Informed Consent. Dr. Fink seems not to have understood the second sentence in the quotation. The patients were given every opportunity, and had of course, every right to refuse consent. The majority acquiesced to the proposed study.

Dr. Fink admits that it is difficult—we believe it impossible—to conduct an interview so that consent can be granted on the basis of complete knowledge. He suggests that one offer "rather a lot of information." With this we agree. But where does one begin and end? Does Dr. Fink believe, for example, that one should inform patients about to receive fluids by vein that thrombophlebitis may result, a thrombus form, and that an embolus may lodge in the lung and prove fatal? Or must he warn that one patient in every 45,000 may die from an anaphylactic reaction to an aspirin tablet?

Being concerned that patients may grant consent either because they trust their physicians completely, or because they are fearful of offending those who care for them, we have turned increasingly to volunteers. The disadvantages of this is that studies are limited to essentially normal, usually young and almost always male individuals.

Guarantor. We believe it essential, that insofar as it is humanly possible, the clinical investigator be *responsible.* This means to us establishment of the safest possible protocol, interruption of a study should an untoward event occur, and constant awareness of a plan of resuscitation (with tested equipment and competent personnel available at all times) should a catastrophe develop. All this we do. Furthermore, studies conducted on individuals receiving general anesthesia require a guarantor. The patient himself cannot request that the study be stopped, for he is unconscious.

The best guarantor might be a third party acting in the role of friend of the subject (amicus curiae). It is difficult, however, to find individuals able to devote the time and possessing the degree of knowledge of the investigators in the area under study.

If Dr. Fink is wondering whether I would have conducted this modest, and in my opinion completely safe study on one of my children, the answer is "yes." Many anesthesiologists are unaware of the relationships in *man* between epinephrine, cyclopropane and ventricular fibrillation, and assume that the latter is always a possibility, the likelihood varying with the bias of the particular anesthesiologist. It is our judgment based upon years of experience that the protocol could not have *caused* ventricular fibrillation in any of the patients selected for study.

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Metabolic Effects of Blood Transfusion: Acid-Base Balance

To the Editor: I am writing in response to Dr. G. G. Nahas' letter (ANESTHESIOLOGY 28: 787, 1967) in which he takes me to task for alleged deviations from fact in my review article, "Metabolic Effects of Blood Transfusion" (ANESTHESIOLOGY 27: 446, 1966).

Dr. Nahas presumes to lecture on the elementary physical chemistry of acid-base balance but is himself either ill-informed or deliberately chooses to distort. At *p*H 6.8, more than 95% of citric acid occurs as fully ionized citrate, and more than 99.9% of lactic acid as lactate. Virtually all of the equivalent hydrogen ions, approximately 14 mM/L, are buffered by plasma bicarbonate and by hemoglobin and other protein within the donor red cells, as clearly stated in my review. The rapid transfusion of such blood in which the buffers have been sharply reduced causes acidosis by dilution, again as stated. The data from Foote, Trede, and Maloney, my simplification of which Dr. Nahas criticizes, is introduced as an excellent example of such an acute dilutional acidosis (and not to advocate the use of ACD blood for cardiopulmonary bypass. My personal view that fresh heparinized blood is the preparation of choice for this procedure is stated both at the beginning and at the end of my review).

Dr. Nahas devotes a major part of his letter to a defense of THAM, concerning the usefulness of which I have serious doubts, but which is hardly a central point of the review. The reader who wishes to pursue the fine points of this controversy should refer to the paper by Bleich and Schwartz.[2]

Finally, we come to the issue of whether to treat the blood or treat the patient; it is clear that the routine addition of bicarbonate or THAM to blood will further add to the already predictable metabolic alkalosis which follows massive transfusion of ACD blood. There are many who consider the high serum sodium and metabolic alkalosis following multiple transfusions of ACD blood (i.e., for open heart surgery) undesirable. Cardiopulmonary bypass and other less massive transfusions are not necessarily accompanied by acidosis, as Dr. Nahas seems to believe, and when acidosis does occur, the severity cannot be predicted in advance. Therefore there can be no justification for the routine addition of alkalinizing agents to transfused blood. Dr. Nahas correctly states that "titration of acidemia in patients is a . . . delicate empirical procedure, because the amount of titratable acid to be neutralized is impossible to assess accurately." If it is difficult to detect the severity of acidosis which already exists, it is impossible to predict before it occurs. The conclusion to be drawn is that the physician who wishes to engage in the heroic procedures for which massive transfusion is necessary must be prepared to make the "delicate, empirical" measurements (i.e., serial measurement of pH and blood gases) which will provide moment-to-moment information concerning the patient's acid-base status.

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REFERENCES

1. Nahas, G. G.: Acid-Base Balance, letter to the Editor, ANESTHESIOLOGY 28: 787, 1967.
2. Bleich, H. L., and Schwartz, W. B.: Tris buffer (THAM): An appraisal of its physiologic effects and clinical usefulness, New Eng. J. Med. 274: 782, 1966.

Surgery

HEART SURGERY Open heart surgery has been characterized by the need for large amounts of fresh heparinized blood, and the relatively great risk of complications due to transfusion. A disposable plastic oxygenator, primed with 5 per cent dextrose in distilled water, 20 to 30 mg./kg., was used in over 1,800 patients. When transfusions were needed, ACD blood was used. No blood was used in 157 patients, whose operations were: repair of atrial septal defect, 77; repair ventricular septal defect, 30; mitral valve replacement, 17; other, 33. Eleven patients belonged to the Jehovah Witness faith. The authors emphasize that blood transfusions may cause complications, and that open heart operations can be done with the use of much less blood than was expected. *(Beall, A. C.: Open Heart Surgery Without Blood Transfusion, Arch. Surg. 94: 567 (April) 1967.)*

MYOCARDIAL INFARCTION In the early post-operative period, myocardial infarction is difficult to recognize. It should be suspected when the ECG differs from the preoperative tracing, involves the ST segment, shows persistent and unexplained sinus tachycardia, and the changes are progressive. Enzyme studies also help in establishing the diagnosis; if SGOT and LDH are elevated due to liver trauma, SGPT is also elevated. Elevation of SGOT and LDH, but normal SGPT suggest myocardial damage. This coupled with even borderline ECG change, strongly suggests myocardial infarction. *(Kelley, J. L., Campbell, D. A., and Brandt, R. L.: The Recognition of Myocardial Infarction in the Early Postoperative Period, Arch. Surg. 94: 673 (May) 1967.)*