CORRESPONDENCE

pH AND ATRACURIUM

Sir.—Drs Flynn, Hughes and Walton (1984) have produced an interesting paper on the effects of cardiopulmonary bypass, hypothermia and atracurium. In the discussion it is stated that the inactivation of atracurium is mainly dependent on temperature and pH. However, no pH value is reported in the paper.

There is some controversy as to whether the blood-gas measurements should be reported as measured at 37 °C, or corrected for temperature (Ream, Reitz and Silverberg, 1982; Ashwood, Kost and Kenny, 1983), although at the moment it is almost a "no-contest". Was the carbon dioxide content held constant during hypothermia in these patients? Two patients began to breathe during the bypass procedure and this could indicate, from personal experience, that the pH was not normal utilizing uncorrected values. Following the scheme as exhibited by ectotherms, there is evidence that the myocardial, cerebral and renal perfusion is better, thus facilitating even body cooling and obviating the necessity to correct increasing base deficits (Becker et al., 1981; Swain, White and Peters, 1984).

Because of the large difference in pH which can arise depending upon which scheme of reporting is used—7.40 or 7.58—it behoves each investigator in the field of hypothermia to report whether the results are corrected for temperature, or not, as this may have profound implications on drug pharmacokinetics and pharmacodynamics.

D. T. BOLTON
Utrecht

REFERENCES
Sir.—Dr Bolton raises the pertinent question of the effect of pH changes on the inactivation of atracurium. In vitro studies with atracurium showed that a decrease from a pH of 7.4 by 0.2 units increased the half-life of the drug 1.5-fold (Merrett, Thompson and Webb, 1983). However, studies in man showed that respiratory-induced changes in pH from 7.25 to 7.56 produced no consistent effect on the level of neuromuscular blockade nor on the rate of recovery (Payne and Hughes, 1981). These investigators did not study the effects of metabolic acidosis in man. Patients with renal and hepatic failure are known to have varying degrees of metabolic acidosis. The study by Hunter, Jones and Utting (1982) showed no difference in the duration of action of atracurium between anephric and normal patients. Furthermore, Ward and Nell (1983) found no increase in the half-life of atracurium in patients suffering from hepatic and renal failure.

Temporary alterations in pH occur often during cardiopulmonary bypass. In our study, correction of abnormalities of temperature-corrected blood-gas results were undertaken in the usual way with values being restored to the "normal range" as soon as possible. In the two patients who started to breathe spontaneously while on bypass at core temperatures of 25 °C and 28 °C respectively, the P CO 2 and 4.3 and 7.3 kPa, pH was 7.5 and 7.1 and base deficit was +1.3 and –12.5. The latter was corrected with appropriate amounts of sodium bicarbonate. No conclusions could be drawn in view of the differences in acid–base status between the two patients.

Our study was essentially a clinical one intended to assess the feasibility of administering atracurium by infusion for cardiac surgery and to determine the rates of infusion required during cardiopulmonary bypass with induced hypothermia. In our view, changes in pH during hypothermia could possibly affect the pharmacokinetics of atracurium, but it would be difficult to separate these from the effect of hypothermia on the rate of inactivation of the drug and on neuromuscular function.

P. J. FLYNN
B. WALTON
R. HUGHES
London

REFERENCES