5 INTRAPARTUM CARE

5.14 POST BIRTH SPECIMEN COLLECTION / EXAMINATION

5.14.1 UMBILICAL CORD BLOOD COLLECTION/ANALYSIS

- AT BIRTH

AIM

To collect cord blood samples at birth, that will enable the detection of respiratory and metabolic acidosis if present following birth.

BACKGROUND INFORMATION

Umbilical cord pH and blood gas values provide valuable information regarding the status of the infant at birth; base excess determination quantifies the magnitude of metabolic acidosis, the putative risk factor for central neurological injury.\(^1\)

Asphyxia is a condition of impaired blood gas exchange and if not resolved will lead to progressive hypoxemia and hypercapnia. Asphyxia may occur in a transient fashion with no pathological impact, but significant exposure leads to tissue oxygen depletion, accumulation of fixed acids and eventually metabolic acidosis. Moderate or severe newborn encephalopathy, respiratory complications, and complex complications increase when the base deficit is between 12-16 mmol/L.\(^2\)

An intrapartum event sufficient to cause cerebral palsy may be defined by evidence of metabolic acidosis in the fetal umbilical arterial cord blood obtained at birth with a pH of less than 7, and a base deficit greater than or equal to 12mmol/L.\(^2\) Analysis of routine paired cord blood samples for all births allows early and appropriate intervention for the neonate when required, and also provides information for medico-legal issues.\(^3\) Epidemiological studies have shown that about 10% of cases of diagnosed cerebral palsy cases in term infants result from intrapartum asphyxia, and despite the widespread use of electronic fetal monitoring and the increased caesarean section rate over the last 30 years the rate of cerebral palsy has not declined in term infants.\(^3\)

KEY POINTS

1. At KEMH collection of arterial and venous cord blood samples are taken for all births whenever possible.
2. If is preferable to obtain both arterial and venous umbilical cord blood samples for analysis. If only one sample is taken it is preferable that it is the arterial sample.
3. A cord blood sample in a heparinised syringe is stable for up to 60 minutes at room temperature.

EQUIPMENT REQUIRED

- Gloves
- Heparinised syringes x 2
- Needles 21g x 2
- Face shield
- 5 clamps
- Optional ice and water
<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>ADDITIONAL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Immediately after birth while the placenta is still in situ and ideally before the baby’s first breath, place four (4) Howard Kelly forceps on the cord to isolate a 20cm segment in the middle.</td>
<td>Delayed umbilical cord clamping may result in significant decreases in arterial blood pH, and increases in arterial blood pCO2 and base excess.(^1)</td>
</tr>
<tr>
<td>2 Cut between the two sets of clamps so that the isolated segment is independent, and both the baby and the placenta still have a clamp in place</td>
<td>Isolating and excising a section of cord allows sampling of cord gases to be delayed until after delivery of the placenta.(^5)</td>
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<tr>
<td>3 Continue usual post birth care of the baby.</td>
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<tr>
<td>4 Collect cord blood (from the placental end of the cord) into a red / pink-topped bottle (EDTA tube).</td>
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<tr>
<td>5 Collect blood for cord blood pH and gas analysis by:</td>
<td></td>
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<tr>
<td>• Placing an additional clamp in the middle of the isolated segment of cord to create two separate sections and</td>
<td></td>
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<tr>
<td>• Collecting two samples of blood, one arterial and one venous, from one of the isolated sections.</td>
<td>A second segment of cord may be required for repeat sampling. See point 8.</td>
</tr>
</tbody>
</table>
When collecting the blood:
  - use heparinised syringes

The order of analysis must be
1. Arterial sample
2. Venous sample

- take blood from the artery first
- collect a larger quantity of blood from the vein and
- remove all air bubbles from the samples by gently rolling the syringe between the fingers

Note: ensure the syringe is upright and the safe cap is in situ prior to doing this.

Blood will clot in the syringe unless heparinised and pre-packaged heparinised syringes provide a cost-effective consistent preparation and contain the correct amount of heparin.1

This will allow identification of different sample types based on time order of collection.

If it is a twin delivery the order of analysis must be
Twin 1 Arterial
Twin 1 Venous
Twin 2 Arterial
Twin 2 Venous

The umbilical artery has a smaller lumen, thicker wall, and contains less blood than the umbilical vein. The umbilical vein is more distended and may provide some support for the artery.1 Arterial blood most accurately reflects the fetal status, while the venous sample reflects the maternal-acid base status and placental function.1

Aids in subsequent sample identification.4
6 When identifying the CORD blood:

- The samples are labelled with the mothers URMN or Unique Number as the results are part of the maternal obstetric history and the results are reported as CORD blood of the mother. The CORD blood samples are a maternal sample and are always collected in the order of Arterial and Venous and Twin 1 and the twin 2.

7. Analyse the samples as soon as possible after their collection.

If there is likely to be a delay in analysing the specimens, place the syringes in a “slurry” of crushed ice and water.

Arterial and venous blood stored in a doubly clamped segment of cord at room temperature can be measured reliably for up to 60 minutes after birth.\(^5\) Placing the syringes on ice may minimise changes from continued metabolism.\(^1\)

Blood sampling for lactate concentration in arterial and venous umbilical cord blood may become unreliable if not analysed within 20 minutes of birth.\(^5\)

8 Check the results are compatible with one arterial and one venous sample by ensuring that the:

- Arterial pH is < the venous pH (by at least a difference of 0.022 units) and
- Arterial pCO\(_2\) is > the venous pCO\(_2\) (by at least a difference of 5.3 mm Hg).

Fetal carbon dioxide is removed from the arterial blood in the placenta, therefore the umbilical venous blood should have a slightly higher pH and a lower carbon dioxide level than the umbilical arterial blood.\(^6\)

9 If the sample does not meet the criteria of point 8, repeat the blood collection from the second segment of isolated cord.

10 Record the results.

**NORMAL CORD BLOOD GAS AND PH (DURING AND POST LABOUR)**

<table>
<thead>
<tr>
<th>At term</th>
<th>pH</th>
<th>Base Excess mmol/L</th>
<th>pO(_2) mm Hg</th>
<th>pCO(_2) mm Hg</th>
</tr>
</thead>
<tbody>
<tr>
<td>UA</td>
<td>7.10-7.38</td>
<td>-9.0 to 1.8</td>
<td>4.1 to 31.7</td>
<td>39.1 to 73.5</td>
</tr>
<tr>
<td>UV</td>
<td>7.20-7.44</td>
<td>-7.7 to 1.9</td>
<td>30.4 to 57.2</td>
<td>14.1 to 43.3</td>
</tr>
</tbody>
</table>

DPMS Ref: 5443 All guidelines should be read in conjunction with the Disclaimer at the beginning of this manual
NORMAL ARTERIAL CORD BLOOD LACTATE

= < 6.1 mmol/L

REFERENCES (STANDARDS)


National Standards – 1 Clinical Care is Guided by Current Best Practice
Legislation - Nil
Related Policies - Nil
Other related documents – Nil

RESPONSIBILITY

<table>
<thead>
<tr>
<th>Policy Sponsor</th>
<th>Midwifery and Nursing Director OGCCU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Endorsement</td>
<td>April 2004</td>
</tr>
<tr>
<td>Last Reviewed</td>
<td>November 2014</td>
</tr>
<tr>
<td>Last Amended</td>
<td></td>
</tr>
<tr>
<td>Review date</td>
<td>November 2017</td>
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