

BLOOD GAS ANALYSIS USING ABL90

Version No	1
DATE OF ISSUE	May 2013
REVIEW INTERVAL	3 yearly
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COPY	1
LOCATION OF COPIES	1. Room PA2 2. Q-PULSE 3. Trust Intranet

CONTENTS

1	SCOPE AND PURPOSE	3
2	RESPONSIBILITY	3
3	REFERENCES	3
4	DEFINITIONS	3
5	RELATED DOCUMENTS	3
6	ACTIONS AND METHODS	4
6.1	PRINCIPLE OF TEST	4
6.2	PERSONNEL TO DO THE TASK / LEVEL OF TRAINING REQUIRED	4
6.3	SPECIMEN REQUIREMENTS.....	4
6.4	EQUIPMENT	4
6.5	MATERIALS/REAGENTS	4
6.6	QUALITY CONTROL.....	4
6.7	METHOD/PROCEDURE	5
6.8	RESULT REPORTING	5
6.9	REFERENCE RANGES	5
6.10	GUIDE TO INTERPRETATION	5
6.11	EMERGENCY AND OUT OF HOURS PROCEDURE	6
7	HEALTH AND SAFETY/COSHH	6
8	APPENDIX 1: STEP BY STEP GUIDE	7

1 SCOPE AND PURPOSE

To outline the procedure for the analysis of blood-gas on the Radiometer ABL90 Flex analyser.

2 RESPONSIBILITY

The department manager has overall responsibility for the performance of this equipment.

Routine maintenance of the analysers is the responsibility of the Point of Care Testing team (PoCT).

Review and updating of the Standard Operating Procedure is the responsibility of the PoCT team.

3 REFERENCES

Adams A. Hahn C. 'Principles and practice of blood gas analysis'

Pub. Franklin Scientific Projects 1979

De Koninck et al; Performance evaluation of four blood gas analysers, Clin Chem Lab Med, 2012, 1083-1091

Radiometer Operator's Manual for ABL90 Flex Q-Pulse POC-EXT-50

4 DEFINITIONS

PoCT Point of Care Testing, pathology investigation performed outside the laboratory setting.

5 RELATED DOCUMENTS

Trust Medical Devices Policy – Accessed via Trust Intranet

Infection Control Policy – Accessed via Trust Intranet

Pathology Sample Acceptance Policy Q-PULSE TRUST-POLICY 1 and Trust Intranet

Blood Gas Analyser Maintenance SOP Q-PULSE POC-SOP-3

Medical Devices Policy – Available on Trust Intranet

Infection Control Policy – Available on Trust Intranet

IT Confidentiality Policy – Available on Trust Intranet

6 ACTIONS AND METHODS

6.1 Principle of test

To measure using specific electrodes the acidity, gas tensions, electrolytes and metabolites in anticoagulated whole blood, plus by using oximetry fractional haemoglobin components.

6.2 Personnel to do the task / level of training required

All trained members of staff who are set up as registered users. **Passwords MUST NOT be shared.** Staff should also complete the relevant competency.

6.3 Specimen requirements

Make sure patients are positively identified prior to sample collection and that the sample and analyser records all correspond (see relevant policies referenced above). For scalp samples use maternal ID, for newborns, prior to NHS number allocation, use name and date of birth (if it is possible delay sampling until after unique identifier is available) for unknown and unconscious patients use unique identifier e.g. A&E number and gender, also see appendix 1.

Volume Required: Only 65uL is required by the analyser however if syringe samples are under filled this can give erroneous results. It is essential to use the specific heparinised blood gas luer capped syringe or heparinised capillary tube, it is essential that clot catchers are used with capillary samples. If samples are to be transported elsewhere for analysis this should be in iced water, with well capped samples, and done promptly.

NB. Portering staff have specific instructions not to collect syringes with needles still attached. Hazard notice (88) 16 specifically applies here.

Storage: Samples must be analysed immediately however they can be kept in iced water or a fridge for a few minutes but will deteriorate so analysis >20mins is not recommended.

6.4 Equipment

Radiometer ABL90 FLEX series blood gas analyzer.

6.5 Materials/Reagents

See specific COSHH notices for sensor and solution pack Q-Pulse POC-EXT-49. All reagents pack supplied by Radiometer, Manor Court, Crawley RH10 9FY.

6.6 Quality Control

The gas machines hold QC samples onboard which are automatically run at preset times but QC can also be manually requested when required (see manual for full details).

6.7 Method/Procedure

See appendix for step by step instructions.

The sample, a syringe or capillary tube, is offered up to the machine when prompted by a message on screen. With the very rare exception of severe hypothermia, it is not necessary to over ride the default temperature setting of 37°C.

6.8 Result Reporting

Results are displayed on screen and then printed. The results are stored on the analyser and can be redisplayed and printed if required but positive patient identification is essential and the patients ventilation status must be known to interpret the results. The data is backed up and stored by the PoCT team.

6.9 Arterial Reference Ranges

Symbol	Parameter	Unit	Ref.range
pH	Acidity	Log of [H+]	7.350 – 7.450
[H+]	Hydrogen Ion	nmol/L	35 - 45
pCO ₂	Carbon dioxide tension	kPa	4.70 – 6.00
pO ₂	Oxygen tension	kPa	11.0 – 14.4
cHCO ₃	Standard bicarbonate	mmol/L	22.0 – 29.0
ct CO ₂	Total Carbon dioxide	mmol/L	25.0 – 30.0
cBase	Base Excess	mmol/L	-2.0 – 2.0
ctHb	Haemoglobin concentration	g/L	115 – 170
Hct _c	Calculated haematocrit		0.350 – 0.550
sO ₂	Oxygen saturation	%	94 – 99
FO ₂ Hb	Fraction of OxyHb in Total Hb	%	94 – 98
FCOHb	Fraction of CarboxyHb in Total Hb	%	0 – 1.5
FMetHb	Fraction of MetHb in Total HB	%	0 – 1.5
FHHb	Fraction of DeoxyHb in Total Hb	%	0 – 5.0
cNa	Sodium	mmol/L	133 – 146
cK	Potassium	mmol/L	3.5 – 5.3
cCa	Ionised Calcium	mmol/L	1.13 – 1.32
cCl	Chloride	mmol/L	95 – 108
cGlu	Glucose*	mmol/L	3.8 – 11
cLac	Lactate	mmol/L	0.6 – 2.5
ctBil	Bilirubin (adult) Neonate ranges vary check with Biochem	umol/L	<21

*Fasting glucose range 2.5 – 5.8 mmol/L. Random glucose of >11.1 mmol/L is raised (WHO guidance)

6.10 Guide to interpretation

The gas results can be viewed on a chart in the instrument results screen which can also be printed which may aid interpretation (capillary and arterial only). All results must be interpreted in conjunction with the clinical history and with reference to sample type and ventilation. Haemolysis, which is not detectable in whole blood, may cause an artifactual increase in measured Potassium.

6.11 Emergency and Out of Hours Procedure

If the instrument is not functioning, samples should be sent to Biochemistry, when sending samples to Biochemistry the lab' or oncall staff must be contacted to avoid delays in processing and the Pathology sample labelling policy must be adhered to. It may also be possible to use the nearest ward/unit device as an alternative but users should check if this is possible. N.B. Sending or taking a sample to an alternative site must not be done if a sample being analysed has caused a blockage as this can lead to multiple device failures and hence compromise service availability.

7 HEALTH AND SAFETY/COSHH

Some components may contain human source material and/or other potentially hazardous ingredients that necessitate certain precautions:

Follow Universal Precautions when handling patient specimens as detailed by the Infection Control Manual. Handle all components and all patient samples as recommended for any potentially infectious human serum or blood specimen in the HHS Publication No. (CDC) 93-8395, Biosafety in Microbiological and Biomedical Laboratories, U.S. Government Printing Office; Washington, DC. Use supplied personal protective equipment. Wipe up spills promptly and decontaminate affected surfaces. Avoid generation of aerosols. Follow appropriate waste handling regulations applicable to your area.

MSDS Radiometer ABL Blood Gas Analyser POC-EXT-49

8 APPENDIX 1A: STEP BY STEP GUIDE SYRINGE SAMPLES

- 1 Login via the barcode reader (N.B. Do **not** share your login).
- 2 Check the analyser is in "READY "mode, lift inlet flap to the syringe position and follow the onscreen prompts.
- 3 Push syringe tip of a well mixed, bubble free, sample firmly into the inlet, take care not to bend the probe. Hold the sample in place until prompted to remove it.
- 4 Return the inlet flap to the home position when prompted.
- 5 Enter the patient information; this information must be entered accurately as it forms part of the patient record, also see 10 below. Patient temperature and ventilation can be entered if desired.
- 6 The patient result is displayed on screen and automatically printed.
- 7 Wait until the date and time footer has printed then tear off paper copy; check values and fix results into notes. The thermal paper used will degrade and become unreadable, even if kept out of direct light, so results acted upon should be recorded. Without a corresponding record of the inspired air it is not possible to interpret the results.
- 8 Press "Acid-Base Chart" to see the result in terms of a Siggard-Anderson nomogram (arterial & capillary samples only) – this can be done when the results are initially display or when recalled.
- 9 **Log-off**, clean-up any drips or spills of blood and dispose of the sample and cleaning materials in accordance with the infection control/waste management policies.
- 10 Unknowns
In **exceptional** circumstances where there are no patient identifiers "UNKNOWN" must be entered into the ID field (do not make up an ID), this will link to any previous unknowns and populate the rest of the fields accordingly so should then be edited to reflect what is known e.g. change surname field to male. These results must not be recalled/reprinted after analysis. Use of "UNKNOWN" as an ID is audited and must only be used when no unique identifiers are available as it compromises the patient record and is a governance risk. N.B. Sample sent to the lab will be rejected if not compliant with their labeling policy.

9 APPENDIX 1B: STEP BY STEP GUIDE CAPILLARY SAMPLES

- 1 Login via the barcode reader (N.B. Do **not** share your login).
- 2 If the capillary contains a mixing wire move this up and down with a magnet to ensure mixing, leave the wire at the end not being sampled from. If bubbles are present these should be moved to the end not being sampled from. If in place remove one end cap. **Put clot catcher on to capillary** at opposite end to wire and bubbles and remove other end cap just prior to use.
- 3 Check the analyser is in "READY "mode, lift inlet flap to the **capillary position** and follow the onscreen prompts.
- 4 Push clot catcher tip firmly into the inlet, take care not to bend the probe. Hold the sample in place until prompted to remove it.
- 5 Return the inlet flap to the home position when prompted.
- 6 Enter the patient information, this information must be entered accurately as it forms part of the patient record, also see 11 below. Patient temperature and ventilation can be entered if desired.
- 7 The patient result is displayed on screen and automatically printed.
- 8 Wait until the date and time header has printed then tear off paper copy; check values then fix results into notes **N.B.** The thermal paper used will degrade and become unreadable, even if kept out of direct light, so results acted upon should be recorded. Without a corresponding record of the inspired air it is not possible to interpret the results.
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