Fetal plasma cAMP at birth in high-risk and normal deliveries with a correlation to fetal heart rate patterns preceeding delivery.

P. Bistoletti, B. Fredholm, H. Lagercrantz

Plasma cAMP is easy to analyze in small blood samples and might be of interest as a quantitative parameter of fetal stress. It may also be used to study the effect of β-mimetic agens used in obstetrics. Plasma cAMP reflects the β-adreno receptor mediated action of catecholamines and may be of help to increase the understanding of the role of fetal catecholamines in fetal and umbilical circulation. We analyzed cAMP, catecholamine concentrations, acid-base state and blood gases in the umbilical artery and vein immediately at birth in 156 infants. C-AMP was measured in various obstetric conditions. Normal pregnancies and deliveries were compared with those complicated by intrauterine asphyxia, postmaturity, intrauterine growth retardation, gestosis, breech presentation, vacuum extraction and operative with vaginal deliveries. We have studied the source of extracellular cAMP, and correlations between β-adrenergic stimulation and fetal heart rate patterns preceeding delivery.

The following results were found:

1) Significantly higher cAMP concentration in umbilical ven than in artery ($p \leq 0.001$) and higher than in maternal venous blood, indicating the placenta as an important site of adenyl cyclase activation.

2) Increasing cAMP concentration with gestational age, various complications during pregnancy and delivery, and intrauterine asphyxia.

3) Lower cAMP concentration after delivery by elective cesarean section compared with vaginal delivery.

4) A good correlation between high cAMP concentration (>100 nM) and fetal catecholamine release ($r = 0.786$).

5) Increased cAMP and H^+ concentration in fetuses with pathological FHR-patterns, mainly baseline-changes and late decelerations.

Conclusion

cAMP might be used as a quantitative parameter of fetal stress. Fetal cAMP increase is correlated to fetal endogenous catecholamine concentrations. An important source of fetal extracellular CAMP seems to be the placenta.

Table 1

Mean cAMP conc in umbilical venous, arterious, and maternal venous blood at birth.

	(n)	cAMP (nM/l $\pm$ SE)
umb. ven	(34)	51.6 ± 7.0
umb. art	(34)	33.3 ± 4.9
maternal post partum	(6)	32.0 ± 9.5
pregnant women before labour	(12)	16.4 ± 1.6

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Table 2

Mean cAMP (ven) and H^+ conc. (art) in umbilical cord blood at birth in various obstetric conditions.

	(n) normal H^+ conc.	(n) H^+ 56-63nM/l	(n) H^+ conc over 64nM/l
preterm	(16)25.3±6(48.9)		(7)72.0±19(65.2)
term vag vertex	(35)36±5(48.6)	(11)42±9(58.4)	(16)72±15(71.8)
postterm	(5) 44±15(48.8)		(8) 83±29(70.6)
IUGR	(14)35±6(52.8)		(5) 99±32(68.8)
toxemia	(6) 28±8(49.8)		(6) 69±24(68.3)
vag delivery	(35)36±5(48.6)	(11)42±9(58.4)	(16)72±15(71.8)
elective section	(21)23±4(49.0)		(5) 61±17(70.0)
acute section	(6) 28±7(50.2)		(9)113±46(80.0)
vag breech	(5) 32±10(50.7)		(8) 82±22(70.4)
vacuum extraction	(10)79±11(57.6)		(7) 96±32(70.3)

Table 3

Predominant and most severe fetal heart rate patterns and mean cAMP and H^+ conc in umbilical cord blood at birth.

FHR (fetal heart rate) patterns:	(n)	cAMP nM/l±SE	(n)	H^+ nM/l±SE
bradycardia (incl decelerations)	(11)	145.1±39.8	(11)	82.7±4
tachycardia (incl decelerations)	(12)	93.4±18.4	(12)	62.8±3
late decelerations	(8)	49.3±3.9	(8)	67.5±4
variable decelerations	(43)	43.6±5.2	(37)	56.4±2
early decelerations	(11)	34.5±5.4	(11)	53.5±3
accelerations and no periodic FHR-changes	(12)	47.1±11.9	(10)	53.0±3

Peter Bistoletti

Department of Obstetrics and Gynecology, Karolinska Institutet, Huddinge University Hospital, Huddinge, Sweden.