

Evaluation of the Radiometer 'ABL4' pH/blood gas/K⁺/Hb analyser

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The ABL4 analyser is designed for stat determination of blood gas (pCO₂, pO₂), pH, potassium and haemoglobin (Hb), a panel particularly adapted to the follow-up of liver transplantation. The performance of the analyser in classical tests was evaluated; in addition, K⁺ measurements were performed in specific conditions (linearity in a non-physiological range, erythrocyte interference).

The evaluation of precision and comparison of methods were carried out according to the guidelines of the SFBC (Société Française de Biologie Clinique), which are similar to those of the NCCLS (EP5-P and EP9-P). Within-run and between-run precision and percentage CV were within the allowable limits of error (see table 1).

The results obtained with the ABL4 correlated well with those from previously validated analysers (table 2). It should be noted that the slope for Hb can be adjusted to 1, using a special built-in function of the ABL4.

Table 1. Precision.

Analyte	Level	Within-run (N = 30)			Between-run (N = 20)		
		Mean	SD	CV %	Mean	SD	CV%
pH	L	7.099	0.002	0.03	7.112	0.005	0.1
	M	7.356	0.0036	0.05	7.359	0.005	0.1
	H	7.590	0.0025	0.03	7.595	0.004	0.1
pCO ₂ (mmHg)	L	20.5	0.24	1.2	19.8	0.6	2.8
	M	42.2	0.61	1.4	41.9	0.9	2.3
	H	63.5	0.35	0.5	62.2	1.8	3.0
pO ₂ (mmHg)	L	50.2	0.9	1.8	49.3	1.6	3.3
	M	108.4	1.3	1.2	104.1	2.6	2.5
	H	185.6	1.8	0.95	176.2	2.9	1.6
K ⁺ conc (mmol/l)	L	2.49	0.03	1.2	2.4	0.1	2.4
	M	4.01	0.03	0.75	3.9	0.1	1.8
	H	5.19	0.03	0.58	5.0	0.1	2.7
Hb conc (g/l)	L	6.85	0.15	2.1	6.80	0.22	3.3
	M	14.58	0.13	0.9	14.45	0.35	2.4
	H	20.00	0.07	0.3	20.20	0.30	1.5

Concentration levels: L = low, M = medium, H = high.

Table 2. Comparison of methods (N = 100).

Analyte	Reference analyser	Slope	Intercept	r
pH	Corning 178 (potentiometry)	0.996	+ 0.02	0.995*
pCO ₂	Corning 178 (potentiometry)	0.990	- 0.23	0.987*
pO ₂	Corning 178 (polarography)	1.066	- 2.8	0.996*
K ⁺	Corning 634 (direct potentiometry)	1.061	- 0.35	0.986*
Hb	Minos St (Drabkin method)	0.897	+ 0.44	0.954*

*p < 0.001

Concerning K^+ , a linear response up to 55 mM potassium was demonstrated in the lavage solution used in liver transplantation. In emergencies, this large linearity range avoids the time-consuming dilution step required with some other whole-blood K^+ analysers. Furthermore, there was no difference between plasma (centrifuged at 4°C) and whole-blood K^+ determinations (mean difference = 0.07, $N = 100$). The absence of RBC interference is important during prolonged surgical interventions which are associated with changes in haematocrit values.

In conclusion, the ABL4 is a reliable blood-gas analyser. In addition, whole-blood K^+ /Hb determinations are good, making the equipment suitable for the management of liver transplantation.

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