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Author(s) Nana Wiberg	

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Acid-Base Values in Umbilical Cord Blood at Birth

Abstract

Umbilical cord blood acid-base status at birth gives an objective evaluation of the fetal exposure and response to hypoxia during labor. The objective of this thesis was to elucidate methodological issues associated with interpretation of cord blood gases. DELAYED CORD BLOOD SAMPLING (Paper I): arterial and venous pH and bicarbonate decreased, and pCO2, base deficit (BD), and lactate increased significantly when blood sampling was delayed, i.e., a mixed respiratory and metabolic 'acidemia' developed; CORD ACID-BASE CHANGES WITH ADVANCING GESTATIONAL AGE (Paper II): a mixed respiratory and metabolic acidemia developed by advancing gestational age. The respiratory component is explained by an increased 'CO2 load' from the growing fetus, whereas the etiology of the metabolic component is unknown; BASE DEFICIT AND FETAL FLUID COMPARTMENT (Paper III): the length of gestation, the choice of fetal fluid compartment (blood or extracellular fluid) and the algorithm for calculation all influenced the BD values, with BDblood higher than BDecf. CORD LACTATE CONCENTRATION AND GESTATIONAL AGE (Paper IV): reference values for lactate in arterial and venous cord blood increased linearly with advancing gestational age; CORD pH, BASE DEFICIT AND LACTATE VALUES ASSOCIATED LOW APGAR SCORE (Paper V): to predict a low Apgar score, gestational age-adjusted acid-base values were overall superior to crude values; Gestational age-adjusted lactate had the overall best accuracy and predicted, in combination with pH, a low Apgar score slightly better than pH plus BD. THESIS SUMMARY: umbilical cord blood acid-base values are influenced by several confounding factors, such as delayed blood sampling, gestational age, and BD calculation algorithm. Gestational age-adjusted reference values are superior to crude values to indicate depressed vitality at birth.

Key words: Acidosis; Apgar score; Base deficit; Blood gases; Gestational age; Hidden acidosis; Lactate; Umbilical cord blood.

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nana.wiberg@med.lu.se

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