described in cats and rabbits during lidocaine infusion (ANESTHESIOLOGY 28: 155, 1967) were not observed. Although no seizure focus was evident, spike and slow-wave complexes were recorded in cortical and depth leads and were quite evident in the amygdala and caudate nuclei. (Supported in part by USPHS Grants NB-07844 and FR00169.)

The Effects of Acidosis on Glycolysis and Pentose Shunt in Skeletal Muscle. G. G. NAHAS, M.D., J. KYPSON, M.D., L. TRINER, M.D., and Y. VULLIEMOZ, M.S., *Department of Anesthesiology, College of Physicians and Surgeons, Columbia University, New York, N. Y.* Acidosis *in vivo* produces marked metabolic and functional alterations. The purpose of the present study was to investigate *in vitro* the effect of acidosis on carbohydrate metabolism. *Methods and Results:* Rat diaphragm was incubated in Krebs–Ringer phosphate buffer for one hour at *p*H 7.4 or 6.8. At *p*H 6.8 there were significant decreases in lactate (−36 per cent) and pyruvate (−22 per cent) production in the medium. Concurrently, glycogen content was significantly increased (+25 per cent). In a second series, the site of action of acid *p*H of muscle on glycolysis was investigated by comparing the concentrations of intermediates of the glycolytic pathway in diaphragm incubated at *p*H 7.4 or 6.8. At *p*H 6.8 glucose-6-phosphate was increased significantly (+22 per cent); fructose-6-phosphate was consistently, but not significantly, higher. Fructose-1,6-diphosphate was decreased significantly (−30 per cent), indicating a decrease in phosphofructokinase activity. Similar changes in intermediates also occurred when muscle was incubated with ouabain 10^{-4} M in medium at *p*H 7.4 or *p*H 6.8. There was no significant change in citrate concentration or O_2 uptake, which might indicate that the Krebs cycle was not affected by *p*H or by ouabain. Glucose-6-phosphate dehydrogenase activity was increased by 100 per cent at *p*H 6.8 (with or without ouabain), indicating an increase in activity of the pentose shunt. Ouabain at *p*H 7.4 did not change the activity of this enzyme. Decrease in phosphofructokinase activity at low *p*H could account for the decrease in lactate production. Maintenance of the Krebs cycle could account, in part, for a decrease in pyruvate. Marked increase in the pentose shunt by acid *p*H, with resulting increase in TPNH, might be a compensatory mechanism in the presence of decreased glycolysis. *Summary:* Acid *p*H produces marked alteration in some of the key enzymes which regulate carbohydrate metabolism.

The Effects of Halothane on Mitosis. J. F. NUNN, PH.D., F.F.A.R.C.S., K. L. DIXON, and J. D. LOVIS, B.SC., PH.D., *Departments of Anesthesia and Botany, University of Leeds, Leeds, Yorkshire, England.* In cultures of the ciliate *Tetrahymena pyriformis,* halothane rapidly causes inhibition of growth, the 50 per cent effective dose being about 1.25 per cent of normal atmospheric pressure at room temperature. The rapidity of action suggested interference with mitosis, although inhibition of DNA synthesis cannot be excluded. *Methods:* Studies of mitosis were carried out on root-tips of *Vicia faba* (the broad bean) exposed for periods of two to 24 hours to concentrations of halothane (prepared by volumetric dilution of saturated vapor) ranging from 0.5 to 2.0 per cent. Germinating beans were exposed to halothane when lateral roots had attained a length of more than one cm. Experimental treatments were carried out in a desiccator which was continuously swept with vapor at a flow rate of about 250 ml/min. The roots were completely exposed to the vapor, their tips not being immersed in water. Controls remained exposed to room air or to air in contact with water containing crystals of thymol, some of which floated. At certain intervals after the commencement of treatment lateral roots were removed and fixed in acetic alcohol. The chromosomes were stained by treatment of the root-tips with the Feulgen reagent following controlled acid hydrolysis. Permanent squash preparations were then made and examined by light microscopy. *Results:* Four hours' exposure to 2 per cent halothane resulted in a very marked reduction in the proportion of the later mitotic stages, anaphase and telophase. Prophases were normal in appearance, but the great majority of mid-division figures showed abnormalities entirely comparable to those associated with exposure to

low concentrations of colchicine. In most of these cells the chromosomes were abnormally short and thick (*i.e.*, hypercontracted), and dispersed at random in the cell, there being no indication of any polarization of the chromosomes. It seems likely that these c-mitosis figures are produced, as in the case of colchicine, by disruption or suppression of the mitotic spindle, with the consequence that mitosis is unable to proceed to completion. In some cells the presence of the ski-arrangement effect showed that the chromatids had separated, but without nuclear division. Complete separation of chromosomes was observed, with the consequence that cells with double the normal number of chromosomes were present. Roots exposed to the same concentration of halothane (2 per cent) for periods of eight hours showed not only the same cytological abnormalities but also an evident reduction in number of cells in division in comparison with the controls. Roots subjected to lower concentrations of halothane reacted differently. Treatment with 0.5 per cent halothane for four hours produced very few detectable abnormalities, but exposure to 1 per cent halothane for the same period resulted in a significant proportion of abnormal mitotic figures, but proportionately less in number and generally less extreme in effect than cells exposed to 2 per cent halothane.

Mechanisms of Ganglionic Transmission during Methoxyflurane and Halothane Anesthesia. L. O. OVADIA, M.D., TSUNG-HAN LI, M.D., and B. E. ETSTEN, M.D., *Department of Anesthesiology, Tufts University School of Medicine, and New England Medical Center Hospitals, Boston, Mass.* Recent studies indicate that there are several pathways for mediation of cardioregulatory impulses through the stellate ganglion, *i.e.*, cholinergic—via "nicotinic" and "muscarinic" receptors, and adrenergic—via alpha and beta receptors (Circ. Res. 20-III: 135, 1967). The present study was undertaken to determine effects of methoxyflurane and halothane upon stellate ganglionic transmission, using direct measurements of evoked postganglionic potentials with simultaneous measurement of myocardial contractile force. *Methods:* Studies were performed in 48 dogs anesthetized with chloralose and urethane given intravenously. The left upper thoracic sympathetic chain was stimulated by single and tetanic electronic stimulations. The evoked postganglionic potentials and changes in the peak (Fm) and the first derivative of myocardial contractile force (dF/dt) were recorded simultaneously using the method described previously (ANESTHESIOLOGY 29: 444, 1968). Two components of the evoked postganglionic potentials (*i.e.*, a first component, PGP_1, related to the beta-adrenergic and muscarinic pathways, and a second, PGP_2, related to the nicotinic pathway) were identified before and during anesthesia. *Results:* Alpha-blocking agents produced augmentation of both PGP_1 and PGP_2. Methoxyflurane produced a dose-related blocking effect. Halothane, due to its alpha-adrenergic blocking effect, produced facilitation of both components of the evoked postganglionic potential, showing no stellate ganglionic blockade in the presence of a decreased myocardial contractile force. *Summary:* These data indicate that the negative inotropic effect of methoxyflurane may be due to depression of both ganglionic transmission and myocardial contractility. In contrast, the negative inotropism induced by halothane may be due only to a direct action of the agent on the heart and not to ganglionic blockade. (Supported by USPHS Grant HE-01711 from the National Heart Institute.)

Hazards of Ethylene Oxide Sterilization. L. RENDELL-BAKER, M.D., and R. B. ROBERTS, M.D., *Department of Anesthesiology, Mount Sinai Hospital, New York, N. Y.* Numerous reports concerning tissue reactions to plastics and rubber after Eto sterilization have appeared recently. Reactions have included hemolysis, either in pump oxygenators or blood administration sets, burns to surgeons' hands from Eto-sterilized rubber gloves, tracheal inflammation and necrosis during prolonged intubation or tracheostomy, and possible thrombophlebitis following the use of intravenous tubing. Toxic stabilizers leaching out of polyvinyl chloride (PVC) plastics, may be one cause of tissue reaction. Hence, only plastics which have passed the U.S.P. Rabbit Muscle Im-