so, especially when a superabundance of stethoscopic attention is given to the organic lesion. During the war I have seen outbreaks of D.A.H. spread amongst neurotic members of hospital wards, from the presence of a few organic cases.

(b) D.A.H. may aggravate heart lesions, valvular or myocardial, more notably if these are inflammatory, by causing increased force and frequency.

(c) D.A.H. may be interpreted organic disease, especially as, when prolonged, it may produce some cardiac enlargement chiefly right-sided, be accompanied by functional murmurs, and provoke common subjective symptoms.

(d) Organic disease may be diagnosed D.A.H., and this more often in subjects manifestly neurotic otherwise.

(e) I am not impressed with the view that latent organic heart disease affords a frequent origin of D.A.H. In my experience it is more often the case that D.A.H. is a factor in determining previous or supervenient infections to the heart.

3. Heart Pain.

If every patient who complains of pain in, around, through, or under the heart (and who has such pain, mark you!) were actually to drop dead suddenly (the usual concept of the consequence of pain in that region), our nervous population would be going down like nine-pins. On the other hand, as we all know (likewise the laity) a very slight attack of cardiac pain may be the prelude to a severe one of angina pectoris and sudden death—immediately, or delayed for years, or may herald gradual heart failure. No wonder, then, that heart pain is so common a reason for consultations, neurotics providing a large proportion of them! Qua pain alone, there are some helpful points in differentiating the organic from the neurotic.

Organic—(a) More frequent in the elderly and in males (excluding infectious carditis and pericarditis); (b) pain that is not described as originating in the heart, but indicated as substernal, in left arm and forearm, root of neck, sometimes as epigastric; (c) pain induced by exertion alone, best recognised by the history of beginning to appear during a wonted exertion, hitherto painless. Neurotic—(a) More frequent in the youthful and in females; (b) pain is more dependent on mental states apart from exertion which, as before said, often provides an emotional stimulus (a patient of mine was all the more convinced that his heart was diseased because the evening before I saw him he had got his worst attack of heart pain when he had been lolling quietly for an hour in an armchair. Inquiry revealed he was reading the newspaper, had just turned over a page, and his eyes had caught "Coroner's Inquest"); (c) the pain is often influenced by a concept—e.g., it may be referred to the left axillary region, from the idea "the heart is on the left side." Or stress being laid upon the quality of the pain may betray concepts—e.g., "bursting," "stabbing," "gnawing" (fateful processes as far as a heart is concerned). In my experience hyperaesthesia is little help; it may be acute in a cardiac neurosis, as it may be in an abdominal one. Of course, the paramount point in the differential diagnosis is the exhaustive search for any organic condition that can produce cardiac pain, but if no such disease is found the examination should be pursued for positive mental evidence of neurosis, failing which a diagnosis remains unmade. Here, again, a compromise is too frequently arrived at. The patient is told that no serious disease has been discovered, and that the cardiac pain is due to a windy stomach from indigestion. True, the indigestion, the wind, and the cardiac pain can be an interacting trinity, but it is one prone to emanate mentally.

(The concluding portion of this section, dealing with Arrhythmia, Giddiness, Night Starts, Pulitation, and Breathlessness will appear in the next issue.)

THE CARE AND FEEDING OF THE PREMATURE INFANT.∗

BY

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To have a clear idea of the difficulties of the care and feeding of the premature infant it is necessary to consider, first, why the child has been born prematurely, and the possible effects on the child of these pathological factors, and secondly, what damage may have occurred to the infant during or after birth. Some of the factors which, acting through the mother, may produce premature labour are syphilis, nephritis, (toxemia of pregnancy), heart disease, acute infectious fevers, chronic infections of the uterus, multiple pregnancy (twins or triplets), poisoning of the mother by lead, arsenic, or other metals. Malformations or abnormalities in the fetus itself, such as cases of hydrocephalus or absence of the abdominal wall, may cause premature birth. Miscarriage occurs sometimes without any known cause. To realise what damage may occur to the infant at birth one must consider the possibilities of haemorrhage, especially cerebral haemorrhage, occurring during labour. In the premature infant the vessels are so poorly formed and supported that, although labour may be extremely easy, trauma and pressure is withstood badly and the slight moulding of the head during birth tends to pull on and tear the fine vessels of the brain and meninges, causing haemorrhage. Another factor is the tendency for premature infants to bleed. The coagulation time is lengthened in many premature infants, and also their "bleeding time." Whether this be due to the fact that these infants suffer from a deficiency of calcium, since that salt is largely given by the mother in the last two months of intra-uterine life, it is difficult to say. Certainly

∗ A Lecture delivered at the Hospital for Sick Children on Feb. 10th, 1927.
the incidence of haemorrhage at birth is much higher in premature than in full-term infants. Very often the haemorrhage gives rise to a clinical picture resembling spastic diplegia, or the infant develops a hydrocephalus with spastic paralysis down one side of the body.

**Care of the Premature Infant.**

In the management of the infant the chief factors are the preservation of its body heat—that is, the prevention of a subnormal temperature—and careful administration of sufficient and suitable food.

**Methods for the Maintenance of Body Temperature.**

The premature infant has no means within itself of keeping its temperature up to normal. Heat must be applied, then, from outside. Its breathing is so shallow, its circulatory system so inactive, and its metabolism so slowed that it is not able to manufacture heat for itself. One of the chief problems therefore with these infants is to keep their temperature within normal limits.

The baby should be received at once into a jacket of cotton-wool, both arms and legs being done up in this material, and the buttocks being kept free with a separate pad to be used as a napkin. The infant is then wrapped round in a shawl and the whole deposited in a basket or bassinet, in which some method of heating has been devised. A simple method for poor parents is to hang several stone ginger-beer bottles, filled with hot water, just within the basket. Two or more hot-water bottles placed one at each side and one at the foot of the basket and changed frequently should suffice to keep the baby’s temperature up to normal. A powerful electric light suspended over the infant, which has been covered by a blanket or tarpaulin, is another method advocated by some. Personally, I find the simpler means the better.

No attempt should be made to bathe a premature infant during the first few weeks of life. It should be kept well rubbed with olive oil and the buttocks sponged from time to time, the whole child well wrapped in its cotton-wool covering. Weighing should be done in its clothing, and when an opportunity arises and the clothing is changed the weight of this can be deducted, so that the weight of the actual child is then ascertained. When the infant has attained the weight of 5 to 6 pounds normal clothing can be used.

The question as to whether premature babies should be admitted to hospital or not is most debatable. Is there any great virtue in the institutional treatment of such cases? Can anything more be done in hospital than in a private house, where an intelligent nurse is in charge? I doubt it. Incubators and superheated rooms specially prepared for the purpose in my experience have not had greater success than those cases treated in a private house and properly cared for by an intelligent mother, however poor she may be.

**The Problem of the Feeding of the Premature Infant.**

The caloric requirements of the premature infant are infinitely higher in proportion to its body-weight than those of a normal infant. The problem is reduced, therefore, to one of securing for the infant a food sufficiently high in caloric value to make it gain and sufficiently digestible to allow its intestinal tract to cope with it in large enough quantities to promote growth. The narrow line between overfeeding and keeping the intestinal tract healthy and underfeeding but supplying sufficient calories is very fine. The slightest swing to either side proves equally disastrous. It is difficult to say whether more premature infants are lost from under- or over-feeding; probably from under-feeding, as it is not commonly known that such infants require relatively enormous quantities to thrive. From the above remarks it is apparent to anyone that the great digestibility of breast milk singles it out as ideal for the feeding of these babies, since it can be dealt with in relatively large quantities without fear of digestive upset in a way in which no other food can compare.

**Breast Feeding.**—There is no doubt that where the mother can breast feed her infant the chances of that infant’s survival are greatly increased. Very often, however, if the infant be much premature, in which case breast milk is all the more necessary, the mother is quite unable to supply this, as it has not appeared. This is especially true in the case of the first baby. In such circumstances a wet nurse should be sought. On the continent this is not a very great problem, but in England the greatest possible difficulty is experienced in procuring a wet nurse. Some of our institutions have paid wet nurses, and I know of no other reason for advocating institutional treatment for a premature baby than the possibility that breast milk can be supplied. Friends or neighbours will occasionally part with some of their breast milk for the time being, however, and give the infant a start. Should the mother be able to breast feed the child or should a wet nurse be obtained, it should be put to the breast twice in the second 12 hours, and thereafter at three-hourly intervals for a gradually lengthening period, commencing with three minutes. If the infant is too feeble and undersized to suck properly the breast milk may be expressed and fed as to be described in artificial feeding. It is well known that a strong healthy infant sucking at one breast tends to make the milk flow from the opposite breast. This fact is taken advantage of and a wet nurse, by placing her strong infant to one breast and at the same time placing the premature infant to the other breast, causes the milk to flow into the mouth of the latter with little or no effort.

**Times of Feeding.**—Certainly for the first fortnight the premature infant on the breast will require to be fed as follows: If under 3½ lb., two-hourly feeding by day and three-hourly feeding by night, and if over 3½ lb. three-hourly feeding by day and
four-hourly feeding by night. More frequent feeds are required when artificial feeding has to be carried out.

**Amount of Breast Milk Required.**—A normal healthy infant requires about 2½ oz. per pound of its body-weight per day—that is, an infant weighing 6 lb. at birth very quickly obtains about 15 oz. of breast milk in the day from its mother (i.e., 2½ × 6). The premature infant requires relatively a greater amount in the day for each of its pounds and fails to thrive on anything less than about 3 oz. per pound body-weight per day—that is, a premature baby weighing 4 lb. will require about 12 oz. of breast milk in the day before it begins to gain weight properly. Waiting for the milk to appear—that is, until the third or fourth day—is more trying for the premature infant than for the normal infant. Complementary feeds, therefore, or the giving of additional feeds after the breast, should be commenced after 24 hours until the mother's breast milk can take their place. In the second 24 hours the infant requires 1½ oz. for each of its pounds in the day, whereas by the fourth 24 hours this has risen to 2 oz. per pound body-weight per day. By a fortnight the full amount of 3 oz. per pound body-weight per day should have been reached at latest.

**Artificial Feeding.**

**Choice of Food.**—The premature baby has not the same ability to manage the various food elements as the full-term child. Sugar is metabolised efficiently and relatively high carbohydrate feeds are to be recommended. Protein or curd, however, must be very carefully modified, as there is no doubt that the infant is most susceptible to curd indigestion in the first few weeks of life. Fat seems to be managed in a moderate manner. Probably the most useful food for the premature infant is unsweetened condensed milk. “Ideal” milk 1 oz., water 3 oz., sugar 1 rounded teaspoon, makes an almost humanised mixture, and the child should gradually be given an amount equal to 3 oz. of this mixture for each of its pounds in the day. This amount should be reached by the fourteenth day. An example would be that of a 4 lb. premature baby requiring 12 oz. of the mixture in the day. The child is to receive ten feeds, and therefore starting with 1 oz. at each feed, the amount can be increased by adding an extra teaspoon to each feed until the whole 12 oz. are given daily. The daily weighing of the child is a most necessary precaution. Should the infant show a steady gain no increase in the feed should be given, but if the weight is stationary, then the feed should be increased cautiously. Other foods also successfully used are the humanised dried milks. These are made up so that one very heaped teaspoon dissolved in 1 oz. of water reconstitutes as near as possible 1 oz. of breast milk. Some of these foods better known are Allenbury No. 1, Prescription Glaxo, Recolac, Humanised Trufood, Almata. It is obvious that the amount required of these would be

3 heaped teaspoons dissolved in 3 oz. of water per pound body-weight per day.

A useful food, but much less known, is lactic acid milk. This is made as follows: to 1 pint of boiled skimmed cow's milk, which has been allowed to cool, 60 drops of (B.P.) lactic acid are added, drop by drop, stirring continuously. This mixture is diluted with an equal quantity of water making it up to 1 quart and a suitable quantity of sugar is added, as a rule 1 heaped teaspoon to each 4 oz. of the mixture. As the child becomes accustomed to this the strength ought to be increased to 2 parts of the milk to 1 of water in a few weeks' time. The lactic acid milk will be found extremely useful in the feeding of premature infants, especially when there has been some slight diarrhoea or vomiting. Fully peptonised cow's milk or full cream dried milks to which lactic acid has been added are also useful, but these require great care in preparation and are probably unduly complicated.

**Times of Feeding.**—The infant under 3½ lb. should be fed at 6, 8, 10, 12, 2, 4, 6, 9, 12, and 3. When thriving well these periods should gradually be lengthened until the infant is fed three-hourly by day and four-hourly by night.

To give an example of the feeding of a particular infant let us take a case such as this. An infant is born one month prematurely weighing 3 lb. I should feed this infant at 6, 8, 10, 12, 2, 4, 6, 9, 12, and 3. I should aim ultimately at giving this child 9 oz. of breast milk in the day, or 9 oz. of the “Ideal” milk mixture, or 9 oz. of lactic acid milk. Supposing the “Ideal” milk mixture is the most suitable, I should commence by giving half an ounce in a bottle with an easy hole in the teat at each feed. Then I should weigh the child each day, which of course necessitates a scales in the home. A spring scales is quite good enough. Each day I should increase the bottles by one teaspoon—that is, having got the child accustomed to half an ounce by the fourth or fifth day, I should give 3 drachms and, if not gaining, I should increase the feed to 6, then to 7, and finally 8 drachms. As soon as the infant commenced to put on weight, an ounce per day or more, no further increase in the feed would be made, but at any sign of stationary weight the feed should be once more increased by a further drachm.

**Difficulties of Administering the Feeds.**—In some infants there is obstinate anorexia. The baby sleeps continuously and there is no desire for food. The mouth should be examined carefully to make sure it is not sore. It may be necessary for a period of 24 hours to give half normal strength saline or boiled water sweetened with sugar. Should the infant be extremely weakly and unable to suck the breast or bottle properly, the Breek feeder or what is known as a premature tube feeder, sold by Messrs. John Bell and Croyden, will be found a great help. This is made by placing on the end of a glass tube a small teat made from the rubber end of a fountain pen-filler, in which a very fine hole
has been pierced. On the other end of the glass tube an unperforated teat or finger-stall is placed and the tube filled with milk. Gentle pressure on the unperforated end forces the milk to flow from the opposite end of the tube and the baby gets its food with little or no work. Glaxo and other firms place a bottle for premature babies on the market, which is supplied with extremely small teats and is most useful. Should the infant refuse all fluid for any length of time it may be given its food by a nasal or gastric tube. This is very seldom necessary.

Blue Turns in Premature Infants.

Premature infants are extremely liable to sudden attacks of cyanosis or blue turns. There may be a variety of causes for this. The infant may have had a slight hemorrhage round about the respiratory centre in the medulla. On the other hand, it may be due to a congenital atelecstasis of the lungs, a portion of one or both having failed to expand. The child may have congenital heart disease due to its prematurity, there may be a communication between the two sides of the heart, or a patent ductus arteriosus. Finally, attacks of sudden cyanosis occur in infants if they become unduly dehydrated. This is seen occasionally where an infant has refused its food or has slept so soundly that it could not be wakened for its feeds. Insufficient fluid is taken and on the possibly the second, third, or fourth day a sudden attack of cyanosis with difficulty in breathing occurs. The giving of fluids to such a case will rapidly right it. Various observers, however, have quoted cases in which there have been blue turns proving fatal and no explanation can be offered. When these attacks of cyanosis come on the infant is best kept quiet and fed in its cot and not picked up or handled in any way. Oxygen should be administered and in cases of extreme urgency a mustard bath may require to be given.

Prevention of Rickets in Premature Infants.

In the last two months of intra-uterine life the infant receives both calcium and iron in large quantities from its mother. Should it be born prematurely it is of necessity short of calcium and iron, and therefore both anemic and an incipient rickets. The incidence of fully developed rickets in premature infants is extremely high. This need not be. From birth the infant requires small doses of cod-liver oil; a half teaspoon of a well-made emulsion will suffice twice daily. Where possible artificial sunshine should be given, and if it be summer-time and the direct rays of the sun are obtainable, these should be made full use of. From an early age raw meat-juice or bone and vegetable soup should be added to the midday bottle. This can be done safely after one month, in teaspoon doses, gradually increased until two tablespoons are being given. Strong milk mixtures are preferable to very weak ones and additions of cereals and soups to the mother's breast milk, if the child be breast fed, should be made at an early date.

EDITORIAL NOTES

About 50 members of the Inter-State Post-Graduate Assembly of North America are paying a short visit to London at the beginning of June. The session opens at Dartmouth House, the head-quarters of the English Speaking Union, 37, Charles-street, W. 1, on Wednesday, June 1st, at 10.15 a.m., with a reception by the Marquis of Reading, G.C.B., and Lord Dawson of Penn, G.C.V.O. On Thursday, June 2nd, at 5.30 p.m., Sir Arthur Keith will demonstrate interesting and unique specimens in the Museum, and on Friday, June 3rd, at 8.30 p.m., the President of the Royal Society of Medicine and Lady Berry will receive the members of the Assembly and the ladies at the Royal Society of Medicine. The morning of Wednesday, Thursday, and Friday will be occupied by short lectures, and each afternoon special programmes have been arranged in certain of the London hospitals. Lady Swaything will receive the ladies at Dartmouth House on Thursday, June 2nd, from 4 to 6 p.m.

* * *

The letter which appeared in our last issue under the title of "Desiderata of New Zealand Post-Graduates" has our warmest sympathy, and we know that the Fellowship has taken a great deal of trouble in trying to arrange clinical assistantships and resident posts for those from overseas. But the difficulty is this: every physician or surgeon in this country desires to see the would-be clinical assistant or resident before he trusts his patients to him. On the other hand, the worker from New Zealand naturally wants to know what appointment he is likely to hold before he leaves his home. However, great as this difficulty is, it should not prove insuperable, and the Fellowship is going to attack it afresh.

* * *

The fourth paragraph of our correspondent's letter expresses the desire of some of the older members of the profession from overseas to see certain men at work in their own hospitals in this country, and wishes that some arrangement could be made for this. The difficulty here is that many teachers are attached to undergraduate hospitals, and are therefore not under the organisation of the Fellowship. But we can assure our correspondent that he need not be diffident; any teacher, whether of undergraduates or post-graduates, will always be pleased to see him.

* * *

We have often referred to the growth of the post-graduate habit within the last two or three decades. In this country it may be said to have begun after the Boer war, when post-graduate
The Care and Feeding of the Premature Infant

Donald Paterson

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