

Calcium

Calcium (99 %) and phosphorus form the essential mineral component of bones in the form of hydroxyapatite. The rest of calcium is present in the extracellular fluid because its concentration is very low in cells. Calcium is a typical extracellular cation. In plasma calcium exists in several forms: bound to proteins (mainly albumin), in the form of complex compounds soluble in water (citrate, lactate) or in the ionized form.

Reference values:

Serum and plasma: 2,10 – 2,55 mmol/l

Clinical significance:

Hypercalcemia: excessive intake (*vitamin D, vitamin A intoxication*)
hyperparathyroidism
cancer (*lung cancer, breast cancer, kidney cancer*)

Hypocalcemia: reduced intake (*diet with restricted calcium, intestinal absorption disorder*)
hormonal disorders (*vitamin D deficiency, hypoparathyroidism*)
kidney diseases
hypomagnesemia
acute pancreatitis
pregnancy

DETERMINATION OF CALCIUM

PRINCIPLE OF THE METHOD

Calcium in the sample reacts with arsenazo III forming a coloured complex that can be measured by spectrophotometry. The intensity of the colour is directly proportional to the calcium concentration in the sample.

MATERIALS AND INSTRUMENTS

Calcium Arsenazo (BioSystems S.A., Spain), tubes, graduated pipette, automatic pipette, pipette pump, cuvette, spectrophotometer SPEKOL 1300

CHEMICALS

Reagent – Arsenazo III 0,2 mmol/l, imidazole 75 mmol/l

Calcium/Magnesium standard – calcium 10 mg/dl (2,5 mmol/l), magnesium 2 mg/dl

PROCEDURE

1. Bring the reagent to room temperature.
2. Pipette into labelled test tubes according to the table.

	BLANK tube 1	STANDARD tube 2	SAMPLE tube 3
Calcium Standard (S)	—	20 µl	—
Sample	—	—	20 µl
Distilled water	20 µl	—	—
Reagent (A)	2,0 ml	2,0 ml	2,0 ml

3. Mix thoroughly and let stand the tubes for 2 minutes at room temperature.
4. Read the absorbance (A) of the standard and the sample at 650 nm against the blank.

CALCULATIONS

The calcium concentration in the sample is calculated using the following general formula:

$$C_{\text{sample}} = (A_{\text{sample}}/A_{\text{standard}}) \times C_{\text{standard}}$$

CONCLUSION