with the β-lipoprotein as a dominating fraction with contributions from other lipoprotein fractions seen in normal adult sera as elucidated by means of agar electrophoresis.

During the same period the fatty acid pattern also changed. At birth low values of oleic acid and linoleic acid and high values of palmitic acid and arachidonic acids were found in cord serum as compared to the corresponding values in the mothers' blood. During the 1st week the content of palmitic and arachidonic acids decreased slightly, whereas the oleic acid was found to increase.

Somewhat different values were found in infants of low birth weight, where the linolic acid was found to be very low.

Related changes in serum levels of vitamin E will be discussed.

15. Intravenous fat loads in low birth weight infants. A. GUSTAFSON, I. KJELLMER, R. OLEGÅRD, and L. VICTORIN. *Univ. of Göteborg, Sweden.*

When the clinical course in low birth weight (LBW) infants is complicated by extreme immaturity, respiratory distress, or hyperbilirubinemia, the peroral route of feeding becomes difficult. In an attempt to investigate whether the caloric demands could be met by intravenous fat infusions, fat loads were performed in normal LBW infants. The fat was given as 20% Intralipid (a soybean oil emulsion) either in single injections or during extended infusions. The concentration of total lipids was followed in serum samples, and the distribution of the lipoproteins was evaluated by means of agar gel electrophoresis. In preterm infants the maximal removal capacity of fat from the intravascular compartment corresponded to some 6–8 g fat/kg in 24 hr. The fat particles injected had a half-life of 1–5 min. In small-for-date infants the initial maximal removal capacity was of the same order but the removal rate rapidly decreased concomitant with the appearance of a secondary generation of fat particles in the blood stream. These were identified as pre-β-lipoproteins on the gel electrophoresis and were considered to originate in the liver. It is speculated that the slower removal of exogenous fat from the intravascular compartment of the small-for-date infants is due to a competition with the pre-β-lipoproteins for the same elimination mechanisms.

16. Evolution of water and electrolyte content of muscle and skin tissues during growth. The concept of chemical maturity. J. DUBOIS and H. L. VIS. *Univ. Libre de Bruxelles, Brussels, Belgium.*

Variations in the hydroelectrolytic composition of skeletal muscle have been studied in 69 normal children aged 2 weeks to 18 months by neutron activation analysis of needle micro biopsies and in 41 adults by the analysis of surgical biopsies with classical chemical methods. The criteria of normality for age of the various elements measured (HOH, Na, K, Cl, P) were established by means of the statistical analysis of the results obtained. The same elements were also measured in the skin of 35 children. It was shown that hydroelectrolytic composition of muscle and skin tissues changes quite distinctly with age. During the first 6 months of life there is a relative diminution of water and extracellular electrolyte muscle values. This evolution is reversed in old age. In cutaneous tissue, during the first 18 months of life there is a gradual fall in the value of water, sodium, and chloride. There is no significant variation in muscle and skin potassium and phosphorus content in relation to age. On the basis of our results, the notion of chemical maturity as defined in the literature must be reconsidered as far as muscle tissue is concerned. In normal children, no correlation was found in the sum concentration of sodium and potassium in the plasma and in the water of the two tissues investigated. This observation implies that the regulation of osmotic equilibrium between plasma and tissue does not depend exclusively on the water and electrolytes movements.

The role of amino acids in this regulation is illustrated by preliminary studies on the free amino acid content of muscle tissue in subjects of various ages.

17. Total body potassium, lean body mass and fat determination in children by ^{40}K measurements with a liquid scintillation whole body counter. A. DONATH, G. PORETTI, and A. ZUPPINGER. *Univ. of Berne, Switzerland.*

Normal values of total body potassium are established by measuring 441 healthy children, expressing the results according to an obesity index (O.I. $= W/10 \cdot H^3$, where W = weight in kg and H = height in m) and classifying the children according to sex and age. While after puberty boys increase their K/kg and keep their O.I. constant, girls' O.I. goes up, but their total K/kg remains unchanged. Total potassium reflects the cellular mass and allows an objective evaluation of muscle waste in progressive muscular dystrophy. The calculation of the lean body mass and, by deduction, of the total fat shows extreme values of practically no fat in anorexia mentalis and 750 g/kg in obesitas permagnia. Total body water has been determined simultaneously in 62 children, and their lean body mass calculated and compared to the values obtained from K determination; the correlation between the two methods is satisfactory. Daily measurements of total body potassium and simultaneous potassium balance studies for 8 days in a case of newly diagnosed diabetes also correlated well.

18. Synthesis and release of plasma proteins by isolated perfused human fetal liver. M. KEKOMÄKI, M. SEPPÄLÄ and A. L. SCHWARTZ. *Children's Hosp.*, and *Univ. of Helsinki, Finland.*

Plasma protein constituents are synthesized by explants of cultured human embryonic liver after the 5th week of gestation. To quantify the incorporation and release of protein in an abstracted physiological system, three human fetal livers of gestational ages of (*a*) 10, (*b*) 14, and (*c*) 20 weeks were perfused for 4 hr through the umbilical vein with an amino acid mixture and glucose in oxygenated Krebs-Ringer bicarbonate. L-Leucine-^{14}C tracer was added to the medium at 60 min, when protein was released to the medium at constant rates of 0.45, 0.60, and 0.15 μg/min/mg of liver protein in *a*, *b*, and *c*, respectively. The incorporation of ^{14}C into the protein was characterized at 240 min by autoradiography of both (*1*) immunodiffusion in agar gel and (*2*) electrophoresis on cellulose acetate. (*1*) ^{14}C was incorporated into albumin, α-fetoprotein, α- & β-lipoprotein, Gc-protein, and transferrin, but not into haptoglobin; (*2a*) a constant fraction (72%) of the label incorporated was found in (albumin + α-fetoprotein) at all three gestational ages; (*2b*) the albumin/α-fetoprotein incorporation of the label was 1.6, 2.3, and 4.4 for *a*, *b*, and *c*, respectively; these values related to each other like the albumin/α-fetoprotein found in the plasma of corresponding fetuses: 2.9, 7.5, and 17; (*2c*) the (stored) protein released by the livers during the first 60 min was mainly albumin.

19. Studies of sulfur amino acids in the immature human: Is cyst(e)ine essential? G. E. GAULL, J. A. STURMAN, and N. C. R. RAIHA. *N.Y. State Inst. Basic Res. Mental Retard., Mt. Sinai Hosp. Sch. of Med., N.Y. and Univ. of Helsinki, Finland.*

Cystathionase activity was not measurable in the liver or brain of 24 human fetuses and 3 prematures. Methionine-activating

enzyme and cystathionine synthase were present. None of these enzymes of transsulfuration was present in the placenta. Thus cyst(e)ine may be an essential amino acid in the immature human until sometime after birth. A single full term infant who died at 7 hr had 7% of normal cystathionase activity in the liver. Amino acid analyses of simultaneously obtained maternal and fetal blood, amniotic fluid, placenta, fetal liver, and fetal brain were performed. No consistent trends were noted during the period studied. However, the fetal-maternal ratio of all plasma amino acid concentrations at time of abortion was high (as at term). The highest ratio, by far, was that of cystine. In some cases, cystine was not measurable in the blood of the mother. Furthermore, in contrast to the mature human, cystathionine, the substrate for cystathionase, was *higher* in fetal liver than in fetal brain. In spite of this accumulation of cystathionine in fetal liver, there was none measurable in fetal or maternal blood nor in amniotic fluid. These studies suggest that the human fetus is entirely dependent on a maternal source of cyst(e)ine and that prematures and perhaps even full term newly born infants are dependent upon dietary sources of cyst(e)ine. Human milk is a high cyst(e)ine, low protein formula, whereas cow's milk is a low cyst(e)ine, high protein formula. Thus, these studies suggest that premature infants fed a high protein cow's milk formula retain more nitrogen and grow faster than infants fed a cow's milk formula containing lower amounts of protein, closer to that found in human milk, because the amount of cyst(e)ine, rather than total nitrogen, may be a limiting factor for protein synthesis. These results may also afford an enzymatic explanation for the transient hypermethioninemia seen in infants on high protein diets.

20. a_1-Fetoprotein, an index of maturation? R. Lardinois, D. Anagnostakis, and M. Ortiz. *Centre de Recherches Biologiques Neonatales, Paris, France.*

It is known that in the human conceptus, serum a_1-fetoprotein reaches a maximal concentration at approximately 13 weeks, then decreases and disappears 1 or 2 weeks after birth. In the first step of this work, the existence of a_1-fetoprotein has been studied in the serum of three groups of neonates (premature, full term, and small for date). Electrophoresis on polyacrylamide gels and immunoelectrophoresis with a specific antibody against human a_1-fetoprotein have been chosen: since they have a different degree of sensitivity, they can be used as a semiquantitative test. At birth, small for date infants have no a_1-fetoprotein or a very low concentration; the concentration is higher in full term babies and still higher in prematures. These observations suggest that a distinction between small for date and premature babies is possible by such a procedure. In the second step of this study, Mancini's immunochemical method for a_1-fetoprotein quantitative estimation is in process in order to see, especially in premature babies, whether serum a_1-fetoprotein concentration at birth is directly related to the length of gestation. If so, we shall have a simple biological test for the assessment of the gestational age of newborn infants.

21. Effects of varying severity of growth retardation on organ weight and cell population in fetal rats. J. S. Wigglesworth. *Hammersmith Hosp., London, England.*

Recent experimental studies have shown that a growth-retarding stress applied early in life results in diminished cell populations of all organs whereas a similar stress applied later on causes reduction predominately in cell size. The object of the present study was to determine the effects on cell size and population of organs of varying the severity of stress at a single time interval in pregnancy. Unilateral uterine ischemia was induced surgically in rats on the 17th day of pregnancy to produce a range of fetuses with birth weight reduced by up to 45% of the values for fetuses from the control uterine horns. Cell size and populations at term were estimated from the figures for organ weight and total DNA. A close correlation was shown between the severity of growth retardation and the degree of reduction in organ weight and cell population although the size of the effect varied for different organs. Reduction in fetal weight by 45% reduced liver weight by 60% and liver cell population by 50%, whereas brain weight was reduced by only 20% with a 12% reduction in cell population. No consistent change was seen in weight or cell population of the placenta. It is concluded that for a growth-retarding stress acting at a single time interval in pregnancy the reduction in cell size and populations of different internal organs is directly related to the reduction in birth weight.

22. IgA deficiency—hereditary aspects. P. Pelkonen and E. Savilahti. *Children's Hosp., Univ. of Helsinki, Finland.*

Familial cases of selective immunoglobulin A deficiency have been documented, but the mode of inheritance remains unsettled. The propositus of the present study, a 9-year-old girl with a past history of frequent upper respiratory tract infections, had an unusually low serum IgA level, between 0.5 and 2.0 mg/100 ml (*i.e.*, IgA detectable by double diffusion but not by the radial immunodiffusion technique). The mother of the patient showed a total lack of serum IgA and suffered from chronic urinary tract infection. The father and brother of the propositus and the maternal relatives tested had normal IgA levels. Both patients had normal karyotypes. In the propositus, IgA was detected in saliva and intestinal juice, but IgM was present in higher concentrations in these secretions. Direct immunofluorescent studies of both rectal and small intestinal mucosa revealed IgA-containing cells, but IgM-containing cells were predominant. In the mother, no IgA was detectable in whole saliva concentrated 20 times, and the rectal mucosa was completely devoid of IgA-containing cells, whereas IgM-containing cells were abundant. These findings suggest that IgA deficiency may differ in degree of severity. The daughter in this family could be heterozygous for a recessive trait, while the mother is homozygous. On the other hand, an autosomal dominant mode of transmission with variable gene expressivity cannot be ruled out.

23. Penicillin and dinitrophenyl antibodies in newborns and mothers detected with chemically modified bacteriophage. S. Levin, Y. Altman, and M. Sela. *Kaplan Hosp. and The Weizman Inst. of Sci., Rehovot, Israel.*

The development of newer, highly sensitive techniques for the detection of small amounts of antibodies opens new fields for investigation. The immunospecific inactivation of chemically modified bacteriophages by antibodies directed toward the attached hapten or protein allows for the detection of as little as 0.2–2.0 ng antibody/ml. Likewise, minute amounts of hapten or protein may be detected and measured by their ability to inhibit the inactivation of the chemically modified bacteriophage by the antihapten or antiprotein antibodies. We have studied the presence of penicillin and DNP antibodies in the sera of newborn infants and their mothers by the use of penicilloylated and dinitrophenylated-T4-bacteriophage. In almost every paired sera studied, evidence was found for the presence of penicillin antibodies. Premixing the sera with penicillin eliminated the penicillin-T4-phage inactivation. Preheating the diluted sera for