

# Fetal acid – base balance in labour

Onnig Tamizian and Sabaratnam Arulkumaran

Academic Department of Obstetrics and Gynaecology  
Derby City General Hospital, Uttoxeter Road, Derby DE22 3NE.

**Intrapartum scalp blood sampling** Decelerations occur in at least 50% of labours where EFM is used. Even with the worst pattern of tachycardia, reduced variability and decelerations, only 50-60% of fetuses are acidotic. Acidosis is a function of time with ongoing insult. CTG has high sensitivity but low specificity. Meta-analysis of three trials comparing Intermittent Auscultation (IA) with EFM used without FBS showed a fourfold increase in caesarean section rate. This increase was limited to twofold where FBS was used in conjunction with CTG, with no improvement in outcome measures in either group.

Decelerations indicate 'stress' to the fetus. Addition of a rise in baseline rate with reduction in baseline variability indicates 'stress' to 'distress' period but the duration of the 'distress' period to development of metabolic acidosis is unpredictable. If FHR develops a 'distress' pattern, FBS may be indicated and this may need to be repeated if delivery is not imminent. During the development of subacute hypoxia a rapid deterioration of pH is possible with no increase in FHR if decelerations involve drop in FHR > 60bpm lasting for 90 seconds or more with less than 60 seconds of recovery in between. A decline in pH at the rate of 0.01/2-4 minutes may occur – the decline being more rapid in situations with IUGR, infection, thick meconium with scanty liquor. It may thus not be appropriate to do FBS if delivery is not likely in a reasonable time span and other risk factors are present as this may cause further delay.

Alternatives to FBS include scalp stimulation or acoustic stimulation. If accelerations occur in response to stimulation, the fetus is unlikely to have acidotic pH. In the absence of accelerations in response to stimulation, 50% of fetuses may be acidotic. Other options include fetal ECG ST waveform analysis and fetal pulse oximetry.

**Umbilical cord blood acid-base assessment** The 26th RCOG study group on Intrapartum Fetal Surveillance (1993) recommended measurement of umbilical artery and vein blood pH and base deficit as a measure of fetal condition at birth.

A wide pH range of 7.00-7.16 is quoted in the literature for acidaemia, but there is general consensus that a cord artery pH <7.00 is significantly correlated with neonatal outcome. Babies with pH <7.00, are more likely to suffer complications in short term. Long term outcome is correlated to Neonatal encephalopathy rather than pH. Base deficit is used as a surrogate to assess metabolic acidaemia - the commonest cut off values include BD > 8mmol as moderate and > 12 as severe metabolic acidosis.

The principal contributor to metabolic acidosis is lactic acid, which at times of oxygen deficiency is mainly produced by anaerobic glycogenolysis. Metabolic acidosis reflects tissue oxygen debt and therefore is of greater prognostic significance than respiratory acidosis. Accumulation of lactic acid together with hypoxia leads to tissue oedema and cellular damage. Lactate can be measured in a 5microlitre blood sample using an electrochemical strip method with results available by the bedside in 60 seconds. It is easier to measure than a full blood gas analysis using a maintenance free, battery operated pocket size device like the Lactate Pro (Oxford Sonicaid Ltd). Lactate is comparable to pH and base deficit with respect to sensitivity, specificity and predictive values of various perinatal complications.

**In conclusion**, scalp blood pH is useful to increase specificity of CTG (ie to verify the CTG reading) while cord blood pH is useful to differentiate the depressed baby due to hypoxaemia/acidosis from other causes.