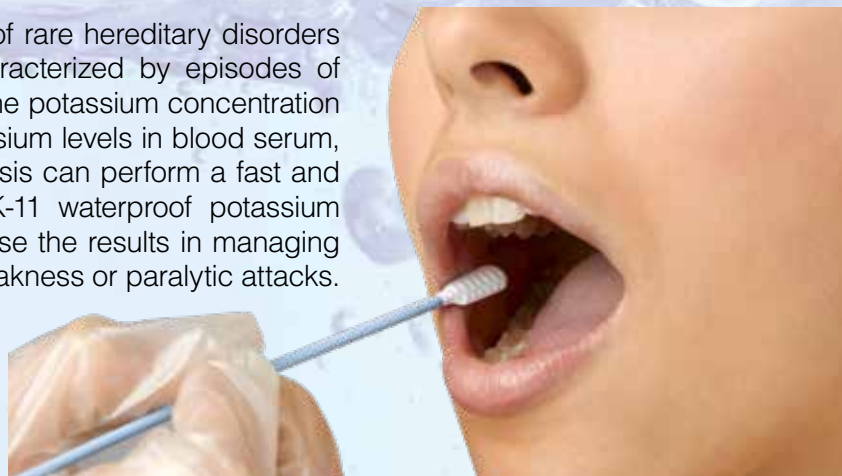


Monitoring Potassium Levels in Human Saliva for Mitigating Periodic Paralysis

Periodic paralyses comprise a group of rare hereditary disorders caused by a mutated gene and characterized by episodes of muscle weakness or paralysis. Since the potassium concentration in saliva was found correlated to potassium levels in blood serum, a person suffering with periodic paralysis can perform a fast and simple saliva test with LAQUAtwin K-11 waterproof potassium pocket meter for self-monitoring and use the results in managing his/her own care to mitigate muscle weakness or paralytic attacks.



Scan QR code with your mobile device to access online content



LAQUAtwin K-11 Product Page

08-2017

Introduction

Saliva is a watery substance formed in the mouths of some animals and humans. It is secreted by the salivary glands to aid in digestion of food and maintenance of oral hygiene. The human saliva is composed of 99.5% water plus electrolytes, mucus, white blood cells, epithelial cells, glycoproteins, enzymes, and antimicrobial agents. The electrolytes in saliva include sodium (Na⁺), potassium (K⁺), calcium (Ca²⁺), and magnesium (Mg²⁺), chloride (Cl⁻), bicarbonate (HCO₃⁻), phosphate (PO₄³⁻), and iodine (I⁻). These ions keep the acidity of the mouth within a certain pH range, typically pH 6.2 - 7.4.¹

A group of rare hereditary disorders characterized by temporary episodes of muscle weakness or paralysis that occurs at irregular intervals is known as periodic paralyses. The cause of these disorders is an inherited mutated gene that controls the development and function of certain ion channels in the muscle membrane. The ion channels are openings that allow the movement of ions in and out of the cell. Defective ion channels fail to regulate the movement of ions properly when potassium levels in the blood fluctuate,

which then result in unbalanced ratio of Na⁺ and K⁺ inside and outside the cell. As a consequence of this unbalanced ratio, the muscle may either respond less (weak) or stop responding (paralysed).²

Most cases of periodic paralysis are associated with alteration in blood serum potassium levels.³ The electrolyte concentrations in saliva are comparable to blood serum values.⁴ Some people afflicted with periodic paralysis are performing a quick saliva test with the previous models of LAQUAtwin K-11 waterproof potassium pocket meter to monitor their potassium levels at the convenience of their homes.

The LAQUAtwin K-11 waterproof potassium pocket meter measures potassium concentrations in microvolume samples and displays results in just a few seconds. The sensor is replaceable and has a sample well embedded with flat potassium ion selective electrode paired with a reference electrode. With this unique design, the sensor is capable of measuring samples as little as 0.3ml with direct application or 0.05ml with sampling sheet. The reading in the backlit digital LCD can be expressed as ppm, mg/L, or mmol/L unit. Note that the mg/L unit is equivalent to parts per million (ppm).

Method

Meter Set-up and Calibration

Prior to using the LAQUAtwin K-11 waterproof potassium pocket meter, it is important to inspect the sensor and make sure that it is clean and free from any damage to prevent contaminating the standard solutions and samples and affecting the results. If the sensor requires cleaning, refer to [Technical Tip 2: LAQUAtwin Ion Sensor Maintenance Procedures](#).



Scan QR code with your mobile device to access online content



Technical Tip 2: LAQUAtwin Ion Sensor Maintenance Procedures

1. Set the meter to display reading in mmol/L unit. Refer to [Technical Tip 7: Procedure for Setting mmol/L Unit in LAQUAtwin Ion Pocket Meters](#).



Scan QR code with your mobile device to access online content



Technical Tip 7: Procedure for Setting mmol/L Unit in LAQUAtwin Ion Pocket Meters

Continued at the back

- Rinse the sensor with distilled or deionized water and blot dry with soft tissue.
- Calibrate the LAQUAtwin K-11 waterproof potassium pocket meter according to manufacturer's instructions using the 150 and 2000 ppm potassium standard solutions included in the kit.

Once the meter is set to display reading in mmol/L unit, the 150 and 2000 ppm potassium standard solutions will be calibrated as 3.8 and 51 mmol/L K⁺, respectively.

Sample Collection and Measurement

The subject must have not eaten, brushed teeth, or drunk anything within 20 minutes prior to testing. To obtain accurate results, a uniform temperature should be maintained for the standard solutions and samples.

- Collect saliva sample from subject's mouth then place it directly onto the sensor. Alternatively, take a sampling sheet using a clean tweezer, saturate it with saliva sample, and then lay it onto the sensor.
- Close the sensor guard and record the reading once stable.
- Rinse the sensor with distilled or deionized water and blot dry with soft tissue.

- Refer to Table 1 to check the corresponding potassium level in blood serum.

Results And Benefits

According to Periodic Paralysis International's website, the saliva values measured by the Cardy K⁺ meter (superseded by LAQUAtwin B-731 and K-11 models) have proven accurate when compared to blood serum values drawn and processed in laboratories. Their table below shows the correlation results based on normal human ranges for blood serum as 3.5 - 5.5 mmol/L K⁺ and for saliva as 8 – 40 mmol/L K⁺.⁵

With the easy operation and portability of LAQUAtwin K-11 waterproof potassium pocket meter, a person suffering from periodic paralysis can conveniently assess his/her own condition and manage it effectively. The person can perform a fast and simple saliva test to monitor his/her potassium level in response to a diet, activity, and other factors that may trigger the disorder and can make the necessary adjustments accordingly to mitigate weakness and paralytic attacks.

Table 1: Saliva - Blood Serum Correlation Results

Saliva	Blood	Saliva	Blood
K ⁺ Levels (mmol/L)			
-4.8	2.7	25.6	4.6
-4.0	2.75	26.4	4.65
-3.2	2.8	27.2	4.7
-2.4	2.85	28.0	4.75
-1.6	2.9	28.8	4.8
-0.8	2.95	29.6	4.85
0	3.0	30.4	4.9
0.8	3.05	31.2	4.95
1.6	3.1	32.0	5.0
2.4	3.15	32.8	5.05
3.2	3.2	33.6	5.1
4.0	3.25	34.4	5.15
4.8	3.3	35.2	5.2
5.6	3.35	36.0	5.25
6.4	3.4	36.8	5.3
7.2	3.45	37.6	5.35
8.0	3.5	38.4	5.4
8.8	3.55	39.2	5.45
9.6	3.6	40.0	5.5
10.4	3.65	40.8	5.55
11.2	3.7	41.6	5.6
12.0	3.75	42.4	5.65
12.8	3.8	43.2	5.7
13.6	3.85	44.0	5.75
14.4	3.9	44.8	5.8
15.2	3.95	45.6	5.85
16.0	4.0	46.4	5.9
16.8	4.05	47.2	5.95
17.6	4.1	48.0	5.6
18.4	4.15	48.8	5.65
19.2	4.2	49.6	5.7
20.0	4.25	50.4	5.75
20.8	4.3	51.2	5.8
21.6	4.35	52.0	5.85
22.4	4.4	52.8	5.9
23.2	4.45	53.6	5.95
24.0	4.5	54.4	6.0
24.8	4.55	—	—

Source: Periodic Paralysis International - <http://hkpp.org/saliva-to-serum-k>

Please note that the LAQUAtwin K-11 waterproof potassium pocket meter is not intended to be used as medical device or substitute to your own health professional's advice. It is best to consult a health professional and use the meter in conjunction with laboratory tests.

References And Suggested Readings

- Saliva. Wikipedia. <https://en.wikipedia.org/wiki/Saliva>
- Periodic Paralysis International – What is Periodic Paralysis? Retrieved from <http://hkpp.org/what-is-periodic-paralysis> on 20 September 2017.
- Periodic Paralysis. Medscape. Retrieved from <http://emedicine.medscape.com/article/1171678-overview> on 22 September 2017.
- Periodic Paralysis International – Testing Potassium Levels with the Cardy Potassium Ion Meter. Retrieved from <http://hkpp.org/test-k-cardy-meter> on 20 September 2017.
- Periodic Paralysis International - Saliva to Serum Potassium Concentrations. Retrieved from <http://hkpp.org/saliva-to-serum-k> on 20 September 2017.

25 September 2017, Rev. 0

LAQUAtwin Pocket Meters Lineup



HORIBA Instruments (Singapore) Pte. Ltd.
 83 Science Park Drive, #02-02A, The Curie, Singapore 118258
 Phone: 65 6908-9660
 Fax: 65 6745-8155
www.horiba-laqua.com
 e-mail: laqua@horiba.com

HORIBA UK Limited
 Kyoto Close, Moulton Park, Northampton NN3 6FL
 Phone: 44 (0) 1604 542567
 Fax: 44 (0) 1604 542699
www.horiba.com/uk
 e-mail: waterquality@horiba.com



www.horiba-laqua.com

IMS
 HORIBA Group is operating Integrated Management System (IMS)
 ISO9001 JOA-0298 / ISO14001
 JOA-E-90039 / ISO13485
 JOA-MD0010 / OHSAS18001 JOA-OH0068Rorum perid novis esimoente,

