ASSOCIATED MOVEMENTS IN NORMAL CHILDREN. David Benjamins and Marcel Kinsbourne, Duke University School of Medicine, Dept. of Pediatrics, Durham, North Carolina.

Changes in associated movements in normal children with age and with varying tasks were studied. In the first task, the children held dowels between the fingers of both hands. They were told to drop individual dowels. The number and position of all dowels dropped were recorded. In the second task they were to squeeze two levers together with each hand against incrementally increasing resistance. The third was to release one hand after holding the levers down with both hands. In the two latter tasks any "overflow" movement of the other hand was recorded. Associated movements, as measured by the first two tasks, decrease with increasing age. Increasing resistance to squeezing by one hand tended to produce "overflow" movement of the other hand. In right handers this was significantly more prominent when the left hand was the active one. In the third task, increasing resistance produced more overflow, but no asymmetry between the hands was found. The results suggest that increasing motor control with age represents the progressive differentiation of precise localized movements out of generalized mass movements. The level of differentiation is not invariant at a given age, but is determined by the amount of force exerted. A model to account for the asymmetry of motor overflow suggests that, whether pressure is to be exerted (not released) by the left or right hand, the motor program for the act is established initially in the left hemisphere.

THE EFFECTS OF INTRAUTERINE HYPOXIA IN EARLY THIRD TRIMESTER ON MONKEY FETUSES. A. W. Brann, Jr., J. E. Rawson, and J. Bebin, University of Mississippi, (Intro. by B.E. Batson).

Pregnant rhesus monkeys were subjected to hypoxia on the 120-125 day of pregnancy (term = 165 days). The animals were sedated with 35 mg/kg. pentobarbital, intubated and placed on controlled ventilation. A catheter was inserted into the descending aorta via the femoral artery for continuous blood pressure, heart rate, pH, and blood gas monitoring. Hypoxia was induced by ventilating mother with 10-12% O₂ mixture to obtain a PaO₂ of 20-35 mm. After the hypoxic insult, the mothers were allowed to carry to term. Delivery was by C-section with the infants resuscitated under radiant heat and cared for in an incubator.

The live born infants who survived the newborn period were raised in captivity with periodic observations. Animals were sacrificed at various stages and the perfused brains examined grossly and microscopically.

The results showed that the intrauterine asphyxia produced either fetal demise or no evidence of CNS damage on the basis of clinical observations and pathological examination. The fetal demise was associated with those mothers whose average mean arterial pressure was below 80 mm during the period of hypoxia and tended to occur in those mothers whose period of hypoxia was longer. These findings are distinctly different from those seen in term infants subjected to partial prolonged hypoxia.

THE IMPORTANCE OF LEUCINE OXIDATION IN ADULT AND DEVELOPING BRAIN. Edward R. Chaplin and Ivan Diamond, (Intro. by M. Grumbach.) Cardiovasc. Res. Inst. and Dept. Ped. and Neurol., Univ. of Calif., San Francisco.

Two important metabolic pathways for the essential branched chain amino acid leucine are incorporation into protein and oxidation to CO₂. It is commonly held that leucine in brain is utilized primarily for protein synthesis. We have obtained evidence that in brain leucine is oxidized to CO₂ at a rate which is 20 times greater than its rate of incorporation into protein. This study explores factors which affect leucine oxidation and incorporation into protein in brain. Using C¹⁴-l-leucine (0.1 mM) and rat brain slices, leucine oxidation to CO₂ and incorporation into protein is linear with time. In slices prepared from adult brain, the CO₂/protein ratio is 21.2[±]4.2. By contrast, the ratio in slices from 6 day old rats is only 0.73[±]0.03 and in minces from fetal brain only 0.33[±]0.002. These changes in leucine metabolism with development are due to changes in both oxidation and protein synthesis. The metabolic fate of leucine also appears to be altered by changes in the nutritional state of the animal. Short periods of food deprivation in 24 day old rats decreased leucine incorporation into protein by as much as 50%. No change was noted in similarly deprived adult rats. These studies indicate that when compared to protein synthesis, oxidation is the major metabolic pathway for leucine in the brain. This pattern changes dramatically with development and can be altered by starvation in young animals.

BRAIN GROWTH FOLLOWING WHEAT PROTEIN SUPPLEMENTATION. H.P. Chase and G.R. Jansen. Univ. Colo. Med. Ctr., Dept. of Ped., Denver, and Colo. State Univ., Dept. of Nutr., Ft. Collins.

The supplementation of wheat with its limiting amino acids, lysine (lys) and threonine (threo) has been shown to improve the growth of children receiving low protein diets. If supplementation also improves brain growth, it might provide a strong argument for routine amino acid addition.

In the present study, 3 pregnant rats were given one of 3 diets: A) bread only, B) bread + lys, or C) bread + lys + threo through 2 pregnancies and lactations. All litters were reduced to 8 offspring (48 pups per diet). At age 22 days, total body weights were greater (p < .001) for pups whose mothers were fed diet C compared to diet B and diet B compared to diet A. Total serum proteins were greater (p < .05) for pups fed diet C (4.5 ± 0.4 g%) compared to diets A (3.7 ± 1.2 g%) or B (3.8 ± 0.3 g%). Total brain, cerebellum, cerebrum, and brain stem weights were greater (p < .001) for offspring from diet C compared to diet B, and for diet B compared to diet A. Cellularity, as measured by total DNA, was similarly greater for all brain areas for diet C offspring compared to diets A or B (p < .001) and for diet B compared to diet A (p < .05 or less). Cell size was reduced only in the cerebellum (>B>A). Brain protein was increased in all brain areas (p < .001) for diets B and C compared to diet A. This study indicates the need for the careful neurologic and intellectual assessment of children receiving wheat supplementation to determine if improvement in these parameters might occur.

RESPONSE OF MINIMAL BRAIN DYSFUNCTION TO DIETARY MANAGEMENT A.R. Colon, (Intro. by William W. Cleveland) Dept. of Peds., U of Miami Sch of Med.

An experimental protocol was designed to treat minimal brain dysfunction (MBD) and/or motor communicative disorder by elimination of common food allergens. Patients considered for the protocol received social, psychological, and medical evaluations, together with buccal smear, urine aminoacid, Guthrie, and dermatoglyphics screens. The criteria for entering this protocol were the diagnosis of MBD and/or speech delay together with physical signs of allergy and/or a family history of allergy. Twelve children ranging in ages from 4 to 9 years were placed on strict milk, wheat, corn, and chocolate elimination diets and followed for a period of 3 months. Independent observation by several clinicians and teachers corroborated that ten of the children registered significant improvements. All children demonstrated a substantial diminution of hyperactivity and two boys who had been on high doses of methylphenidate and thioridazine were able to suspend medication within one week of diet initiation. All children demonstrated substantial improvement in expressive skills within 18 to 20 days of diet initiation. Speech became more moderate in speed, of greater clarity, and proper syntax. Two boys who had violent components to their MBD became more passive. After definitive improvement was registered, the children were rechallenged and all demonstrated regression to prior problems within one to two days. The most common offending agents were milk and wheat. Possible food allergy should be explored in children with MBD and motor speech disorders.

SPINAL EVOKED RESPONSE IN THE PEDIATRIC AGE GROUP. Joan B. Cracco, Leonard Graziani, Gary Carpenter, and Roger Q. Cracco. Depts. of Neurol. and Ped., SUNY-Downstate Med. Center, Brooklyn, N.Y., Jefferson Med. College, Phila., Pa.

Summated responses to peroneal nerve stimulation were recorded from surface electrodes placed over the lumbar, thoracic, and cervical spine of 50 normal infants and children. These potentials progressively increased in latency rostrally. In bipolar leads over the cauda equina and rostral spinal cord initially positive triphasic potentials were recorded. Leads over the caudal spinal cord yielded larger, more complex potentials. The conduction velocity of the response from lumbar to cervical recording sites was about 25 meters/sec. in the newborn; it progressively increased with age reaching adult values (65M/sec.) after 3 years.

In 2 children with spinal cord lesions clinically judged to be complete, responses caudal to the lesion were normal; leads rostral to the lesion yielded no response. In 1 child with a clinically asymmetrical cord lesion responses were normal with stimulation of the unaffected leg; stimulation of the affected leg yielded responses only caudal to the lesion. In 2 children with diabetes mellitus conduction velocities from lumbar to cervical recording locations were slow.

Although preliminary, these results suggest that this method may be of value in the neurological assessment of infants and children.