LECITHIN SYNTHESIS IN FETAL PRIMATE TISSUES AS MEASURED *in vivo*. Philip M. Farrell, Michael F. Epstein, Alan R. Fleischman, Gary K. Oakes, and Elizabeth A. Knight, (Intr. by Paul A. di Sant'Agnese), NIAMDD and NICHD, NIH, Bethesda, Md.

The choline incorporation pathway (I) accounts for >95% of *de novo* lecithin synthesis in fetal monkey lung slices. This *in vivo* study examined the incorporation of ^3H -choline and ^{14}C -ethanolamine into lecithin. Isotopes were injected into 140-148 day fetal Rhesus monkeys via an interplacental venous catheter maintaining the integrity of the amniotic cavity and the circulation. After 2 hrs, $^3\text{H}/^{14}\text{C}$ labeling in TLC-isolated lecithin was measured in various organs. Results (% transport-precursor incorporated into lecithin) from 4 fetuses

LECITHIN SYNTHESIS	Lung	Liver	Brain	Kidney
Pathway I	82	43	88	70
Pathway II	1.7	4.4	5.2	1.3

indicate that pathway I predominates over pathway II (phosphatidyl ethanolamine methylation) in these tissues. ^3H -lecithin was present in fetal plasma after 2 hrs but not in tracheal or amniotic fluid. Maternal treatment with IM betamethasone 48 hrs prior to delivery resulted in greater than normal incorporation of ^3H -choline into lecithin in lung, but not liver, brain, or kidney in 2 fetuses examined thus far. Additionally, one acidotic fetus showed a reduced pathway I rate in all organs except brain. Therefore, the choline incorporation pathway of fetal primate lung a) is predominant in synthesis of lecithin, and b) may be enhanced by corticosteroids and depressed by acidosis.

REGULATION OF PULMONARY LECITHIN SYNTHESIS IN THE FETAL RAT. Philip M. Farrell and David W. Lundgren, (Intr. by Paul A. di Sant'Agnese), NIH, Bethesda, Md.

Regulation of pulmonary lecithin (the principal surfactant-phospholipid) synthesis is of crucial importance to the fetus and neonate. In our studies metabolic control mechanisms have been investigated in lung samples from over 700 rat fetuses of varying gestational ages. It has been found by incubation of lung slices with isotopic precursors that the choline incorporation pathway accounts for >97% of lecithin synthesis. The rate of this pathway is significantly ($p < .001$) enhanced after 20 days gestation (term = 22 days). Specific activities of two pathway enzymes, choline kinase (CK) and choline phosphotransferase (CPT), have been measured in lung homogenates from rat fetuses of 16-22 days gestation (DG). CK rises from 740 at 16.5 DG to 1440 pmole/min/mg protein at 19.6 DG ($p < .001$) and falls from this peak value to 760 pmole/min/mg at 21.3 DG. CPT, although rising from 38 pmole/min/mg at 16.5 DG to 54 at 19.6 DG ($p < .02$), does not peak until 20.5 DG (60 pmole/min/mg, $p < .001$). The enzyme then declines in activity as the fetus approaches term. Kinetic properties (Km values, pH profiles, etc.) have also been determined for CK and CPT.

These findings suggest that CK and CPT may play a key role in accelerating pulmonary lecithin synthesis in the developing fetus. However, since the rate of lecithin production continues to increase after 21 DG when CK and CPT activities are declining, other regulatory mechanisms may be operative in the term fetus and neonate.

METABOLIC STUDIES OF TRANSIENT TYROSINEMIA AND LATE METABOLIC ACIDOSIS IN PREMATURE INFANTS. S. Fernbach, R. Summons, A. Duffield and W. Pereira, Depts. of Ped. and Genetics, Stanford Univ. Med. Ctr., Stanford, California (intr. by Philip Sunshine)

The recently developed technique of gas chromatography (GC) - mass spectrometry (MS) - supported by computer has considerably improved the analysis of physiologic fluids. This study attempted to demonstrate the value of the GC-MS-computer system in the investigation of urinary metabolite patterns in two metabolic problems of prematurity, viz, transient tyrosinemia and late metabolic acidosis. A total of 124 24-hours urine specimens were analyzed in 9 infants. Transient tyrosinemia, characterized by 5-10 fold increases over basal excretion of urinary tyrosine, p-OHphenyllactate and p-OHphenylpyruvate, was noted in 5 of the infants. Several infants had fluctuating levels of urinary tyrosine metabolites although dietary protein intake remained constant at 3-4 gm/kg/day and ascorbic acid at 50 mg/day. Sporadic testing can underestimate the actual incidence of transient tyrosinemia. Late metabolic acidosis was seen in 4 infants, but bore no relation to transient tyrosinemia. The ratio of urinary net acid to urea excretion increased with increasing base deficit, implying a non-protein origin of the metabolic acid. No unique metabolic patterns were characteristic of late metabolic acidosis. The use of GC-MS-computer systems is a promising technique for metabolic studies of premature infants.

INCREMENTAL GROWTH IN THE SMALL PREMATURE INFANT. P. M. Fitzhardinge. Dept. of Ped., McGill Univ., Montreal. (Intr. by E. Colle)

In order to provide a baseline for assessment of the effect of early high caloric alimentation in the small premature infant, a group of infants, gestation of 32 weeks or less and birth weights within 2 standard deviations of the mean, received only a 20-calorie/oz. Similac formula supplemented by 10% G/W iv. to provide a daily fluid intake of 120cc/kg by day 3. The average caloric intake at 1 week was 101 ± 26 cal/kg/d. 65 of the 82 survivors were seen at the estimated date of delivery (EDD) and then at 3 month intervals for 1 year. Using the EDD as birthdate equivalent, actual size and rates of linear and weight growth were compared with similar data from 24 normal full term infants. Rates of linear growth for both sexes were identical to those of the full term. The mean length was at the 50th percentile of the Stuart grid throughout the first year. Rate of weight growth tended to be slower for the first 6 months although the difference was significant only for girls. Mean weight fell between the 3rd and 50th percentiles. Head growth was accelerated the first 3 months but approximated the 50th percentile thereafter. Smaller stature at 1 year was associated with a low caloric intake at 1 week (mean 84cal/kg/d). The mean developmental quotient was 92 uncorrected, 108 corrected, and was unrelated to early caloric intake. The results suggest that prolonged early undernutrition is associated with decreased weight growth the first 6 months post-term.

LECITHIN CONTENT IN HYPOPHARYNGEAL MUCUS OF NEWBORN INFANTS. Howard A. Fox, Laszlo Sarkozi, Warren N. Rosenfeld (Intr. by Horace L. Hodes) Mount Sinai Sch. of Med., Dept. of Pediatrics and Chemistry, New York

Determination of lecithin, sphingomyelin ratios (L/S) has been used to quantitate lecithin in amniotic fluid. We have modified this technique to study lecithin content of hypopharyngeal mucus in the newborn. Mucus samples collected during the first 2 hours after admission to the Newborn Special Care Unit were analysed for L/S in 93 infants. In 10 infants, L/S of amniotic fluid obtained at Caesarian section was compared to the 0-2 hr. collection of hypopharyngeal mucus with good correlation. In the 17 infants with Idiopathic Respiratory Distress Syndrome (IRDS), the mean L/S of hypopharyngeal mucus was 1.6 (range 0.4 - 1.9). With serial sampling, L/S in infants with IRDS either remained low until clinical improvement was noted, or never rose in those infants who succumbed. Infants who did not develop IRDS had hypopharyngeal mucus L/S's ranging from 0.9 - 13.0 with a trend of increasing L/S with increasing gestational age. Such infants with low L/S were not significantly acidemic on admission and showed rising L/S values over the first 12 hours. L/S determination of hypopharyngeal mucus appears to be a rapid means of objectively documenting IRDS and of providing *in vivo* information on pulmonary biochemical maturity.

EFFECT OF THERMAL ENVIRONMENT AND CALORIC INTAKE ON HEAD GROWTH OF LOW BIRTH INFANTS DURING THE LATE NEONATAL PERIOD. Leonard Glass, Rasila V. Lala, Vishnu Jaiswal, and Sarvesh K. Nigam, Depts. of Pediatrics, Jewish Hospital and Medical Center of Brooklyn and Harlem Hospital Center, N.Y., N.Y.

Prolonged exposure of low birth weight infants to subthermoneutral environmental temperatures in the late neonatal period is associated with decreased rates of weight gain and linear growth. In order to assess the effects of ambient thermal conditions on postnatal head growth, we have reared 40 asymptomatic infants (birth weights 900 to 1800 gm) under 4 study conditions (WH-abd. skin temp. 36.5°C, caloric intake 144 Cal/kg/day; WL-abd. skin temp. 36.5°C, caloric intake 120 Cal/kg/day; SH-abd. skin temp. 35.0°C, caloric intake 144 Cal/kg/day; SL-abd. skin temp. 35.0°C, caloric intake 120 Cal/kg/day) after the first week of life.

Group	No. of Infants	Average Daily Increase in Head Circ. (cm/day)	Median (and Range)
WH	9		0.150 (0.086-0.200)
WL	10		0.152 (0.114-0.192)
SH	10		0.138 (0.064-0.179)
SL	11		0.120 (0.064-0.158)

The rate of head growth (average daily increase in head circumference) was significantly greater ($P < 0.01$) in the WH and WL groups than in the SL group. These differences in head growth may be of importance in the psychomotor development of low birth weight infants.