modalities. Results indicate that chlorpromazine is without significant protective effect but that significant added protection results when any one of most of the antibiotics used is given. Again the typical decompensatory phase does not develop in either group of animals regardless of whether they die or survive.

The observations indicate that shock may be irreversible in the absence of the classic decompensatory phase. This suggests that decompensation is not a basic component of the shock syndrome. When a decompensatory phase is allowed to develop, however, it is clearly an unfavorable influence. Its development may be less the consequence of the stress per se than the result of species characteristics (dog vs human, rat) or experimental methods. In this regard other studies indicate that other components of experimental techniques namely dose ranges of heparin and anesthetics, predispose to the onset of the typical decompensatory phase. The purer form of shock, without decompensation, should be a less confusing entity to study since the stress responses are not clouded by uncontrolled or unintentional ancillary factors.

Correlations of the Electroencephalogram with Trifluoroethylvinyl Ether (Fluoromar®) Anesthesia. J. R. HOUSEHOLDER, M.D., AND L. E. MORRIS, M.D., Department of Anesthesiology, University of Washington School of Medicine, Seattle, Washington.

TRIFLUOROETHYLVINYL ether (Fluoromar®) has the property of producing rapid anesthetic induction and emergence and is capable of causing respiratory arrest in the presence of high concentrations of oxygen. Because of these properties a study of this agent was pursued to see if it would produce EEG patterns significantly different from those resulting from other anesthetic agents, and to see if the EEG patterns could be correlated with venous blood level of trifluoroethylvinyl ether and clinical estimates of depth of anesthesia.

Sixteen patients, ranging in age from 89 to 33 years, the majority of whom were to have operations involving the lower extremities, were selected on a random basis. Premedication consisted of atropine sulfate 0.2 to 0.4 mg., one hour prior to induction of anesthesia. In the operating room bipolar fronto-occipital needle electrodes were placed midline in the scalp and the leads were connected to a multi-channel Gilson recorder. Lead I of the electrocardiogram was recorded simultaneously. Pre-induction waking state electroencephalogram patterns were obtained. Induction of anesthesia was with nitrous oxide-oxygen, semiclosed circle absorption, adding trifluoroethylvinyl ether as rapidly as tolerated. The system was closed as soon as possible and anesthesia maintained with trifluoroethylvinyl ether and oxygen through an endotracheal tube. Venous blood samples were obtained through an indwelling plastic catheter which had been threaded through the cephalic vein up to the junction with the external jugular vein. Samples were drawn when there was a definite change in the electroencephalogram pattern or when there was judged to be a clinical change in depth of anesthesia. Forty-nine blood samples were chemically analyzed, utilizing a bromination of the trifluoroethylvinyl ether in an excess of methanolic bromine and back titration of the excess bromine with normal thiosulfate.

Since nitrous oxide was used as an induction agent, initial electroencephalogram patterns were probably influenced by this agent. Patterns observed after the system was closed were probably more representative of trifluoroethylvinyl ether effect. Interpretations of the electroencephalogram patterns were limited to the planes of Stage III, since excitement stages created too much interference and artefacts often.

Examination of the records of the sixteen patients revealed patterns that recurred frequently. Blood samples were obtained with the appearance of these patterns and an attempt was made to correlate the blood level with the electroencephalogram pattern. The electroencephalogram patterns at progressively increased venous blood levels were:

9.00 mg.%—14–16 cps, moderate voltage
15.75 mg.%—3–4 cps, high voltage
18.20 mg.%—2.5–3 cps with beginning flattening 1¾ sec. duration
29.60 mg.%—1.5–1.0 cps with suppression periods of about 1 sec.

Elimination curves were made for two patients. The shape of the curve indicated that the major portion of the drug was eliminated within the first thirty-five minutes from the termination of anesthesia, which on the electroencephalogram appeared to be relatively deep.

On the basis of the present findings it does not seem to be justifiable to assign definite electroencephalogram patterns to corresponding estimated depths of trifluoroethylvinyl ether anesthesia. The rapidity of action of trifluoroethylvinyl ether made it almost impossible to satisfactorily judge depth of anesthesia by clinical signs. The correlation of blood levels and electroencephalogram patterns more nearly reflected the true depth of anesthesia, but here too there were factors that altered the electroencephalogram pattern so that the true state of cortical activity was not reflected. Some electroencephalogram patterns seemed correlative with trifluoroethylvinyl ether blood levels but further work is necessary to delineate these more precisely.

Studies of Two New Potent Analgesics: Anileridine and Dihydrocodeine. ARTHUR S. KEATS, M.D., J. TELFORD, M.D., AND Y. KUROSU, M.D., Department of Anesthesiology, Baylor University College of Medicine, Houston, Texas.

ANILERIDINE dihydrochloride, a substituted meperidine (aminophenylethyl meperidine), was compared to meperidine (50 mg. intramuscularly) and dihydrocodeine bitartrate was compared to morphine (10 mg. subcutaneously). Analgesic potency was determined by the method described by Keats, Beecher, and Mosteller (J. Appl. Physiol. 1: 35, 1950). The effects on respiration were determined in normal subjects in whom alveolar ventilation and end-tidal carbon dioxide tension were measured simultaneously before and after drug administration, both on room air and 3 to 4 per cent carbon dioxide inhalation. The frequencies of various subjective drug effects were determined in surgical patients on the day before operation.

Forty milligrams of Anileridine was found to be the analgesic equivalent of 100 mg. of meperidine. Fifty milligrams of Anileridine exceeded 100 mg. of meperidine in analgesic potency. At 40 mg., Anileridine depressed respiration as much as 100 mg. of meperidine. However after 3 hours, respiration had returned to control levels following Anileridine whereas respiration remained depressed following meperidine. Two groups of surgical patients (40 in each) received either Anileridine (50 mg.) or meperidine (100 mg.) intramuscularly. Qualitatively Anileridine produced all the subjective effects of meperidine including nausea, vomiting, and itching. However sedative effects were less common after Anileridine and fewer patients found the psychic effects of Anileridine to be pleasant.

Dihydrocodeine (30 mg.) was only 9 per cent less effective than morphine (10 mg.) in relieving postoperative pain. At this dose respiration was only slightly depressed at one hour following drug administration and not depressed at three hours. At 30 mg. the subjective effects of dihydrocodeine were more similar to that of a placebo than to morphine (30 patients in each group). The incidence of nausea and vomiting following dihydrocodeine was not greater than that following a placebo. Sixty milligrams of dihydrocodeine was found to be the analgesic equivalent of 10 mg. of morphine. However, at this dose, respiration was depressed almost as much as following 10 mg. of morphine. Ninety milligrams of dihydrocodeine produced no greater analgesia than 60 mg. Dihydrocodeine was unable to exceed the analgesia of 10 mg. of morphine in these doses.

An Infant Pneumotachograph. BENTON D. KING, M.D., AND STANLEY JAMES, M.D., Departments of Anesthesiology, State University of New York at New York and Columbia University College of Physicians and Surgeons, New York, New York.

PROBLEMS encountered in the measurement of respiration of the newborn infant are related primarily to the subjects's lack of cooperation, small tidal volume and lability of respiratory pattern. Measuring apparatus must of necessity incorporate light weight, small dead space, low inertia and minimal resistance. These demands have been fulfilled by various modifications of the Silverman child pneumotachograph mask.