

Sawtooth Potassium and Hemoglobin Results

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CASE DESCRIPTION

A 5-year-old boy was admitted with dyspnea, fever, night sweats, and unexplained bruising. Radiography revealed several pulmonary consolidations, and laboratory investigations showed marked hyperleukocytosis with 90% blasts. He was diagnosed with T-cell acute lymphoblastic leukemia. Hemoglobin (Hb)² and potassium results in the subsequent days, during therapy, showed a sawtooth pattern [Fig. 1: central lab, solid dots; point of care (POC), open dots]. The physician was confused and unsure what Hb and potassium results to act on and contacted the laboratory.

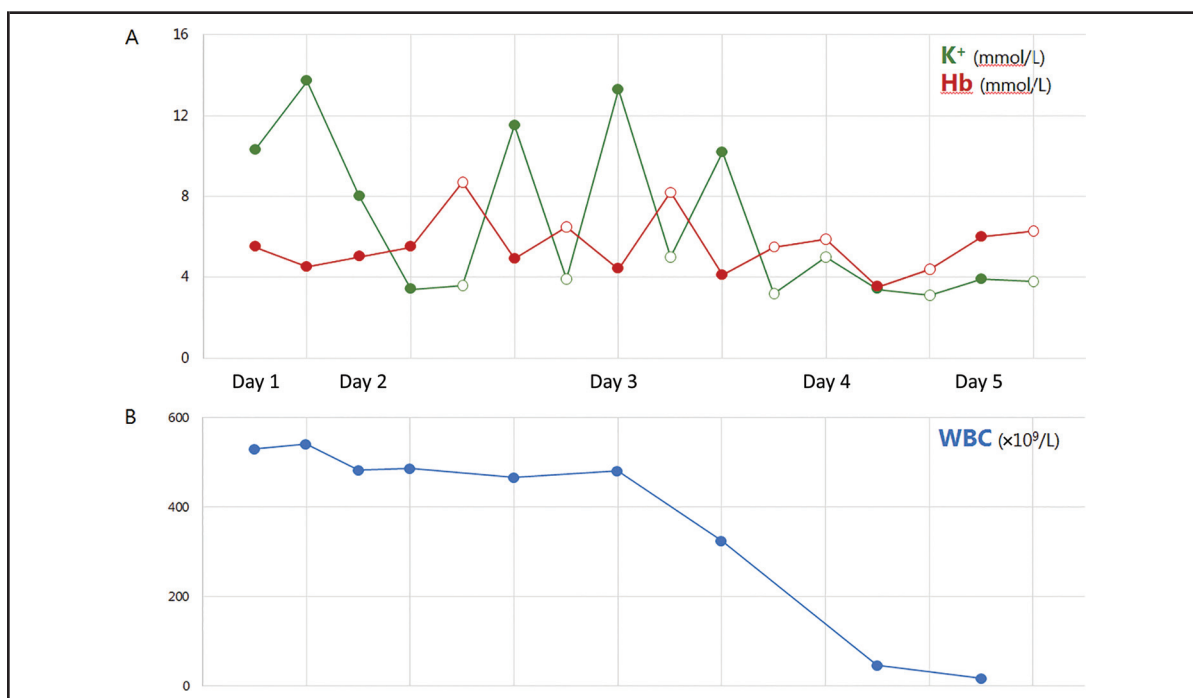


Fig. 1. Potassium, hemoglobin and leucocyte count results in time.

(A), Potassium (K^+ ; mmol/L) and Hb (mmol/L) results in time. Hb: 1 mmol/L = 1.61 g/dL. Open dots, K^+ and Hb analyzed on i-STAT POC analyzer. The i-STAT Hb is calculated from hematocrit using a fixed mean cell Hb concentration of 21 mmol/L. Solid dots, K^+ analyzed on a Beckman-Coulter-Olympus AU5811 chemistry analyzer and Hb by spectrophotometric measurement of the cyanide derivative of Hb on an Abbott CELL-DYN Sapphire. (B), Leukocyte count $\times 10^9/L$ (WBC) in time, measured on Abbott CELL-DYN Sapphire.

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² Nonstandard abbreviations: Hb, hemoglobin; POC, point of care

QUESTIONS

1. What Hb measuring method can be less reliable in patients with leukemia?
2. What laboratory artefacts can be encountered in potassium measurements in patients with leukemia?

The answers are below.

ANSWER

The i-STAT POC analyzer calculates Hb from hematocrit, which is determined by conductometry. Therefore, high numbers of leukocytes, decreasing the conductance as erythrocytes do, can result in severely overestimated Hb results (1).

POC potassium whole blood measurements are preferable, as leukolysis during pneumatic tube transport and centrifugation may cause pseudohyperkalemia in samples analyzed on chemistry analyzers (2, 3). Note that the saw-tooth pattern disappeared and central lab and POC testing results converged upon normalization of leukocyte numbers.

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