skin (wrist, ankle, back) and lesions and weekly urinalyses were done on 38 children in 6 families. One month later a 43-year-old mother, her 5-year-old twins, and an unrelated child, not in the study, had onset of acute nephritis (AGN) within a 14-day period. Findings included hematuria (4/4), proteinuria (3/4), hypertension (3/4), low serum complement and C'3 (4/4), and elevated streptococcal antibodies (4/4). All exhibited impetigo, and lesions in 3 of 3 patients cultured before treatment yielded type 57 streptococci. Throat cultures were negative and no pharyngitis preceded onset. Latent periods for the twins were 19 and 22 days. Type 57 streptococci reappeared on the normal skin of both twins after penicillin therapy, resulting in recurrence of lesions in one. Over a 10-week period 704 cultures from the twins and 4 siblings yielded 297 (42%) positive for group A streptococcus, of which 294 were M-57. Lesions accounted for 42%, normal skin sites for 47% and nose and throat for 11%. Normal skin sites were positive for the M-57 strain in 4 of 6 children before development of lesions (mean 8 days). This strain was found in the respiratory tract (5 of 6) only after its recovery from normal skin and/or lesions. Impetigo with type 57 but no AGN occurred in 16 other children. This is the first report of the occurrence of type 57 nephritis in this country. Prospective studies document the skin as the initial site of infection in these patients with AGN. The nephritogenic strain was found on normal skin prior to the development of impetigo and reappeared after treatment.

54 *Kinetics of Peritoneal Dialysis in Children.* A. B. GRUSKIN and M. L. COTE, Dep. of Ped., Temple Univ. Sch. of Med. and St. Christopher's Hosp. for Children, Philadelphia, Pa. (introduced by V. H. Auerbach).

Peritoneal dialysis was performed in 7 uremic children (4 months to 18 years). Rates of diffusion of Na, K, Cl, PO_4, urea, creatinine, and uric acid were similar to adult diffusion curves. With the exception of uric acid diffusion, no age related differences were found. Peritoneal urea and creatinine clearances paralleled the rate of exchange of dialysis fluid. Actual urea clearance values were within the range of clearance values obtained in adults dialysed at similar rates. Data to compare creatinine clearances in adults to children is not available over the range of dialysis volumes utilized in their studies. Estimation of urea production based on the average daily rise in BUN revealed similar production rates per kg body weight in all ages.

These studies demonstrate no intrinsic age-related differences in the kinetics of peritoneal dialysis. Thus, there is no necessity to correct peritoneal clearances to either 70 kg body weight or 1.73 M^2, in order to compare children to adults. The greater 'efficiency' of peritoneal dialysis in children can be ascribed to a smaller body pool size in children relative to adults. Therefore, at a give clearance rate, the amount of material in the pool diminishes at a faster rate in children than in adults. Moreover, since peritoneal clearance increases as the rate of dialysis increases, no single clearance value for a given individual exists but rather a family of values related to the rate of dialysis. (Supported in part by NIH grants RR-5624. HD-2870 and FR-75.)

55 *Calorie Deficiency in Children on Chronic Hemodialysis and Some Effects of Calorie Supplements.* JAMES M. SIMMONS, DAVID M. PERIN, DONALD E. POTTER and MALCOLM A. HOLLIDAY. Dept. of Ped., Univ. of California San Francisco Med. Center, and San Francisco Gen. Hosp., San Francisco, Calif.

Uremic children, including those on chronic hemodialysis, often exhibit mild lassitude, are wasted, and do not grow well. The absolute volumes of the total body water and extracellular fluid compartments of children compared with adults are small, necessitating strict dietary limitations of protein, sodium potassium and water. Observed cell mass is low and extracellular volume is high, confirming clinical impression of wasting and salt retention. Food record analyses of 10 children on hemodialysis 3 times weekly indicate that within the dietary restrictions calorie intakes were approximately 50% of ideal in the 5 small children (< 110 cm in height and < 6 years old), and 70% of ideal in the 5 larger children (> 125 cm and > 10 years old). Daily calorie supplements of from 40–55% of ideal intake were taken by 3 of the small children and 2 of the larger children, increasing their total calorie intake to 75–95% ideal. The heights of 9 of the children were measured monthly for no less than 4 months, and growth velocity computed from this Growth velocity was compared to the 50th percentiles of growth increments in normal children of the same age and was expressed as a fraction of normal growth velocity for the period of observation. The 5 children given calorie supplements all grew at 0.9–1.7 of normal and the 4 non-supplemented children grew at 0.1–0.4 of normal. Protein intakes were all above recommended. These findings provide tentative evidence that calorie deficiency may be a factor in uremic growth failure, and that in the absence of other complications, some growth is possible when high density calorie supplements are provided.

56 *Growth After Renal Transplantation in Children.* RICHARD N. FINE, CARL M. GRUSHKIN, BARBARA M. KORSCH and ELLIN LIEBERMAN, Childrens Hosp. of Los Angeles and Univ. of So. Calif. Sch. of Med.

Growth (3–16 cm) has occurred in only 6 of 19 renal allograft recipients, aged 2 to 18 years, who have survived 6 to 36 months post-transplantation. At the time of transplantation 9 of 19 children were < 10th percentile in height for their chronologic age; 5 were > 10th percentile and 5 were > 50th percentile. Growth has occurred in 5 of 6 children < 12 years of age at the time of transplantation and in only 1 of 13 > 12 years at transplantation. Eight of 12 children > 12 years who did not grow after transplantation had fused distal femoral and/or proximal tibial epiphyses at the time of transplantation. The daily dose of prednisone was < 15 mg at the time of growth in 5 of the 6 children who grew, whereas, all the children who did not grow were receiving > 15 mg daily. No spectacular (> 4 cm) catch-up growth occurred during the first 6 months after transplantation. The child who has survived the longest and has grown 16 cm in 36 months, required < 8 mg of prednisone daily for the past 33 months. One 7 ½-year-old boy grew 4 cm during the first 6 months after transplantation while receiving 10 mg of prednisone daily; chronic rejection occurred and no further growth has occurred during the next 18 months. Menstruation has occurred in 4 of 6 adolescent girls 4 to 12 months after transplantation; all had menses prior to transplantation. The lack of growth post-renal homotransplantation is re-

lated to the dosage of prednisone used for immunosuppression, the absence of growth potential at the time of transplantation and the development of chronic rejection.

57 *Nocturnal Enuresis: Correlation with Bacteriuria, Proteinuria and Dysuria.* WARREN F. DODGE, EVELYN F. WEST and LUTHER B. TRAVIS, Univ. of Texas Med. Branch, Dept. of Ped., Galveston, Texas.

Nocturnal enuresis has troubled parents and physicians at least since the 16th century. Theories as to its cause and cure have varied with the fad and fashion of the times and, until recent years, most studies have been remarkable principally for sampling bias and lack of controls. Myths which have been recently discarded include those relating it to deep sleep, lack of early toilet training, spina bifida occulta, low intelligence or common behavior problems. The present investigations of renal disease in school children presented a unique opportunity to evaluate the role of abnormal urinary findings in enuretic children and their non-enuretic classmates as well as re-examination of its association with sex, ethnic group, socio-economic level, birth order and mother's level of education and marital status.

The prevalence of current bed-wetting for 6- to 10-year-old children was noted to be 18% for girls and 24% for boys ($p < 0.001$); and to differ significantly by ethnic group for girls but not for boys; by socio-economic level and family size for boys but not for girls; and for both sexes by mother's education but not by the other demographic characteristics examined. For girls, prevalence of significant bacteriuria increased in association with both presence and frequency of current enuresis ($p < 0.005$) and past complaint of dysuria ($p < 0.025$). No significant difference for prevalence of proteinuria in boys or girls was noted when analyzed by current enuresis or past complaint of dysuria.

58 *Measurement of Renal Function by Radionuclide Disappearance Curves.* GERALDINE I. SILKALNS, DONALD L. JECK, ADRIAN SPITZER, CHESTER M. EDELMANN, Jr. and M. DONALD BLAUFOX, Albert Einstein Coll. of Med., Dept. of Ped. and Radiol., Bronx, New York.

Reports based on adult patients suggest that either GFR or RPF can be measured accurately from the rate of disappearance of a radionuclide from the blood following a single intravenous injection. Although the advantage of avoiding urine collections in children is obvious, few attempts have been made to validate the method in this age group. Inulin, creatinine, and PAH clearances were performed and compared with simultaneous measurements obtained from iothalamate ^{125}I or orthoiodohippurate ^{131}I disappearance curves calculated as clearances by compartmental analysis (open, two compartment system). The results obtained in 31 patients ranging in age from 18 months to 16 years, with levels of renal function as estimated by C_{IN} between 20 and 158 ml/min/1.73 m², were:

		n	ratio	r
^{125}I vs.	Inulin	12	0.96	0.93
	Creatinine	16	1.05	0.94
^{131}I vs.	PAH	6	0.81	0.97

No differences attributable to age or level of function were observed. It appears, therefore, that GFR or RPF can be estimated validly in children using the disappearance of a radionuclide from the blood.

59 *Hypersarcosinemia: New Observations.* F. H. GLORIEUX, F. MOHYUDDIN, D. T. WHELAN and C. R. SCRIVER, McGill Univ., Children's Hosp. Res Inst., Montreal.

Sarcosinuria was found in a 10-year-old French-Canadian boy with normal IQ, small stature (< 3rd percentile) and bilateral contractures of lower limb muscles. Coexistent hypersarcosinemia (0.18–0.34 μM; normal < 0.02 μM) was unmodified by large supplements of folic acid, the coenzyme for the presumably abnormal apoenzyme, sarcosine dehydrogenase. It is appropriate to screen urine for this trait, since sarcosine is cleared rapidly by kidney (8–35 ml/min/1.73 m²). The Tm sarcosine is about 160 μmoles/min/1.73 m² in the 'blocked catabolic mutant'. Sarcosine appears to interact weakly with a system shared by imino-acids and glycine. Sarcosine loading (100 mg/kg p.o.) produced 3 different responses in subjects. Normal: rapid disappearance of sarcosine from plasma ($t\,½ \sim 30$ min) with a fall in plasma glycine. Proband: greatly delayed disappearance of plasma sarcosine ($t\,½ \sim 153$ min) with no change in plasma glycine. Parents of proband: initial plasma sarcosine concentration normal but delayed disappearance of plasma sarcosine ($t\,½ \sim 68$ min) with a rising plasma glycine level. These findings suggest the trait is autosomal recessive in this pedigree. We were unable to detect sarcosine dehydrogenase activity in normal skin fibroblasts sub-cultured for 14 regenerations; consequently lack of activity in the proband's fibroblasts is of no significance. (Research supported by grants from Quebec MRC and MRC, Canada.)

60 *Studies on Alkaline Phosphatase in Hypophosphatasia.* YOUNG J. KIM and LYMAN A. PAGE, Dept. of Ped., Stanford Univ. Sch. of Med.

Central to an understanding of the pathogenesis of hypophosphatasia is the question of whether or not there is a deficiency of alkaline phosphatase (AP) activity in bone. A recently reported patient with the full syndrome had consistently normal total AP activity in serum and the suggestion was made that deficiency of phosphatase was not of primary pathogenic importance [SCRIVER and CAMERON, New Engl. J. Med. *281:* 684, 1969].

We have studied two children who have the typical osseous and dental lesions of hypophosphatasia, markedly increased excretion of phosphoethanolamine, and total activity of serum AP in the normal adult range. AP was undetectable histochemically in leukocytes of the patients and was normal in family members. Extraction of the patients' leukocytes yielded extremely low activity. Electrophoresis of the patients' sera on polyacrylamide gel consistently yielded a single major band of phosphatase activity with a rate of migration intermediate between the rates of the two fast bands seen in normal sera. The two fast bands in normal sera have been identified as hepatic and osseous AP by comparison with extracts of tissues. Although the dominant band in the patients appeared to migrate differently from any seen in normal sera, there were no unusual isozyme patterns of AP from sera and leukocytes of family members. Studies of sensitivities of various AP to heat, *l*-phenylalanine, and urea did