

## BOOK REVIEWS

*Shock—Blood Studies as a Guide to Therapy.* JOHN SCUDDER, M.D., Med.Sc.D., F.A.C.S. 315 pages, 55 illustrations and 5 plates. J. B. Lippincott Company. Price, \$5.50.

Shock is a pathological physical state which occurs commonly in a variety of conditions. These conditions embrace most branches of medicine and make it important that physicians and surgeons have an understanding of shock which will allow them to diagnose and treat it rationally.

This new book by John Scudder is divided into four parts, namely: one, historical and experimental; two, varieties of shock, analysis and treatment; three, historical development and bibliography; and four, laboratory manual.

Allen O. Whipple in the foreword of the book tells us that John Scudder while working in the United States in 1815 investigated fluid balance as a thesis for his degree of doctor of medicine. Later he worked in India where he saw much of dehydration in cholera and dysentery. Three generations later we find the present John Scudder in India interested in dehydration. His experience there was transferred to the treatment of intestinal obstruction and shock where equal success seemed to be obtained with the proper use of solution of sodium chloride. Dr. Scudder began working in this country on the problem of dehydration as found in intestinal obstruction and fistulae. This led to the estimation and treatment of the dehydrated state in the presence of burns, acute pancreatitis and perforated ulcers of the gastrointestinal tract. This work was carried on in the Rockefeller Institute for

Medical Research where, in addition, associated work was done on plasma proteins and the preservation of human blood.

Part one: The historical references to shock date back to early in the eighteenth century when a French surgeon and an English minister made accurate observations, the validity of which it has taken two centuries to substantiate. The word shock first appeared in 1743 and was associated early with trauma. Generalized vaso-constriction was observed in shock, affecting both veins and arteries, following which there was a decrease in volume flow. Venous pressure increases, capillary congestion and dilatation occur and the result is an increase in the capillary bed. The theories of shock include: one, toxemia; two, loss of circulating fluid; three, neurogenic imbalance; and four, adrenal exhaustion. All of these theories have been under investigation during the past two hundred years.

Historically, the treatment of shock called for heat, intravenous fluids (hypertonic and normal saline, gum acacia, and sodium bicarbonate) emetics and lavage, sedation, Trendelenberg position, oxygen, and transfusions. The latter was advocated as long ago as 1750. In recent years preserved blood has been utilized, also preserved plasma.

In the experimental work with traumatic shock the electrolytes were considered. Among the anions, chlorides have been found both increased and decreased, bicarbonates are often reduced, and proteins are generally decreased. Among the cations, sodium is decreased, calcium may be increased or decreased, while potassium is increased. The non-protein-nitrogen,

blood urea, and creatinine are increased, the blood sugar fluctuates, and the hydrogen ion concentration is increased.

Potassium is found in both animal and vegetable cells. A phenomenon which is generally known is that potassium accumulates in cells living in a medium richer in sodium than potassium. Potassium acts first as a stimulant then as a depressant to both the central nervous system and peripheral nerves. It is a poison to striated and smooth muscle. On cardiac muscle, in small amounts it slows the rhythm and lengthens the refractory phase, while in larger amounts it causes cardiac arrest. Striated muscle contains a predominance of potassium, three to one over sodium, and this potassium is easily lost after trauma, thus its importance in the conception of traumatic shock. On blood vessels potassium causes vasoconstriction, acting locally upon the muscle in the vessel wall as well as by increasing irritability of nerves supplying the vessels. Even when present in small amounts potassium causes a fall in blood pressure. Assimilation takes place through the gastro-intestinal tract and excretion is through the kidneys chiefly. The level of potassium in the body is maintained by efficient kidney excretion, holding back by the liver, excretion into bile, temporary storage in muscle and red blood cells, and loss by salivation or vomiting. Thus in shock whether caused by tissue abuse, loss of fluids, hemorrhage, stimulation of the sympathetic nervous system, injection of toxins or destruction of adrenal tissue there is an alteration of potassium metabolism, a derangement which serves as an indication of profound injury of cells.

The physical measures of hemo-concentration that are of value in shock are: specific gravity of peripheral blood and venous blood, cell count and

cell volume, determinations of plasma proteins and potassium. The specific gravity of blood is found to change in shock several hours before the change in pulse and blood pressure. In 1884 Roy gave a method of measuring shock (specific gravity of blood) more delicate and of more value than determination of blood pressure. In 1926 Hamilton and Barbour introduced the falling drop method of determining the specific gravity of body fluids; this method is twenty-five times more sensitive than the average red blood cell count in measuring dehydration. Briefly the specific gravity of peripheral blood, the red cell count, cell volume, and plasma potassium all are increased in hemoconcentration.

Part two. This part of the book contains rather complete case studies and analysis of various types of shock, namely: postoperative, traumatic, traumatic complicated by hemorrhage, hemorrhagic, burns, perforated duodenal ulcer, and primary shock due to paraganglioma of adrenal tissue. Normal values are given as obtained from healthy adult males. The treatment of shock is presented in detail and the results are shown graphically.

The treatment presented consisted of transfusions, administration of oxygen, external heat, 5 per cent sodium chloride as well as normal saline, Ringers solution, saline with glucose, and cortical extract. The more severe the shock, the higher were the values for potassium in the plasma and, as such it could be used as a prognostic aid. If the plasma potassium was increased over one hundred percent the outcome was fatal, whereas seventy one per cent. of patients recovered in whom the increase was fifty per cent. or less. Several interesting studies are presented concerning five patients who suffered severe burns in the Hindenburg disaster. They presented the most striking changes in both peripheral and

venous blood with a high specific gravity, high cell volume, increased plasma potassium, and decreased plasma proteins.

The author feels that hypertonic saline is to be used only in small amounts (200–500 cc.) and its effects should be controlled by repeated blood determinations as well as by the response of the patient. The best success was obtained with the combined administration of hypertonic sodium chloride, cortical extract and transfusions.

Cortical extract is discussed at length and its use is advocated in treatment of shock as it is said to correct many altered physiological functions and abnormal chemical and physico-chemical states. It acts to restore blood volume, relieves hemo-concentration, raises blood pressure, and increases alkaline reserve through promotion of base retention. It restores renal function, causing increased excretion of potassium as well as ammonia and retention of both sodium and chloride. It increases heat production, decreases the retained nitrogenous elements in the blood and lowers the value for blood potassium. Cortical extract, where used, showed a better survival rate (52 percent) in moribund patients and in several cases of post-operative shock, where the usual measures failed; it alleviated the shock when administered with salt solution. The extract is given intravenously in repeated small doses.

The author does not say that shock is due to potassium poisoning but believes that alterations in potassium in both blood and body fluids serve as a measure of profound cellular changes.

Part three of the book is unique in that it is concerned entirely with historical developments in the conception and treatment of shock, in the physiologic and toxicologic effects of potassium, and of some of the functions of the adrenal glands.

An extensive bibliography is pro-

vided, citing over five hundred references.

Part four is a short laboratory manual describing the technique of the different determinations suggested by the author.

*Summary:* This book contains material suitable for wide clinical application in daily practice. It is well written and is excellently authenticated by references. Dr. Seudder has studied his problem profoundly and has given us a foundation for clinical practices that may be responsible for the saving of many lives.

C. B. H.  
R. M. T.

*Cyclopropane Anesthesia.* BENJAMIN HOWARD ROBBINS, B.A., M.S., M.D., Associate Professor of Pharmacology, Vanderbilt University School of Medicine. Pages 175. Baltimore: Williams & Wilkins Company, 1940. Cloth—Price \$3.00.

This small but comprehensive book serves to clarify the present status of cyclopropane as an anesthetic agent. Starting from the history of its first discovery and dealing with its physical and chemical characteristics and methods of manufacture, it then devotes a series of chapters to the effects of cyclopropane on the important organs and tissues of the body, both in the experimental animal and the human subject. These chapters contain useful summaries. The figures and tables which are presented are illustrative and easily read. One of the eleven chapters in the book is devoted to the clinical administration of cyclopropane as an anesthetic agent and while several techniques are mentioned there is a limited amount of discussion regarding actual clinical administration. Separate chapters discuss the complications following cyclopropane anesthesia and the indications and contraindications for the use of this valuable anesthetic