

## **Detection of Dehydration by Using Volume Kinetics.**

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### **Background**

Patients admitted to surgery may be dehydrated, which is difficult to diagnose except when it is severe (>5% of the body weight). We hypothesized that modest dehydration can be detected by kinetic analysis of the blood hemoglobin concentration after a bolus infusion of crystalloid fluid.

### **Methods**

Four series of experiments were performed on 10 conscious, healthy male volunteers. Separated by at least 2 days, they received 5 or 10 mL/kg acetated Ringer's solution over 15 minutes. Before starting half of the IV infusions, volume depletion amounting to 1.5 to 2.0 L (approximately 2% of body weight) was induced with furosemide. The elimination clearance and the half-life of the infused fluid were calculated based on blood hemoglobin over 120 minutes. The perfusion index and the pleth variability index were monitored by pulse oximetry after a change of body position.

### **Results**

Dehydration decreased the elimination clearance of acetated Ringer's solution [median (25th-75th percentile)] from 1.84 (1.23-2.57) to 0.53 (0.41-0.79) mL/kg/min (Wilcoxon matched-pair test  $P < 0.001$ ) and increased the half-life from 23 (12-37) to 76 (57-101) minutes ( $P < 0.001$ ). The smaller infusion, 5 mL/kg, fully discriminated between experiments performed in the euhydrated and dehydrated states, whereas the urinary excretion provided a less-reliable indication of hydration status. Dehydration decreased the perfusion index but did not affect the pleth variability index.

### **Conclusion**

Dehydration amounting to 2% of the body weight could be detected from the elimination clearance and the half-life of an infusion of 5 mL/kg Ringer's solution.