

transport system for sodium outward and potassium inward across the membranes of intact erythrocytes. The ATPase and active sodium and potassium transport have the following unusual group of properties in common. (1) Both were located in the membrane. (2) Both utilized adenosine triphosphate (ATP) in contrast to inosine triphosphate. (3) Both required sodium and potassium ions together. Either sodium or potassium ion alone was ineffective. (4) Potassium ion activation was completely inhibited by high concentrations of sodium ion in both systems. (5) Ouabain inhibited both systems. (6) Ammonium ion substituted for potassium ion but not for sodium ion in both systems. (7) The concentrations at which sodium ion, potassium ion, ouabain, and ammonium ion showed half of their maximal effects were the same in both systems. The identification of this ATPase activity as part of a transport system implies that sodium and potassium ions are more than simple cofactors; as substrates for transport they should be moved from one part of the system to another at a rate dependent on the rate of dephosphorylation of ATP. The movement is not apparent, of course, in a suspension of broken membranes. The identification suggests that the reciprocal competitive inhibition between sodium and potassium may mean that on each side of the membrane the linked transport system must free itself of one substance as transported product before it can take on the other as transportable substrate. (Post, R. L., and others: *Membrane Adenosine Triphosphatase as Participant in Active Transport of Sodium and Potassium in Human Erythrocyte*, *J. Biol. Chem.* 235: 1796 (June) 1960.)

BUFFERING OF BLOOD PLASMA

Buffering of blood plasma in man depends upon red blood cells, chemical buffers in blood and tissue cells, respiratory system, and the kidneys. The role of each in maintaining blood plasma pH is examined in detail. At a constant P_{CO_2} , the total blood buffer value is 76.8 mEq./l. for a change in one pH unit. Of this total, 3 per cent is due to plasma bicarbonate, 28 per cent to other chemical buffers in the blood, and 69 per cent to the presence of a gas phase. When the alveolar ventilation changes in response to variations

in pH and P_{CO_2} , the blood buffer value increases substantially. The tissues and kidneys have the capacity to contribute substantially to the buffer value of blood, but they react more slowly than the respiratory system and chemical buffers in the blood. (Gilbert, D. L.: *Buffering of Blood Plasma*, *Yale J. Biol. & Med.* 32: 378 (April) 1960.)

PUMP-OXYGENATOR In 1926 S. S. Broukhonenko devised a machine for sustaining life in mammals while cardiopulmonary bypass was performed. It consisted of two diaphragm pumps and a donor lung which was rhythmically inflated while being perfused by one of the pumps. It was used successfully three times. The inventor suggested that such machines could be perfected for the uses to which they are in fact being presently put. (Probert, W. R., and Melrose, D. G.: *Early Russian Heart-Lung Machine*, *Brit. Med. J.* 1: 1047 (April 2) 1960.)

PUMP-OXYGENATOR A pump-oxygenator system requiring no blood for priming adds greatly to the safety of, and makes possible a wider application of heart-lung bypass procedures. The patient's blood is collected, oxygenated, and returned through a low volume extra-corporeal circuit in which little trauma occurs. (Neptune, W. B., Bougas, J. A., and Panico, F. G.: *Open-Heart Surgery Without Need for Donor-Blood Priming in Pump-Oxygenator*, *New Eng. J. Med.* 263: 111 (July) 1960.)

CARDIAC SURGERY For 71 operations on the heart and great vessels a 0.1 per cent solution of Arfonad (trimetaphen) in 5 per cent glucose was injected by the drip method. The use of ganglion-blocking drugs in operations on the heart and great vessels is justified by the possible prevention of operative shock, the lowering of the blood pressure and by the creation of satisfactory conditions for the surgeon. (Meshalkin, E. N., and Stadnikova, E. I.: *Ganglion Block in Operations on Heart and Main Blood Vessels*, *Khirurgiya* 9: 3, 1959.)

TRANSAMINASE The serum glutamic oxaloacetic transaminase levels in 80 patients, undergoing cardiac repair and with total body perfusion, were markedly increased when po-

tassium-induced cardiac arrest was employed as compared to nonarrested cases. It is not definitely known whether the enzyme release is due to a direct effect of potassium citrate upon the myocardium, to hypoxia, or to a combination of these factors. (Quinn, J. W., and others: *Transaminase Values Following Open-Heart Surgery*, *Ann. Surg.* 152: 45 (July) 1960.)

SHOCK Intravenous injection of lethal doses of endotoxin in anesthetized dogs produces a rapid decrease in total blood histamine, a concomitant rise in plasma histamine, and increased peripheral vascular responsiveness to histamine. Histamine apparently performs a crucial role in progressive development of hypotension after endotoxin is administered. (Hinshaw, L. B., and others: *Role of Histamine in Endotoxin Shock*, *Proc. Soc. Exp. Biol. & Med.* 104: 379 (July) 1960.)

STARLING'S LAW Transfusion of 1500 cc. of whole blood in the control state produces no significant change in central blood volume, an average elevation of cardiac output of .50 l. per minute and of left ventricular stroke work of 23 g.-m. The increase in each of these parameters resulting from transfusion during partial ganglionic blockade with Arfonad was substantially greater averaging 348 ml., 2.4 l. per minute and 73 g.-m., respectively. This suggests that when hypervolemia is induced acutely in intact man marked alterations in circulatory dynamics are prevented by the activity of the autonomic nervous system. This results in reflex venodilatation and depression of myocardial contractility, and accordingly, Starling's law of the heart cannot be readily demonstrated. When hypervolemia is induced after the activity of the autonomic nervous system has been reduced, more striking hemodynamic changes occur, resembling those in a Starling heart-lung preparation when venous inflow is augmented. (Frye, R. L., Braunwald, E., and Cohen, E. R.: *Studies on Starling's Law of Heart; Modification by Ganglionic Blockade*, *J. Clin. Invest.* 39: 1043 (July) 1960.)

CEREBRAL BLOOD FLOW A method employing Kr^{79} permits the rapid continuous estimation of total cerebral blood flow in man.

Cerebral blood flow determined by the Kr^{79} method and corrected for intracranial volume is significantly higher than the values obtained simultaneously with the nitrous oxide method. The results of the two methods are, however, significantly correlated. The Kr^{79} method is capable of following rapid changes in cerebral blood flow during unsteady states such as those induced by hyperventilation, carbon dioxide inhalation, or *l*-norepinephrine infusion. When combined with arteriovenous oxygen differences, the Kr^{79} method may be employed to follow changes in cerebral metabolic rate as well. (Lewis, B. M., and others: *Method for Continuous Measurement of Cerebral Blood Flow in Man by Means of Radioactive Krypton (Kr^{79})*, *J. Clin. Invest.* 39: 707 (May) 1960.)

INTRA-ARTERIAL TRANSFUSION Intra-aortic injections of blood have been used in treatment of terminal states during operations and especially during thoracic operations when the aorta is easily accessible. Using X-ray control and 40-60 per cent solution of methiodal it was found that blood injected into the aorta enters the cerebral and coronary arteries. An injection of 50 ml. of the contrast medium is sufficient to fill the coronaries while 100 ml. is required in order to fill the cerebral arteries. The high degree of efficacy of the method was demonstrated in experiments on animals when intra-aortic injections of blood were given after clinical death had taken place. Intra-aortic injections were given to 40 patients; positive effect was observed in 33 (sustained in 13 and transient in 20 cases). (Karyukina, A. T.: *Intra-Arterial Injections of Blood in Experimental and Clinical Terminal States*, *Eksper. Khir.* 2: 58, 1959.)

ESOPHAGEAL ECG LEAD Seventy patients, aged 22 to 60 years, with hypertension were examined. The esophageal ECG lead has the advantage in demonstrating earlier axis deviations to the left (increased S wave and decreased R wave at all levels) and signs of slowing of intraventricular conduction (from 0.11 to 0.16 sec.). In 19 cases changes in the QRS-complex were only found in the esophageal lead, these changes being either absent or only slight in the other leads. Changes in the T wave (biphasic, negative or dimin-