in the course of his discussion of metabolism of drugs by the liver that, with the exception of chloroform, there is no evidence that any of the metabolites of inhalation anesthetics are hepatoxic. In fact, a compound such as disulfiram (Antabuse), which inhibits microsomal enzymes as well as enzymic induction, *prevents* the central hepatic lobular necrosis and the increase in serum SGOT associated with chloroform anesthesia.

Dr. M. B. Chenoweth, Research Scientist in the Biochemical Research Laboratory of the Dow Chemical Co., also commented on the lack of relation between hepatic drug metabolism and hepatic toxicity. He noted, for example, that inhibition of ethanol metabolism results in hepatotoxicity while there is no toxicity when ethanol is metabolized normally.

The consensus of the symposium participants was their halothane metabolism may be related to those rare instances in which halothane is associated with hepatic damage, but that there is presently no evidence to support such a hypothesis. It is, however, a hypothesis which deserves careful consideration and investigation. The concensus drifted further from unanimity in considering development of a sensitization reaction to halothane (or its metabolites) as an explanation for halothane-induced hepatic reactions. This reviewer admits to his bias in favor of the sensitization theory on the basis of compelling personal experience; he gained the impression that some of the reluctance to accept the possibility that halothane-induced hepatitis is a sensitization phenomenon is related to inability to accept the concept that sensitization reactions exist which fall far short of the classic Shwartzman reaction.

Dr. B. A. Britt, Research Associate in the Department of Pharmacology, University of Toronto, discussed the etiology of malignant hyperpyrexia. In doing so she made a strong clinical and biochemical case for differentiation between patients who develop hyperpyrexia in the absence of anesthetically-induced muscle rigidity and patients who develop rigidity after succinylcholine and/or halothane. The former, a minority, are easier to treat, the mortality is not as great, and the hyperthermia not as severe. Hyperpyrexia preceded by rigidity represents a genetically transmitted, highly lethal condition. Dr. Britt and her associates have been able to perform a unique study of the syndrome based upon biochemical and electron microscopic analyses of vastus lateralis muscle biopsies obtained from patients who had survived hyperpyrexic episodes. Their most important finding was that halothane produced a significant decrease in calcium uptake by sarcoplasmic reticulum in patients with the rigid type of hyperpyrexia. They hypothesize that this results in abnormal energy production and utilization, associated with heat production great enough to cause marked elevations of temperature. The basis for the abnormal calcium uptake induced by halothane in these patients remains unexplained; it was not observed in biopsies obtained from normal control patients or from one individual who had experienced the non-rigid type of hyperpyrexia. Equally important was their fortuitous observation that the intravenous infusion of procainamide produced a rapid lowering of temperature (from 107 F to below 98 F within 15 minutes) in a patient with the rigid type of hyperpyrexia. If confirmed in other patients, this will represent a most important contribution to the management of this potentially lethal complication of general anesthesia.

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Surgery

SHIVERING Shivering occurred in 52 per cent of 716 patients following anesthesia with halothane. Small doses of narcotic analgesics were found to be the best method of treatment. Antianalgesic drugs caused an increased incidence of shivering. The loss of heat due to peripheral vasodilatation and the antianalgesic property of halothane are thought to be the causes of the shivering. Because shivering increases oxygen requirements, maintenance of a constant body temperature during surgical operation is recommended. (*Gozon, F.: Cause and Treatment of Spasticity following Halothane Anesthesia, Der Anaesthesist 18: 257 (Aug.) 1969.*)