

Table S1 List of PubMed search criteria for each query. All searches applied the filter “Clinical Trial” and “Humans”. Concept 1 and concept 2 were linked using the “AND” operator

Query Number	Concept 1	Concept 2	Results	Selected
1	"urine pH" OR "urinary pH" OR "urine alkalization" OR "urinary alkalization" OR "urine acidification" OR "urinary acidification"	"Pharmaceutical Preparations" (Mesh) OR drug* OR pharmaceutical* OR medication* OR bicarbonate OR citrate OR phosphate OR "Diet" (Mesh) OR food* OR drink* OR "cranberry" OR "Vaccinium macrocarpon" (Mesh) OR "baking soda" OR "soda, baking" OR "lasix" OR "Furosemide" (Mesh) OR "methionine" OR "Methionine" (Mesh) OR "1/6 molar sodium lactate" OR "Sodium Lactate" (Mesh)	245	91
2	"Urine"	"potassium bicarbonate" OR "KHCO ₃ "	26	2
3	"urine pH" OR "urinary pH" OR "urine alkalization" OR "urinary alkalization" OR "urine acidification" OR "urinary acidification"	"potassium bicarbonate" OR "KHCO ₃ " OR "moonstone" OR "lithobalance" OR "KSP" OR "KSP Key Lime" OR "KSP VeryBerry"	17	5

Table S2 Full list of studies with interventions and type of pH analysis

PMID	Title	First author	Year	Study type	Intervention (route)	pH analysis
22500592	Noncitrus alkaline fruit: a dietary alternative for the treatment of hypocitraturic stone formers	Baia	2012	Randomized controlled trial (RCT)	Cantaloupe Juice (Oral)	pH meter
29363092	The tolerability of Potassium Citrate Tablet in patients with intolerance to Potassium Citrate Powder form	Basiri	2018	quasi-controlled trial	Citrate (Oral)	24-hour urine
12631089	Effect of vitamin C supplements on urinary oxalate and pH in calcium stone-forming patients	Baxmann	2003	dose-response study	Vitamin C (Oral)	24-hour urine
29739680	Alkalinization with potassium bicarbonate improves glutathione status and protein kinetics in young volunteers during 21-day bed rest	Biolo	2019	crossover RCT	Potassium Bicarbonate (Oral)	24-hour urine
31778632	A pilot randomised controlled trial evaluating the pharmacodynamic effects of furosemide versus acetazolamide in critically ill patients	Brown	2019	RCT	Furosemide (IV)	urinalysis
34386816	Increasing Vegetable Intake Decreases Urinary Acidity and Bone Resorption Marker in Overweight and Obese Adults: An 8-Week Randomized Controlled Trial	Cao	2021	parallel RCT	High vegetables and fruits diet (Oral)	24-hour urine
8896124	The possible value of ascorbic acid as a prophylactic agent for urinary tract infection	Castelló	1996	RCT	Vitamin C (Oral)	NA
30585747	The Effect of Lemonade and Diet Lemonade Upon Urinary Parameters Affecting Calcium Urinary Stone Formation	Cheng	2019	prospective blinded crossover	Lemonade (Oral)	24-hour urine
1593849	Stone-forming potential of milk or calcium-fortified orange juice in idiopathic hypercalciuric adults	Coe	1992	crossover study	Orange juice (Oral)	24-hour urine
24055481	Efficacy of urine alkalinization by oral administration of sodium bicarbonate: a prospective open-label trial	Cohen	2013	prospective study	Sodium bicarbonate (Oral)	urinalysis
25990255	Potassium Bicarbonate Supplementation Lowers Bone Turnover and Calcium Excretion in Older Men and Women: A Randomized Dose-Finding Trial	Dawson-Hughes	2015	RCT	Potassium Bicarbonate (Oral)	24-hour urine
30036516	Impact of Potassium Citrate vs Citric Acid on Urinary Stone Risk in Calcium Phosphate Stone Formers	Doizi	2018	crossover study	Citrate (Oral)	24-hour urine
6308063	Urinary alkalinization and smoking cessation	Fix	1983	observational	Sodium bicarbonate (Oral)	24-hour urine
11762790	A comparison of the effects of potassium citrate and sodium bicarbonate in the alkalinization of urine in homozygous cystinuria	Fjellstedt	2001	crossover study	Sodium bicarbonate (Oral)	24-hour urine
16006907	Effect of cranberry juice consumption on urinary stone risk factors	Gettman	2005	crossover study	Cranberry (Oral)	24-hour urine
31209191	Prevention of Contrast-induced Nephropathy in Patients with Chronic Kidney Disease Undergoing Elective Coronary Angioplasty or Angiography with Sodium Potassium Citrate Solution, a Double Blind Randomized Clinical Trial	Ghorbani	2019	RCT	Citrate (Oral)	pH strip
37479949	Effect of a high-citrate beverage on urine chemistry in patients with calcium kidney stones	Goldfarb	2023	crossover RCT	Moonstone (Oral)	24-hour urine
19066876	Effect of two sports drinks on urinary lithogenicity	Goodman	2009	crossover study	Performance drink (Oral)	24-hour urine
30213095	Potassium Citrate Supplementation Decreases the Biochemical Markers of Bone Loss in a Group of Osteopenic Women: The Results of a Randomized, Double-Blind, Placebo-Controlled Pilot Study	Granchi	2018	parallel RCT	Citrate (Oral)	24-hour urine
32811843	Innovative prolonged-release oral alkalisng formulation allowing sustained urine pH increase with twice daily administration: randomised trial in healthy adults	Guittet	2020	RCT	ADV7103 (Citrate + Bicarb) (Oral)	NA
25856221	Increased intake of selected vegetables, herbs and fruit may reduce bone turnover in post-menopausal women	Gunn	2015	RCT	High vegetables and fruits diet (Oral)	pH strip
19112278	Sodium bicarbonate to prevent increases in serum creatinine after cardiac surgery: a pilot double-blind, randomized controlled trial	Haase	2009	RCT	Sodium bicarbonate (IV)	NA
23610561	Prophylactic perioperative sodium bicarbonate to prevent acute kidney injury following open heart surgery: a multicenter double-blinded randomized controlled trial	Haase	2013	RCT	Sodium bicarbonate (IV)	NA
28289931	A pilot randomized study on use of oral acetazolamide in patients with refractory dysuria	Hamidi	2017	RCT	Acetazolamide (Oral)	urinalysis
32645831	Comparison of Two Dietary Supplements for Treatment of Uric Acid Renal Lithiasis: Citrate vs. Citrate + Theobromine	Hernandez	2020	crossover RCT	Citrate (Oral)	pH meter
7361797	Effect of ascorbic acid on urine pH in patients with injured spinal cords	Hetey	1980	crossover RCT	Vitamin C (Oral)	pH meter
25491498	Effect of diet composition on acid-base balance in adolescents, young adults and elderly at rest and during exercise	Hietavala	2015	crossover RCT	High vegetables and fruits diet (Oral)	pH strip
9110682	Effect of cranberry juice on urinary pH in older adults	Jackson	1997	crossover RCT	Cranberry (Oral)	pH meter
20003665	Effect of cranberry drink on bacterial adhesion in vitro and vaginal microbiota in healthy females	Jass	2009	crossover RCT	Cranberry (Oral)	24-hour urine
30409184	Fructose increases risk for kidney stones: potential role in metabolic syndrome and heat stress	Johnson	2018	RCT	Fructose (Oral)	24-hour urine
18361754	A preliminary evaluation of the safety and tolerance of medicinally ingested vinegar in individuals with type 2 diabetes	Johnston	2008	RCT	Apple Cider Vinegar (Oral)	pH meter
17333204	Clinical study on the effect of mineral waters containing bicarbonate on the risk of urinary stone formation in patients with multiple episodes of CaOx-urolithiasis	Karagülle	2007	crossover RCT	Mineral water (Oral)	24-hour urine
11177203	Cross-over study of the influence of bicarbonate-rich mineral water on urinary composition in comparison with sodium potassium citrate in healthy male subjects	Kessler	2000	crossover RCT	Mineral water (Oral)	24-hour urine
38439	Effect of cranberry juice on urinary pH	Kinney	1979	RCT	Cranberry (Oral)	pH meter
17572176	Comparison between lemonade and potassium citrate and impact on urine pH and 24-hour urine parameters in patients with kidney stone formation	Koff	2007	prospective cross-over trial	Citrate (Oral)	24-hour urine
32363926	Using Low-Calorie Orange Juice as a Dietary Alternative to Alkali Therapy	Large	2020	crossover RCT	Orange juice (Oral)	24-hour urine
32307012	Effects of daily ingestion of sodium bicarbonate on acid-base status and anaerobic performance during an altitude sojourn at high altitude: a randomized controlled trial	Limmer	2020	RCT	Sodium bicarbonate (Oral)	pH strip
15156934	Evaluation of cranberry supplement for reduction of urinary tract infections in individuals with neurogenic bladders secondary to spinal cord injury. A prospective, double-blinded, placebo-controlled, crossover study	Linsenmeyer	2004	crossover RCT	Cranberry (Oral)	urinalysis
1306665	Indomethacin treatment in children with daytime frequency of micturition	Luo	1992	RCT	Indomethacin (Oral)	NA
21976719	Hypercalciuria associated with high dietary protein intake is not due to acid load	Maalouf	2011	crossover study	High protein diet (Oral)	24-hour urine
2851386	Changes in urinary pH following bicarbonate loading	McKenzie	1988	crossover RCT	Bicarbonate loading (Oral)	pH meter
26636423	Acute renal haemodynamic effects of glucagon-like peptide-1 receptor agonist exenatide in healthy overweight men	Muskiet	2016	crossover study	Exenatide (IV)	NA
24560157	Urinary lithogenic risk profile in recurrent stone formers with hyperoxaluria: a randomized controlled trial comparing DASH (Dietary Approaches to Stop Hypertension)-style and low-oxalate diets	Noori	2014	RCT	DASH diet (Oral)	24-hour urine
17699358	Comparative value of orange juice versus lemonade in reducing stone-forming risk	Odvina	2006	crossover RCT	Orange juice (Oral)	24-hour urine
16645424	Prevention of thiazide-induced hypokalemia without magnesium depletion by potassium-magnesium-citrate	Odvina	2006	RCT	Citrate (Oral)	24-hour urine
3051946	(Citrate (CG-120) therapy in urolithiasis. 2. Effect on urinary and serum biochemistry)	Ohkawa	1988	longitudinal study	Citrate (Oral)	24-hour urine
30845731	Serum Uric Acid-Lowering Effects of Combined Glycine and Tryptophan Treatments in Subjects with Mild Hyperuricemia: A Randomized, Double-Blind, Placebo-Controlled, Crossover Study	Oshima	2019	crossover RCT	glycine, L-tryptophan (Oral)	NA
1399378	A double-blind placebo-controlled trial of omeprazole on urinary pH in healthy subjects	Osther	1992	crossover RCT	Omeprazole (Oral)	pH meter
3892044	Long-term treatment of calcium nephrolithiasis with potassium citrate	Pak	1985	observational	Citrate (Oral)	24-hour urine
3784284	Successful management of uric acid nephrolithiasis with potassium citrate	Pak	1986	observational	Citrate (Oral)	24-hour urine
19137409	A comparison of sodium bicarbonate infusion versus normal saline infusion and its combination with oral acetazolamide for prevention of contrast-induced nephropathy: a randomized, double-blind trial	Pakfetrat	2009	RCT	Acetazolamide (Oral)	NA
31974286	Sodium Bicarbonate Supplementation and Urinary TGF-β1 in Nonacidotic Diabetic Kidney Disease: A Randomized, Controlled Trial	Raphael	2020	RCT	Sodium bicarbonate (Oral)	24-hour urine
4087694	Hyperkalemic renal tubular acidosis: effect of furosemide in humans and in rats	Rastogi	1985	observational	Furosemide (IV)	NA
15359356	Biological effects of drinking-water mineral composition on calcium balance and bone remodeling markers	Roux	2004	crossover RCT	Mineral water (Oral)	NA
10423646	Effect of varying doses of potassium-magnesium citrate on thiazide-induced hypokalemia and magnesium loss	Ruml	1999	RCT	Citrate (Oral)	24-hour urine
6645208	Contrasting effects of potassium citrate and sodium citrate therapies on urinary chemistries and crystallization of stone-forming salts	Sakhaee	1983	crossover RCT	Citrate (Oral)	24-hour urine
15311008	Stone forming risk of calcium citrate supplementation in healthy postmenopausal women	Sakhaee	2004	RCT	Citrate (Oral)	24-hour urine
21703942	Biochemical control of bone loss and stone-forming propensity by potassium-calcium citrate after bariatric surgery	Sakhaee	2012	crossover RCT	Citrate (Oral)	pH meter
15570319	Effect of a phosphate supplement on urine pH in patients with neurogenic bladder receiving intermittent catheterization	Schlager	2005	prospective study	Neutra-phos (Oral)	pH strip
33561968	The Impact of Diet on Urinary Risk Factors for Cystine Stone Formation	Siener	2021	crossover study	Mixed western/vegetarian diet (Oral)	NA
27314247	Effect of oral cranberry extract (standardized proanthocyanidin-A) in patients with recurrent UTI by pathogenic E. coli: a randomized placebo-controlled clinical research study	Singh	2016	RCT	Cranberry (Oral)	pH strip
23434165	Effects of food or sleep deprivation during civilian survival training on clinical chemistry variables	Stähle	2013	crossover RCT	Sleep deprivation (NA)	pH strip
34959951	Short-Term Supplemental Dietary Potassium from Potato and Potassium Gluconate: Effect on Calcium Retention and Urinary pH in Pre-Hypertensive-to-Hypertensive Adults	Stone	2021	crossover RCT	Potato (Oral)	NA
22954563	Sodium bicarbonate for the prevention of contrast-induced nephropathy: the efficacy of high concentration solution	Tamai	2012	RCT	Sodium bicarbonate (IV)	NA
32503502	Reduction of ureteral stent encrustation by modulating the urine pH and inhibiting the crystal film with a new oral composition: a multicenter, placebo controlled, double blind, randomized clinical trial	Torreçilla	2020	parallel RCT	Methionine (Oral)	24-hour urine
18560820	Citraturic, alkalinizing and antioxidative effects of limeade-based regimen in nephrolithiasis patients	Tosukhowong	2018	RCT	Lime powder (Oral)	24-hour urine
27367723	An Intervention with Mineral Water Decreases Cardiometabolic Risk Biomarkers. A Crossover, Randomised, Controlled Trial with Two Mineral Waters in Moderately Hypercholesterolaemic Adults	Toxqui	2016	crossover RCT	Mineral water (Oral)	pH meter
19911683	Dissolution of radiolucent renal stones by oral alkalinization with potassium citrate/ potassium bicarbonate	Trinchieri	2009	crossover study	Citrate+Bicarbonate (Oral)	pH strip
15565439	Renal tubular cell damage and oxidative stress in renal stone patients and the effect of potassium citrate treatment	Tungsanga	2005	comparative cross sectional study	Citrate (Oral)	24-hour urine
33810868	Effect of Bicarbonate on Net Acid Excretion, Blood Pressure, and Metabolism in Patients With and Without CKD: The Acid Base Compensation in CKD Study	Tyson	2021	crossover RCT	Sodium bicarbonate (Oral)	24-hour urine
30225852	Lime powder regimen supplement alleviates urinary metabolic abnormalities in urolithiasis patients	Ungaroenwathana	2019	RCT	Lime powder (Oral)	24-hour urine
28181941	Sodium Bicarbonate Versus Sodium Chloride for Preventing Contrast-Associated Acute Kidney Injury in Critically Ill Patients: A Randomized Controlled Trial	Valette	2017	RCT	Sodium bicarbonate (IV)	NA
33205810	SGLT2 inhibition versus sulfonylurea treatment effects on electrolyte and acid-base balance: secondary analysis of a clinical trial reaching glycemic equipoise: Tubular effects of SGLT2 inhibition in Type 2 diabetes	van	2020	parallel RCT	Dapagliflozin (Oral)	24-hour urine
26245599	Non-allopathic adjuvant management of osteoarthritis by alkalinisation of the diet	van	2015	crossover RCT	Citrate (Oral)	NA
38519	Influence of long-term citro-soda ingestion on acid-base balance and blood gases	van	1979	observational	Citro-soda (Oral)	urinalysis
19619921	Sodium bicarbonate plus isotonic saline versus saline for prevention of contrast-induced nephropathy in patients undergoing coronary angiography: a randomized controlled trial	Vasheghani-Farahani	2009	RCT	Sodium bicarbonate (IV)	NA
8501777	Effect of orange juice consumption on urinary stone risk factors	Wabner	1993	crossover study	Orange juice (Oral)	24-hour urine
15156935	Effect of cranberry extract on bacteriuria and pyuria in persons with neurogenic bladder secondary to spinal cord injury	Waites	2004	RCT	Cranberry (Oral)	pH strip
17410104	Urinary acidification assessed by simultaneous furosemide and fludrocortisone treatment: an alternative to ammonium chloride	Walsh	2007	crossover RCT	Ammonium chloride (Oral)	pH meter
16997051	Biochemical and stone-risk profiles with topiramate treatment	Welch	2006	cross-sectional study	Topiramate (Oral)	24-hour urine
29619799	Low-carbohydrate, ketogenic diet impairs anaerobic exercise performance in exercise-trained women and men: a randomized-sequence crossover trial	Wroble	2019	crossover RCT	Keto diet (Oral)	pH strip
10652038	Potassium-magnesium citrate versus potassium chloride in thiazide-induced hypokalemia	Wuermser	2000	RCT	Citrate (Oral)	24-hour urine
36261757	Comparison potassium sodium hydrogen citrate with sodium bicarbonate in urine alkalization: a prospective crossover-controlled trial	Xue	2023	crossover RCT	Citrate (Oral)	pH meter
33211886	The efficacy and safety of citrate mixture vs sodium bicarbonate on urine alkalization in Chinese primary gout patients with benzbromarone: a prospective, randomized controlled study	Xue	2021	parallel RCT	Sodium bicarbonate (Oral)	NA
17509313	Reduction of renal stone risk by potassium-magnesium citrate during 5 weeks of bed rest	Zerwekh	2007	RCT	Citrate (Oral)	24-hour urine
23910312	Property changes of urinary nanocrystallites and urine of uric acid stone formers after taking potassium citrate	Zhang	2013	comparative	Citrate (Oral)	urinalysis