"Kettle"-type vaporizers, when in good working order and properly used, will deliver extremely precise concentrations of halothane under free flow conditions. With closed systems and IPPB, these vaporizers are subject to a 30 per cent error in delivered concentration unless a check valve is used, and still subject to a 15 per cent error with an external check valve. The described valve is not only a more efficient remedy, but is the least expensive method suggested to date.

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Halothane and Hepatic Necrosis

To the Editor.—A plague of reports of death and disease following the use of halothane is predictable.

Past and future reports should be scrutinized objectively and with intense care. Reports of liver disease following the use of halothane are utterly inconclusive, unless all of the following criteria are fulfilled:

(1) The time interval between putative cause and effect is reasonable.
(2) All other iatrogenic causes are, as nearly as possible exonerated, including, surgery itself, other anesthetic agents, and non-anesthetic agents.
(3) Indubitable evidence rules out infectious hepatitis, or, failing this:
(4) Careful epidemiologic study demonstrates incidence in time and number and place significantly higher than in a control halothane-free series.
(5) Pre-existing liver disease is, as nearly as possible, ruled out.

The report from Michigan (Brody, G. L., and Sweet, R. B.: ANESTHESIOLOGY 24: 29, 1963) fails in several ways to meet these criteria. For example, no mention is made of the length of time covered in the survey or of the comparative incidence of such liver necrosis in similar cases done without halothane in the same period of time by the same anesthesiologists in the same places. Indeed, we are not even told where the cases were except for one which is acknowledged to have been done in the authors' hospital. Little or no effort is reported to rule out causes of hepatic disease other than halothane. Two of the patients had biliary disease, and it is hardly an improbable leap from there to the liver.

The guilt of halothane is apparently given credence by implication. The authors' words, "These four cases offer no proof that halothane was the direct cause of the massive hepatic necrosis; however, the implications that such is the case are strong" are almost their only bow to the objectivity of the scientific method —scarcely more than a faint nod, really.

Indictment often has the emotional effect of conviction. The circumstantial evidence adduced to date hardly proves guilt, but it tarnishes the innocence of a useful drug.

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To the Editor.—It becomes apparent when one reads the two reports concerning halothane toxicity in the March 7 issue of the *New England Journal of Medicine* that those articles had been submitted *concurrently* with ours, not *sequentially*. This seems to us to indicate that others using halothane have also been concerned about its possible toxicity. None of the articles submitted offers more than circumstantial evidence that halothane can, in rare instances, produce hepatic necrosis and none can be construed to be a *study* of the drug. Rather, our intent was simply to call this problem to the attention of anesthesiologists with the hope that a statistically significant scientific evaluation of halothane might be undertaken. Such a study is now being organized to include several teaching institutions.