MNCHIP

Electrolyte Panel Lyophilized Kit

【Product Name】

Electrolyte Panel Lyophilized Kit

【Packing Specification】

Type A: 1 Test / Disc, 10 Discs / Box;

Type B: 1 Test / Disc, 10 Discs / Box.

Type A1: 1 Test / Disc, 10 Discs / Box;

Type B1: 1 Test / Disc, 10 Discs / Box.

Type A and Type A1 without diluent container; Type B and Type B 1 with diluent container.

Type A Type B contains K^+, Na^+, CL^-, Ca^{2+}, Mg^{2+}, P and CO_2; Type A1 and Type B1 contains K^+, Na^+, CL^-, and Ca^{2+}.

【Testing Instrument】

Celercare M or Pointcare M chemistry analyzer

【Intended Use】

The Electrolyte Panel Lyophilized Kit used with the Celercare M or the Pointcare M chemistry analyzer, is intended to be used for the in vitro quantitative determination of potassium (K^+), sodium (Na^+), chloride (CL^-), calcium (Ca^{2+}), magnesium (Mg^{2+}), phosphorus (P) and carbon dioxide (CO_2) in heparinized whole blood, heparinized plasma, or serum in a clinical laboratory setting or point-of-care location.

The Electrolyte Panel Lyophilized Kit measurements are used in the diagnosis of salt metabolism disorders.

【Principles of Testing】

The Electrolyte Panel Lyophilized Kit is used to quantitatively test the concentration of the seven biochemical indicators in the sample, which is based on the spectrophotometry. The principles are as follows:

Potassium (K^+)

In the coupled enzyme reaction, pyruvate kinase (PK) dephosphorylates phosphoenolpyruvate (PEP) to form pyruvate. Lactate dehydrogenase (LDH) catalyzes conversion of pyruvate to lactate. Concomitantly, NADH is oxidized to NAD^+. The rate of change in absorbance due to the conversion of NADH to NAD^+ is directly proportional to the amount of potassium in the sample. Interferences from other ions are minimized with the addition of some special ingredients.

ADP + PEP $\xrightarrow{K^+,\ PK}$ Pyruvate + ATP

Pyruvate + NADH + H^+ $\xrightarrow{LDH}$ Lactate + NAD^+

Sodium (Na^+)

In the enzymatic reaction, β-D-galactosidase is activated by the sodium in the sample. The activated enzyme catalyzes the reaction of o-nitrophenyl-β-D-galactopyranoside (ONPG) to o-nitrophenol and galactose.

ONPG $\xrightarrow{Na^+,\ \beta\text{-D-galactosidase}}$ o-Nitrophenol + Galactose

Chloride (CL^-)

The method is based on the determination of chloride-dependent activation of α-amylase activity. Deactivated α-amylase is reactivated by addition of the chloride ion. The reactivation of α-amylase activity is proportional to the concentration of chloride ion in the sample. The reactivated α-amylase converts the substrate, 2-chloro-4-nitrophenyl-β-1,4-galactopyranosylmaltoside (CNP-G2) to 2-chloro-4-nitrophenol (CNP) producing color and 1,4-galactopyranosylmaltoside. The reaction is measured bichromatically and the increase in absorbance is directly proportional to the reactivated α-amylase activity and the concentration of chloride ion in the sample.

CNP-G2 $\xrightarrow{Cl^-,\ \alpha\text{-amylase}}$ CNP + G2

Calcium (Ca^{2+})

Calcium in the patient sample binds with arsenazo III to form a calcium-dye complex.

Ca^{2+} + Arsenazo III ⟶ Ca^{2+}-Arsenazo III Complex

It is an endpoint reaction. The amount of total calcium in the sample is proportional to the absorbance.

Magnesium (Mg^{2+})

The hexokinase (HK) activation method is described as:

Glucose + ATP $\xrightarrow{HK,\ Mg^{2+}}$ G-6-P + ADP

G-6-P + $NADP^+$ $\xrightarrow{G-6-PDH}$ 6-Phosphogluconate + NADPH + H^+

The rate limiting reaction is the HK reaction. Magnesium from the sample activates HK, which in turn catalyzes the breaking down of glucose to form glucose-6-phosphate (G-6-P) and ADP. G-6-P reacts with nicotinamide adenine dinucleotide phosphate ($NADP^+$) to form reduced nicotinamide adenine dinucleotide phosphate (NADPH) and 6-phosphogluconate in the presence of glucose-6-phosphate-dehydrogenase (G-6-PDH). This is a first-order rate reaction. The rate of production of NADPH is directly proportional to the amount of magnesium present in the sample. Absorbance is measured bichromatically at 340 nm and 405 nm.

Phosphorus (P)

The enzymatic method for the MNCHIP system uses maltose phosphorylase (MP) coupled through β-phosphoglucomutase (β-PGM) and glucose-6-phosphate dehydrogenase (G6PDH). The amount of NADH formed can be measured as an endpoint at 340/405 nm.

Maltose + Pi $\xrightarrow{MP}$ Glucose-1-Phosphate (G-1-P) + Glucose

Glucose-1-Phosphate (G-1-P) $\xrightarrow{\beta\text{-PGM}}$ Glucose-6-Phosphate (G-6-P)

Glucose-6-Phosphate (G-6-P) + NAD^+ $\xrightarrow{G6PDH}$ NADH+ 6-Phosphogluconate+H^+

Carbon Dioxide (CO_2)

In the enzymatic method, the specimen is first made alkaline to convert all forms of carbon dioxide (CO_2) to bicarbonate (HCO_3^-). Phosphoenolpyruvate (PEP) and HCO_3^- then react to form oxaloacetate and phosphate in the presence of phosphoenolpyruvate carboxylase (PEPC). Malate dehydrogenase (MDH) catalyzes the reaction of oxaloacetate and reduced nicotinamide adenine dinucleotide (NADH) to NAD^+ and malate. The rate of change in absorbance due to the conversion of NADH to NAD^+ is directly proportional to the amount of CO_2 in the sample.

PEP + HCO_3^- $\xrightarrow{PEPC}$ Oxaloacetate + Phosphate

Oxaloacetate + NADH + H^+ $\xrightarrow{MDH}$ NAD^++Malate

【Principle of Operation】

Refer to the Celercare M or the Pointcare M chemistry analyzer Operator's Manual, for the Principles and Limitations of the Procedure.

【Description of Reagents】

Each Electrolyte Panel Lyophilized Kit contains lyophilized test-specific reagent beads. A lyophilized blank reagent bead includes in each disc for a judgment of error 0209.

Type B is the reagent disc with diluent container.

Type A is the reagent disc without diluent container.

Calibration information is included in barcode code. Please check it on the label.

The component of each Electrolyte Panel Lyophilized Kit is as follows (after redissolution):

Component	Quantity
Potassium assay reagent	13.5 μL
Sodium assay reagent	13.5 μL
Chloride assay reagent	13.5 μL
Calcium assay reagent	9.7 μL
Magnesium assay reagent	13.5 μL
Phosphorus assay reagent	13.5 μL
Carbon dioxide assay reagent	5.3 μL
Stabilizer	Appropriate amount

【Storage】

Store reagent discs in their sealed pouches at 2-8°C (36-46°F). Do not expose opened or unopened discs to direct sunlight or temperatures above 32°C (90°F). Reagent discs may be used until the expiration date included on the package. The expiration date is also encoded in the unique code printed on the sealing pouch. An error message will appear on the Celercare M or the Pointcare M chemistry analyzer display if the reagents have expired.

A torn or otherwise damaged pouch may allow moisture to reach the unused disc and adversely affect reagent performance. Do not use a disc from a damaged pouch.

【Sample Requirements】

Sample collection techniques are described in the "Sample requirement" section of the Celercare M or the Pointcare M chemistry analyzer Operator's Manual.

The required sample usage is 100 μL of lithium heparin whole blood, lithium heparin plasma, serum or quality controls. Please add diluent when using Type A. The required diluent usage is 430 μL of sterilized water for injection.

Whole blood samples collected by venipuncture must be homogeneous before transferring the sample to a reagent disc.

At the same time, it is necessary to carry out the test within 60 minutes. Before taking the test, shake the lithium heparin blood collection tube gently upside down several times.

Use only lithium heparin evacuated specimen collection tubes for whole blood or plasma samples.

The test was started within 10 minutes after transferring the sample to the reagent disc.

【Interfering Substances】

Studies on known drugs or chemicals have found that when the interfering substances contained in the sample exceed the contents in the table below, the final test results are affected.

Interfering substances concentration （≤）						
Analyte	Bilirubin mg/dL	Intralipid mg/dL	Hemoglobin mg/dL	Vitamin C mg/dL	Ca^{2+} mmol/L	Mg^{2+} mmol/L
K^+	16	150	50	75	——	——
Na^+	10	150	50	75	——	——
Cl-	18	210	50	75	——	——
CO_2	45	525	250	75	——	——
Ca^{2+}	180	210	200	75	——	3
Mg^{2+}	120	140	50	——	2	——
P	45	525	100	27	——	——

【Procedure】

Materials Provided

Electrolyte Panel Lyophilized Kit

Celercare M or Pointcare M chemistry analyzer

Please add diluent into the diluent port when using Type A(sterilized water for injection); please tear off the aluminum strip before using for Type B.

Transfer pipettes (fixed volume 100 μL for sample and 430 μL for diluent) and tips

Test Procedure

The complete sample collection and step-by-step operating procedures are detailed in the Celercare M or the Pointcare M chemistry analyzer Operator's Manual.

Calibration

Each batch of reagent is calibrated using Rondox standard serum to obtain the disc-specific calibration parameters before shipment.

The calibration parameters stored in the two-dimentional code printed on the sealed pouch are provided to analyzer at the time of scanning the code.

Refer to the Celercare M or the Pointcare M chemistry analyzer Operator's Manual for the specific information.

Quality Control

Refer to Operator's Manual of the Celercare M or the Pointcare M chemistry analyzer. Performance of the Celercare M or the Pointcare M chemistry analyzer can be verified by running controls. For a list of approved quality control materials with acceptance ranges.

If control results are out of range, repeat one time. If still out of range, call MNCHIP customer service or local distributers for technical support. Do not report the results if controls are outside their labeled limits.

Results

The Celercare M or the Pointcare M chemistry analyzer automatically calculates and prints the analyte concentrations in the sample. Details of the endpoint and rate reaction calculations are found in the Celercare M or the Pointcare M chemistry analyzer Operator's Manual.

【Normal Reference Ranges】

These ranges are provided as a guideline only. It is recommended that your office or institution establish normal ranges for your particular patient population.

Analyte	SI Units	Common Units
K^+	Serum: 3.5 ~ 5.3 mmol/L Whole blood and plasma: 3.0 ~ 5.1 mmol/L	Serum: 3.5 ~ 5.3 mmol/L Whole blood and plasma: 3.0 ~ 5.1 mmol/L
Na^+	137 ~ 147 mmol/L	137 ~ 147 mmol/L
Cl^-	99 ~ 110 mmol/L	99 ~ 110 mmol/L
Ca^{2+}	Adult: 2.03 ~ 2.54 mmol/L; Children: 2.25 ~ 2.67 mmol/L	Adult: 8.12 ~ 10.16 mg/dL; Children: 9.00 ~ 10.68 mg/dL
Mg^{2+}	Adult: 0.6 ~ 1.1 mmol/L; Children: 0.5 ~ 0.9 mmol/L	Adult: 1.46 ~ 2.67 mg/dL; Children: 1.22 ~ 2.19 mg/dL
P	0.9 ~ 1.34 mmol/L	2.79 ~ 4.15 mg/dL
CO_2	23 ~ 29 mmol/L	23 ~ 29 mmol/L

【Interpretation of Results】

Physiological interferents (hemolysis, icterus and lipemia) cause changes in the reported concentrations of some analytes. The sample indices are printed on the bottom of each printout to inform the

operator about the abnormal sample. The operator should avoid sample hemolysis caused by irregular blood collection.

The Celercare M or the Pointcare M chemistry analyzer suppresses any results that are affected by >10% interference from hemolysis, lipemia or icterus. “HEM”, “LIP”, or “ICT” respectively, is printed on the printout in place of the result.

Any result for a particular test that exceeds the assay range should be analyzed by another approved test method or sent to a referral laboratory. Do not dilute the sample and run it again on the Celercare M or the Pointcare M chemistry analyzer.

【Limitations of Procedure】

The Electrolyte Panel Lyophilized Kit should be used with the Celercare M or the Pointcare M chemistry analyzer, and is just used for in vitro diagnosis (IVD).

As with any diagnostic test procedure, all other test procedures including the clinical status of the patient, should be considered prior to final diagnosis.

【Performance Characteristics】

Accuracy

Analyte	The relative deviation or absolute deviation should meet the following requirements
K^+	B% ≤ 15.0%
Na^+	B% ≤ 15.0%
Cl^-	B% ≤ 15.0%
Ca^{2+}	B% ≤ 5.0%
Mg^{2+}	B% ≤ 15.0% or Absolute deviation ≤ 0.2 mmol/L
P	B% ≤ 10.0%
CO_2	B% ≤ 10.0%

Batch precision

Analyte	Coefficient of variation (≤ *)
K^+	5.0%
Na^+	5.0%
Cl^-	5.0%
Ca^{2+}	3.0%
Mg^{2+}	5.0%
P	5.0%
CO_2	5.0%

Inter batch precision

Analyte	Relative Range (≤ *)
K^+	10.0%
Na^+	10.0%
Cl^-	10.0%
Ca^{2+}	5.0%
Mg^{2+}	10.0%
P	10.0%
CO_2	10.0%

Dynamic Ranges

Analyte	Dynamic Ranges
K^+	1 ~ 8 mmol/L
Na^+	90 ~ 170 mmol/L
Cl^-	60 ~ 140 mmol/L
Ca^{2+}	1 ~ 4 mmol/L
Mg^{2+}	0.2 ~ 1.6 mmol/L
P	0.2 ~ 3.5 mmol/L
CO_2	10 ~ 35 mmol/L

【Notes】

Used reagent discs contain human body fluids. Follow good laboratory safety practices when handling and disposing of used discs. See the Celercare M or the Pointcare M chemistry analyzer Operator’s Manual for instructions on cleaning biohazardous spills.

The reagent discs are plastic and may crack or chip if dropped. Never use a dropped disc as it may spray biohazardous material throughout the interior of the analyzer.

Reagent beads may contain acids or caustic substances. The operator does not come into contact with the reagent beads when following the recommended procedures. The operator should avoid ingestion, skin contact, or inhalation of the reagent beads.

The diluent can be selected from purified water having a conductivity (measured at 25℃) greater than 10 MΩ/cm, we recommend using the sterilized water for injection to reduce discrepancies or errors in test results due to the water, and it should be prevented from being exposed to the air for a long time after opening.

【Symbols Used in Labelling】

Symbol	Explanation
IVD	In vitro diagnostic medical device
	Manufacturer
EC REP	Authorized representative in the European Community
	Use-by date
LOT	Batch code
	Date of manufacture
CE	CE MARK
	Consult instructions for use
	Limit of temperature
UDI	Unique device identifier
	Do not re-use

【Manufacturer】

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