The cough reflex returns quickly after the termination of the anaesthesia. The early return of this reflex is in agreement with the general observation that pethidine is rather ineffective in causing its abolishment. Control of cough with pethidine during nitrous oxide anaesthesia is probably due to the slightly greater depth of anaesthesia which it provides, and when the nitrous oxide is discontinued pethidine itself will not inhibit the cough reflex.

The pharyngeal reflex usually becomes active only after consciousness has returned. Many patients do not object to the presence of a pharyngeal airway even after they awaken. On request they will open their mouth to facilitate its removal.

Summary

A further report on nitrous oxide independent of oxygen restriction has been presented.

The factors which we consider important, based on our experience in over 2,000 administrations for all kinds of operations, including intra-abdominal and intrathoracic procedures, have been emphasized.

Pethidine and curare continue to be the preferred drugs for enhancing respectively the reflex obtunding and relaxing qualities of nitrous oxide.

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PROLONGATION OF THE INITIAL STARVATION PERIOD IN PREMATURE INFANTS

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Prematurity still ranks high among the causes of neonatal death. Its prevention is a matter of obstetric concern. The successful rearing of a premature infant is one of the paediatrician's major tasks, and any method of removing one of the hazards associated with prematurity is worthy of consideration. The special hazards operate particularly in the first three days of life, during which period about 75% of the fatalities occur. Intracranial trauma, congenital malformations, and atelectasis may be beyond therapeutic care, but asphyxia following inhalation of fluid—which is a common cause of death—can be avoided if no fluid be given during these first few days.

It is the purpose of this paper to describe the rationale and the routine followed in the care of a group of premature infants weighing between 2 and 5 lb. (0.9 and 2.3 kg.) at birth.

Premature infants may suffer considerable shock at birth and their immature respiratory centres be further adversely affected by anaesthetics or analgesics administered to the mother as well as by cerebral oedema or actual intracranial haemorrhage. The sucking reflex may be absent and the swallowing and coughing reflexes inadequate. As a result a spill-over of ingested fluid from the oesophagus into the trachea may easily occur and lead to asphyxia. Death due to this cause in premature infants often occurs following an attack of cyanosis during or immediately after a feed.

The lungs are deficient in elastic tissue and are slow to expand, so that pulmonary collapse occurs easily. The ingestion of fluid may lead to abdominal distension, and this results in an elevation of the diaphragm and a further tendency to pulmonary collapse.

Time of First Feeding

For these reasons delaying the initial feeding from the customary 24 hours after birth to 70 hours or more would seem a logical procedure if it did no harm to the infant.

During the past two and a half years this principle has been applied to 231 premature infants. The time of initial feeding has been in every case determined by the infant himself or herself. The routine is to place the infant in a cot immediately after his airway has been cleared, maintain an equable temperature (varying from 75 to 85° F. (23.9 to 29.4° C.) according to weight) and an adequate humidity (65%), and administer oxygen as necessary. The infant is kept as quiet as possible and away from bright light. The position in the cot is changed three-hourly and a fresh napkin applied when the previous one is soiled or wet. Recently some of these infants have been nursed naked and they have proved more active, so that routine three-hourly position-changing becomes less important.

After a variable number of hours the infant begins to cry—feebly at first and readily ceasing when his position is changed—but gradually the cry increases in strength and persistence and sucking movements of the lips are evident. When this occurs the first feeding is given. Table I

TABLE I.—Hour at Which First Feed was Given in 231 Cases

Weight in lb. and oz.	No.	Hour of First Feeding		
		Max.	Min.	Average
2-2.7 (0.9-1.1 kg.)	9	96	26	60
2.8-2.15 (1.13-1.33 kg.)	23	102	31	73
3-3.7 (1.36-1.56 kg.)	35	105	15	61
3.8-3.15 (1.58-1.78 kg.)	58	111	28	61
4-4.7 (1.8-2 kg.)	67	106	19	53
4.8-4.15 (2.04-2.24 kg.)	39	105	20	48

shows the hour at which this happened. By this time the shock of birth and the effects of any maternal anaesthetic have passed and the increasing crying has led to some further expansion of the lungs.

Effects of the Starvation Period

What have been the effects of this period of starvation? First, the weight loss, as might be expected, has been greater than in infants fed earlier. Table II shows the weight loss in the various groups. The interesting features are that the average loss is similar, irrespective of the birth weight. But when this loss is recorded as a percentage of the birth

TABLE II.—*Weight Loss of Premature Infants at Fourth Day After Birth in 219 Cases*

Weight in lb. and oz.	No.	Weight Loss in oz.		
		Max.	Min.	Average
2-2,7	7	7	4	5 (14%)
2,8-2,15	20	11	4	6 (14%)
3-3,7	32	10	0	6 (12%)
3,8-3,15	58	13	0	6 (10%)
4-4,7	66	14	0	6 (9%)
4,8-4,15	36	11	0	6 (8%)

weight a marked difference is evident, the smallest infants losing nearly twice as much as the largest—yet with no evident deleterious effect.

In a series of infants nursed during 1947, before this "starvation regime" was in use, the average weight loss for infants of similar weights was $2\frac{1}{2}$ oz. (71 g.). It will be observed that in four of the groups no weight loss occurred in the "minimum" column. In each of the 3 lb.-3 lb. 7 oz. (1.36-1.56 kg.) and 3 lb. 8 oz.-3 lb. 15 oz. (1.58-1.78 kg.) groups there was only one infant who did not lose. Small infants were routinely fed by gavage, which entailed no energy loss on the part of the infant, and this probably explains the apparent anomaly, for the weight loss was recorded routinely on the fourth day—this having been found to be the commonest day at which the lowest level was reached.

Secondly, the weight gain has been greater by the end of the third week than in a series routine-fed. Table III

TABLE III.—*Weight Gain of Premature Infants at 22nd Day After Birth in 181 Cases*

Weight in lb. and oz.	No.	Weight Gain in oz.		
		Max.	Min.	Average
2-2,7	7	15	0	6
2,8-2,15	18	11	-1	5
3-3,7	32	17	-1	7
3,8-3,15	53	29	-1	7
4-4,7	52	20	-7	8
4,8-4,15	19	14	-1	6

shows the gains attained. They represent excess over the birth weight, so that for the total weight gained the initial loss must be added. There is no doubt that when these infants did begin to feed they were more active and hungry and fed better: particularly was this so in the case of those infants nursed naked. (The totals in Tables II and III are lower than that in Table I because of the death or discharge from hospital of some infants.)

Thirdly, oedema of greater or less degree, which is of common occurrence in premature infants, disappears more quickly if fluid is withheld. Of these 231 infants 9% had oedema, and in every case it had disappeared at the end of 48 hours. In no case was feeding begun till oedema had disappeared.

Fourthly, rise of temperature might have been expected if dehydration became pronounced, comparable to the "inanition fever of the newborn" in bigger infants. Approximately a quarter of the infants showed elevations to 100° F. (37.8° C.) shortly before being fed, the temperature falling to normal within 48 hours of feeding. In no case were any symptoms evident. Special watch was kept on kidney function, but no abnormality was detected. The urines showed no increased incidence of albuminuria, there was no cylinduria or excess deposit, and no elevation of blood urea was encountered. At necropsy no ill effects were observed in the kidneys (or, indeed, in any other organs) either macroscopically or microscopically. The blood sugars showed the usual variations met in the newborn

period, with an initial fall in the hours immediately after birth, and a subsequent rise, even before feeding was begun. The figures varied from 10 to 95 mg. per 100 ml. No case presented signs of hypoglycaemia. All the infants were given vitamin K, and no signs of hypoprothrombinaemia developed, but the importance of administering this vitamin as a routine should be stressed in view of the prolonged withholding of milk.

Nursing

It is well known that the ultimate factor in minimizing the death rate in premature babies is not breast milk or incubators or humidified isolation cubicles, but good nursing. The two sisters in charge of the units where these babies were nursed were both experienced and their opinions on this regime are therefore pertinent. They agree in regarding it as an improvement on the older method of routine feeding at a given fixed hour, and think it of particular value in the smallest infants. Their main feeling, however, is one of confidence that the great "post-feeding asphyxia" problem has largely disappeared and they can now go off duty with equanimity, knowing that they will not find one or more of the infants missing when they return to duty—having died of asphyxia following a feed.

A corollary of this is that the average period of starvation could probably be increased. When in any doubt about how much longer an infant will go, the sister will quite often feed him eight to ten hours earlier than necessary so that she may herself give him the first feed, rather than leave this hazard to a less-experienced colleague on night duty.

It may be asked if any of these small infants might not cry or show signs of hunger and die of inanition in consequence. This is unlikely, for only three infants of the 231 became markedly dehydrated and needed parenteral fluid. If there is any doubt about the safety of continuing starvation the state of renal secretion may help. Urination becomes progressively less as the hours pass, and a dry napkin for 24 hours continuously usually denotes that the time for fluid administration is approaching.

In the case of premature infants born at home who have to be transferred to a "premature unit" in hospital, it is important that the non-deleterious effects of withholding fluids should be more widely known, and that these infants should be given nothing by mouth before their admission to hospital. This would result in a fall in the number of deaths due to asphyxia and inhalation bronchopneumonia.

Summary

Attention is drawn to the advantages of delaying the first feeding of premature newborn infants till three to four days after birth. It is a safe procedure and has given excellent results. The actual time of first feeding is determined by the individual infant and is decided by his cry and by progressive diminution of urinary excretion.

We are indebted to Sister Goode, of the Duchess of York Hospital for Babies, and Sister Aumonier, of St. Mary's Hospital, who had the nursing care of these premature infants, and to the staff of these two hospitals. We are also indebted to Professor A. G. Watkins and Dr. J. Jacobs, of Cardiff, who introduced to our notice the technique and advantages of nursing premature infants in the nude. Particularly would we mention our debt to Dr. Clement Smith, of Boston, U.S.A., who described the rationale and results of his "starvation regime" to us in 1947.

Between April 21 and May 22 Dr. Macdonald Critchley went on a lecture tour in Turkey as visiting professor in neurology to the University of Istanbul. He also delivered lectures in Athens and in Ankara under the auspices of the British Council.