

Parenteral nutrition mixtures controls by inductively coupled plasma optical emission spectrometer: influence of proteins on electrolyte assay.

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CONTEXT

Acquisition of an inductively coupled plasma optical emission spectrometer (ICP-OES), ICAP 7400 duo (ThermoFisher), to carry out analytical control of parenteral nutrition mixtures, led us to determine optimal conditions for validating electrolytes dosing method.



OBJECTIVE

The aim of this study is to determine influence of proteins during analytical control of binary parenteral nutrition mixtures by ICP-OES in sodium, potassium, calcium and magnesium.

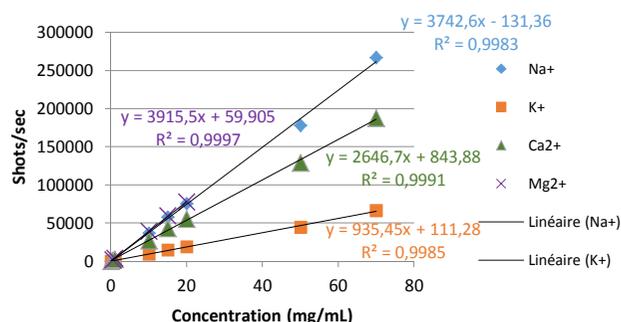
METHODS

Five bags of 5 standards binary formulas and 15 nominatives bags were produced with the qualified automated compounding system, BAXA EM 2400. A sample of each bag was taken after homogenization.

Study of matrix effect :

- 2 ranges of calibration: with or without proteins
- Analyze Na⁺, K⁺, Ca²⁺ and Mg²⁺ concentrations of each sample according to these 2 ranges.
- Comparison of the correlation coefficients according to the Fischer transformation.

The matrix effect has not been statistically demonstrated (U < 1.96). Correlation coefficients obtained are greater than 0.999 for the 4 analytes and the coefficients of variation obtained are the same whatever range used.



Nominatives bags :

REs are on average lower with the non-protein range.

	Non-protein range	Protein range
Na ⁺	2,94%	3,30%
K ⁺	2,99%	3,28%
Ca ²⁺	3,55%	3,25%
Mg ²⁺	4,41%	5,54%

RESULTS

Standards bags:

- Mg²⁺ : relative error (RE) averages are lower with protein range (<3% vs. <5%).
- Na⁺, K⁺, Ca²⁺ :
 - RE means are the same or even higher with the protein range
 - one bag has an RE greater than + 10% for calcium

		Na ⁺		K ⁺		Ca ²⁺		Mg ²⁺	
		Non-protein range	Protein range						
SAPS	ER (%)	1,50	1,69	1,71	1,65	4,29	2,82		
	CV (%)	1,8	1,9	1,8	1,8	2,8	2,8		
Not salty	ER (%)			2,73	5,03			4,27	2,64
	CV (%)			2,2	2,2			2,4	2,4
Very salty	ER (%)	2,62	2,06	2,32	2,37			5,32	2,12
	CV (%)	2,9	2,9	3	3			3	3
Salty	ER (%)	4,77	3,89	3,89	6,21			3,50	3,22
	CV (%)	2,6	2,6	2,1	2,1			2	2
DO	ER (%)					1,96	6,99		
	CV (%)					2,8	2,8		

DISCUSSION/CONCLUSION

This study showed that presence of proteins in the calibration range didn't influence accuracy of the results obtained except for magnesium. Thus, protein range will not be used to validate the dosing method of parenteral nutrition mixtures by ICP-OES.