanate	6.9	Cl	Yes	Increased results. Use another method
		Glu	Yes	Decreased results
		BUN	No	
Thiocyanate (therapeutic)	0.5 [8]	Glu	No	
Uric Acid	1.4	Glu	No	

The degree of interference at concentrations other than those reported above might not be predictable. It is possible that interfering substances other than those tested may be encountered.

Relevant comments regarding interference of Acetaminophen, Acetylcysteine, Bromide, Hydroxyurea, Iodide, Nithiodote and Salicylate and are noted below:

- Acetaminophen has been shown to interfere with i-STAT glucose results at a concentration proscribed by the CLSI guideline, 1.32 mmol/L, which represents a toxic concentration. Acetaminophen at 0.132 mmol/L, which represents the upper end of the therapeutic concentration, has been shown not to significantly interfere with i-STAT glucose results.
- Acetylcysteine has been tested at two levels: the CLSI recommended level of 10.2 mmol/L and a concentration of 0.30 mmol/L. The latter is 3 times the peak therapeutic plasma concentration associated with treatment to reverse acetaminophen poisoning. APOC has not identified a therapeutic condition that would lead to levels consistent with the CLSI recommended level.
- Bromide has been tested at two levels: the CLSI recommended level and a therapeutic plasma concentration level of 2.5 mmol/L. The latter is the peak plasma concentration associated with halothane anesthesia, in which bromide is released. APOC has not identified a therapeutic condition that would lead to levels consistent with the CLSI recommended level.
- Hydroxyurea has been shown to interfere with glucose and BUN results at 0.92 mmol/L. Hydroxyurea is a DNA synthesis inhibitor used in the treatment sickle cell anemia, HIV infection, and various types of cancer. The malignancies that it is used to treat include melanoma, metastatic ovarian cancer, and chronic myelogenous leukemia. It is also used in the treatment of polycythemia vera, thrombocythemia, and psoriasis. At typical doses ranging from 500 mg to 2 g/day,

concentrations of hydroxyurea in a patient's blood may be sustained at approximately 100 to 500 µmol/L. Higher concentrations may be observed soon after dosing or at higher therapeutic doses.

- Iodide has been tested at the CLSI recommended level of 2.99 mmol/L, which is close to the peak concentration after a lethal dose. A lethal dose is reported to be in the range of 2–4 grams [17], which equates to 3.1–6.3 mmol/L assuming the dose is fully distributed in a typical blood volume of 5 L. Iodide can be used to treat thyroid disease (i.e., hyperthyroidism). A study showed serum iodide reaches mean peak concentration between 1.8 mg/L (0.014 mmol/L) and 2.2 mg/L (0.017 mmol/L) after a month of supplementation at 50 mg/day. [18] Iodide has been shown to interfere with i-STAT chloride results at 2.99 mmol/L. The lowest concentration tested at APOC of 0.4 mmol/L has been shown to not significantly interfere with i-STAT chloride results. APOC has not identified a therapeutic condition that would lead to levels consistent with the CLSI recommended level.
- Nithiodote (sodium thiosulfate) has been shown to interfere with sodium, potassium, chloride, glucose and BUN results at 16.7 mmol/L. Nithiodote (sodium thiosulfate) is indicated for the treatment of acute cyanide poisoning. The journal article titled "Falsely increased chloride and missed anion gap elevation during treatment with sodium thiosulfate" indicated that sodium thiosulfate could be used in the treatment of calciphylaxis indicating that "the highest concentration likely to be seen in plasma [is] after infusion of a 12.5 g dose of sodium thiosulfate pentahydrate. Assuming that the 12.5 g dose of sodium thiosulfate pentahydrate is distributed in a typical blood volume of 5 L with a hematocrit of 40%, the peak sodium thiosulfate plasma concentration expected is 16.7 mmol/L." [15]
- Salicylate has been shown to interfere with i-STAT chloride result at 4.34 mmol/L, a toxic concentration that is proscribed by the CLSI guideline. Salicylate at 0.5 mmol/L, which represents the upper end of the therapeutic concentration range, has been shown not to significantly interfere with i-STAT chloride results.

OTHER FACTORS AFFECTING RESULTS

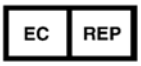
Factor	Analyte	Effect
Sodium heparin	Na	Sodium heparin may increase sodium results up to 1 mmol/L. [19]
Hemodilution	Na	Hemodilution of the plasma by more than 20% associated with priming cardiopulmonary bypass pumps, plasma volume expansion or other fluid administration therapies using certain solutions may cause clinically significant error on sodium and chloride results. These errors are associated with solutions that do not match the ionic characteristics of plasma. To minimize these errors when hemodiluting by more than 20%, use physiologically balanced multi-electrolyte solutions containing low-mobility anions (e.g., gluconate).
	Cl	
Line draw	Hct	Low hematocrit results can be caused by contamination of flush solutions in arterial or venous lines. Back flush a line with a sufficient amount of blood to remove intravenous solutions, heparin, or medications that may contaminate the sample. Five to six times the volume of the catheter, connectors, and needle is recommended.
Cold temperature	K	Potassium values will increase in iced specimens.
Allowing blood to stand (without exposure to air)	K	If heparinized whole blood is allowed to stand before testing, potassium values will first decrease slightly, then increase over time.
	Glu	Glucose values will decrease in whole blood samples over time. Venous blood glucose is as much as 7 mg/dL less than capillary blood glucose as a result of tissue utilization. [20]
Sample type	K	Serum Potassium results may be 0.1 to 0.7 mmol/L higher than

<table>
<tr><th>Factor</th><th>Analyte</th><th>Effect</th></tr>
<tr><td></td><td></td><td>Potassium results from anticoagulated samples due to the release of Potassium from platelets [1] and red blood cells during the clotting process.</td></tr>
<tr><td>Sample mixing</td><td>Hct</td><td>Samples from 1 mL syringes should not be used to determine hematocrit if testing is delayed.</td></tr>
<tr><td>Hemolysis</td><td>K</td><td>Potassium values obtained from skin puncture samples may vary due to hemolysis or an increase in tissue fluid from improper technique during the collection procedure.</td></tr>
<tr><td>pH dependence</td><td>Glu</td><td>The dependence of the i-STAT glucose test with respect to pH is as follows: values below pH 7.4 at 37°C decrease results by approximately 0.9 mg/dL (0.05 mmol/L) per 0.1 pH unit. Values above pH 7.4 at 37°C increase results by approximately 0.8 mg/dL (0.04 mmol/L) per 0.1 pH unit.</td></tr>
<tr><td>$\boldsymbol{P}O_2$ dependence</td><td>Glu</td><td>The dependence of the i-STAT glucose test with respect to $\boldsymbol{P}O_2$ is as follows: oxygen levels of less than 20 mmHg (2.66 kPa) at 37 °C may decrease results.</td></tr>
<tr><td>Erythrocyte sedimentation</td><td>Hct</td><td>• The measurement of certain blood samples with high erythrocyte sedimentation rates (ESR) may be affected by analyzer angle. While testing blood samples, beginning 90 seconds after the cartridge is inserted, the analyzer should remain level until a result is obtained. A level surface includes running the handheld in the downloader/ recharger.
• Hematocrit results can be affected by the settling of red blood cells in the collection device. The best way to avoid the effect of settling is to test the sample immediately. If there is a delay in testing of a minute or more, the sample must be remixed thoroughly.</td></tr>
<tr><td>White Blood Cell Count (WBC)</td><td>Hct</td><td>Grossly elevated white blood cell counts may increase results.</td></tr>
<tr><td>Lipids</td><td>Hct</td><td>Abnormally high lipids may increase results. Interference from lipids will be about two thirds the size of the interference from protein.</td></tr>
<tr><td>Total Protein</td><td>Hct</td><td>Hematocrit results are affected by the level of total protein as follows:
<table>
<tr><th>Displayed Result</th><th>Total Protein (TP) < 6.5 g/dL</th><th>Total Protein (TP) > 8.0 g/dL</th></tr>
<tr><td>HCT < 40% PCV</td><td>Hct decreased by ~1% PCV for each decrease of 1 g/dL TP</td><td>Hct increased by ~1% PCV for each increase of 1 g/dL TP</td></tr>
<tr><td>HCT > 40% PCV</td><td>Hct decreased by ~0.75 % PCV for each decrease of 1 g/dL TP</td><td>Hct increased by ~0.75 % PCV for each increase of 1 g/dL TP</td></tr>
</table>
• Total protein levels may be low in neonatal and burn patient populations, as well as in additional clinical populations listed in Statland.[3] Total protein levels may also be decreased in patients undergoing cardiopulmonary bypass (CPB) or extracorporeal membrane oxygenation (ECMO) and with patients receiving large volumes of saline-based intravenous (IV) fluids. Care should be taken when using hematocrit results from patients with total protein levels below the adult reference range (6.5 to 8 g/dL).
• The CPB sample type can be used to correct the hematocrit result for the dilutional effect of the pump prime in cardiovascular surgery. The CPB algorithm assumes that cells and plasma are diluted equally and that the pump priming solution has no added albumin or other colloid or packed red blood cells. Since perfusion practices vary, it is recommended that each practice verify the use of the CPB sample type and the length of time in which the CPB sample type should be used during the recovery period. Note that for hematocrit</td></tr>
</table>

Factor	Analyte	Effect
		values above 30% PCV, the CPB correction is ≤1.5% PCV; the size of the correction at this level should not impact transfusion decisions.
Sodium	Hct	The sample electrolyte concentration is used to correct the measured conductivity prior to reporting hematocrit results. Factors that affect sodium will therefore also affect hematocrit.

For BUN/Urea, endogenous ammonium ions will not affect results.

KEY TO SYMBOLS

Symbol	Definition/Use
	14 days room temperature storage at 18–30 ^{0}C.
	Use by or expiration date. The expiration date, expressed as YYYY-MM-DD, indicates the last day the product may be used.
	Manufacturer's lot number or batch code. The lot number or batch code appears adjacent to this symbol.
	Sufficient for <n> tests.
	Authorized representative for Regulatory Affairs in the European Community.
	Temperature limitations. The upper and lower limits for storage are adjacent to upper and lower arms.
	Catalog number, list number, or reference.
	Do not reuse.
	Manufacturer.
	Consult instructions for use or see System Manual for instructions.
	*In vitro* diagnostic medical device.
	Compliance to the European directive on *in vitro* diagnostic devices (98/79/EC)
	For prescription use only.

Additional Information: to obtain additional product information and technical support, refer to the Abbott company website at www.pointofcare.abbott.

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