The Complete Fetal Scalp Blood Sampling Kit

A new direction in fetal blood monitoring containing the essential pieces of equipment in a new innovative design.

The Complete Fetal Scalp Blood Sampling (FSBS) procedure pack contains everything necessary to complete a fetal blood sample, without the use of petroleum jelly.

The FSBS procedure pack contains a Lina™ single handed Fetal Blood Sampling Wand, heparinised capillary tubes, capillary caps, mixing wires and universal blood gas analyser adapters. The adapters will fit the majority of commonly available blood gas analysers.

The procedure pack can also be purchased with the ELA self-contained, self-illuminating amnioscope.

Ordering Information

Part Number	
4201-AC	The Complete FEBS Kit
4201-ZAC	The Complete FSBS Kit including ELA (ELA-01)

The Complete FSBS Kit and ELA.

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Fetal scalp blood sampling – clinical theory and practical applications

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Fetal scalp blood sampling

Bretscher and Saling[1] first introduced fetal scalp blood sampling to assess fetal well-being in the 1960s, and the technique has evolved parallel to fetal heart rate monitoring (Tuffnel *et al* 2006[2]).

CLINICAL THEORY

Measuring fetal heart rate allows a clinician to identify when a fetus is in stress, however the cause of stress can not be identified fully through the interpretation of fetal heart rate alone. Although some cardiotocograph machines have been shown to reduce the need for a fetal blood sample (Vayssière *et al* 2007[3]), they still do not provide the most accurate information required to make a decision regarding the form of delivery.

Glucose is the main substrate for fetal energy production. In aerobic conditions, glycolysis occurs where the fetus has full access to oxygen via the placenta. The glucose is turned into pyruvate acid and placed into the citric acid cycle where ATP is generated and carbon dioxide (CO_2) and water (H_2O) are displaced as waste products. CO_2 and H_2O are then excreted along the placenta and disposed of by the mother. (Figure 1) (Nordström 2004[4]).

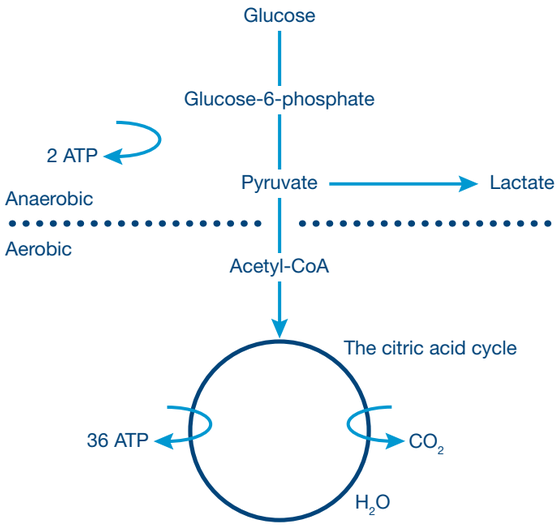

Figure 1: Schematic representation of anaerobic and aerobic metabolism in the fetus. *Diagram taken from Nordström 2004*.

However, when the fetus has no access to oxygen from the placenta, then anaerobic respiration takes place. The pyruvate acid does not enter the citric acid cycle but converts into lactate (Figure 1).

A build up of lactate and carbon dioxide causes lactacidema (metabolic acidosis) to occur, and over time becomes more severe. In the first instance lactacidemia can impair cellular function and later energy depletion can compromise cellular integrity. The depletion of the cells can therefore lead to fetal mortality; hence corrective action in a short time scale for fetal delivery is critical (Nordström 2004[4]).

The build up of lactate and CO_2 alters the acid-base balance of the blood, which can be identified by the fetal blood pH. It has been found that there is a good correlation between lactate concentration measured subcutaneously, and the levels within the brain during hypoxic experiments on sheep models (Nordström 2004[4]). This correlation therefore supports the supposition that sampling of fetal blood from the capillaries in the scalp, the subcutus compartment (epidermis), is one of the best options to identify fetal well-being.

Saling and Bretscher[1] devised the 'gold standard' of fetal pH measurement based on a study of 80 cases they performed in 1962 (Nordström 2004[4]). (Table 1).

pH	Description	Action
>7.2	Normal fetus	Blood sampling should be repeated if the fetal heart rate abnormality persists
7.2–7.25	Pre-acidotic	Repeat blood sample within 30 minutes or consider delivery if rapid fall since last sample
<7.2	Acidotic	Delivery immediately

Table 1: Cut off values of fetal blood pH and the actions to take.

These fetal blood pH levels have become the determining factors in deciding the best and most efficient procedure to deliver the baby. In the UK, the National Institute for Clinical Excellence (NICE) guidelines on caesarean section suggest that when a C-section is contemplated due to a non-reassuring fetal heart rate or in cases of fetal comprise (such as lactemidia), a fetal blood sample should be taken provided there is no technical difficulty or contraindications (Annappa *et al* 2008[5]).

Fetal scalp blood sampling is one of the most important procedures available that can aid in the increase of the number of normal deliveries around the world. Caesarean sections are high risk, abdominal surgery for the mother and are also high risk to the fetus. To ensure that the correct and most effective procedure is followed for the sake of the fetus and mother, the pH of the fetal blood is critical in aiding in the decision making process.

Therefore, the ease of taking a fetal blood sample is crucial in providing reliable pH results, as they are to be based on the 'gold standard' cut off values in Table 1.

There have only been two studies to date that have looked at the median time to take a fetal blood sample from the moment of decision to the result. Annappa *et al* (2008[5]) found that the median time to take a fetal blood sample from decision to result was 17 minutes, Tuffnel *et al* (2006[2]) also found a very similar time of 18 minutes to take a fetal blood sample. This length of time is crucial as the maximum decision to delivery time is 30 minutes for a caesarean section. The length of time to take the fetal blood sample must be taken into account for the decision to delivery time process.

Annappa *et al* (2008[5]) and Tuffnel *et al* (2006[2]) both found that the median time to prepare for a fetal blood sample was 8 minutes and 5 minutes respectfully. Therefore one area in the process of fetal blood sampling where time can be reduced is the preparation of the tools to take a fetal blood sample.

PRACTICAL APPLICATION

BridgeMaster Medical provides the well known tools with an added benefit to aid in the reduction of the time constraints and effective collection of the sample.

BridgeMaster Medical now provides all options for fetal blood sampling to meet each individual's requirements in a simple and effective way!

The Complete Fetal Scalp Blood Sampling Kit

The Complete Fetal Scalp Blood Sampling (FSBS) Kit is made up of three main components:

- ELA – an electronically illuminating amnioscope
- Lina™ Blood Sampling Wand
- The FSBS Kit – a tray that holds all items required for taking a fetal scalp blood sample.

The Kit contains the Lina™ Blood Sampling Wand with accessories in a tray and a resting place for ELA. The FSBS tray contains the blood sampler as well as:

- heparinised capillary tubes
- mixing wires
- end caps for all capillary tubes
- universal blood gas analyser adapter with clot buster*
- long cotton tipped buds.

The Complete FSBS Kit is designed to provide you with all the essential tools for blood sampling. With heavily heparinised capillary tubes and mixing wires you have a relatively long time before the blood will start to clot, ensuring that the result from the blood gas analyser (which may be a few minutes walk down the hall) will be accurate.

The capillary tube adapter provides connection to the vast majority of blood gas samplers worldwide.

The Lina™ Blood Sampling Wand** is a single handed device for sampling fetal blood. The sampler contains a pre-mounted capillary tube that is heavily sodium heparinised and a retractable pre-mounted angled blade providing maximum incision depth of 1.7mm.

In order to collect fetal scalp blood, make a single incision to penetrate the fetal head, then retract the blade and rotate the blood sampler around to collect the blood in the pre-mounted capillary tube.

The benefits of a pre-mounted blade, include reducing the time required to prepare the sampler as well as reduced the risk of 'needle stick' injury to the user. The unique sampler means that the use of petroleum jelly is not required to take an adequate sample. Petroleum jelly may interfere with the accurate analyses of blood or may clog the analyser.

The FSBS Kit is one of the world's first procedure packs for fetal blood sampling where no petroleum jelly is required.

Electronically Illuminating Amnioscope (ELA)

ELA is a self-contained, self-illuminating amnioscope that is fully sterile and disposable.

The removal of the obturator from the ELA housing simply switches the light source on. Replacing it switches the light source off. This provides a light source right in the palm of your hands!

No additional light source or power is required with ELA. The amnioscope is 'single patient use' and can be used on the same patient multiple times.

ELA has its own specific resting place on the Complete FSBS tray. However, ELA is available individually packed or as part of the FSBS Kit.

* Adaptor should fit the majority of blood gas analysers, however this is not guaranteed and it is the responsibility of the end user to check.

** Lina's™ Blood Sampling Wand is available as part of the Complete FSBS Kit.

References

1 **Bretscher** J., **Saling** E. pH values in the human fetus during labor. *Am J Obstet Gynecol 1967* Apr 1;97(7):906–911.

2 **Tuffnell** D., **Haw** W., **Wilkinson** K. How long does a fetal scalp blood sample take? *BJOG 2006*; 113:332-334.

3 **Vayssière** C., **David** E., **Meyer**. N. *et al*. A French randomized controlled trial of ST-segment analysis in a population with abnormal cardiotocograms during labor. *Am J Obstet Gynecol 2007*; 197:299.e1-299.e6.

4 **Nordström** L. Fetal scalp and cord blood lactate. *Best Practice & Research Clinical Obstetrics and Gyanceology 2004*; 18 (3):467-476.

5 **Annappa** R., **Campbell** D.J. & **Simpson** N.A.B. Fetal blood sampling in labour and the decision to delivery interval. *European Journal of Obstetrics & Gynaecology and Reproductive Biology*; 141:10-12.