205 MORPHOLOGICAL AND FUNCTIONAL CORRELATES OF SYNCHRONOUS BEATING BETWEEN EMBRYONIC HEART CELL AGGREGATES AND LAYERS. Eva B. Griepp, Jean-Paul Revel, John H. Peacock and Merton R. Bernfield. Stanford University School of Medicine, Departments of Pediatrics and Neurology, Stanford and California Institute of Technology, Division of Biology, Pasadena.

In the belief that intercellular communication plays a role in development, we have studied beating 7-day chick embryo heart cell aggregates and layers. In comparison with asynchronous controls we have shown correlations between synchronous beating and both the appearance of gap junctions revealed by freeze-fracture and electrophysiologic evidence of ionic coupling at the interface between them.

The freeze-fracture studies reveal gap junctions which are small, often unusual in shape and occur in clusters; these features are also characteristic of the gap junctions in intact hearts from embryos of the same age. When the interfaces between 11 synchronous and 10 asynchronous aggregate-layers were compared there were significant differences in the number of gap junctions and the total area of gap junctions per cell, but no significant differences in the number of cells containing junctions, the percent of total membrane area occupied by junctions, their density or their average size. The electrophysiological studies showed no propagation of stimulating current pulses from aggregate to layer in 16 asynchronous instances, but successful transmission in 6 of 7 synchronous aggregate-layers. These data indicate that synchronous beating is a sensitive detector of the presence of ionic coupling and of gap junctions, suggesting its usefulness in further studies of the role of intercellular communication in development.

206 AN ORGAN CULTURE MODEL FOR THE STUDY OF FETAL LUNG MATURATION. Ian Gross, Mary Rose Czajka, G.J. Walker Smith. (Spon. by J.B. Warshaw) Yale University School of Medicine, Depts. Pediatrics and Pathology, New Haven, Conn.

We have developed an organ culture model for the study of biochemical and morphological maturation in late gestation fetal rat lung. Lungs from 18 or 19 day fetal rats are chopped into cubes with 0.8 mm sides using a McIlwain tissue chopper. The explants are placed on a millipore filter supported on a stainless steel grid and cultured in F12 medium in 95%O_2, 5%CO_2 at 37'C. Use of an air and CO_2 environment resulted in areas of central necrosis.

Morphologic maturation continues in culture with the progressive development of larger and more numerous alveoli, flatter alveolar lining cells and less stromal tissue. There is a progressive decrease in type II cell glycogen content and an increase in the number of lamellar bodies. Vascular elements are less well preserved. Biochemical findings after varying periods in culture are tabulated below. Values are expressed as a percentage of those obtained with fresh lung tissue from 18 or 19 day fetuses.

	24 Hours	48 Hours	72 Hours
Glucose oxidation to CO_2	118.7%	117.0%	128.8%
Protein content	95.7%	71.4%	75.0%
(^{3}H) choline incorporation into:			
Phosphatidylcholine	59.2%	123.6%	192.1%
Sphingomyelin	50.5%	134.3%	194.0%

This data indicates that fetal lung remains viable in short term organ culture, a useful model for the study of hormonal influences on lung development. Supported by HL19752.

207 BILE ACID CONJUGATION IN HUMAN FETAL LIVER IN ORGAN CULTURE. L.R.Haber, V.Vaupshas, B.Vitullo, R.C.deBelle. (intr.by K.N.Drummond) Montreal Children's Hospital, Montreal, Canada.

An organ culture system for prolonged maintenance of human fetal liver in vitro has been developed. Using this system, bile acid metabolism was investigated. Multiple liver specimens were obtained from human abortuses and stillbirths ranging from 9-30 wks. gestation (gest.). Within 3hrs. of hysterotomy, 1-2mm pieces of liver were placed in scored petri dishes and incubated in modified Leibovitz medium under air on a rocker panel at 37°C. Morphological integrity was demonstrated by LM and EM for periods up to 10 days in vitro. Functional viability was established by adding 14C-cholic acid to the medium and assaying the conjugates formed after extraction and TLC. Cholic acid (C) was taken up by the tissues and conjugated to form taurocholate (TC) and glycocholate (GC) which were then secreted into the medium at a constant rate during 10 days in vitro and in constant increments during a selected 24hr. period. TC is the predominant conjugate formed by fetuses < 20wks. gest. and with increasing gest. age the proportion of CC synthesized increases. Taurine added to the medium in concentrations equimolar to glycine enhanced TC synthesis at all gest. ages ($p<0.001$), increasing total conjugate synthesis. The addition of $2x10^{-4}$ mM hydrocortisone (HC) to the medium increased the proportion of GC synthesized during early gest. ($p=.01$). The results establish that in the human fetus taurine is preferentially conjugated with primary bile acid and suggest that HC has a maturation effect on human fetal hepatocytes in organ culture.

208 CONGENITAL FAILURE OF AUTOMATIC CONTROL OF VENTILATION, GASTROINTESTINAL MOTILITY, AND HEART RATE. Gabriel G. Haddad, Norman M. Mazza, William A. Blanc, Richard F. Defendini, John M. Driscoll, Ralph A. Epstein, Robert B. Mellins. Coll. of Phys. & Surg., Columbia Univ., Depts. of Ped., Anesth. and Path. New York.

We report a new syndrome with the simultaneous failure of control of ventilation (Ondine's Curse), esophageal and intestinal motility (Hirschsprung's disease), and heart rate in three infants, who died in the first few months of life; two were siblings.

Detailed physiologic studies were performed in one, and pathologic studies in three. Ventilation was measured by the barometric method or by pneumotachography. Sleep was staged using the EEG, EOG, and EMG. Minute Ventilation ($\dot{V}$) and respiratory rate (f) were lower in Quiet sleep ($\dot{V}$=315ml, f=18/min) than in both REM sleep ($\dot{V}$=477ml, f=22/min) and wakefulness ($\dot{V}$=654ml, f=29/min). Respiratory pauses >5 sec occurred more frequently in Quiet than in REM sleep. $\dot{V}$ increased by 25% after IV doxapram but not following aminophylline, progesterone or imipramine. Minimal short term (beat to beat) variability of the ECG R-R interval (interquartile range $< \pm 1.5$ msec.) in both Quiet and REM sleep indicated abnormal control of heart rate. Histologic studies revealed aganglionosis of the colon in all three patients; serial sections of the brain stem in the siblings failed to reveal any abnormality. The Riley-Day Syndrome was excluded. We believe that a congenital abnormality in the autonomic nervous system is responsible for this syndrome.

209 WHITE ADIPOSE TISSUE (WAT) AND HEAT PRODUCTION IN THE NEWBORN RABBIT. T. Heim, H. Schenk, F. Varga E. Goetze. (Spon. by D. Fraser) Research Institute Hospital for Sick Children, University of Toronto, Canada; Dept. Pediat., Univ. Medical School Pécs, Hungary and Institute of Pathophysiology, Univ. Jena, German Democratic Republic.

The question has been raised repeatedly whether in addition to it's other functions WAT takes part like an "electric blanket" in thermoregulatory heat production as does brown adipose tissue (BAT). The purpose of this study was to investigate the in vivo metabolic activity of WAT during acute and prolonged exposure to cold (Ta 20°C). Pool size (M) and specific radioactivities (SA) of lipids in WAT and BAT, as well as flow rates of free fatty acids (m_{SF}) from plasma into WAT and BAT were studied by injecting ^{14}C-1-palmitate (20 X 10^6 cpm/100 g. body weight) into 7-day-old rabbits reared in a thermoneutral (Ta 35°C; Group I), or cold environment (Ta 20°C; Group II), or subjected to starvation at Ta 35°C (Group III), or at Ta 20°C (Group IV). Experiments were carried out at Ta 20°C in all four groups of rabbits. The M of esterified (EFA) plus non-esterified fatty acids (NEFA) of WAT was reduced in well-fed animals raised in the cold as well as in starving ones. The SA of tissue EFA plus NEFA was highest in Groups III and IV, indicating an increased FA metabolism of WAT in animals subjected to starvation prior to acute exposure to cold. The m_{SF} into WAT increased two-fold in Group IV, but remained about one-fifth that of the m_{SF} into BAT, suggesting that the contribution of WAT to cold-induced calorigenesis of the whole animal is of secondary importance.

210 EFFECT OF COLOSTRUM ON GROWTH OF INTESTINAL MUCOSA. Wm. C. Heird and Inge H. Hansen. Columbia Univ. Col. of Phys. & Surgs., Dept. of Peds., N.Y.

Recently, Widdowson et al. (Biol. Neonate 28:272, 1976) reported that jejunal mucosal mass of piglets suckled by their mother increased 45% in the first 24 hours of life whereas the mass of those fed only water did not change. This impressive finding could be due specifically to colostrum or to feeding per se. To differentiate the role of each, small intestinal mucosal mass (MM), DNA and protein (Pr) content, plus disaccharidase activities were determined in groups of beagle puppies at birth (Controls; n=6) and after 24 hours of either suckling (n=5) or artificial feeding with simulated bitch milk (n=5). Body weights of the latter 2 groups increased similarly. While neither MM, DNA nor Pr of the artificially fed group were different from controls, MM of the suckled group was 82.1% greater ($p<0.001$), DNA content was 60% greater ($p<0.001$), and protein content was 91.3% greater ($p<0.001$). These differences were apparent in all segments of the intestine. The increased DNA, Pr and Pr/DNA ratio in this group suggest that the rapid increase in mucosal mass was due to both hyperplasia and hypertrophy. Specific activities of lactase, sucrase, and maltase were similar in the 3 groups but because of increased MM total activity of all was greater in the suckled group. These results extend the findings of Widdowson et al. to another species and demonstrate that the rapid early mucosal growth results specifically from colostrum, not merely feeding. They strongly suggest that colostrum contains a growth factor specific for intestinal mucosa.