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# Clinical Research

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# 01

## A new device for simple and accurate urinary pH testing by the Stone-former patient.

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**Purpose:** Urinary pH is an important factor linked to renal stone disease and a useful marker in the treatment of urolithiasis. Although the gold standard for measuring urinary pH utilizes a glass electrode and a pH meter, at present dipstick testing is largely used to estimate urinary pH. However, the accuracy and precision of this method may be insufficient for making clinical decisions in patients with lithiasis. The aim of this study is to describe a new device for urinary pH testing.

**Methods:** The device includes a pH sensor based on differential measurement of an ISFET-REFET pair. The drawbacks associated with this type of configuration, namely short lifetime and manual fabrication, have been overcome in the prototype. An automatic one point calibration is performed when turning on the system. Two buffer solutions were utilized to determine the intra- and inter-day precision of the device. The pH of 30 fresh human urine samples was measured using a pH-meter, a dipstick and the new electronic device.

**Results:** In some cases, dipstick measurements differed from those of the pH meter by more than 0.40 units, a clinically relevant discrepancy, whereas none of the measurements made with the new electronic device differed from the results of the pH-meter by more than 0.1 pH units.

**Conclusions:** This new electronic device has the possibility to be used by stone-formers to control their urinary pH at home, increasing the tools available for stone prevention and prophylaxis.

**Keywords:** Urinary pH; Renal lithiasis; pH measurement; pH self-control

*Grases F, Rodriguez A, Berga F, Costa-Bauza A, Prieto RM, Burdallo I, et al. A new device for simple and accurate urinary pH testing by the Stone-former patient. Springerplus. 2014;3(1):1–5.*

# 02

## Evaluation of a Portable Urinary pH Meter and Reagent Strips.

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**Objective:** To evaluate a portable electronic pH meter and to put its accuracy in perspective with reagent strips read by a layperson, a healthcare professional, and an electronic reading device.

**Materials and methods:** Based on a preanalysis on 20 patients, a sample size of 77 urine aliquots from healthy volunteers was necessary to obtain sufficient study power. Measurements of urinary pH were obtained by use of reagent strips, a portable pH meter and a laboratory pH meter (gold standard). Reagents strips were read by a professional experienced in interpreting strips, a layperson, and an electronic strip reader. The mean matched pair difference between measurement methods was analyzed by the paired t-test. The degree of correlation and agreement were evaluated by the Pearson's correlation coefficient and Bland-Altman plots, respectively.

**Results:** The mean matched pair difference between the gold standard and all other pH measurement methods was the smallest with the portable electronic pH meter (bias 0.01, 95% confidence interval [CI] -0.07 to 0.08;  $p = 0.89$ ), followed by strips read by a professional (bias -0.09, 95% CI -0.21 to 0.02;  $p = 0.10$ ), layperson (bias -0.17, 95% CI -0.31 to -0.04;  $p = 0.015$ ), and electronic strip reader (bias -0.29, 95% CI -0.41 to -0.16;  $p < 0.001$ ). The portable electronic pH meter achieved the highest Pearson's correlation coefficient and narrowest 95% limits of agreement, followed by strip interpretation by a professional, electronic strip reader, and layperson. To quantify the ability of pH measurement methods to correctly classify values within a predefined urinary pH target range, we performed classification tests for several stones. The portable electronic pH meter outperformed all other measurement methods for negative predictive values.

**Conclusions:** Findings of this study support that the portable electronic pH meter is a reliable pH measuring device. It appears to be more accurate compared to reagent strips readings.

**Keywords:** human; pH; reagent strip; urinalysis; urine; urolithiasis .

*De Coninck V, Keller EX, Rodríguez-Monsalve M, Doizi S, Audouin M, Haymann J-P, et al. Evaluation of a Portable Urinary pH Meter and Reagent Strips. J Endourol. 2018;32(7):647–52.*

# 03

## Urinary pH as a Target in the Management of Lithiasic Patients in Real-World Practice: Monitoring and Nutraceutical Intervention for a Nonlithogenic pH Range

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**Introduction:** We assessed the effectiveness of the joint use of a pH meter in combination with dietary supplements in restoring the urinary pH balance of patients with medical history of uric acid or calcium phosphate/calcium oxalate stones in real-world practice.

**Methods:** An interventional, prospective, and open-label study was performed. At baseline visit, patients were assigned to a group according to the type of previous calculus and urinary pH: the alkalinizer group (uric acid stones and/or pH < 5.5) and acidifier group (calciumoxalate stones and/or pH > 6.2) received dietary supplement to increase or decrease, respectively, urinary pH. Patients were examined at baseline and after treatment for 30, 60, and 90 days. Urinary pH, type of therapy, compliance, and self-reported renal colic events were recorded at each visit.

**Results:** The study included 143 patients, 45.5% in the alkalinizer group and 54.5% in the acidifier group, and the mean age was 53.60 years. Both nutraceuticals were significantly effective in normalizing urinary pH ( $P < 0.00001$ ) at all follow-up visits compared with baseline, with a maximum percentage of patients who achieved nonlithogenic pH (54.9%) at day 60 ( $P < 0.00001$ ). Analysis of the effect of treatment compliance at 60 days indicated that 71.8% of compliant and 45.9% of noncompliant patients achieved nonlithogenic pH (odds ratio [OR]: 3.03, 95% confidence interval [CI]: 1.29-6.66). A Cox-regression model indicated that nonlithogenic pH at 90 days (hazard ratio [HR]: 0.428, 95% CI: 0.193-0.947) and compliance at 60 days (HR: 0.428, 95% CI: 0.189-0.972) were independently associated with colic complaints-free survival.

**Conclusions:** In patients with medical history of renal lithiasis, monitoring of pH in combination with dietary supplements may be useful in maintaining nonlithogenic pH values, yielding very high ratios of success, especially in compliant patients. Besides this main outcome, a reduction in self-reported colic complaints associated with pH balance was also observed.

**Keywords:** kidney stones, renal lithiasis, pH control, nutraceuticals, food supplement, patient compliance to treatment, self-reported colic events

*Galan-Llopis JA, Torrecilla-Ortiz C, Luque-Gálvez MP, Group P-L, Peris-Nieto X, Cuñé-Castellana J. Urinary pH as a Target in the Management of Lithiasic Patients in Real-World Practice: Monitoring and Nutraceutical Intervention for a Nonlithogenic pH Range. Clin Med Insights Urol [Internet]. 2019;12:117956111985355. Available from: <http://journals.sagepub.com/doi/10.1177/1179561119853556>*

# 04

## Combined Use of a Medical Device and a Dietary Complement in Patient Urinary pH control in Patients With an Implanted Double J Stent.

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This study evaluates the effectivity in urinary pH Control and the prevention of calcification in Double J stent using a device combined with the intake of dietary supplements. Every patient will receive hygienic-dietary indications. Patients will also take one out of the three dietary supplements regarded within the study (pH Up, pH Down and Cysteine) to control the adequate pH level, always following medical indications.

# 05

## This Study Evaluates the Superiority of Daily Self-pH Monitorization of Lit-control® pH Meter Compared to the Monitorization of Reactive Strips (Standard of Care).

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This study evaluates the superiority of daily self-pH monitorization of Lit-control®pH meter compared to the monitorization of reactive strips (standard of care).