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EFFECT OF ADENOSINE RECEPTOR BLOCKADE ON HYPOGLYCEMIA-INDUCED DILATIONS OF PIAL ARTERIOLES (PA) IN PIGLETS

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Hypoglycemia (HG) is associated with increased cerebral blood flow. We have shown dilation of PA in the newborn pigs during HG. To determine if this is caused by the cerebral vasodilator adenosine (ADO), we studied the effects of 8-sulphophenyl-theophylline (8-SPT), an ADO receptor antagonist on HG-induced dilation of PA. A cranial window was implanted over the right parietal cortex of newborn pigs for observation of a selected PA (50-100 μm) by videomicroscopy at 20 min intervals. 2 μm changes in vessel diameter could be resolved. HG was induced by insulin in 9 matched control and 9 8-SPT piglets. In the latter group, the window was superfused (50 μl/min) with 10^{-5} M 8-SPT prior to manifest HG (blood glucose <1.4 mmol/l).

RESULTS: PA diameter (mean $\pm$ SEM; μm) are shown in table: * $p<0.05$ vs normoglycemia (NG); ** $p<0.05$ vs corresponding HG in controls.

	NG	HG 20min	HG 40min	HG 60min	HG 80min
Control	68 ± 3	90 ± 5 *	93 ± 6 *	93 ± 8 *	100 ± 8*
8-SPT	68 ± 4	75 ± 5 **	75 ± 6 **	77 ± 6	79 ± 7

CONCLUSION: The attenuation of PA dilations by 8-SPT indicates that adenosine participates in the mediation of HG-related brain hyperemia.

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CEREBRAL BLOOD FLOW DURING HYPOXEMIA AND REOXYGENATION WITH 21% OR 100% O_2 IN NEWBORN PIGS. Terje Rootwelt, Jan-P. Odden, Christian Hall and Ola D. Saugstad. Inst. Surg. Res. and Dept. Ped. Res., Rikshospitalet, Oslo, Norway.

To test the effects of resuscitation with 21% or 100% O_2 on cerebral blood flow (CBF), hypoxemia was induced in 14 newborn pigs (2-5 days) by ventilation with 8% O_2 in nitrogen. When base excess reached -20 mmol/L, they were randomly resuscitated with either 21% O_2 (n=6) or 100% O_2 (n=8) for 25 min followed by 21% O_2 in both groups. Blood flow was measured in brainstem (BS), cerebellum (CBL) and cerebrum (CBR) with a radioactive microsphere method.

Mean duration of hypoxemia was 59 min in both groups. Flow values were (ml/100g/min, mean±SD):

		Hypoxemia		Reoxygenation		
		Before	End of	5 min	20 min	60 min
BS	21%	80±23	140±31*	310± 99*	173±47*	89±41
	100%	85±28	176±88*	355±132*	161±60*	81±24
CBL	21%	84±18	77±36	185± 65*	147±62*	84±43
	100%	89±31	94±59	216±110*	134±64*	84±26
CBR	21%	52±14	62±18	115± 29*	83±32*	44±14*
	100%	53±20	73±44	118± 51*	73±33*	52±22

* $p<0.05$ compared to before hypoxemia

CBF was significantly increased in both groups in all areas after 5 and 20 min of reoxygenation.

Conclusion: We could not demonstrate any significant differences in regional CBF between two groups of hypoxic newborn pigs reoxygenated with 21% or 100% O_2.

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CEREBRAL BLOOD FLOW AND LEFT VENTRICULAR OUTPUT IN PREMATURE INFANTS AFTER 21 VERSUS 80% OXYGEN AT BIRTH. Kaare E. Lundstrøm and Gorm Greisen. Dept. of Neonatology State University Hospital, Copenhagen, Denmark.

Even short hyperoxaemia has been shown to produce prolonged cerebral vasoconstriction in preterms. Cerebral blood flow (CBF) in preterms is less than in older infants and adults. We hypothesised that this may partly be due to exposure to exessive oxygen at birth.

In a prospective, randomized study of infants ≤ 32 weeks of gestational age we used 21 or 80 % oxygen during stabilisation/resuscitation in the delivery room. Two hours after birth, CBF was measured using Xe-clearance and left ventricular output (LVO) was calculated measuring the internal aortic diameter with M-mode echocardiography and aortic flow velocity using pulsed Doppler ultrasound.

Results: This interrim analysis involves 30 infants, 14 randomized to 21 (GrI) and 16 randomized to 80 % O2 (GrII). Supplemental oxygen was administered in the delivery room to two infants in Gr.I, and two hrs. after birth to 6 in GrI and 10 in GrII.

Mean (SD) values in the groups (I/II) were
CBF: 16.2 (5.7)/ 13.8 (4.7) ml/100g/min., p=0.21.
LVO: 240 (58) / 263 (60) ml/kg/min., p=0.32.

Conclusion: These preliminary results shows no diffence between the groups. Resuscitation with 21 % oxygen is possible in a majority of preterm infants.

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RESUSCITATION OF HYPOXIC NEWBORNS WITH ROOM AIR OR OXYGEN Siddarth Ramji, Gosta Rooth, and Ola D. Saugstad Department of Pediatrics, Maulana Azad Medical College, New Dehli, Department of Pediatrics, Uppsala, and Department of Pediatric Research, Oslo

To study the short term effects of resuscitation of hypoxic newborn babies with room air, a randomized multicenter study was initiated. Here the data from one center is reported. Entry criteria were: birth weight > 1000 gram, heart rate at birth < 80 per min and or apnoe justifying resuscitation. This was performed with bag and mask or after endotracheal intubation when needed. Babies were enrolled into a group treated with room air (RA, N=36) or 100% oxygen (O_2, N=42). Babies in RA group who did not respond within 90 seconds were treated with supplementary oxygen.

	BW kg	GA weeks	Age: 1.breath	1.cry	resuscitation min
RA	2.43	38.4	1.45	3.0 **	2.3 *
O_2	2.41	38.1	1.82	4.8	3.8

* $p<0.05$ ** $p< 0.01$ RA vs O_2 groups

Heart rate from birth to 10 minutes and Apgar scores from 1 to 20 minutes were identical in both groups as well as pH, BE, paO_2 and $paCO_2$ at 10 and 30 minutes post partum. Neonatal mortality was 2/36 in RA and 4/42 in O_2 groups (NS) respectively. The study shows that judged by short term follow up hypoxic newborn infants may be resuscitated with room air just as well as with 100% O_2.

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THERMAL BALANCE IN TERM INFANTS NURSED IN AN INCUBATOR WITH A RADIATIVE HEAT SOURCE

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Radiative heat loss is an important mode of heat loss in convectively heated incubators. The "Transparent Radiant Hood Warmer" (Air Shields Vickers), a device that heats the roof of the Isolette C100 incubator, was used to study the response of 11 healthy, term infants exposed to an isolated change in roof temperature (T_{roof},°C) at stable ambient air temperature (T_{amb},°C) and humidity (RH,%).

Respiratory water loss (RWL,mg/kg min), oxygen consumption ($\dot{V}O_2$,ml/kg min), transepidermal water loss (TEWL,g/m² h), skin blood flow (Q_s,%, intervall A=100%), skin (T_s,°C) and central body (T_c,°C) temperatures were continuously monitored. After an interval without active heating of the incubator roof (interval A), the roof was heated to 33°C (interval B) and then to 36°C (interval C). Mean values for each interval, including convective (H_{conv},W/m² °K) and radiative (H_{rad},W/m² °K) heat loss, are given in the table (*= $p<0.01$, compared to interval A).

Interval	T_{roof}	T_{amb}	RH	T_s	T_c	Q_s	H_{rad}	H_{conv}	RWL	$\dot{V}O_2$	TEWL
A	30.5	32.2	50	35.4	37.1	100	32.7	8.5	3.7	4,7	9.8
B	33.8*	32.4	50	35.7*	37.2*	106	25.6*	8.9	3.7	4.7	10.1
C	35.6*	32.6	50	35.9*	37.3*	104	20.7*	8.8	3.7	4.5	9.6

Conclusion: Warming the incubator roof results in a marked decrease in radiative heat loss, and an increase in skin and central body temperatures, without any significant change in skin blood flow, respiratory water loss, oxygen consumption or transepidermal water loss.

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TOTAL ENERGY EXPENDITURE (TEE) IN VENTILATOR DEPENDENT EXTREMELY-LOW-BIRTHWEIGHT (ELBW) INFANTS

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Undernutrition due to inadequate energy intake and poor energy reserves is a major problem in ELBW infants who require prolonged mechanical ventilation. It is probable that raised TEE in these babies contributes further to the undernutrition but studies by indirect calorimetry are not possible. Our aim was to use the doubly labelled water method of TEE measurement in ELBW infants having prolonged ventilation. This method allows calculation of CO_2 production rate from the disappearance from the body of the stable isotopes deuterium and oxygen-18, and thus calculation of TEE.

TEE was determined in 8 ventilator dependent ELBW infants (mean gestational age 24.9w, mean birthweight 760g) on 3 occasions. Energy intakes were calculated from exact records of enteral and parenteral intake. Results below are mean (SD).

	3 weeks	6 weeks	10 weeks
TEE (kcal/kg/d)	62.5(15)	68.0(27)	67.3(20)
Energy intake (kcal/kg/d)	104(17)	114(10)	119(4)

Undernutrition in the first 10 weeks of life of sick ELBW infants is due both to inadequate energy intake and raised TEE. Inadequate energy storage will not allow normal growth in these babies.Greater clinical priority should be given to improving the nutritional intake of the ELBW infant.