†1339 MATURATION OF BODY TEMPERATURE CONTROL OF PREMATURELY BORN INFANTS.

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Each of 12 AGA premature infants (birth weight 0.84-1.48 kg) was studied once weekly for 3 to 6 weeks beginning at age 4-10 d. Each week metabolic heat production (M) and body temperatures were measured for 1-1.5 h after equilibration at each of four abdominal skin temperatures (Ts) (35.5, 36.0, 36.5, 37.0°C) in a single-walled incubator (Air-Shields C-86H) operated by skin temperature servocontrol. The neutral skin temperature (nTs) was determined as that at which M was minimal while rectal temperature (Tr) was normal (36.5-37.5°C).

The modal nTs was 36.0 or 36.5°C at all ages. The rectal-skin gradient at neutrality (nTr - nTs), the neutral metabolic rate (Mn), and the metabolic response to cold (M35.5 - Mn) all increased with age. Mean values are shown in the table below:

Age (wk)	1	2	3	4	5	6
nTs (°C)	36.4	36.2	36.1	36.5	36.5	36.4
nTr - nTs (°C)	0.5	0.6	0.8	0.8	0.8	0.9
Mn (W/kg)	2.0	2.3	2.4	2.7	2.8	2.9
M35.5 - Mn (%Mn)	7	13	17	22	18	10

At 1 week, M was independent of Ts; Tr varied with Ts but was always 0.5°C higher. After week 1, M was highest at Ts 35.5°C. M increased with age regardless of Ts. Defense against cold improved, as skinfold thickness and the capabilities for vasoconstriction and raising M all increased with age. Metabolic heat production of these small premature infants depended more on age (from 1 to 6 weeks) than on skin (or environmental) temperature.

1340 SHOULD SKIN TEMPERATURE SERVOCONTROL PROBES BE SHIELDED FROM THE ENVIRONMENT IN INCUBATORS?

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We performed 1238 paired measurements of abdominal skin temperature with and without a foil-backed, adhesive foam shield placed over the thermistor (YSI). Paired measurements were made simultaneously at adjacent skin sites. All infants (28-33 wk gestation) were in single-walled incubators operated by skin temperature servocontrol.

The shielded thermistor always recorded a higher temperature than the unshielded thermistor; the difference ranged from 0 to 1.2°C. There were 824 measurement pairs in the supine position (mean 0.27°C, SD 0.14°C) and 414 in the prone position (0.31 ± 0.19°C). The supine data were considered more reliable because the thermistors could always be attached in the same position (mid-epigastrium) and there were fewer problems with skin contact. The supine data were examined by analysis of variance. The effect of shielding (shielded - unshielded) increased with age (0.24°C at 1 wk to 0.32°C at 6 wk) and decreased with skin control temperature (0.30°C at 35.5°C to 0.25°C at 37.0°C). The effect of shielding also correlated significantly (linear regression analysis) with the core-skin, core-environment, and skin-environment thermal gradients, and also with the tissue insulation.

Although statistically significant, these effects are of little clinical significance. It is important, however, to realize that shielding the servocontrol probe in incubators increases the perceived temperature by an average of 0.3°C.

1341 VISUAL INFORMATION PROCESSING IN INFANTS WITH INTRAVENTRICULAR HEMORRHAGE (IVH).

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We assessed visual attention in an habituation/recovery paradigm and performance on the Bayley Scales of Infant Development in the second year of life among twelve patients who suffered moderate (Grades II-III) or severe (Grade IV) IVH, either unilateral or bilateral.

Test results showed that patients with unilateral bleed had greater habituation to a redundant stimulus, indicating more efficient information processing. Recovery of attention to a novel stimulus appeared to be related to the severity, rather than the laterality, of the IVH. As measured by the Bayley Psychomotor Index (PDI), patients with unilateral bleeds performed better than those with bilateral involvement (mean 85 vs 66). The PDI was unaffected by the grade of IVH. The Bayley Mental Development Index (MDI) was affected by severity level, with higher IVH grades showing poorer performance (mean 71 vs 56).

The results of the study support the hypothesis that unilateral hemorrhage results in a more optimal development than a bilateral one, and this may be independent of the grade of the bleed.

1342 VITAMIN E (VIT.E) IN HUMAN EYE-RETINAL, CHOROIDAL AND VITREOUS LEVELS WITH & WITHOUT TREATMENT.

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Despite widespread prophylactic use of vit. E for the prevention of retrolental fibroplasia (RLF) in preterm infants, there is no information on vit. E levels within the eye. We previously reported retinal levels of vit. E in kittens (Pediatr Res 18:323A, 1984). We measured vit. E levels in retina, choroidal and vitreous tissue in 20 human eyes. Eyes were obtained at death after informed consent. Infants who survived >24 hrs. had received oral vit. E 50 mg/kg/day. Birth weight and gestational age (GA) ranged from 0.62 to 2.9 kg and 26 to 40 wks. Two infants had RLF (Stage I-II) before death. Data on vit. E in serum, retina, choroidal, vitreous obtained at the time of death are shown below. Vit. E was assayed by HPLC. From this data we conclude: a) No correlation between serum and retinal levels could be found; b) Choroidal and vitreous levels increased minimally in the treated group; c) Retinal levels in the treated group were significantly higher than the untreated; and d) Retinal levels increased with gestational age. These data show lack of relationship between serum and retinal levels and RLF.

G.A. wks.	Out-Come	No. Eyes	RLF	Vit.E Rx	Serum mgm%	Retina* µg/g	Choroid* µg/g	Vitreous* µg/g
≤27	Died[a]	8	-	No	0.1	36±16	60	2.5
	Lived[b]	6	1(I)	Yes	1.27	533±100	164	21.5±18
30-32	Lived[b]	2	0	Yes	1.1	211	-	-
		2	1(II)	Yes	1.8	1520	40	2.5
40	Died[a]	2		No	1.3	1000	10	2.5

a=Died <24 hrs., b=Lived >25 days, µg/g of protein, ± = M±S.D.

1343 DETERMINANTS OF THE ONSET OF BREATHING AT BIRTH.

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We used mechanical ventilation of the fetal lung in utero to alter fetal blood gases and thus separate the influences of PO_2 and PCO_2 on the onset of extrauterine breathing. Acute experiments: 7 pregnant sheep were operated under spinal anesthesia at 140-145 days' GA. An endotracheal tube, connecting tubes to the ventilator and a carotid artery catheter were placed in the fetus under local anesthesia, and the uterus was closed. Mechanical ventilation was started using O_2, N_2 and CO_2 to achieve the desired blood gas pattern. After 2 h the uterus was reopened, the fetus delivered, the umbilical cord clamped and the fetus placed either in a 40°C saline bath or on a cold table. Mechanical ventilation was stopped 2 min after delivery and the time to onset of breathing was observed. Chronic: Fetal electrodes, vascular catheters, endotracheal and ventilator tubes and an inflatable occluder on the umbilical cord were placed in 2 pregnant sheep at 127 days' GA. The fetuses were ventilated in utero 5 or more days later with O_2 or N_2 + CO_2. The ventilator was stopped, the cord occluded, and the time to onset of breathing (diaphragm EMG) recorded. Results are given in the table.

	Acute							Chronic			
PO_2* (mmHg)	374	323	57	9	14	23	13	-	11	32	22
PCO_2* (mmHg)	66	27	46	42	36	24	26	-	68	47	42
Warm bath	yes	yes	yes	yes	yes	no	no	Intrauterine			
Time (sec)**	<5	60	60	>120	75	<10	15	***	138	67	56

*At onset of breathing. ** To onset of breathing. *** Did not breathe.

Conclusions: 1. Cold and hypercapnia are important stimuli for the onset of neonatal respiration. 2. Hypoxia depresses breathing at this time. 3. Cord clamping without change in blood gases does not result in breathing.

1344 PULMONARY HYPOPLASIA AND VASCULAR ABNORMALITIES IN CONGENITAL DIAPHRAGMATIC HERNIA (CDH).

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In a prospective study of 58 infants with CDH, there were 30 survivors who demonstrated ductal shunting, reversible with hyperventilation and 28 non survivors with severe hypercarbia and hypoxemia which could not be reversed with either vasodilators or hyperventilation (mean airway pressure >20cms H_2O, resp. rates >40/min). Detailed morphometric analysis of the post mortem lung was carried out in 7 infants. Pulmonary vascular changes were mild relative to infants with persistent pulmonary hypertension (PPH) (J Pediatr 98:962,1981*) but comparable to a previously reported case of CDH. (Brit J Surg 58:362,1971). Considerably more severe pulmonary hypoplasia was identified in 3 patients in whom lung volumes were available and total alveolar number could be calculated. (Newborn controls Am Rev Resp Dis 129:208,1984)**

Diagnosis	Extension of Muscle % Alv. Wall Arteries Muscularised		Medial Hypertrophy % Wall Thickness of Arteries 100-200 cc		Total No. of Alveoli	
	Lung(I)	Lung(C)	Lung(I)	Lung(C)	Lung(I)	Lung(C)
CDH	35±9	45±8	13±3	11±4	$1.6x10^6$	$5.8x10^6$
PPH*	100		25			
Control	0		6		**49-82x10⁶/Lung	

Thus, while there is increased muscularity in the pulmonary vascular bed of these severely affected infants, the irreversible hypoxemia and hypercarbia seen in life may be better explained by deficiency in number of alveoli and accompanying arteries in both ipsilateral (I) and contralateral (C) lungs.