subjects and 10 asthmatics as controls. Instantaneous changes in lung volume, air flow and esophageal pressure were measured and simultaneous flow-volume and flow-pressure curves recorded. Striking differences were noted between asthma and CF: 1. below 95 % of the total lung capacity, pressures in excess of those required to produce maximum expiratory flow rates depressed flow in CF but not in asthma; 2. forced expiration was associated with a transient reversal in the slope of the single breath nitrogen curve in CF and not in asthma. Cineradiographic evidence of collapse of bronchiectatic airways during forced expiration and cough with retention of contrast medium distal to the collapse was provided. It is concluded that in CF: 1. airway obstruction is less uniform and involves larger airways than in asthma; 2. increased expiratory pressure collapses larger airways. This study emphasizes the necessity of combining postural drainage with liquefaction of bronchial secretions in CF. (SPR)

8 *Influence of Intracardiac Shunting on Left Ventricular Muscle Mechanics in Tetralogy of Fallot.* MOUAZZA M. JARMAKANI*, MADISON S. SPACH, SAM B. EDWARDS*, RAMON V. CANENT, Jr.*, M. PAUL CAPP*, VISHNU JAIN* and ROGER C. BARR*, Duke University Medical Center, Durham, N.C.

The need continues for better quantitation of left ventricular function. Previous studies have indicated the nature of intracardiac shunting in tetralogy. Simultaneously recorded left ventricular pressure and biplane cines were analyzed to construct continuous left ventricular function curves in 'normales' and in tetralogy patients. The original measurements throughout 3–6 consecutive beats were analyzed by a digital computer with numerical and graphic outputs of: LV pressure, LV volume, rate of volume change (flow), LV mid-circumference and its instantaneous velocity, tension at the endocardial surface, work and power. The force-velocity-length and pressure-volume-flow relationships of the left ventricle were depicted in three dimensional plots during the active state (systole) of the LV muscle for normals and tetralogy patients. In normals, maximum flow and peak velocity of shortening occurred at high tension levels in mid-systole; whereas in tetralogy, peak flow and velocity occurred during 'isovolumic' contraction at lower tensions. The continuous' function curves' were markedly abnormal in tetralogy with peak rate of flow and of circumference shortening occurring prior to opening of the aortic valve. The results indicate that the left ventricle in tetralogy functions more efficiently than normal and unloads 15 to 40 percent of its stroke volume during isovolumic contraction. This results in lower than normal stroke work values. (SPR)

9 *Studies of Left Ventricular Function in Children by Increasing Peripheral Resistance with Angiotensin.* L. JEROME KROVETZ, THOMAS G. MCLOUGHLIN* and GEROLD L. SCHIEBLER, Univ. Florida Col. of Med., Gainesville, Fla.

While satisfactory catheterization techniques for detection of shunts and abnormal movements of heart valves are available, assessment of myocardial function remains difficult. In normal human subjects angiotensin, produces systemic vasoconstriction which results in increased left ventricular stroke work (LVSW). Ross and BRAUNWALD studied 18 patients using graded infusions of angiotensin and showed a good correlation of clinical severity and LV function curves. To learn the value of this technique in children, LV function was assessed using graded infusions of angiotensin (2 to 3.8 mcg/min) in ten normals (age range 5 to 15 years) and 21 patients with LV abnormalities (age range 2 months to 15 years). The best method of graphing this data is to plot LV end-diastolic pressure versus the ratio of calculated to predicted LVSW. Predicted LVSW (in newton-meters), based on 24 normal children, is given by the formula: $= 0.745 + 0.0133$ wt (kg) $- 0.00243$ ht (cm) $- 0.00384 \times$ heart rate. All nine patients with primary LV endocardial fibroelastosis had abnormal LV function curves. Four of eight patients with Hunter-Hurler syndrome had depressed LV function as did two of three patients with idiopathic myocardial hypertrophy. One 2-month-old male with cardiac glycogenosis had a markedly depressed LV function curve, LV stroke work decreasing with increasing LV end-diastolic pressure.

Of the 16 abnormal LV function curves, only 7 had resting elevated LV enddiastolic pressures. An additional 5 had low resting LVSW ranging from 17 to 43 % of predicted. Thus, abnormal LV function was detected only following angiotensin infusion in one-fourth of these patients. (SPR)

10 *Neurohumoral Mechanisms of Ventricular Tachycardia in Experimental Heart Block.* HERBERT D. RUTTENBERG*, ROGER A. HURWITZ* and IWAO KANDA*, UCLA Sch. of Med., Los Angeles, Cal. (introduced by Leonard M. Linde).

The purpose of this study was to investigate the pathways by which electrical stimulation of the hypothalamus produces paroxysmal ventricular tachycardia (PVT) in dogs with chronic complete atrioventricular (A-V) block. Left thoracotomy was performed in 20 dogs to pass wire loops around the stellate ganglion and ansa subcalvia (cardiac nerves). Two weeks later, right thoracotomy was performed for placement of wires around the right cardiac nerves for production of complete A-V block by transatrial injection of formalin into the A-V node. One week later, under chloralose anesthesia, monopolar electrodes were placed into the lateral hypothalamic areas for 20 sec stimulations of 20 V, 1 msec, 50 cps stimulations. Aortic pressures (AP), left ventricular pressures (LVP) and ECG were recorded. In all 20 dogs, stimulation in the posterolateral hypothalamus (fields of Forel) caused an immediate depressor response followed by an increase in AP (systolic, diastolic and pulse pressure) with moderate increase in ventricular rate (VR). In 8 of these dogs, the pressure rise was followed by PVT with an average latency of 23 sec, a change in VR from 56 (resting VR) to 140, and a change in site of pacemaker. Production of PVT was not prevented by bilateral ablation of cardiac nerves. The long latent period suggested a humoral pathway. Administration of epinephrine HCl 5 to 10 μg/kg body weight produced PVT in 10 of 13 dogs with a latent period of 25 sec. This humorally-induced PVT was not prevented by ablation of cardiac nerves or α-adrenergic receptor blockade but was blocked by β-adrenergic receptor blockade. These studies suggest that adrenergic humoral mediation is a major pathway for production of PVT in heart block. (SPR)

11 *The Effect of Human Growth Hormone (HGH) on Red Cell Glucose Metabolism.* FRANK A. OSKI and ALLEN ROOT*, Dept. of Pediatrics, Univ. of Pa. Sch. of Med., Philadelphia, Pa.

HGH has been found to inhibit glucose consumption in the intact erythrocyte and in hemolysates. The inhibition is dose dependent and species specific. Inhibition of glucose consumption is associated with a rise in red cell levels of glucose-6-phosphate and fructose-6-phosphate and with an increase in the % of the glucose metabolized via the pentose pathway. These effects suggest that HGH may alter red cell glucose consumption by inhibition of phosphofructokinase activity.

Incubation of crude HGH in a final concentration of 128 μg/ml produced a 55.1±4.7 % decrease in red cell glucose consumption in 21 normal adults. Red cells from premature infants showed a 37.5 % inhibition, term infants 45.9 %, children 3 months to 12 years 51.2 %, and individuals over age 65 only 17.0 %. Five patients with hypopituitarism responded in a normal fashion—52.4 % inhibition while 3 patients of short stature with normal levels of HGH showed responses of only 19.9, 18.2 and 12.3 % and one of these individuals showed no growth response after 3 months of HGH therapy. The decreased inhibitory effect observed in the erythrocytes of premature infants, the aged, and in certain individuals with short stature may reflect end organ unresponsiveness. This simple *in vitro* test may be useful in predicting HGH responsiveness and in further defining the mechanism of action of this hormone in a cell that metabolizes only carbohydrates. (SPR)

12 *Thyroid Hypocalcemic Factor (Thyrocalcitonin) in Children.* CONSTANTINE S. ANAST, RICHARD A. GUTHRIE* and JOAN A. FOLWELL*, Univ. of Missouri, Sch. of Med., Columbia, Mo.

Previous studies indicated that thyrocalcitonin (TCT), the thyroid hypocalcemic factor, played an important role in calcium homeostasis in animals. In the present study the response to calcium loads was compared in normal and in thyroid-treated athyrotic children in an effort to obtain physiologic evidence for the secretion of a hypocalcemic factor (TCT) by the thyroid gland of children. Calcium, in a dose of 10 mg/kg, was administered i.v. at a constant rate over a 3-hour period. Periodic blood samples obtained before, during and after the infusion were analyzed for calcium, magnesium and phosphorus. Although the baseline serum calcium levels were similar in the athyrotic and normal children, there was a significant quantitative difference in the response of these two groups to calcium loads. Substantially greater increases in serum calcium levels were observed in most of the athyrotic children. The mean increase in serum calcium mid-way and at the end of the infusion was twice as great in the athyrotic as in the normal children. A similar difference was still detected 30 and 60 minutes after the end of the infusion. On the other hand, in two cretins with intact thyroid glands (defect in organification of iodine) and in children with thyrotoxic goiters, the response to calcium loads was similar to that observed in the normal children. The serum magnesium levels remained constant in all of the children studied and no consistent changes were observed in the serum phosphorus levels.

This study provides evidence for the secretion of a thyroid hypocalcemic factor (TCT) in children and indicates the nature of its role in maintaining calcium homeostasis. (SPR)

13 *Plasma 17-Ketosteroid Levels During Adolescence.* ROBERT L. ROSENFIELD*, A. ANNE PATTI* and WALTER R. EBERLEIN, Children's Hospital of Philadelphia, Pa.

To study adrenal maturation at adolescence, pooled blood was collected from prepubertal males, age 6–9 years, and from pubertal boys, age 12–14 years. Plasma steroid sulfates were extracted in the form of methyl green salts, which were solvolyzed and then successively subjected to purification by means of the Girard T-reagent, digitonin, thin-layer chromatography, and gas-liquid chromatography (free steroid, acetate, trimethylsilyl ether) on the phases SE-52 and QF-1. In the 6–9 year-old pool the level of androsterone sulfate (AS), corrected for 80 % recovery, was 8.6 μg %; and of dehydroepiandrosterone sulfate (DHAS), corrected for 65 % recovery, 13.5 μg %. In the 12–14 year-old male pool the level of AS was 56.7 μg % and of DHAS 80.3 μg %. In adult males, studied for comparison, plasma levels of AS were 40–53 μg % and of DHAS 89–209 μg %. No etiocholanolone sulfate or free 17-ketosteroid was detected.

The dramatic rise of plasma DHAS and AS during adolescence appears to occur simultaneously wih beginning testicular maturation. Since ACTH secretion is not known to change at the time of adolescence, these observations suggest that beginning adrenal production of DHAS at this age is not directly related to ACTH stimulation, but rather that it is promoted by some other trophic factor. (SPR)

14 *Urinary Acid Mucopolysaccharides in Myxedema.* J. KENNETH HERD*, State Univ. of N.Y. at Buffalo, Sch. of Med., Buffalo, N.Y. (introduced by Sumner J. Yaffe).

Changes of the skin in myxedema are thought due to changes in its composition of acid mucopolysaccharides (AMPS). In the skin of the hypothyroid rat it has been shown that the content of hyaluronic acid is increased and the content of chondroitin sulfate decreased. A study of the changes in the urinary excretion of acid mucopolysaccharides in two children with acquired myxedema was carried out in order to gain more knowledge about the character of myxedema in humans. Twenty-four hour urines were collected on both children before and at the beginning of treatment with dessicated thyroid. AMPS were precipitated with cetyl trimethyl ammonium bromide and excretion expressed as mg of hexuronic acid/gm of creatinine. AMPS were then fractionated on columns of Dowex 1X2 (Cl-) and eluted with 6 stepwise gradients of NaCl. Components in each fraction were identified by microelectrophoresis on cellulose acetate, analysis of hexuronic acid, hexosamine and sulfate content and identification of the specific hexosamine by paper chromatography.

Pretreatment total AMPS were normal for both children and remained so during initial treatment with dessicated thyroid. However, chromatographic fractionation of the pretreatment urinary AMPS yielded a product in the first fraction which is nearly identical in both children and which appears to be hyaluronic acid. Hyaluronic acid is not found in this fraction of AMPS from control urine in this laboratory. The results suggest that human myxedema also contains increased hyaluronic acid. (SPR)

15 *Decreased Incorporation of Uracil-2-C^{14} in the RNA Fraction of Mouse Fibroblast Cultures Grown with Pancreatic Diabetic Insulins.* CLAUDE C. ROY*, RONALD GOTLIN*, DENNIS SHAPCOTT* and DONOUGH O'BRIEN, Univ. of Colo. Med. Ctr., Denver, Col.