

- **181** FUNCTIONAL UNIDIRECTIONAL BLOCK BETWEEN TWO LAYERS OF CARDIAC CONDUCTING TISSUE. Edward D. Overholt, Richard D. Veenstra, David A. Rawlings, Richard Wiedmann and Ronald W. Joyner, Departments of Pediatric Cardiology and Physiology and Biophysics, the University of Iowa, Iowa City, Iowa

Unidirectional block is a fundamental component in the initiation of a reentrant cardiac arrhythmia. The activation sequences of the adult rabbit (n=10) or canine (n=5) left anterior papillary muscle were mapped two-dimensionally using multiple monopolar extracellular electrodes with computerized data acquisition and analysis. Isochronal maps were then made to determine the activation patterns of the superficial Purkinje (P) layer or the underlying ventricular (V) layer during stimulation of an attached P strand or the apical V surface. The P cell layer extends over most of the surface of the left papillary muscle, but the direct propagation from the P layer into the underlying V layer is limited to several relatively discrete basal sites. We have additionally demonstrated sites located more apically which allow propagation in only one direction; namely, from the underlying V layer into the P layer. This phenomenon occurs because of a proposed resistive barrier between the two layers which is spatially inhomogeneous, with the junctional resistivity between the P and V layer increasing from base to apex. These sites of potential unidirectional conduction could have functional significance under abnormal conditions when the available sites of P-to-V conduction are reduced. This property could, therefore, operate as one of the mechanisms of cardiac reentrant arrhythmias.

- **182** REPERFUSION FOLLOWING GLOBAL ISCHEMIA: CORONARY FLOW DISTRIBUTION WITH BLOOD VERSUS PERFLUORO-CHEMICAL. Mark D. Parrish, Robert J. Boucek, Michael F. Artman, Richard D. Olson, Thomas P. Graham. Vanderbilt Medical Center, Nashville, TN.

Unique rheological properties of perfluorochemical emulsions (PF), i.e. smaller particle size and lower viscosity, may improve the distribution of coronary flow following global ischemia. Thus we compared the effects of reperfusion with blood (n=6) and PF(n=6) following 30 minutes of global ischemia, in the isolated perfused (constant flow) rabbit heart. We measured endocardial/epicardial flow ratios (EN/EPI) coronary resistance (RES), and recovery of contractile function (dP/dT), 10 and 120 minutes after global ischemia. All hearts were perfused with blood prior to ischemia. Results are shown in the table. Values are expressed as % of pre-ischemic measurement  $\pm$  SEM.

	RES		EN/EPI		dP/dT	
	10'	120'	10'	120'	10'	120'
BLOOD	81 $\pm$ 6	96 $\pm$ 14	87 $\pm$ 5	105 $\pm$ 6	43 $\pm$ 3	64 $\pm$ 6
PF	26 $\pm$ 10*	82 $\pm$ 10	111 $\pm$ 7*	139 $\pm$ 14*	43 $\pm$ 5	94 $\pm$ 7*

(\*different from blood reperfusion group p<.05) Ten minutes following ischemia, coronary resistance and EN/EPI ratio decreased with blood while both parameters increased with PF reperfusion. By 120' post-ischemia, EN/EPI ratio and contractile function were greater with PF compared to blood reperfusion. Thus, reperfusion of the globally ischemic heart with PF may improve functional recovery due to greater endocardial flow. We speculate that this is mediated by the smaller particle size and lower viscosity of PF compared with blood.

- **183** BLOOD-PRESSURE IN INFANTS WITH BRONCHOPULMONARY DYSPLASIA. J.E. Larson, M.P. Leuschen, J. Erikson, R.M. Nelson. University of Nebraska Medical Center, Department of Pediatrics, Omaha, NE.

Infants admitted to the Neonatal Intensive Care Unit have many risk factors that may predispose them to hypertension. To determine if infants with Bronchopulmonary Dysplasia (BPD) are at greater risk for hypertension, we evaluated blood-pressure (BP) in 114 infants with a birthweight < 2 kilograms. BPs were obtained in infants hospitalized for one month or longer either directly or by Doppler method if direct method was unavailable. BP was evaluated at one week and one month of age. The incidence of patent ductus arteriosus and presence and grade of intraventricular hemorrhage were examined. In addition, we analyzed the duration of umbilical artery placement. All data were analyzed by birthweight groups. There was significant increase (p < .01) in mean and systolic BPs from one week to one month in infants with BPD and < 1000 grams. At one month the infants < 1000 grams and with BPD had significantly higher BPs than those without BPD in the same weight group (p < .01). There was no correlation in these infants with the incidence of intraventricular hemorrhage or patent ductus arteriosus. The mean duration of umbilical artery catheter placement in infants < 1000 grams with BPD was 12 days compared to 3.8 days in those infants without BPD in the same weight group. The infants with BPD and < 1000 grams birthweight thus are at risk for hypertension.

- † **184** LEVEL, TREND AND VARIABILITY OF BLOOD PRESSURE DURING CHILDHOOD: THE MUSCATINE STUDY. Ronald M. Lauer, William R. Clarke. University of Iowa, Departments of Pediatrics and Preventive Medicine, Iowa City, Iowa 52242

Prediction of hypertension occurring in adult life from pressures measured at one point in time in childhood is difficult because BP in children tracks in different ways. From BP and body size measures in 4313 children (initial age 5-13 years) examined longitudinally at two-year intervals for a decade, the following were calculated: mean of age-sex-survey specific percentiles as a measure of level (L); slope of percentiles over time as a measure of trend (T); average difference from the regression line as a measure of variability (V). L,T,V of BP were divided into quintiles with the first and fifth quintiles used to define low and high limits: 5% appear to be tracking towards high SBP with either high L, flat T, and low V, or high L, high T, and low V; 7.5% had labile high SBP with high L and high V. Correlations (p<0.001) between L of SBP with L of height, weight, relative weight were 0.31, 0.47, and 0.35 respectively; and correlations between T of SBP with T of body size measures were 0.16, 0.26, and 0.17 respectively. The direct relationship of L T of BP to body size indicates that higher BP occurs in tall, obese children or those with accelerated growth. Thus although final rank of BP may not be established until growth is complete, there are groups of children that can be identified who appear to be tracking towards future high blood pressure.

- **185** FETAL HEART MITOCHONDRIAL RESPIRATORY ACTIVITY FOLLOWING  $\beta$ -RECEPTOR BLOCKADE IN UTERO DURING HYPOXIA. Rey-In Lin,\* L. Craig Wagerle,\* Juan Alvarez,\* Geoffrey Rose,\* Linda M. Sacks,\* and Maria Delivoria-Papadopoulos. Univ. of PA., Depts. of Physiol. and Pediat., Phila., PA.

The present study investigates the contribution of endogenous  $\beta$ -receptor stimulation mediated through hypoxia to the adaptive response of MITO to hypoxia in fetal guinea pig hearts. Twenty pregnant guinea pigs were divided in 4 groups: Gr C (control), Gr H (hypoxia, 7-10% O<sub>2</sub> for 1 hr), Gr P (propranolol HCl, 1.0 mg/kg, I.V.), Gr PH (propranolol + hypoxia). States 3 and 4 MITO respiratory rates (RR) (nmol O<sub>2</sub>/min/nmol a+a<sub>3</sub>) were assayed with glutamate-malate (GM), succinate (SU), and tetramethyl-p-phenylene-diamene HCl/ascorbate (TMPD). State 3 and 4 RR's in Gr C fetal hearts were 89.9 and 13.7 (GM), 81.3 and 25.5 (SU), 170 and 125 (TMPD), respectively. The Ca<sup>++</sup> uptake (murexide method) was 51.3 nmol Ca<sup>++</sup>/min/nmol a+a<sub>3</sub> in this group. Fetal hearts in Gr H had increased State 3 RR and Ca<sup>++</sup> uptake (significantly to 159.9 nmol/min/nmol a+a<sub>3</sub>) but not State 4 RR. Gr P showed increases in States 3 and 4 RR over Gr C by 33% and 28% (GM), 57% and 37% (SU), 26% and 0% (TMPD) respectively. In similar studies in newborn pigs, Gr P State 3 (GM) increased to 137.7 from 70.4 (Gr C). In Gr PH, hypoxia had a less significant effect on the MITO RR and Ca<sup>++</sup> uptake compared to Gr H and Gr P (107.7, GM; 147.2, SU; 245.2, TMPD for State 3 and 7.36, GM; 18.8, SU; 122.6, TMPD for State 4 and Ca<sup>++</sup> uptake was 144.5). Propranolol increases MITO respiratory activity presumably through sympathomimetic actions. Since effects of propranolol and hypoxia are different (propranolol increased States 3 and 4 while hypoxia increased only State 3), it would appear that the adaptive response to hypoxia is not mediated through  $\beta$ -receptor activation.

- **186** "ANATOMIC SEQUELAE OF BALLOON ANGIOPLASTY OF PULMONARY ARTERIES IN CHILDREN", Russell V. Lucas, Jr., James E. Lock, Brooks S. Edwards, Jesse E. Edwards. Depts. of Pediatrics & Pathology, Univ. of Minn. & United Hospitals.

Three children, in whom seven pulmonary arteries (PA) had been balloon dilated, were evaluated at autopsy. Ages at dilation were 2½, 2½, and 8 years. The dilating balloon was three to four times the diameter of the undilated PA. Dilating pressure was 7-9 atmospheres. In five PA, angiographically measured predilation diameter averaged 2.6mm (2-2.9mm) and post dilation diameter averaged 6mm (5.5-6.6mm).

In two PA, balloon dilation had occurred zero and three days prior. Each PA revealed a long, linear, medial tear. Microscopy revealed transmural rupture and hemorrhage into the media and adventitia of both.

The other five PA were evaluated 4-14 months post-dilation. Each PA had a long, linear, healed, medial tear. Microscopy revealed prior transmural rupture in all 5 PA. Healing occurred by reconstitution of media to approximately normal thickness in 4 of 5. This neo media was composed of disrupted and noncircumferential elastic tissue fibres interspersed with collagen. In one PA, 14 months post dilation, the media at the rupture site was only 1mm thick. Increased collagen and elastic fibre deposition was present in the adventitia in all five and also in the intima in two. These healing processes did not compromise PA diameter. Transmural rupture was the major mechanism of diameter increase in all 7 PA. In six the adventitia maintained PA integrity. One PA ruptured during balloon dilation.