

Validation of ionized magnesium using the pHox Stat Profile analyser

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Background

Awareness of the range of biological functions of magnesium (Mg) is growing. The benefits of Mg testing on critically ill patients have been recognized (1, 2). Most laboratories measure only total serum Mg concentrations while the ionized form (iMg) is believed to be the physiologically active component (2, 3). By using an ion-selective electrode iMg can be measured.

Aim of the study

To validate the pHox Stat Profile analyzer (Nova Biomedical) for the assessment of ionized magnesium. The use of different vacutainers and stability at different temperatures is tested. Stability of iMg in serum at -20°C is evaluated while several studies store samples at -20°C.

Methods

- Sample collection: blood samples were taken from healthy volunteers (n=3), collected in different vacutainers (lithium heparin (Li-hep) 17 IU/mL, serum glass, serum with clot activator). Per drawing 6 consecutive measurements were performed.
- Stability testing: storage at different temperatures (room temperature, 4°C, and -20°C) measured at different time points (0, 2, 4, 6, 24 and 48 hours; 1, 2, 4 and 8 weeks).

Results

- iMg in serum from glass tubes and clot activator tubes does not differ from Li-hep whole blood results (Figure 1).
- The assay has good precision: CV < 5.0% (Table 1).
- Whole blood kept for more than 2 hours at RT (and 4 hours at 4°C) shows significant different iMg values compared to baseline.
- Serum cannot be stored at -20°C: significant lower values are observed after 1 week (Figure 2).

References

1. Sen et al. Neurotherapeutics 2010; 7: 91
2. Soliman et al. Crit Care Med 2003; 31: 1082
3. Saris N-El et al. Clin Chim Acta 2000; 294: 1

Table 1: Precision testing for 15 successive measurements in 3 different samples.

	Sample 1	Sample 2	Sample 3
Mean (mmol/L)	0.549	0.531	0.641
SD	0.01	0.007	0.015
CV	1.75%	1.33%	2.38%

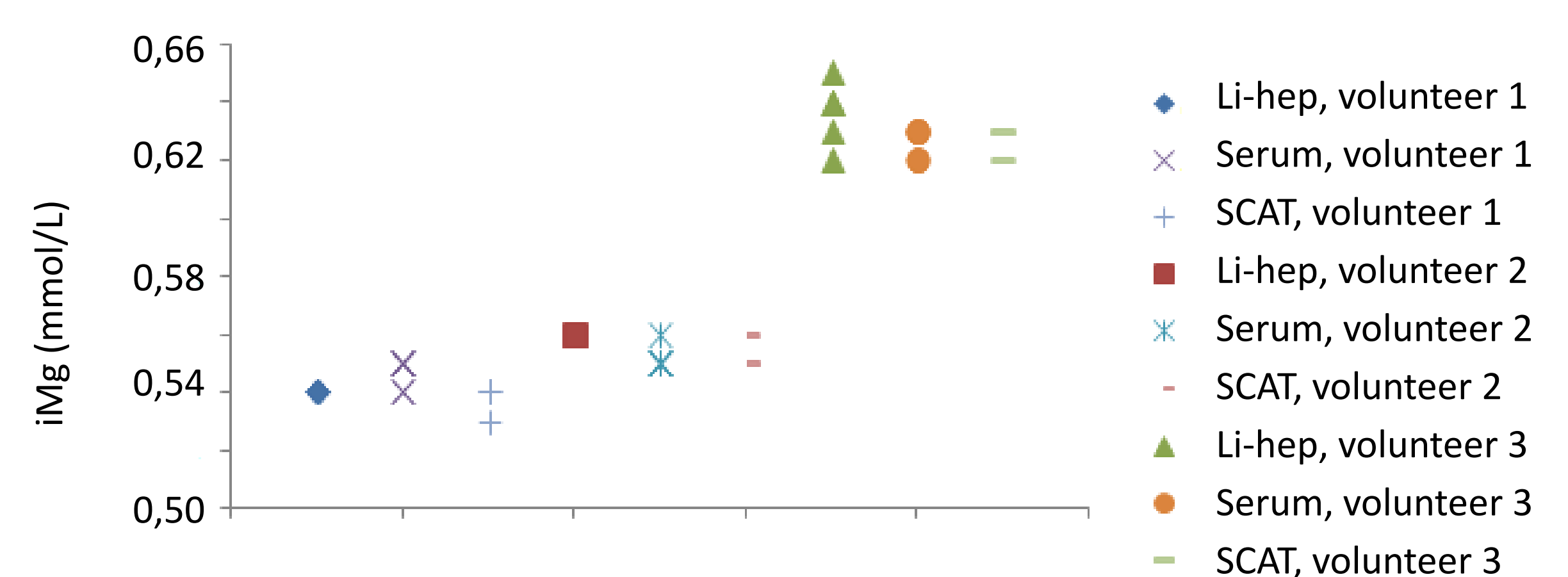


Figure 1: Different tubes (Li-hep, serum glass and clot activator (SCAT) were tested in 6 consecutive measurements in 3 volunteers.

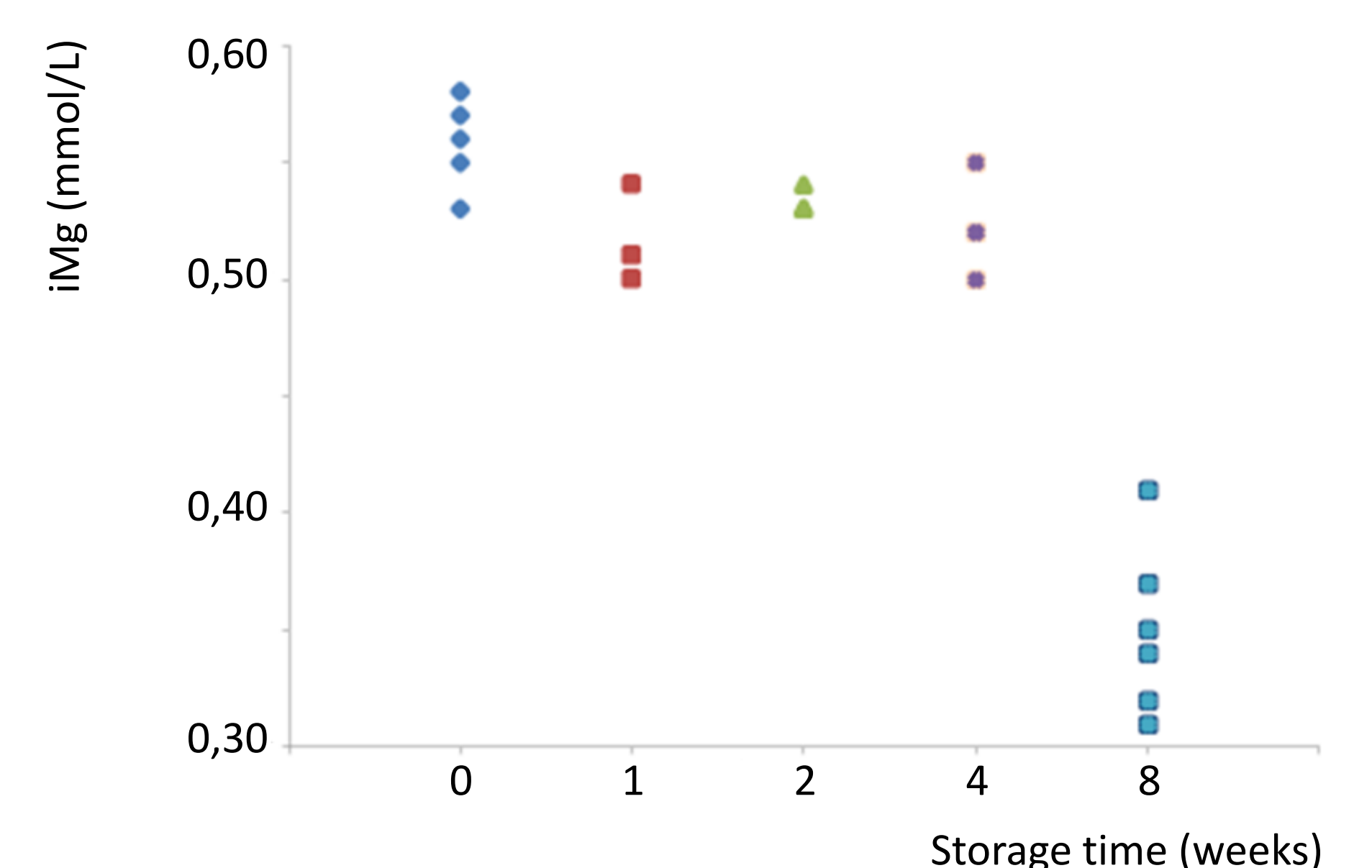


Figure 2: Decrease in iMg concentration in serum after storage at -20°C.

Conclusions

The pHox analyzer measures ionized magnesium with high precision. Whole blood samples should be collected using Li-hep 17 IU/mL as a anticoagulant and can be stored for up to 2 hours at room temperature and 4 hours at 4°C prior to analysis. Serum samples cannot be stored at -20°C.

