

ACUTE CONDITIONS IN PEDIATRICS

1 ACINO-INSULAR TRANSFORMATION IN PANCREASES OF CHILDREN WITH INTRACTABLE HYPERINSULINIC NEONATAL HYPOGLYCEMIA

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Marking by peroxidase-conjugated anti-insulin antibodies, and electron microscopy reveal in these pancreases, besides normal islets of Langerhans in lobular exocrine tissue -a/numerous insulin cells inside acini, singly or in small groups, with dense crystalline insulin granules. Some acinar "mixed cells" contain both zymogen and insulin granules, a possible intermediate transformation stage. -b/large "extra-lobular islets", in contact with pancreatic ducts whose most epithelial cells contain insulin granules and give way to budding of insulin cells, showing growth of extra lobular endocrine islets from duct walls. In one child, the lobulate tissue is mainly composed of endocrine islets with small or irregular duct-like hollows and pseudo-acinar figures. In this syndrome of endocrine metaplasia related to "B-cell nesidioblastosis", a defect in regulation of the differentiation and secretory mechanism of the primitive insulin cells could be attributed to a neoplastic process of the diffuse endocrine system cells.

2 CEREBRAL METABOLISM AND CEREBRAL BLOOD FLOW /CBF/ IN CHILDREN

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Anaesthetized children without cerebral disease were investigated before elective surgery with the permission of the parents and of the Ethical Committee, Karolinska Institutet. CBF and cerebral arterio-venous differences of oxygen and circulating substrates were determined. Average values of CBF and uptake of oxygen, glucose, acetoacetate and D-beta-hydroxybutyrate and production of lactate and pyruvate were:

Age in years	0-1	1-5	6-14	10-13
Subjects, no	9	8	9	6
CBF ml/100 g/min	69	68	75	61
O ₂ μ M/100 g/min	104	146	146	113
Glucose - " -	27	24	18	20
AcAc - " -	0,6	1,6	1,4	0,8
HBA - " -	2,1	7,0	3,8	1,2
Lactate - " -	2	5	6	5
Pyruvate- " -	0,8	0,7	1,3	-

CBF was higher than in adults anaesthetized the same way. Uptake of oxygen and glucose and production of lactate and pyruvate were in the same range as adult values, while the uptake of ketone bodies was higher, partly due to higher arterial concentrations in the children. Supported by SMRC Proj.no 19-P4106,19-X-3787.

3 PLASMA INSULIN /IRI/, GLUCAGON /IRPG/ AND GROWTH HORMONE /STH/ IN INFANTS ON TOTAL PARENTERAL NUTRITION /TPN/ AND CONSTANT RATE ENTERAL NUTRITION /CREN/

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Plasma glucose, FFA, IRI, IRPG, and STH levels were determined in the equilibrium period in average 20 days after initiation of nutritional therapy. 11 children on TPN and 9 on CREN were studied. Results: 1/The parameters studied remained stable during the investigation 2/ there were no significant differences between the parenteral and enteral introduction of nutritional substrates.

	T.P.N.	CREN
Plasma glucose /mg %/:	86±15	81±11
FFA / μ Eq/l/:	101±30	135±23
IRI / μ U/ml/:	11±6	7.6±2.4
IRPG /pg/ml/:	85±22	148±96
I/IRPG /molar ratio/:	2.64±1.24	1.34±2.15

Conclusion: These results suggest that the prolonged constant rate administration of the nutrients leads to a new hormonal equilibrium stable and characterized by 1/The absence of increase in STH levels 2/the adaptation of biohormonal pancreatic secretion which provides a perfect homeostasis of carbohydrate metabolism, an inhibition of lipolysis as evidenced by the low FFA levels and the utilisation of aminoacids for anabolic needs.

4 VARIATIONS IN THE THERMAL DIFFERENCES BETWEEN FETUS AND MOTHER DURING CONTRACTIONS

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The fetal temperature was monitored continuously with a thermistor attached to the fetal scalp electrode. Simultaneously the maternal temperature was registered from a thermistor in the vagina 5 mm from the fetal probe. The difference between the fetal and maternal temperatures $\Delta T = T_f - T_m$ was obtained electronically and displayed on a recorder together with the intrauterine pressure and the fetal heart rate. More than 100 pressure and ΔT complexes were registered from 10 patients. ΔT increased during contractions in all cases range 0.01-0.20°C. When the uterine activity was coordinated there was a statistically significant correlation between the intrauterine pressure and ΔT . The level of ΔT and also variation of it seems to be depending on the fetal condition.

5 THE DEPLETION OF ENERGY RICH SUBSTANCES CORRELATED TO CHANGES IN FETAL HEART RATE AND ECG

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Previous findings have indicated that changes in the fetal ECG convey information about fetal hypoxic stress, well in advance of any alteration in fetal heart rate and blood pressure. To define a possible relation between the ECG changes and myocardial metabolism, a study was performed on 40 mature guinea-pig fetuses acutely exteriorized and submitted to a graded hypoxia. The depletion of glycogen, creatinephosphate and ATP in the fetal heart, liver and brain was correlated to an ECG-scoring system taking the severity of the ST-T changes into account. A strong linear correlation was found between the ECG scores and the depletion of heart glycogen and creatine-P. The ATP was unaffected until the glycogen was depleted /25 % of initial value/. At this point, brain and liver glycogen were also severely affected. Bradycardia /AV-block, type II/ was strongly correlated to failing myocardial metabolism. It is concluded that the changes in the fetal ECG pattern could be regarded as a sign of myocardial glycolysis and early hypoxic stress.

6 PLASMA INSULIN LEVELS AND METABOLIC RESPONSE FOLLOWING DIFFERENT CARBOHYDRATE LOADS IN NEWBORN INFANTS

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Glucose, fructose or galactose was administered intraumbilically in newborns. We measured the values of plasmatic immunoreactive insulin /IRI/, acid-base balance, individual sugars, lactate, pyruvate and of FFA. The increase of IRI values started from 18-22 μ U/ml reaching the peak as early as 3 minutes after administration /64±15 after glucose, 38±8 after fructose and 47±8 μ U/ml after galactose administration/. For galactose a further increase was observed. The most favourable values of acid-base balance and of lactate were found after galactose administration. On the contrary a deterioration was seen after fructose. The decrease of FFA lasted for the longest time after galactose administration. These results show that in comparison with glucose, fructose has certain disadvantages, whereas galactose administration is more favourable because of a quick assimilation in the first days of life.