
Urine Calcium (Sulkowitch test)

Background

The urine calcium or Sulkowitch test is a simple test to determine the amount of calcium in the blood by testing for calcium in the urine. The test measures calcium being excreted from the body. Calcium absorption depends on the acidity of the stomach, as well as a number of other co-factors including the amount of phosphate present, and takes place in the upper small intestine.

Discussion



The kidneys have a calcium threshold, not unlike its glucose threshold. When calcium levels in the serum rise above a certain level, it will spill into the urine. Conversely, when the serum level of calcium drops there will be no spill-over.

- The kidney's serum calcium threshold is 7.5 – 9.0 mg/dL or 1.875 – 2.25 mmol/L.
- The optimal serum calcium level is 9.2 – 10.0 mg/dL or 2.30 – 2.50 mmol/L, which is a value above the normal calcium threshold for the kidney. Hence, in a normal person there is usually a slight spill-over of calcium from the serum into the urine.
- When the blood calcium drops below 7.5 mg/dL or 1.875 mmol/L there will be no calcium spill-over into the urine.
- When the blood calcium increases above 10.0 mg/dL or 2.50 mmol/L there will be a measurable increase in calcium spill-over in the urine. The amount of calcium in the urine will also be affected by dietary intake of calcium.
- People on a low calcium diet may have abnormally low urine calcium.
- The test can be a marker for adequate digestion and absorption. Eliminating refined foods, optimizing digestion (especially stomach pH and adequate protein digestion), and balancing the systemic pH of the body will help maintain adequate calcium levels.
- Please see the section on the Tissue Mineral Assessment tests for ways to balance minerals and electrolytes.

When would you run this test?

1. To assess serum calcium levels.
2. As a marker for adequate digestion and absorption.
3. To monitor calcium supplementation for adequate digestion and absorption.

Directions

1. Put a dropper full of urine into a test tube
2. Add one dropper of Sulkowitch Reagent- shake to mix
3. Wait 60 seconds and observe turbidity

Results

Low calcium:	Clear:	Little to no discernible fine white precipitate can be seen
	Light turbidity:	Black type can be seen and read through the test tube
Normal:	Some turbidity:	Black type can be seen but not read through test tube.
High calcium:	Heavy turbidity:	Black type cannot be seen through the test tube
	Milky:	It looks like milk which has been diluted with water

Clinical implications

HIGH CALCIUM LEVELS

Increased urine calcium levels almost always accompany ↑ blood calcium levels

Clinical Implication	Additional information
Excess calcium consumption or supplementation	More calcium than is needed may appear in the urine causing a heavy precipitate
Excess calcium being mobilized from the bone	↑ acidosis in the body, osteoporosis, metastatic cancer, myeloma with bone metastasis, increased tissue acidosis
A diet high in refined sugars	A fast food diet high in refined carbohydrates and sugars can cause urinary calcium loss.
Thyroid hypofunction	Serum calcium may be increased in either primary thyroid hypofunction or secondary thyroid hypofunction due to anterior pituitary dysfunction. Increased serum calcium may increase the urine calcium level in this situation.
Conditions associated with an increase urine calcium	<ul style="list-style-type: none"> • Parathyroid hyperfunction • Sarcoidosis • Primary cancers of the breast and bladder • Metastatic malignancies • Wilson's disease • Renal tubular acidosis • Glucocorticoid excess • Respiratory disease

LOW CALCIUM LEVELS

A low urine calcium with a clear solution indicates a low serum calcium

Clinical Implication	Additional information
Calcium need and/or a need for its co-factors	Factors that enhance calcium digestion, absorption and metabolism may need to be assessed in order to increase the urine calcium into normal range. This is especially the case with a normal urine pH. Use the Tissue mineral assessment test to fine-tune calcium and co-factor supplementation.
Hypochlorhydria	The body is unable to digest the ingested or supplemented calcium.
Excess protein intake	A very high protein diet can cause a decreased urine calcium especially with a decreased urine pH.
Malabsorption	Due to calcium's effect on the drawing of fats through the intestinal wall and protein absorption. Also celiac's disease.
Conditions associated with an decrease urine calcium	<ul style="list-style-type: none"> • Hypoparathyroidism • Vitamin D insufficiency • Muscle spasms • Ingestion of alkaline supplements and antacids

Interfering Factors:

Falsely increased levels	Falsely decreased levels
<ul style="list-style-type: none"> • Excess milk intake • Drugs: growth hormone, PTH, Vit. D • Urine taken after a high calcium meal • Corticosteroids 	<ul style="list-style-type: none"> • Increased phosphate or bicarbonate • Antacid use • Alkaline urine • Thiazide diuretics

Related Tests:

Additional diagnostic information can be obtained by looking at urine calcium patterns with urinary pH. Please see the section of Urinary patterns for a more detailed description of patterns seen with Urine calcium. Tissue mineral assessment.