

ously. At approximately 1 month of age the child was discharged. *Conclusions:* It is believed that a metabolic and respiratory regimen such as the foregoing allows the premature infant with hyaline membrane disease time to develop surfactant, and thus establish more normal surface tensions with a resultant decrease in the work of breathing. Further clinical and laboratory work is being undertaken to evaluate the alterations that occur during such supportive care of infants with this syndrome.

The Synergistic Toxicity of Local Anesthetics. T. JASON AKAMATSU, M.D., and KLAUS H. SIEBOLD, M.D., *Department of Anesthesiology, University of Washington School of Medicine, Seattle, Washington.* This study was undertaken to determine whether synergistic toxicity results from a solution containing a mixture of different local anesthetics. *Method:* The method consisted of determining LD₅₀ doses for the individual local anesthetic, combining the various LD₅₀ doses in large groups of white mice, and noting their combined toxicity. The commonly used local anesthetics mepivacaine, lidocaine, chloroprocaine, and tetracaine were studied, as was the combination of propitocaine and tetracaine. *Results:* The results were as follows:

	Lidocaine LD ₅₀ + Tetracaine LD ₅₀	Mepivacaine LD ₅₀ + Tetracaine LD ₅₀	Chloroprocaine LD ₅₀ + Tetracaine LD ₅₀	Propitocaine LD ₅₀ + Tetracaine LD ₅₀
Injected	100	100	100	100
Surviving	10	12	20	12

Discussion: The practice of combining a local anesthetic agent with the property of fast onset with an agent of long duration is not an uncommon one (Moore, D. C.: *Regional Block*. Thomas, 1957; Bonica, J. J., *Clinical Applications of Diagnostic and Therapeutic Nerve Blocks*. Thomas, 1959). Previous studies (Daos, F. G., Cope, L., and Virtue, R. W.: *ANESTHESIOLOGY* 23: 755, 1962; Adriani, J., and Zepernick, R. G.: *Anesth. Analg.* 43: 133, 1964) have demonstrated that this practice is not one without hazard. However to date, none have demonstrated quite as markedly as

this study, the inherent danger of utilizing this anesthetic technique. *Summary:* The solution resulting from the mixture of two local anesthetics was found to have a synergistic toxicity in experimental animals.

Effects of Prolonged Inhalation of Hydrocarbon Gases on Rats. J. A. ALDBRETE, M.D., and ROBERT W. VIRTUE, M.D., *University of Colorado Medical Center, Denver, Colorado.* Studies in laboratory animals to determine the hematologic effects of prolonged and continuous exposure to nitrous oxide have been reported (Green, C. D., and Eastwood, D. W.: *ANESTHESIOLOGY* 24: 341, 1963). The present study was undertaken to observe the actions of subanesthetic concentrations of ethylene, cyclopropane and acetylene on the peripheral blood cell counts and the cellularity pattern of the rat's bone marrow. *Method:* Groups of 6 male albino rats, 6 to 8 weeks old, were confined in a plexiglass chamber for six days. Gases were delivered continuously from an anesthetic machine. Circulation was maintained by a fan within the chamber. Soda lime on the bottom of the chamber assured carbon dioxide absorption. The concentration of oxygen within the chamber was maintained constant and was monitored frequently. Before confinement and on the third and sixth days of confinement, samples of blood were taken for leucocyte, erythrocyte and thrombocyte counts. Blood for hematocrit determinations was procured from the ophthalmic plexus. Before sacrificing, a bone marrow aspirate was obtained from the iliac bone. Autopsies were performed. *Results:* The animals exposed to 60 per cent ethylene and 40 per cent oxygen showed a diminution of white cell count of 48 per cent. The erythrocytes and thrombocytes were diminished 11 and 19 per cent, respectively. Bone marrow slides showed a decrease of cellularity of approximately 30 per cent. There was a normal granulocyte to erythroblast ratio (1:1). Polymorphonuclear cells were scarce. Megakaryocytes were normal. The group exposed to 6 per cent cyclopropane and an air-oxygen mixture which contained 30 per cent oxygen showed diminution of 66 per cent of the initial mean value of leucocytes; the differential count demonstrated a granulocytosis of

8 per cent with a proportional decrement of lymphocytes. Erythrocyte and thrombocyte counts dropped 14 and 13 per cent respectively. The bone marrow slides showed a granulocyte to erythroblast ratio of 0.5:1 owing to a diminution of the granulocyte count. The mature polymorphonuclear cells were curtailed and the total cellularity of the bone marrow was 70 per cent of the original. The megakaryocyte count was unchanged. Rats exposed to 50 per cent acetylene and 50 per cent oxygen had decrements in their cell counts. Leucocytes were 57 per cent; erythrocytes 82 per cent and thrombocytes 78 per cent of normal. The differential white blood cell count revealed a lymphocytosis of 10 per cent. The granulocyte to erythroblast ratio was 1:0.5 due to the diminution of erythroblasts. There was an increase of eosinophils and a diminution of megakaryocytes in the bone marrow specimens. In all the animals the hematocrit was not significantly altered. The food intake and activity were decreased. No microscopic alterations could be found in the various organs examined. The control group exposed to air under the same environmental conditions failed to show physical or hematological variations. *Discussion:* The effects of prolonged inhalation of ethylene, cyclopropane and acetylene on the hematopoietic system of rats were demonstrated. Both peripherally and in the bone marrow, the granulocytes were diminished to the greatest degree after exposure to cyclopropane. Erythropenia occurred to a greater extent in the acetylene group. This same group also showed the greatest depression of platelet count. *Summary:* Rats inhaling subanesthetic concentrations of ethylene, cyclopropane or acetylene for six days showed significant alteration of peripheral blood cell count as well as variations in bone marrow cells.

Crystalline Infusion Therapy in the Intraoperative Support of Blood Volume. ANTONIO BOBA, M.D., *The Albany Medical College of Union University and The Albany Medical Center Hospital, Albany, New York.* The plasma water is a constant fraction of the total extracellular water volume (Moore, F. D.: *New Eng. J. Med.* 273: 567, 1965). If the assumption is made that the ratio is a

constant, then any expansion of the extracellular water space would lead to a predictable expansion of the plasma water. In principle, one should also be able to match any loss of whole blood with an expansion of the total extracellular water so that the resulting expansion of plasma water would maintain a constant whole blood volume, albeit of lower hematocrit. This hypothesis was tested in 34 patients subjected to various operative procedures (15 radical mastectomies, 11 major pelvic, 5 major orthopedic, 3 others). The ages ranged from 18 to 74 with a median of 47 years. The operating time varied from less than 3 hours (6 patients) to more than 5 hours (5 patients) with a median duration of 4 hours and 5 minutes. *Method:* Expansion of the plasma water was accomplished by means of lactated Ringer's solution administered intravenously as follows: at all times the value for measured blood loss multiplied by three must be a figure equal to or smaller than the volume of infused lactated Ringer's solution. In addition, all patients received an infusion of 5.0 per cent glucose in water at the rate of 100.0 ml./hour, prorated from 0 hours of the day of operation (the entire load to be infused at the termination of the procedure). Total intraoperative infusion therapy varied from 1,000 ml. to 6,925 ml. Therapy with lactated Ringer's solution varied from 300 ml. to 5,250 ml. The operative blood loss varied from 200 ml. to 1,800 ml. absolute (6.0 to 58.0 per cent of the patients' blood volume). Blood volumes, measured before and after operation demonstrated that this procedure is capable of supporting an effectively normal blood volume. There were no intra- or post-operative complications that could be ascribed to the high water load or to the consequences of hemodilution. *Conclusion:* It appears that the use of the prescribed formula allows the support of an effectively normal blood volume under the conditions which have been reported.

Arterial Blood Oxygenation During Thoracotomies Using 30 per cent Oxygen and 70 per cent Nitrous Oxide. AZMY R. BOUTROS, M.D., and MARY R. WEISEL, M.D., *Department of Anesthesia; College of Medicine, University of Iowa, Iowa City, Iowa.* Recent