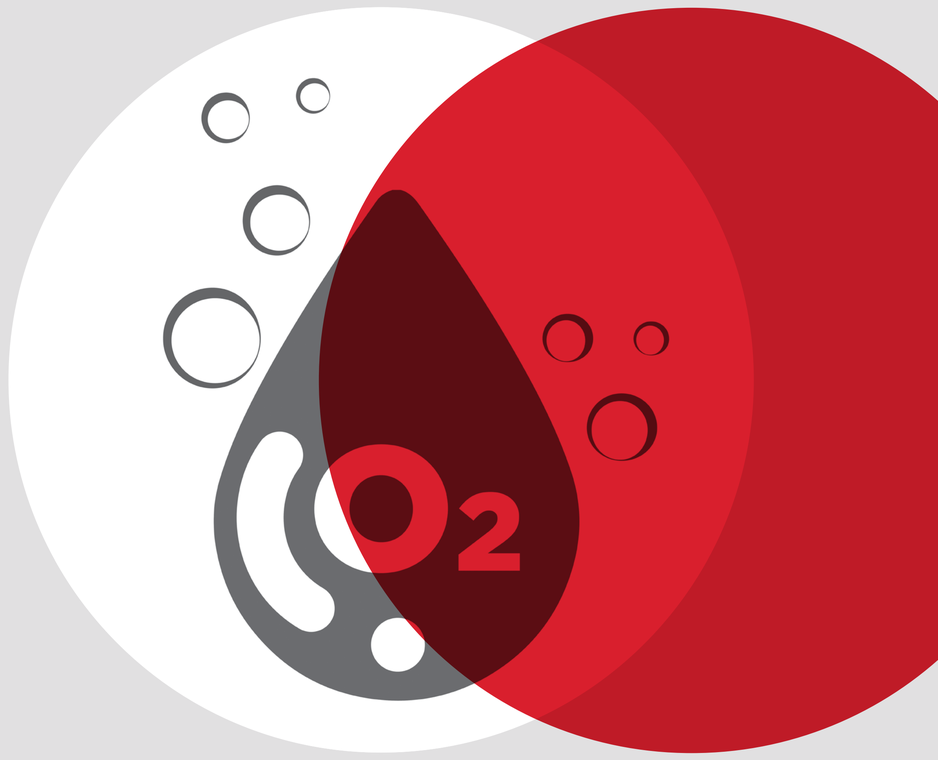
Stability of RCPAQAP Blood Gas and Co-Oximetry Samples



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Introduction

The stability of EQA samples over the course of a 12-month cycle is essential to ensure valid assessment of laboratory results. Based on previous studies conducted by RCPAQAP, lyophilised material was shown to be stable over 12-months even under adverse conditions e.g., extended ambient shipping time. Other potential options to detect instability are a shift in medians between duplicate samples in subsequent surveys and or evidence of "tailing" in the all-result histograms.

Based on the specifications from our suppliers, the stability of EQA Blood Gas and CO-oximetry material is stated to be 18 months when stored at 2–8°C after production. We sought to validate the manufacturer claims for stability of aqueous Blood Gas and CO-oximetry samples by monitoring changes in precision for duplicate sample results over a 12-month timeframe as well as any evidence of "tailing".

Method

In-house software was used to compare median data from all results returned for duplicate samples across six levels (1–6) analysed up to 11-months apart for the 2021 RCPAQAP Blood Gases program. Potential significant differences between medians were assessed against RCPAQAP Analytical Performance Specifications (APS). CVs <8% were considered acceptable within run variance.

Results

When compared to the related APS's, there were no clinically significant changes in medians (all <1.0) across the entirety of the program (Figs 1–3 and Table 1). The within-run CVs were all <8% with the exception of the low levels for pO_2 (Mean 36 mm Hg; Median 43 mm Hg; SD 13), Carboxyhaemoglobin (Mean 1%; Median 1%; SD 1) and Methaemoglobin (Mean 12%; Median 12%; SD 1). Further, there was no evidence of any "tailing" in the histograms (Fig 4).

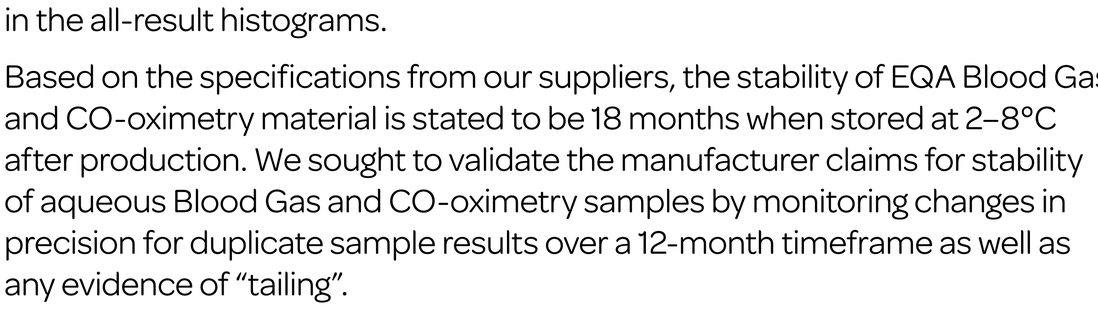

Figure 1. Low concentration sample medians for each measurand obtained over four surveys.

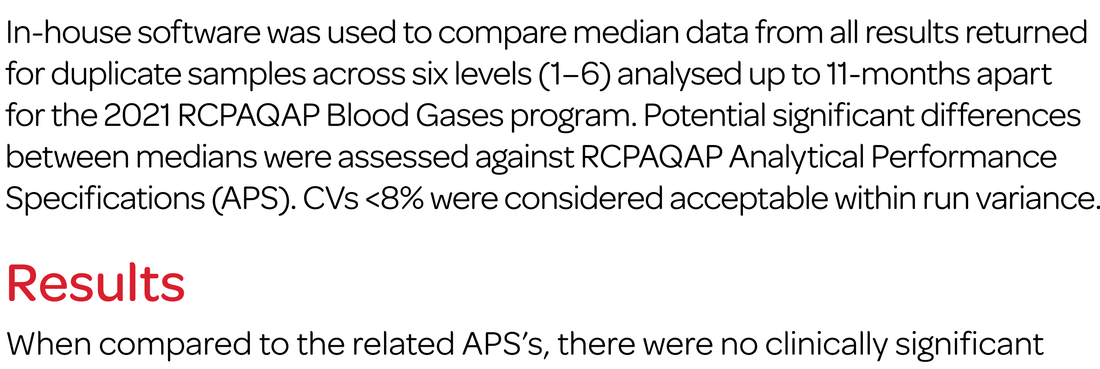

Figure 2. Medium concentration sample medians for each measurand obtained over four surveys.

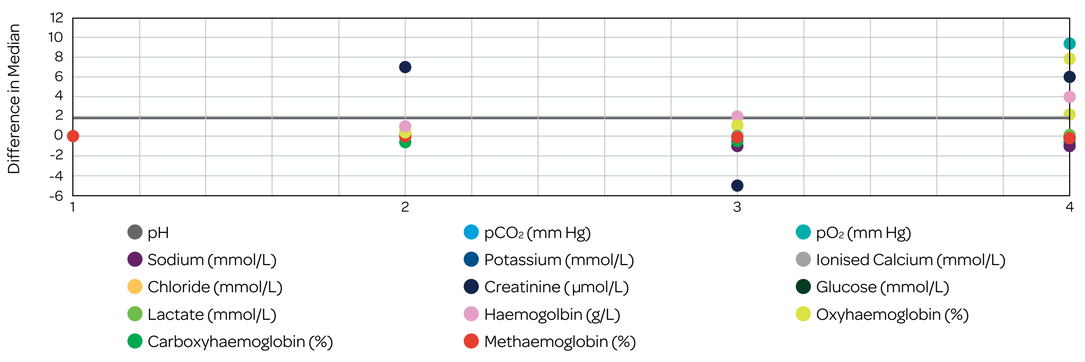

Figure 3. High concentration sample medians for each measurand obtained over four surveys.

Table 1. Medians for low, medium and high concentrations. In brackets is the overall difference obtained from subtracting the last value from the first.

Measurand	Low	Medium	High
pH	7.14 (0)	7.32 (0)	7.62 (0)
pCO_2 (mm Hg)	21.05 (0.27)	47.4 (0.5)	63.95 (0.08)
pO_2 (mm Hg)	43.5 (-1)	114.5 (-3)	166.5 (-4)
Sodium (mmol/L)	117 (0)	134 (0)	159.5 (1)
Potassium (mmol/L)	2.2 (0)	3.3 (0)	5.7 (0)
Ionised Calcium (mmol/L)	0.44 (0)	1.15 (0)	1.67 (0)
Chloride (mmol/L)	79 (0)	96 (0)	121 (0)
Creatinine (amol/L)	43 (0)	295.5 (-2)	541 (-6)
Glucose (mmol/L)	2.2 (0)	12.05 (0.1)	21.6 (0.1)
Lactate (mmol/L)	1.2 (0)	10 (0)	14.85 (-0.1)
Haemoglobin (g/L)	77 (0)	132.5 (-2)	182.5 (-4)
Oxyhaemoglobin (%)	45.85 (-0.7)	73.1 (-1.1)	88.75 (-2.2)
Carboxyhaemoglobin (%)	1.15 (0.4)	12.3 (0.6)	27.35 (0.6)
Methaemoglobin (%)	10.75 (1.7)	15.55 (0.75)	28.05 (0.2)

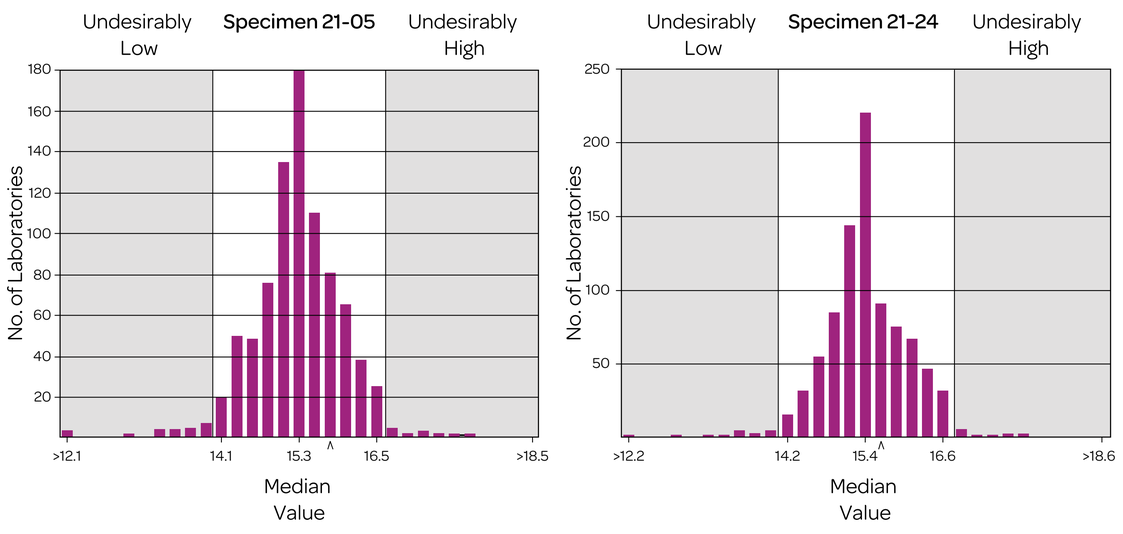

Figure 4. Left histogram displaying first time level 2 glucose was run (21–05) in March 2021. Right histogram demonstrating last time level 2 glucose was run (21–24) in November 2021.

Discussion and Conclusion

This study confirms the stability of RCPAQAP Blood Gas and CO-oximetry samples over the duration of a 12-month program under laboratory storage conditions. The higher CVs (>8%) were expected for the low levels of pO_2, Carboxyhaemoglobin and Methaemoglobin.

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