

orotic acid into the RNA of the nuclear and other subcellular fractions, was unaffected by neonatal thyroidectomy, thus suggesting that the effect of thyroid deficiency on protein synthesis during early development may occur at the level of translation of the genetic message, rather than at the level of transcriptions.

MAX HAMBURGH
City College of New York and
Department of Anatomy,
Albert Einstein College of Medicine,
Bronx, New York 10461

Fetal Growth and Development

A symposium on Fetal Growth and Development was held in San Diego, 16-20 November 1968, and sponsored by the Department of Pediatrics of the University of Wisconsin Medical Center with the cooperation of the Johnson and Johnson Pediatric Institute. It was planned by Harry A. Waisman and George R. Kerr of Wisconsin.

Benirschke discussed the relationship between the pathological development of the placenta and fetal malformations. He presented a number of examples, such as (i) the transfusion syndrome in monozygotic twins, where a shunt develops between the umbilical artery of one twin to the vein of the other; (ii) the frequency of harelip and cleft palate in human monozygotic vis-a-vis dizygotic twins. In the discussion it was pointed out that little is known about either the anatomy or the function of human placentas with chromosomal abnormalities. Villee summarized a variety of biochemical data pertaining to enzymatic differentiation in the fetus and the placenta. He spoke of "biochemical senescence" in which there is a decline of oxygen utilization, glycogen content, and a changing pattern of glucose metabolism. Winick discussed the cellular growth of various organs in the fetus and the placenta in terms of hyperplasia versus hypertrophy. The cellular growth of most organs, as measured by the total DNA content, ceases before birth is reached. Moog reviewed our knowledge of chemical embryology by discussing three enzymes. The first enzyme was tryptophan pyrrolase whose burst of activity is associated with a separation from the mother; the second, phosphopyruvate carboxylase, increases its activity re-

markably soon after birth; a third example concerned the mysteries of the five LDH isomers in various species, each of which appears to have a different pattern. Hon focused attention upon the problem of continuous monitoring of the fetal heart by electrocardiography. Ramsey discussed the current techniques of placentography; the major part of her presentation consisted of a motion picture which was a beautiful demonstration of the maternal uteroplacental circulation during relaxation and contraction utilizing cineradiography. Diczfalussy of Sweden told of the fetal-placental endocrine unit, a concept which has been recognized within the past 5 years, and which helps explain why there is very little de novo synthesis of steroids from acetate; rather, the circulating sterols and steroids are utilized. Mèndez-Bauer of Uruguay summarized the effects of hypoxia on the fetus with particular reference to the Type II dips, or delayed deceleration, following uterine contractions. Nadler described how removal of amniotic fluid obtained in the middle trimester can be used to detect genetic malformations in the developing fetus. The fluid has also been used for isolation of viruses. The desquamated fetal cells may be used for cytological study, such as the sex chromatin which is of value in the prognosis of hemophilia carriers or they may be used as biochemical markers or for the cultivation of cells. Rudolph presented his methods of studying the fetal circulation in utero in the sheep. He developed a technique of injecting plastic microspheres with radioactive labels into varying portions of the fetal circulation to show that the umbilical flow, which constitutes 40 percent of the cardiac output, always falls when the fetuses are exteriorized. Lucey discussed the pigments of the amniotic fluid in relation to erythroblastosis, and pointed out the need for accurate diagnosis of hydropsfetalis in utero. Grumbach described the endocrine control of fetal growth and that there is an inherent capacity of an embryo or fetus to grow even though most or probably all of its endocrine organs are missing or quiescent. Dancis reviewed the processes of the placental transfer of sugars, amino acids, sodium and potassium, estrogens, and free fatty acids. He discussed the various methods of study which would be useful in further elucidation of membrane transport

mechanisms in general. Silverstein presented the immunologic development of the lamb fetus, which is capable of responding to a selected antigen by the production of antibodies, and from that time on into the postnatal period a sequential achievement of competence occurs depending upon a hierarchal order of antigens. Sinclair told about the energy requirements for growth and differentiation, and what role O_2 -utilization plays in the recovery from malnutrition. Sever described the significance of viral infections which are known to affect embryonic development of man, such as rubella, cytomegaloviruses, and toxoplasmosis. Intrauterine fetal malnutrition was discussed by Gruenwald, who told that interference with nutrition to the fetus is the result of deficiencies of the maternal uteroplacental circulation, rather than problems with placental transport. The subject of fetal malnutrition was continued by Naeye, who noted that cell size and cell numbers are actually more reliable indicators of malnutrition than organ weights or body weight. James reviewed the effects of acute asphyxia upon the brains of neonatal monkeys. Sontag described his early studies of recording types of fetal activity and fetal behavior in relation to subsequent personality and adult behavior. Waisman reported experiments on the effects of hyperaminoacidemia on fetuses of the rat and monkey. High phenylalanine dietary intakes by the mother led to marked increases of phenylalanine and tyrosine levels in the fetus resulting in mental retardation, even though the neonates received a normal diet. Hahn presented data on lipid metabolism by fetal rat tissues, both in vitro and in vivo, and noted that rats weaned prematurely were predisposed to hypercholesterolemia in later life. Drillien from Scotland noted that the brain may be permanently affected if nutritional restrictions are imposed at a time when it is undergoing a period of rapid myelination. Van den Berg closed the meeting by discussing the statistical approach to fetal and perinatal growth. Page summarized the conference by pointing out the gaps in our knowledge and the needs for some new areas of investigation in fetology from which future information could be applied to decrease fetal wastage and abnormal infants.

ERNEST W. PAGE
San Francisco, California