

## English

### Intended use

The ISE module of the COBAS INTEGRA systems is intended for use in the quantitative determination of sodium, potassium, and chloride in diluted urine using ion-selective electrodes.

### Summary<sup>1,2</sup>

Electrolytes are involved in most major metabolic functions in the body. Sodium, potassium, and chloride are amongst the most important physiological ions and the most often assayed electrolytes. They are supplied primarily through the diet, absorbed in the gastrointestinal tract, and excreted by the kidneys.

*Sodium* is the major extracellular cation and functions to maintain fluid distribution and osmotic pressure. Some causes of increased urine levels of sodium include adrenal failure, salt-losing nephritis, and diuretic therapy. Causes of decreased levels include adrenocortical hyperfunction, states with reduced glomerular filtration rate, e.g. congestive heart failure, and acute oliguria and prerenal azotemia. Excretion of urinary sodium is highly dependent on dietary intake and state of hydration. Sodium levels in urine are measured to evaluate renal function, and in studies of electrolyte, acid-base, and water balance.

*Potassium* is the major intracellular cation and is critical to neural and muscle cell activity. Some causes of increased urinary potassium levels include beginning of starvation, primary and secondary aldosteronism, and primary renal diseases (renal tubular syndromes, during the recovery phases of acute tubular necrosis, metabolic acidosis, and metabolic alkalosis). Hyperkalemia is also observed in administration of adrenocorticotropic hormone, hydrocortisone, and cortisone. Decreased levels are found in chronic potassium deficiency states and in renal diseases with decreased urine flow.

Evaluation of potassium levels in urine is useful in renal function tests and in studies of electrolyte and acid-base balance.

*Chloride* is the major extracellular anion and serves to regulate the balance of extracellular fluid distribution. Physiological increase of urinary chloride is found with postmenstrual diuresis and a decrease with premenstrual salt and water retention, in parallel with an increase and decrease of urinary sodium levels. Increased chloride excretion is found in any case of massive diuresis (e.g. potassium depletion or adrenocortical insufficiency). Causes of decreased urinary chloride include adrenocortical hyperfunction and postoperative stress syndrome. Urinary excretion of chloride normally approximates the dietary intake.

Chloride in urine is examined in evaluation of electrolyte composition and in acid-base balance studies.

### Test principle

Ion-selective electrodes using automatically diluted urine specimens.

### Precautions and warnings

Pay attention to all precautions and warnings listed in Section 1 / Introduction of this Method Manual.

For USA: For prescription use only.

### Reagent handling

Ready for use.

### Specimen collection and preparation

For specimen collection and preparation only use suitable tubes or collection containers.

Only the specimens listed below were tested and found acceptable.

Urine (24-hour collection, unstabilized)

Collect 24-hour urine for sodium, potassium, and chloride determinations without addition of preservatives and/or stabilizers. Store refrigerated during collection.

Stability: <sup>3</sup>	<i>Sodium</i>	14 days at 15-25 °C
	<i>Potassium</i>	14 days at 15-25 °C
	<i>Chloride</i>	7 days at 15-25 °C

The specimens are automatically diluted 1:6 (1+5) by the instrument.

### Applications for urine

#### COBAS INTEGRA 400 plus/800 test definition

Measuring mode	ISE	
Test range	<i>Sodium</i>	20-350 mmol/L
	<i>Potassium</i>	1-150 mmol/L
	<i>Chloride</i>	20-350 mmol/L
Unit	mmol/L	

### Pipetting parameters

Sample	20 µL
Diluent (H <sub>2</sub> O)	100 µL

### Calibration

Calibrators	ISE Solutions 1, 2
	ISE Calibrator Indirect/Urine
Calibration replicate	Single
Calibration interval	Five hours (main calibration)
	Every sample (one-point calibration)

Once opened, ISE Solution 1 and 2 are stable on-board up to 2 weeks.

Once opened, ISE Calibrator Indirect/Urine is stable on-board up to 8 weeks.

### Note

Any ISE mode change (between direct, indirect, and urine) is initiated using ISE Solution 1 as a dummy sample in an appropriate dilution.

ISE Solution 3 is used during maintenance procedures (COBAS INTEGRA 800 analyzers only).

### Quality control

Quality control	Quantitative urine controls are recommended for routine quality control.
Control interval	5 hours recommended
Control sequence	User defined
Control after calibration	Recommended

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

Follow the applicable government regulations and local guidelines for quality control.

### Calculation

Refer to the Section "Principle of Measurement" in the general description "Ion-Selective Electrode Module".

### Limitations - interference

Criterion: Recovery within ± 20 % of initial value.

The following drugs were tested according to the recommendations of the VDGH<sup>a)</sup> and caused no significant interference when added to aliquots of pooled normal human urine up to the indicated concentrations.

Ampicillin	200 mg/L
Cefalotin	1200 mg/L
Ceftriaxone	1000 mg/L
Cilazapril	3.6 mg/L
Codeine	1000 mg/L
Caffeine	5000 mg/L
Cyclosporine	5 mg/L
Erythromycin	1500 mg/L
Furosemide	100 mg/L

Propranolol	200 mg/L
Sulfamethoxazole	600 mg/L
Trimethoprim	20 mg/L
pH	≥ 5.5

Falsely high chloride values have been reported from patients receiving perchlorate medication. This is due to an interference of perchlorate ions with chloride ISE determinations.

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination and other findings.

a) Verband der Diagnostica und Diagnostica Geräte Hersteller

#### Expected values<sup>4</sup>

Urine (24 h) (Adults)	<i>Sodium</i>	40-220 mmol/day
	<i>Potassium</i>	25-125 mmol/day
	<i>Chloride</i>	110-250 mmol/day

The urinary excretion of sodium, potassium, and chloride varies significantly with dietary intake. The values given here are typical of people on an average diet.

Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference range.

#### Specific performance data

Representative performance data on the COBAS INTEGRA analyzers are given below. Results obtained in individual laboratories may differ.

#### Precision

Precision was determined using human samples and controls in an internal protocol with repeatability and intermediate precision (2 aliquots per run, 2 runs per day, 20 days).

The following results were obtained.

<i>Sodium</i>	Level 1	Level 2
Mean	56 mmol/L	259 mmol/L
CV repeatability	1.0 %	0.49 %
CV intermediate precision	3.0 %	1.2 %
<i>Potassium</i>	Level 1	Level 2
Mean	33 mmol/L	125 mmol/L
CV repeatability	0.26 %	0.67 %
CV intermediate precision	1.4 %	2.0 %
<i>Chloride</i>	Level 1	Level 2
Mean	53 mmol/L	267 mmol/L
CV repeatability	0.97 %	1.2 %
CV intermediate precision	2.8 %	2.2 %

#### Method comparison

Sodium and potassium values for human urine samples obtained on the COBAS INTEGRA 700 ISE module (y) were compared with those determined using an alternative manufacturer's electrolyte module (indirect measurement) (x).

Chloride values for human urine samples obtained on the COBAS INTEGRA 700 ISE module (y) were compared with those determined on a COBAS INTEGRA 700 analyzer (previous chloride electrode) (x).

Samples were measured in duplicate. Sample size (n) represents all replicates.

<i>Sodium</i>	Alternative system	
Sample size	(n)	174
Corr. coefficient	(r)	0.996
	(r <sub>s</sub> )	0.995

Lin. regression	$y = 0.95x + 3.4 \text{ mmol/L}$
Passing/Bablok <sup>5</sup>	$y = 0.96x + 1.5 \text{ mmol/L}$

The sample concentrations were between 25 and 249 mmol/L.

<i>Potassium</i>	Alternative system	
Sample size	(n)	162
Corr. coefficient	(r)	0.999
	(r <sub>s</sub> )	0.999

Lin. regression	$y = 1.04x - 0.7 \text{ mmol/L}$
Passing/Bablok <sup>5</sup>	$y = 1.04x - 0.4 \text{ mmol/L}$

The sample concentrations were between 3.5 and 104 mmol/L.

<i>Chloride</i>	COBAS INTEGRA 700 analyzer	
Sample size	(n)	100
Corr. coefficient	(r)	0.983
	(r <sub>s</sub> )	0.979

Lin. regression	$y = 1.09x + 0.6 \text{ mmol/L}$
Passing/Bablok <sup>5</sup>	$y = 1.09x + 1.9 \text{ mmol/L}$

The sample concentrations were between 24 and 269 mmol/L.




#### References

- 1 Tietz NW, Pruden EL, Siggaard-Andersen O. Electrolytes. In: Burtis CA, Ashwood ER, eds. Tietz Textbook of Clinical Chemistry. 2nd ed. Philadelphia: WB Saunders Co 1994;1354-1374.
- 2 Tietz NW, ed. Clinical Guide to Laboratory Tests, 3rd ed. Philadelphia: WB Saunders, 1995;124-127(chloride), 840-841 (lithium), 502-507 (potassium), 562-565 (sodium).
- 3 Young DS. Storage of specimen. In: Effects of Preanalytical Variables on Clinical Laboratory Tests. 1st ed. Washington: AACC Press 1993;4:269-278.
- 4 Data on file at Roche Diagnostics.
- 5 Bablok W, Passing H, Bender R, et al. A general regression procedure for method transformation. Application of linear regression procedures for method comparison studies in clinical chemistry, Part III. J Clin Chem Clin Biochem 1988 Nov;26(11):783-790.

A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the border between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.

#### Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard.

	Contents of kit
	Volume after reconstitution or mixing
	Global Trade Item Number

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# ISE-U

ISE in Urine



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