1141 A NEW FORM OF X-LINKED GLYCOGEN STORAGE DISEASE. J.P. Keating, B.I. Brown, N.H. White, S. DiMauro. Departments of Pediatrics and Biochemistry, Washington University School of Medicine, St. Louis, Mo., and the Department of Neurology, Columbia University, New York, N.Y.

Seven members in 5 generations of a Midwestern family suffer with a form of glycogenosis involving liver and muscle. The illness is characterized during childhood by hepatomegaly, muscle weakness, delayed puberty and growth retardation. As adults, the disabilities decrease. Metabolic studies revealed elevation of serum uric acid in 2 subjects, but no disturbance in glucose homeostasis. One adult has clinical gout.

In 7 liver biopsy specimens, an accumulation of PAS positive-diastase removable material was found. Biochemical analysis of liver specimens from 3 family members for glucose-6-phosphatase, debrancher enzyme, phosphorylase, phosphorylase kinase, glycogen synthetase and fructose-1, 6-diphosphatase, revealed no explanation for the glycogen accumulation. In all cases, glycogen structure was normal, and glycogen content increased (12-16% W/W). In 2, muscle glycogen was increased.

In this family, only males were afflicted, and the trait was passed through females, suggesting an X-linked pattern of inheritance. The previously described X-linked glycogenosis was associated with phosphorylase kinase deficiency. Since this enzyme is present in this family, a new form of X-linked glycogen storage disease is suggested.

1142 DECREASED GLUCOSE UTILIZATION WITHOUT INCREASED PRODUCTION FOLLOWING STIMULATION OF EPINEPHRINE IN CHILDREN. Douglas Kerr, Satish Kalhan, and Kou-Yi Tserng, Case Western Reserve University, Rainbow Babies & Children's and Cleveland Metropolitan General Hospitals, Cleveland, Ohio.

The hyperglycemic effect of epinephrine is commonly attributed to increased glucose production. After infusion of physiological amounts of epinephrine in adults, glucose production transiently increases without a change in utilization. In the present studies in children, glucose production and utilization rates were estimated after stimulation of endogenous epinephrine with 2-deoxyglucose (50 mg/kg, i.v. over 30 min). In 4 control children plasma epinephrine increased 13 fold to 1330 ± 430 (SE) pg/ml and glucose increased by 39 ± 11 mg/dl during 60 min following 2-deoxyglucose. Glucose production, measured by primed constant infusion of 6,6-$^2H_2$-glucose, was initially 6.1 ± 1.1 mg/kg min and did not change. The increase in plasma glucose was accounted for by a decrease in glucose utilization of 2.0 ± 0.6 mg/kg min. This was not a direct effect of 2-deoxyglucose, because in 4 epinephrine deficient children plasma epinephrine and glucose did not increase . In another study 6 control and 6 epinephrine deficient children were given glucose (500 mg/kg, i.v. in 1 min) which was repeated 2 hrs after 2-deoxyglucose. In the controls the disappearance rate of glucose decreased from 2.7 ± 0.4 to 1.4 ± 0.1 %/min after 2-deoxyglucose ($p<0.01$); in the epinephrine deficient subjects the rate did not change (2.1 ± 0.3 %/min). These data indicate that in children the hyperglycemic effect of increased endogenous epinephrine is due to decreased glucose utilization.

1143 METABOLIC EFFECTS OF TREATMENT OF SYSTEMIC CARNITINE DEFICIENCY, Douglas Kerr, Susan Shurin, Kou-Yi Tserng, and Charles Hoppel; Case Western Reserve University; Rainbow Babies and Children's, Cleveland Metropolitan General, and Veterans Administration Hospitals; Cleveland, Ohio.

Twin girls were found at 3 mo to have fatty liver, transient erythroblastopenia, hypoglycemia, and cardiomyopathy. One twin died suddenly at 7 mo; autopsy showed fatty infiltration of the viscera and tissue carnitine was extremely low. In the surviving twin total carnitine was 8-12 uM in plasma, 160 uM in muscle, and 130 uM in liver, all very low. Carnitine, but not its precursor trimethylsine, was low in urine. Urinary C_6-C_{10} dicarboxylic acids were increased. At 14 mo, fasting for 10 hr resulted in lethargy and hypoglycemia. Plasma free fatty acids (FFA) were increased, while short and long chain acyl carnitines (SCA,LCA) were low (see Table). The RQ(CO_2/O_2) and disappearance rate of an i.v. glucose load (3.8 %/min) were relatively high. Treatment with l-carnitine, 50 mg/kg d, begun at 15 mo increased plasma carnitine to 75-90 uM. Muscle, liver, and cardiac function improved; mental development was normal. At 19 mo, fasting for 17 hrs was well tolerated with normalization of metabolism:

Therapy	RQ	Glucose (mg/dl)	FFA (mM)	Plasma Carnitine (uM) Free	SCA	LCA
Before	0.92	28	4.0	2	2	7
After	0.78	73	2.4	31	18	31

Treatment with l-carnitine improved oxidation of fat while fasting, and improved the prognosis of this potentially fatal illness.

1144 NEONATAL CEREBRAL ENERGY METABOLISM FOLLOWING EXTENDED MATERNAL CANINE STARVATION (MCS). R.Kliegman, E-L. Miettinen, S. Kalhan and P. Adam*. CWRU, Cleveland Metropolitan Gen Hosp., Div. of Pediatric Metab., Cleveland, OH

Eight pregnant dogs were fasted for 5 days while 6 controls were fasted overnight. After birth, pups were fasted and sacrificed at 0,3,6,9 and 24 hrs of age. Though fetal cerebral glucose (CG) values were equivalent, CG levels became lower following MCS at 3 hrs (1.7±.32vs3.7±.71μ mol/g)+. Thereafter, CG levels were equivalent. Fetal cerebral glycogen (Gly) content was unaffected by MCS however after 24 hrs of neonatal fasting and MCS Gly was lower (1.82±.09vs2.46±.24). Glucose-6-phosphate was unaltered but fructose-6-phosphate was lower at 0,6 and 9 hrs in MCS pups. Cerebral pyruvate levels were similar however lactate was lower at 3 and 6 hrs after MCS. The cytoplasmic NAD/NADH ratio was increased after MCS at 3 hrs (1394±104vs1005±146). There were no alterations of fetal or neonatal citrate levels. Malate was lower in MCS pups at 3,6 and 9 hrs while oxaloacetate was increased at 0 hrs. Aspartate levels were elevated following MCS at 3 and 6 hrs while glutamine was decreased at 3,6 and 9 hrs. Fetal levels of phosphocreatine (PC) and ATP were equivalent. However cerebral PC was depressed at 3,6 and 9 hrs, while ATP was lower at 6 and 9 hrs after MCS. The total adenine nucleotide pool, though equivalent at birth, became lower at 3,6 and 9 hrs. The cerebral energy reserve was lower in MCS pups at 3,6,9 and 24 hrs. These data suggest that neonatal canine cerebral energy metabolism has been adversely affected following MCS. Energy production in particular is most affected as ATP, PC and the total adenine nucleotide pool are diminished. *Deceased +Mean±SE

1145 AMMONIA METABOLISM OF A PATIENT WITH ORNITHINE TRANSCARBAMYLASE DEFICIENCY DETECTED BY ^{15}N TRACER METHOD. Hiroko Kodama, Osamu Nose, Shintaro Okada and Hyakuji Yabuuchi, Department of Pediatrics, Osaka University Hospital, Osaka, Japan. (Spon. by Albert B. Sabin).

Glutamine and glutamate are said to serve to remove excess of NH_4 in animals. But the detailed relationship in ammonia metabolism between NH_4 and amino acids was not known in urea cycle enzymopathies. We investigated the ammonia metabolism of a patient with OTC deficiency (an 8-year-old female) using ^{15}N tracer method. $^{15}NH_4Cl$ was administered orally to the patient (500mg) and a volunteer (1g). The ^{15}N excess ratios of amino acids and urea in the serum were examined during time course after the administration of $^{15}NH_4Cl$. The ^{15}N excess ratios of amino acids were examined in the form of the N-TFA-O butylester derivatives using gas chromato-mass spectrometry. Urea ^{15}N was assayed using an isotope ratio mass spectrometry. The incorporation of ^{15}N into urea in the patient was decreased to one forth compared to that in the control. The large amount of ^{15}N was incorporated immediately into alanine, asparagine, glutamine(α-N) and glutamate. This pattern is very significant compared to the normal control. But the incorporation of $^{15}NH_4Cl$ into another amino acids in the patient was the same as that in the control. Accordingly, we suggest that alanine and asparagine could serve to remove excess of NH_4 in patient with OTC deficiency.

	1 hr	3 hr	6 hr	( ): control
asparagine	4.1(0.1)	1.9(0.8)	1.9(0.3)	atoms % excess
alanine	7.7(0.2)	3.4(3.2)	1.0(1.6)	atoms % excess

1146 PLASMA ALKALINE PHOSPHATASE ACTIVITY, NEONATAL RICKETS. WHAT IS NORMAL? Ilya Kovar, Philip Mayne, Donald Barltrop. (Spon. by Mildred Stahlman) Department of Child Health and Chemical Pathology, Westminster Medical School, London, England.

Rickets has been recognized increasingly in preterm infants (PTI) inspite of prophylactic Vitamin D. An increased plasma alkaline phosphatase activity (PAP) may be of value in diagnosis (1) but adequate reference data are lacking. This paper reports serial determinations of PAP together with plasma calcium (Ca) and inorganic phosphorus (P) in a group of 30 consecutive PTI birthweight 1580g (±0.41), of gestational age 31 weeks (±2.54), using carefully standardized analytical techniques (2). The initial mean PAP was 857 u/l (range 180-2250) at a mean post-conceptual age of 34.4 wks (r 29-38). This contrasts with the upper limit in childhood of 825 u/l and adults 330 u/l. Subsequently 18 infants showed the characteristic increase, peak and decrease pattern in PAP previously described (2). Of this group 4 had radiological proven rickets and a mean peak PAP of 3068 u/l (±443) while the remainder (14) had a mean peak value of 1548 u/l (±194). Serial Ca and P determinations showed no significant change. The PAP was of bony origin. The data indicate that the upper normal limit of PAP in the PTI is 5 x the corresponding adult value. PAP exceeding 7.5 x the adult reference limit may be compatible with radiological detectable rickets. Anti-rachitic prophylaxis in PTI may have to be reviewed.

Ref. (1) PAP in the LBW baby, Kovar I, Mayne P. Proc. Paed. Res. Soc. Arch Dis Child, in press. (2) PAP in preterm infants. Kovar I, Mayne P. Act. Paed. Scand., in press.