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Correspondence

Uptake of Lidocaine from the Trachea

To the Editor:—I read with interest the paper, "Lidocaine in Arterial Blood after Laryngotracheal Administration" by Viegas and Stoelting.[1]

In 1972, at the Fifth World Congress of Anesthesiology,[2] we reported a similar investigation measuring the uptake of lidocaine from the trachea. Thirty patients admitted for minor operations on the nose and throat was studied. Lidocaine, 4 per cent, 2 mg/kg, was instilled into the trachea via a Steiner cannula. Our results are shown in figure 1. There was a significant and continual increase in lidocaine and its metabolites in plasma throughout the first 30 to 60 minutes, followed by a gradual decline in plasma levels thereafter.

The plasma level of lidocaine rarely exceeded 1 μg/ml. Glycine xylidide was by far the most major metabolite seen in the plasma, and its blood levels frequently exceeded 8 μg/ml. The plasma levels of monoethyl glycine xylidide were below that of lidocaine, and only occasionally was the parahydroxy metabolite observed at the lower limits of detection (0.2 μg/ml). The peak blood levels of lidocaine in the 30 patients ranged from a low of 0.1 μg/ml to a high of 2.0 μg/ml.

In 1965, Telivuo[3] also found a slow absorption of lidocaine from the respiratory tract with spontaneous ventilation. Recently, Chu *et al.*[4] also found slow absorption. There seems to be adequate evidence to dispel the earlier belief[5] that local anesthetic absorption through the mucous membrane, at least in the trachea, could simulate intravenous administration.

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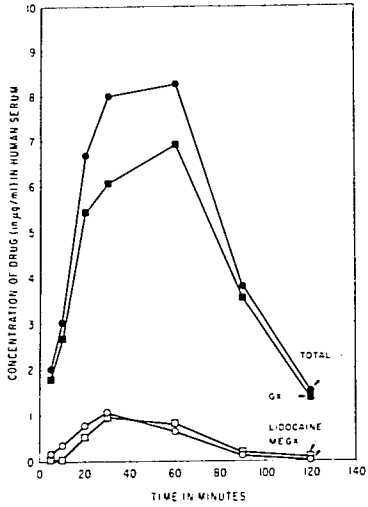

FIG. 1. Results. MEGX = monethyl glycine xylidide; GX = glycine xylidide; TOTAL = lidocaine and metabolites.

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Specific Gravity and Density

To the Editor:—By definition, specific gravity (Sp Gr)—some prefer "relative density"—requires *two* particular temperatures.[1] Density (D), a similar and more fundamental physical property, requires but *one* temperature.[2] Wilbert King and I reported a mean human cerebrospinal fluid (CSF) D 37 C of 1.0010 g/ml (numerically equals Sp Gr 37/4 C) with a safe 99.73 per cent normal distribution range of 0.9998–1.0022.[3] Dividing this mean CSF Sp Gr 37/4 C by the water D 37 C, 0.9934 g/ml, yields a mean Sp Gr 37/37 C of 1.0077. Both means represent the Sp Gr of CSF at body temperature; yet they differ by a vast 0.0067. The reason lies in the second, denominator reference water temper-

TABLE I. Specific Gravities and Densities of Some Peridural Anesthetic Agents

	Specific Gravity		Density (g/ml)		Reference
	$\frac{25}{25}$ C	$\frac{37}{37}$ C	25 C*	37 C†	
Water	1.0000	1.0000	0.9971	0.9934	3
Citanest					§
1 per cent	1.0055		1.0026		
2 per cent	1.0071		1.0042		
3 per cent	1.0085		1.0056		
Lidocaine					§
1 per cent	1.0064		1.0035		
1.5 per cent	1.0064		1.0035		
2 per cent	1.0067		1.0038		
Lidocaine with epinephrine, 1:100,000					§
1 per cent	1.0066		1.0037		
2 per cent	1.0075		1.0046		
Carbocaine					¶
1.0 per cent‡	1.006	1.006	1.003	0.999	
1.5 per cent‡	1.006	1.006	1.003	0.999	
2.0 per cent‡	1.006	1.006	1.003	0.999	
Marcaine					¶
0.25 per cent‡	1.0061	1.0063	1.0032	0.9997	
0.50 per cent‡	1.0064	1.0059	1.0035	0.9993	
0.75 per cent‡	1.0059	1.0058	1.0030	0.9992	
Nesacaine-CE					#
2 per cent, range	1.0100–1.0103	1.0044–1.0099	1.0071–1.0074	0.9978–1.0032	
3 per cent, range	1.0111	1.0104–1.0108	1.0082	1.0037–1.0041	
Human CSF					3
Mean	1.0070	1.0077	1.0040	1.0010	
Safe, normal range (± 3 SD)	1.0058–1.0082	1.0065–1.0089	1.0028–1.0052	0.9998–1.0022	

* Numerically equals Sp Gr $\frac{25}{4}$ C. † Numerically equals Sp Gr $\frac{37}{4}$ C.

‡ Hypobaric re CSF at body temperature.
§ Modlinger RE, Astra Pharmaceutical Products, Worcester, Mass.
¶ Urdang A, Winthrop Laboratories, New York, N.Y.
# Gunson GH, Manni PE, Pennwalt Prescription Products, Rochester, N.Y.

ature. Failure of authors to tabulate both temperatures has created unnecessary confusion in the relationship of Sp Gr of CSF versus spinal or peridural anesthetics, which may enter the human CSF and exert an effect at body temperature.

In a recent valuable Clinical Report,[4] specific gravities were tabulated with only one temperature. Cooperative pharmaceutical companies have provided the values in table 1 with both required temperatures, and I computed the densities. Proprietary solutions contain the generic components plus additives for osmolality, *p*H, and/or preservation. Pharmacologically, these additives may be inert; but physically, they are significant. Where so listed, the companies indicated that their proprietary solutions were actually measured.

The Clinical Report[4] stated that "the specific gravity of cerebrospinal fluid is greatly increased" by the intravenous infusion of 40 g glucose as 5 per cent dextrose in lactated Ringer's solution within an hour to a 58-kg non-diabetic primigravida. I believe that this degree of elevation is quantitatively untested and unknown. One g/kg glucose given intravenously over a 3–5-minute period to normal human subjects elevated the CSF glucose content to a maximum of only 60 mg/100 ml above the pre-test level.[5] In non-diabetic human subjects whose blood sugars were artificially raised as high as 300 mg/100 ml over a 2½-hour period, the maximum CSF glucose content was 100 mg/100 ml.[6] One diabetic patient who had a CSF glucose content of 156 mg/100 ml had a measured D 37 C of 1.0013 g/ml—increased, but well within the normal range.[3]

It is tempting to extrapolate densities (or specific gravities) measured at 25 C to the clinically useful 37 C or to relate the D of agents measured at 25 C to the D of CSF at 25 C and then assume that these relationships are valid at 37 C. These processes may well be scientifically unsound and medicolegally dangerous. Technical equipment is presently available to pharmaceutical manufacturers, who often provide important and complete data upon request. Anesthesiologists would procure more such information if they announced that they would utilize only such agents for which the data are published.

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Society of Obstetrical Anesthesia and Perinatology

To the Editor:—The communication from Doctor Gertie Marx describing the history of the Committee on Maternal Welfare of the American Society of Anesthesiologists and the organization and early activities of the Society of Obstetrical Anesthesia and Perinatology was most enjoyable and, I believe, very appropriate. I would like to point out that Dr. Richard B. Clark, Dr. James O. Elam, and Dr. James A. Evans were also co-founders of the Society of Obstetrical Anesthesia and Perinatology. They share equally with those of us who were graciously mentioned in responsibility for and initiation of this organization.

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