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*p*H and Muscle Relaxants

To the Editor:—Recently Ono *et al.*[1] described potentiation of *d*-tubocurarine neuromuscular block *in vitro* by increased P_{CO_2}.

Potentiation of monoquaternary relaxants such as *d*-tubocurarine and vecuronium by low *p*H may be attributed to a change of a tertiary ammonium group into a quaternary group by combining with a hydrogen ion, and hence the molecule may change into a bisquaternary relaxant. This will increase attraction of the relaxant molecule to the anionic cholinergic receptors. Also, the increased polarity of the molecule may limit its passage across cellular barriers, including liver cells. Thus, a decrease of *p*H not only increases the neuromuscular block achieved by monoquaternary muscle relaxants, but may also delay its rate of elimination.

The effect of *p*H on *d*-tubocurarine block has been also explained by alteration of the percentage ionization of its phenolic hydroxyl groups.[2] The *d*-tubocurarine molecule has, beside its ammonium groups, two phenolic hydroxyl groups with *p*Ka values of 8.1 and 9.1, and is therefore liable to vary its degree of ionization of these hydroxyl groups. This variation results in anionic charges that can decrease the attraction of the molecule to the anionic cholinergic receptors and facilitate permeation of cell membranes by the formation of zwitterions.[3]

In contrast to the effect of *p*H on monoquaternary muscle relaxants, Ono *et al.* showed that high *p*H potentiates and low *p*H counteracts the response to bisquaternary relaxants.[1] A possible mechanism is the ability of *p*H changes to vary the activity of both the plasma cholinesterase and acetylcholinesterase, and hence carbon dioxide may act as a physiologic anticholinesterase.[4] Other factors such as change of protein binding and/or the degree of ionization of the cholinergic endplate receptors cannot be excluded.

Controlled animal studies demonstrate incomplete antagonism by neostigmine of blocks produced by *d*-tubocurarine[5] and pancuronium[6] during respiratory acidosis. Thus, although hypercapnia augments the neuromuscular block of monoquaternary muscle relaxants and decreases the block of bisquaternary relaxants, its effect may be complicated in both groups by "neostigmine-resistant curarization."[7]

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Discrepancies in Upper-limb Blood Pressure and Their Impact on Internal Mammary Artery–Coronary Artery Grafting

To the Editor:–Recently a difference between right and left arm blood pressures in vascular surgery patients has been described.[1] Despite the recommendation that routine measurement of blood pressure be performed in both arms prior to cardiac catheterization, it is not unusual for patients to come for coronary artery bypass graft (CABG) surgery without such measurements. Our recent experience with a patient scheduled for CABG surgery who had a marked difference in blood pressure between both arms reinforces this point.

A 59-yr-old man with a history of diabetes, hypertension, two previous myocardial infarctions, unstable angina, and a diagnosis of severe triple-vessel coronary artery disease was scheduled for CABG surgery with intended use of the left internal mammary artery. The patient came to the operating room premedicated with morphine and scopolamine. Intraarterial blood pressure measured from the left radial artery showed a blood pressure of 80/60 mmHg. Simultaneous noninvasive blood pressure in the right arm (Dynamap) showed the blood pressure to be 125/80 mmHg.

Subsequent measurements of intraarterial blood pressure from the right radial artery confirmed the difference between the two arms to be accurate. We discussed this observation with the surgeon and recommended that the left internal mammary artery not be used, considering the pressure difference of 40–45 mmHg. We relied on the right radial artery pressure throughout the subsequent surgical management and the immediate postoperative course because it closely correlated