features of lupus glomerulonephritis with azathioprine-prednisone therapy. In addition, following suppression of the active proliferative lesion a new finding of membranous transformation was found.

Split products of fibrin in renal disease. ROSEMARY ANANIA and GEORGE A. RICHARD. *Univ. Fla. Coll. Med., Gainesville, Fla.* (Intr. by G. L. Schiebler).

Split Products of Fibrin (SPF) were determined by the tanned red-cell hemagglutination inhibition assay in 331 patients with various types of renal disease. The study included 77 sex-age matched controls. The mean value for SPF in the control group was 4.55 ± 2.46 S. D.

SPF were elevated in the Hemolytic-Uremic Syndrome (1/1), Lupus Erythematosis (SLE) (8/10), Steroid Resistant Nephrosis (SRN) (7/13), Acute Glomerulonephritis (AGN) (13/26), Steroid Dependent Nephrosis (SDN) (8/32), Renal Vein Thrombosis (3/3), Hereditary Nephritis (4/15), Active Anaphylactoid Purpura (2/3), and Hypocomplementaremic Nephritis (1/3).

To a lesser degree, the SPF were elevated in Steroid Sensitive Nephrosis (1/14), Idiopathic Hematuria (3/23), Post Acute Anaphylactoid Purpura (1/14), Post Acute Glomerulonephritis (2/20), Acute Urinary Tract Infection (2/18), and Post Urinary Tract Infection (2/81).

No elevation in the SPF was noted in Orthostatic Proteinuria (16), Idiopathic-Hypertension (15), Single Kidney (15), Hydronephrosis (9), and Chronic Glomerulonephritis without Azotemia (14).

A depressed Beta 1 C/Beta 1 A was closely correlated with the SPF in SLE (9/10) and AGN (24/26). Positive immunofluorescent staining of renal biopsy tissue for at least one immunoglobin was correlated with an elevated SPF in SRN (6), SLE (5), AGN (5), and SDN (3). Immunoflourescent stains for fibrinogen were seldom positive. These data indicate that SPF are not diagnostic, and may be elevated in several types of renal disease.

Antigen identification in Goodpasture's syndrome. RAWLE M. MCINTOSH and WILLIAM R. GRISWOLD (Intr. by Fred G. Smith). *UCLA, Los Angeles, Calif.*

Although there is unquestionable evidence that an anti-basement membrane antibody is involved in the development of the renal lesion in Goodpasture's syndrome the specific antigen has not been clearly identified. In an attempt to clarify this problem serum and antibody eluted from a patient with Goodpasture's syndrome was studied by fixation to normal human glomerular basement membrane (GBM) before and after treatment with collagenase, neuraminidase and 8 M urea. Controls for buffer, pH and temperature were employed. Absorption studies and spleen cell and lymphocyte transformation studies using GBM glycoproteins prepared by method of Kefalides were also performed.

Double layer immunofluorescent studies demonstrated that both serum and eluate fixed to the GBM of untreated normal human kidney and normal human kidney treated with 8 M urea, and neuraminidase. However they did not fix to collagenase treated kidney. This suggests that the collagen like glycoprotein rather than the non-collagenous or sialic acid rich glycoprotein is the antigen which induces autoimmune nephritis in Goodpasture's syndrome. Although cell transformation studies were inconclusive this finding was confirmed by absorption studies.

Nature of kidney-bound antibody in the renal disease of bacterial endocarditis. ROBERT L. LEVY and RICHARD HONG. *Univ. of Wisconsin Med. Ctr., Madison, Wis.*

It is thought that the renal disease which sometimes accompanies bacterial endocarditis is due to antigen-antibody complex mechanisms because of the demonstration of immunoglobulin and complement in histologic specimens; however, the specificity of the antibody is not known. We have attempted to further define the pathogenetic mechanism by elution of kidney-bound protein and investigation of its properties. A patient with no previous renal disease who died of bacterial endocarditis and renal failure was studied. He presented with bacterial endocarditis accompanied by elevations of serum immunoglobulins and ultimately developed a monoclonal IgM. Light microscope examination of the kidney revealed segmental nephritis; fluorescent staining showed deposits of the 3 major classes of immunoglobulins and complement along the glomerular basement membrane (GBM) in a "lumpy-bumpy" distribution. Protein was eluted from the *post-mortem* kidney and radiolabeled with I^{125}. Radioautographic studies showed the presence of IgG and IgA. The eluted antibody was shown to selectively combine with bacteria (formalin fixed) cultured from the patient *ante-mortem*. There was also evidence for anti-GBM antibody activity of the eluate. The eluted antibody was not anti-antibody (i.e. did not selectively combine with IgG coated human red blood cells). The demonstration in the kidney eluate of antibacterial antibody specific for the organism cultured from the patient strongly supports the concept of antigen-antibody complex disease in the pathogenesis of the nephritis which accompanies SBE.

Tamm-Horsfall glycoproteinuria: An early index of human renal allograft rejection. ROBERT H. SCHWARTZ, ALLYN G. MAY, ERIC A. SCHENK, RICHARD B. FREEMAN, MICHAEL F. BRYSON, and JAN VAN ESS. *Univ. of Rochester Sch. of Med., Rochester, N. Y.* (Intr. by Douglas Johnstone).

Urinary glycoprotein of Tamm and Horsfall (T & H) is a renal substance found in the ascending limb of the loop of Henle and the distal convoluted tubule. Excretion can be measured by 0.58 M NaCl precipitation. Normal excretion = (1.7–2.1 mg/hr/1.73 sq. m. body surface area). Increased excretion occurs with dichromate-induced renal tubular damage in rats. This observation suggested that monitoring T & H excretion might provide an early index of kidney damage in human allograft rejection. Eight patients (4 males, 4 females. Age 9–49 years) were studied during the first 37–120 days post-transplantation. Seven rejection episodes in 5 patients were diagnosed clinically. In each instance T & H excretion exceeded 25 mg/24 hours (½ upper limit of normal adult excretion = normal excretion of one kidney) prior to the onset of clinical rejection. The interval between onset of increased excretion and clinical rejection was between 4 and 14 days (mean = 9 days). Peak excretion rates up to 110 mg/24 hours occurred. High excretion rates in chronic rejection (1 patient) and in glomerulonephritis of the transplanted kidney (1 patient) were also observed. In these instances T & H was primarily in the form of insoluble urinary casts. Since anti-rejection measures are likely to be more effective when the diagnosis of a rejection episode is early, T & H measurement has a practical clinical value.

The "swan-neck" lesion in childhood cystinosis. CHARLES P. MAHONEY, GARY E. STRIKER, and GEORGE H. FETTERMAN. *Univ. Wash. Med. Sch., Seattle; Children's Hosp., Pittsburgh, Pa.* (Intr. by Robert P. Igo).

Ever since the demonstration of the "swan-neck" lesion (shortening and narrowing of the neck of the proximal renal tubule) in cystinosis by nephron microdissection, it has been a source of speculation. The prenatal or postnatal onset of the lesion and its role in the pathogenesis of cystine storage have been debated. To study this problem, renal function tests, kidney biopsies, and renal tissue amino acid analyses were performed on two cystinotic infants at six and 12 months of age. At six months, the infants showed a generalized aminoaciduria, proteinuria and glucosuria but not hypophosphatemia, hypokalemia or polyuria; and they were pitressin responsive. Renal biopsies did not show the "swan-neck" lesion by light microscopy or nephron microdissection. However, electron microscopy revealed vacuolization and previously undescribed ultramicroscopic crystals in the epithelial cells of the neck region of the proximal tubule. The unbound cystine concentration in the kidney biopsies was three-fold greater than in controls. At 12 months of age the infants exhibited hypokalemia, hypophosphatemia, polyuria and subnormal pitressin responses. Typical "swan-neck" lesions were demonstrated by nephron microdissection. The unbound cystine concentration was ten times normal levels. These studies indicate the "swan-neck" lesion in cystinosis is an acquired rather than congenital defect and it follows rather than precedes cystine storage.

Paramedical personnel in evaluating children with renal disease. DEBBIE DEAN, BARBARA PETERS, and GEORGE A. RICHARD. *Univ. Fla. Coll. Med., Gainesville, Fla.* (Intr. by G. L. Schiebler).

During the past four years we have utilized the Clinical Laboratory Patient Service Assistant to help us evaluate children with renal disease. She arranges, conducts and calculates all studies, except for performing the renal biopsy. This has permitted us to evaluate 450 children with renal disease, including 2,000 complete series of renal function studies and 300 renal biopsies.

Previously, this diagnostic work-up required 5.5 hospital days. The Clinical Lab. Patient Service Assistant has permitted us to evaluate each patient in the outpatient dept. in 7 hours (overnight hospitalization required for renal biopsy). The studies include two 12-hour urine collections in the recumbent and ambulatory positions (done prior to coming to the hospital), concentrating and diluting capacity, urine culture and urinalysis, creatinine and urea clearance, tubular resorption of phosphate, blood gases, appropriate serological studies and blood chemistries, and a water load test. An intravenous pyelogram and voiding cystogram can be done before and after the studies are completed, respectively.

The Clinical Laboratory Patient Service Assistant has permitted us to decrease hospitalization time, decrease expenses to the family for lodging, decrease cost to the insurance carrier and the time of confinement in the hospital. She represents a familiar friend to the children with renal disease whom we follow.

Body composition in uremic children and the effects of chronic hemodialysis. CAROL J. WILSON, DONALD E. POTTER, JEAN L. HARRAH, MACARIO BUZON, and MALCOLM A. HOLLIDAY. *Univ. of Calif., San Francisco, and San Francisco Gen. Hosp., Calif.*

Chronically uremic children seldom grow normally; growth while on extended hemodialysis is usually not adequate. In order to delineate more precisely the components of this growth failure and the changes in body composition with chronic dialysis, 46 simultaneous measurements of total body water and of extracellular water (ECW) were determined in 24 children aged 2–17 yrs. The data were divided into two groups: uremic children dialyzed <3 mos and those dialyzed >6 mos. Published data of Cheek for healthy children of similar age were used for comparison. In the uremic children body weight (BW) and height (Ht) were below normal for age. ECW was significantly higher in both groups for Ht and BW, and its fluctuations tended to confuse interpretation of weight changes. In both groups, cell mass (CM), derived from calculated intracellular water, was low in relation to BW and Ht. While on dialysis, Ht, BW, and CM tended to increase; CM as per cent BW did not change, and increases in CM with Ht were less rapid than in normals. Correlation between changes in CM with change in Ht was low. Nutritional status was a factor in rate of increase in CM and in Ht. Although normal linear growth velocity may be observed on dialysis, catch-up growth is uncommon. Growth occurred without restoration of the normal relationship of CM to Ht. These studies have proved useful in defining the character of body composition in uremic children and in evaluating changes in body composition in individual patients with time, variations in caloric intake, and with growth.

GASTROENTEROLOGY AND ENZYMOLOGY

Growth of the small intestine in IUGR and normal rat pups. M. K. YOUNOSZAI (Intr. by Samuel J. Fomon). *Univ. of Iowa Coll. of Med., Univ. Hosp., Iowa City, Iowa.*

Small intestinal growth was compared in intra-uterine growth-retarded (IUGR) pups, obtained from rats fed a diet containing 6% protein during pregnancy and normal (N) control pups. All pups were delivered by C-section at term and nursed with normal foster mothers (7–9 pups/litter). At birth mean body weight in IUGR (27 pups) was 4.3g and in normals (28 pups) 6.3g. Mean small intestinal weight (mg) in IUGR pups was less than in normals (IUGR = 105, N = 140, $p < 0.01$). The intestinal length (cm) was also shorter in the IUGR pups (IUGR = 19.7, N = 21.1, $p < 0.01$). The intestinal hypotrophy (relative low weight/cm) in IUGR pups was more marked in its distal one-third than in the more promixal segments. By age 8 days body weight (16g) and intestinal weight (470mg) were similar in the two groups. However, in the IUGR group hypotrophy was still noted in the distal one-third of the intestine. At this age intestinal length was greater in IUGR pups than in normals (IUGR = 36.4, N = 34.1, $p < 0.05$). Intestinal tissue water and protein contents were similar in IUGR pups and normals. However, protein content (% wet wt.) in the middle one third of the intestine was higher at 8 days than at birth (IUGR, N: 0 days = 14.5, 14.6, 8 days = 16.8, 16.2; $p < 0.01$).

Thus the relatively more rapid body growth in IUGR pups was associated with a similar rapid growth of the small intestine which was more prominent in the proximal than in the distal segments. The higher protein content in the mid-gut at 8 days compared to that at birth suggests a better functional capability of this segment at 8 days than at birth.

Mechanism of antigen absorption from the small intestine. W. ALLAN WALKER, RICHARD CORNELL, LAURA M. DAVENPORT and KURT J. ISSELBACHER. *Harvard Med. Sch., Mass. Gen. Hosp., Boston, Mass.* (Intr. by J. Warshaw).

Evidence exists that the intestine is permeable to antigenic macromolecules. The mechanism of absorption and factors af-