Conclusion.

Summarizing the position, morbidity in the puerperium is in the main due to a single cause, the *Streptococcus pyogenes*; the failure of vaccines, a specific means of treatment, is, therefore, the more disappointing.

It appears that all but a few of our morbid cases recovered spontaneously. This being so, the conclusion follows that special remedies, such as vaccines, are of subsidiary importance in the prevention of sepsis as compared with conservative and aseptic midwifery. Puerperal sepsis, being a specific disease, must be recognized as a definite clinical process to be treated like any other infectious or contagious malady.

We are particularly indebted to Dr. Malcolm Donaldson for assistance and advice throughout the inquiry. The inauguration of the experiment on the extern district and the details of treatment were due in the first instance to him, and were carried out under his direction. To Donaldson also is due the introduction of the systematic use of sterile dressings and towels on the district, and insistence on conservative methods in the management of labour; his name in particular must therefore be associated with this paper. The extern midwifery department is grateful to Dr. Mervyn Gordon, consulting bacteriologist to the hospital, for large supplies of vaccine, and for much helpful advice on its application.

Acknowledgement is due to the Medical Research Council for assistance in the conduct of the experimental side of the inquiry.

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OBSERVATIONS ON BREAST-FEEDING.*

BY

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It is customary in this Branch for the incoming president to deliver an address or read a paper, a task which I, as a general practitioner, have viewed with some dismay. I have chosen, however, a subject which I think is interesting to all general practitioners, and particularly to

CHART 1.—Showing superiority of breast-feeding over artificial feeding in good and bad conditions of home. B1, Breast-fed by careful mothers. B2, Breast-fed by careless mothers. A1, Artificially fed by careful mothers. A2, Artificially fed by careless mothers.

TABLE I.—Showing the average weights at 1 year of infants grouped according to the income of individual members of the family after rent is paid.

	Average weekly income up to—					Over 5s.
	1s.	2s.	3s.	4s.	5s.	
Entirely breast-fed to 6 months.	1b. oz. 17 13	1b. oz. 18 0	1b. oz. 18 13	1b. oz. 18 7	1b. oz. 18 12½	20 2½
Not entirely breast-fed to 6 months.	15 11	16 6	15 14	16 6½	17 3	17 9

those who, like myself, have been engaged in the work of infant welfare for many years. To such the question of breast-feeding is paramount, whether we consider it from the point of view of the mortality or well-being of the infant, or even from that of the comfort and happiness of its parents. Chart 1 and Table I illustrate this; the type

* Being the presidential address delivered to the Midland Branch on July 13th, 1928 (abridged).

of home or of mother, or the wage of the father, makes no difference to the comparative results. Breast-feeding, then, being of prime importance, why is it that so many women do not continue to suckle for the necessary period? I propose to discuss a few of the reasons which so often lead to the abandonment of breast-feeding.

The mammary secretion depends almost wholly on one vital factor—the efficiency of the suction stimulus of the infant, acting probably through the sympathetic system, with a centre in the medulla. As the milk is formed it accumulates in the enlarged galactophorous ducts, and after the tension has reached a certain point further secretion is inhibited. If the ducts are emptied a new secretion begins. The emptying of the ducts seems to constitute the normal physiological stimulus to the gland cells, and any condition in mother or child interfering with this stimulus will cause difficulty in the establishment and maintenance of breast-feeding. In the case of the child interference with suction may be due to:

1. *Prematurity or immaturity or some cerebral injury at birth*, often resulting in somnolence. In some of these infants suction is ill controlled and inco-ordinated, or the act of swallowing may be bungled, so that the milk escapes by the mouth or sets up fits of coughing. Apart from actual injury, infants who have suffered severely at birth from the effects of a difficult labour are apt to be inert, lax, and feeble in suction for a few weeks.

2. *Various infective disorders*, such as sepsis neonatorum, icterus, eclampsia, and haemorrhagic disease, which cause loss of appetite and refusal to suck.

3. *Indigestion*, often brought about by injudicious purgation or irregular or too frequent feeds, is usually of a simple type due to too frequent feeding. It has been stated that there may also be a fat indigestion, brought about by the ingestion of excess fat in the frequent small feeds; the child is being fed practically on "strippings" always carrying a high percentage of fat. I think, however, this is extremely doubtful. Some of the wet-nurses at the Paris Maternité frequently give from 30 to 40 feeds a day, and the infants under their care do not appear to suffer from fat indigestion at all.

4. *Morbid conditions of the child's nose, mouth, and upper air passages*, such as thrush, Bednar's aphthae, nasal catarrh, adenoids, bronchitis, cleft palate, etc.

5. *Congenital dyspepsia*, a constitutional condition characterized by indigestion from the outset.

6. *A neurotic temperament.*

In the case of the mother there may be:

7. *Local conditions*, such as depression, excoriation or cracking of the nipples, and abscess of the breast.

8. *General conditions*, such as malnutrition from deficient nourishment; carious teeth; dyspepsia, etc.; and

9. *Psychological causes*, as anxiety, excitement, over-exertion, want of sleep, etc. Budin describes a serious setback to three or four infants in the Paris Maternité due to a violent fit of passion in their wet-nurse.

Many of the difficulties I have enumerated can be obviated by simple hygiene of the breasts before or after delivery; and other troubles, and their treatment, are matters of everyday experience. I do not propose to dwell further on these, but rather to discuss the more serious conditions which interfere with the establishment and maintenance of lactation, and, incidentally, certain theories and speculations of my own concerning some of them.

CONDITIONS AFFECTING THE MOTHER.

Delayed Lactation.

In some cases the full supply of milk may not be forthcoming for three or four days after labour, and may even be postponed for three weeks. If there is delay this is one of our most difficult periods; the mother is getting very anxious about her child, and must be encouraged and reassured in every possible way. It is well to avoid any form of artificial feeding. If this is not possible, a little boiled water sweetened with saccharine, or an ounce of whey, may be given for the first three days. We should, however, strictly limit the amount—the child must be kept hungry till lactation is established.

Underfeeding of the Mother.

Underfeeding of the nursing mother has, I am sure, some effect, not perhaps on the actual development of lactation, but certainly on its efficiency. I have had the

opportunity of observing a very large number of cases of breast-feeding by women distinctly suffering from poverty and underfeeding, and I submit for consideration a chart and figures which are the result of my observations.

CHART 2.—Showing the average weights of breast-fed infants grouped according to the financial position of the parents (a) in poverty, average number in family=5.7, average income per person, less rent=2s. 1d.; (b) not in poverty, average number in family=3.66, average income per person, less rent=4s. 11½d.

TABLE II.—Showing condition of breast-fed infants at 1 year grouped according to wage of fathers.

	Wage less than £1 weekly.	Wage over £1 weekly.
Good	59 per cent.	79 per cent.
Fair	29 "	18 "
Puny	12 "	3 "

It is evident that something has interfered with the normal growth of the breast-fed baby in poverty, and I suggest that it is some deficiency in the quantity or quality, or both, of the mother's milk.

In a paper published by Pritchard on "The food requirements of infants," he gives the figures of a large number of observations on test feeds conducted by himself and other English and Continental observers, and, commenting on them, he says:

"Making allowance for all sources of error, I find that the average consumption of breast milk by the slum infant is about 33 per cent. less than the estimates given by German observers for institutional infants, or than the estimates I have myself made in the case of infants in well-to-do families."

Subsequently, in a paper read by me at the National Conference on Infant Mortality in 1914, on "The effect of income on nursing capacity and infant growth," I produced further figures obtained from my own infant welfare centre, and other sources in Birmingham, corroborating this view; and in addition emphasizing the fact that, generally speaking, the gain in weight of the child varied with the amount of milk taken.

No doubt, in large measure, as pointed out by Pritchard, the smaller amount of milk given by the consultation or slum mother is an indication of the smaller demands of her child, but may there not be other factors at work? Mental shocks, great emotion, intense anxiety, may not only diminish the milk flow, but absolutely stop it. Budin has reported such a case in his book *The Nursling*. A British Government report prepared by the Intelligence Department in 1918 on "Infant welfare in Germany during the war" states that "in many instances mental distress deprived mothers of the power to feed their infants at the breast."

I have myself seen a case in which the shock caused by the accidental death of her husband completely inhibited a woman's milk production. Is it too much to suppose that, if great emotion can completely inhibit, the minor but long-continued worries and anxieties of the working woman may diminish the supply? And if we admit the effect of mental strain, can we exclude, as another factor, the physical strain undergone by a nursing mother who is being constantly underfed?

Evidence as to the improvement in the quality of their milk which followed the proper feeding of nursing mothers is afforded by the observations of Duncan and Elgood Turner, working independently in Birmingham. They analysed numerous samples of milk from poverty-stricken women who were being given one substantial meal five or six days a

week, and they agree that "while the mothers were being fed the percentage of fat in nearly all cases increased, and diminished when the meals were discontinued... the baby's weight curve improved as the fat content increased."

In similar circumstances I investigated 23 cases in Birmingham, and found that there was an average improvement of 1.16 oz. weekly, as compared with the average gain before dinners were supplied, or something like 3 lb. if the improvement was maintained for ten months. A chart illustrating this, in two cases, is shown below; the improvement in the curves while meals were being given to the nursing mothers is evident.

CHART 3.—Effect on infant weight curves of feeding nursing mothers.

CONDITIONS AFFECTING THE CHILD.

Feebleness or Somnolence from Prematurity, Immaturity, Twin Birth, Toxaemias, etc.

Regular three-hourly breast-feeding will probably prove successful in a week or two. In these cases, as in all in which the breast is not completely emptied by the child, the breasts should be emptied by expression, and the resultant milk fed to the infant; to leave milk in the breasts is to cause cessation of function. If this treatment is not successful the weakling may be fed by a foster-mother, while her more robust child is suckled from the poorly yielding breast; or a robust child and the weakling can be fed simultaneously by the mother herself; the suction of the robust infant at one breast will induce an easy flow from the other into the mouth of the weakling. We must avoid artificial feeding. Even mixed feeding will eventually teach the child to shirk the comparatively hard work implied in breast-suction.

For *cleft palate* a suitable obturator fitting on to the nipple can be obtained. *Adenoids* should be removed if interfering with suction; and *nasal catarrh* treated by instillation of warm alkaline lotion (sodium bicarbonate 1 per cent., borax 1 per cent.) from an ordinary eye dropper.

Congenital Dyspepsia.

In some children indigestion is evident almost from the first, as shown by green stools, colic, vomiting, abdominal rigidity, and flatulence. We are told by the friends that "the milk does not suit," or that it is "too windy." These cases, which I have called "congenital dyspepsia," have been described by Czerny as manifestations of the status lymphaticus, and he says that they occur in two groups—one composed of infants who are weak, puny, and complaining, in whom there may be no growth for weeks, though they are fed at quite proper intervals and there is an ample milk supply. The other group has an entirely different aspect. The child grows rapidly, and becomes fat, flabby, and pasty; it is subject to seborrhoea and other disorders of the skin, and to affections of the mucous membranes, such as nasopharyngeal catarrh, causing nasal obstruction, which, together with the intercurrent dyspepsia, is liable to lead, sooner or later, to artificial feeding. It seems to me somewhat difficult to believe that two such radically different pictures should belong to one and the same diathesis; but the practical point is that both types suffer from this obstinate indigestion, and that all these infants must be kept on the breast for at least three months. No other food is to be thought of.

In the case of the fat, pasty child it is well to limit the amount of milk taken by shortening the time at the breast to eight to ten minutes, and to give from 1 to 2 ounces of barley water before the feed, as advocated by Cameron. We have to bear in mind that the loss of appetite caused

by the indigestion will impair the efficiency of the suction stimulus, with consequent diminution, and possible cessation, of the breast function. The breasts, therefore, should be emptied as completely as possible by pumping or expression after the child has finished its feed.

The Neurotic Child.

Of all difficult problems perhaps the most difficult is that of the neurotic child. It has been stated that 50 or 60 per cent. of the early failures to obtain breast-feeding are in the case of children of this type. Let me describe a typical case.

The child was the son of a nervous, excitable woman, whose only previous son had died in infancy; her youngest daughter was 13 years old. She was intensely anxious to have a son, and to nurse and rear him when he came. From the first things went wrong. Lactation was late in establishment, and the mother became almost frantic with anxiety. When I saw the child he was already infected with his mother's excitement; he was restless, sleepless, and constantly crying. His expression was anxious, he was tense and rigid, and his fists were clenched; if asleep the least noise would wake him with a start, and the crying would begin afresh. Put to the breast, he would suck greedily, almost fiercely, for a minute or two, and then relinquish the nipple and begin crying again. The mother became absolutely worn out; the inco-ordinate, inefficient suction was causing rapid diminution of the milk, while, on the other hand, the constant, restless movements and consequent heat loss of the child were causing a demand for an increased supply; a vicious circle was established, and the milk available was clearly insufficient. With all this there was frequent vomiting of a character to suggest, at first sight, a pyloric stenosis. About 7 lb. at birth, at 2 months old the child weighed 7½ lb. It had been taken off the breast at 4 weeks, and many things had been tried since, without success. The mother would not consent to a wet-nurse. Without my knowledge he was taken to a local children's hospital, and there it was suggested that an operation should be performed, and the parents were given twenty-four hours in which to think it over. The father saw me, and I told him that no operation was necessary and that "all the child wanted was mother's milk." I knew that a wet-nurse was available if they were willing to have her. They consented to try it; and the child had its first good meal for nearly two months, and slept soundly for ten hours. After that he never looked back. He was wet-nursed for three months, and at 5 months went on to dried milk without any trouble.

CHART 4.

The weight curve of this child is shown on the chart as A. The other curve (B) is that of another similar case.

A wet-nurse, however, should be looked upon as a last resort, for it may be possible to restore the child to its own mother's breast by the method described by Cameron. He says that such children must be isolated from their mothers except at feeding times, since the nervous upset of mother and child is acting and reacting. They should be applied to the breast, on a pillow to avoid disturbance, while quiet and drowsy. If this be impossible, he gives one grain of chloral and one grain of potassium bromide before each feed; in ten minutes the child should be asleep, and can then be effectively nursed. Such treatment can be kept up for weeks, if necessary. As further measures he advises hot packs, prolonged hot baths, and a "strait waistcoat," in the shape of a very tight shawl.

Wet-nursing.

I have made frequent references to the value of wet-nursing in difficult cases, but even this has its own difficulties. The mother is generally very reluctant to consent

to this procedure; it is often difficult to find a suitable wet-nurse able and willing to leave her own home and go into the house of a stranger; the necessary physical examination of the proposed nurse takes time, and sometimes leads to trouble, and, in working-class households, the extra expense is a matter of consequence. Moreover, I know of no place in the provinces to which we can apply for a wet-nurse with much hope of success. Recently, however, I have had a very striking and interesting experience.

I managed to obtain a wet-nurse for a baby with severe indigestion, the mother having been unable to suckle for reasons into which I need not enter. The weanling was 4 months old, the foster-mother's baby was 9 months; I do not regard the difference in age as of much consequence. It was arranged that the foster-mother should be sent for at 8 o'clock every morning, and leave for home at 8 p.m., any feed required between these hours to be artificial. We found, however, that the weanling would not suck, though there was an ample supply of freely flowing milk from well-formed nipples. However, I taught the women to express the milk and feed it to the baby from a bottle. They were quite successful and obtained 3 ounces for each meal. Soon they began to find that they could express much more than the infant could take, and eventually could obtain over 12 ounces from one breast at the first expression about 9 a.m. The foster-mother had avoided nursing her own baby from that breast through the night. After consulting me, they arranged to obtain this amount each morning and store it for use during the day, and the wet-nurse then went home.

Here was a problem vastly simplified—the problem of how to wet-nurse a baby five miles away without the nurse being away from her own home all day long. I have looked up all the literature in my possession, but cannot find any reference to the maximum amount to be obtained from a woman's breasts at one sitting. Budin's wet-nurses at the Maternité have given from 50 to 74 ounces per diem divided up into thirty-four to forty feeds, but he does not say what was the greatest amount taken at one feed or pumping.

Hachner reports a test feed of 7 ounces (?average) during the seventh month, and Forsyth a maximum feed of 6½ ounces, on one occasion, during the seventh week; both of these were private cases and, presumably, the milk was obtained from one breast only. It would appear, therefore, that it should not be difficult at any time to obtain almost a full day's supply from both breasts of a wet-nurse by an early morning expression. Would, however, milk obtained thus in bulk be deficient in fat? I think it quite probable. On the other hand, since the child to be fed in this way is probably a dyspeptic, a slight deficiency in fat might be rather an advantage than otherwise.

Too Frequent Feeding.

Too frequent feeding, especially if irregular, is, I am sure, a frequent cause of failure after the milk has been well established. It might be thought that this is due, partly at any rate, to maternal exhaustion, but Budin's experiences at the Paris Maternité amply disprove any such suggestion. As already pointed out, at this institution wet-nurses can give as many as thirty-five to forty feeds daily and still continue to afford an ample supply. Rather, I think, it is due to loss of appetite in the child and the consequent deficient suction—a loss of appetite caused by indigestion. It is surprising how many infants are still being fed, at least in the first few weeks, two-hourly, in spite of all our teaching. In a series of over 500 cases of breast-feeding analysed by me of babies born in the last three years no less than 57 per cent. were being fed two-hourly in the first two months; and of these 19 per cent. ceased breast-feeding in the first month, as against 7 per cent. only of those fed three-hourly. At six weeks 74.5 per cent. of the two-hourly group and 87.2 per cent. of the three-hourly group were still entirely on the breast.

Leven and Barrett found that in normal infants the evacuation of milk from the stomach, as shown by x-ray photographs, took a minimum of one and three-quarter hours from the time the infant relinquished the nipple, and that in the case of atrophied or dyspeptic infants it might take as much as three hours. Curiously enough, the time taken was about the same for all forms of milk,

and whether diluted or undiluted. They concluded that the minimum interval between feeds must be three hours.

Here is a chart, taken from an article by Dr. Harold Waller, which illustrates the effect on milk production of too frequent feeding. The child was an inveterate screamer and was constantly being fed in the hope of achieving quiet. Note the poor weight curve and the

TEST MEALS IN OUNCES.

CHART 5.

when I got up." The figures I have quoted point to one important cause, but there must be others. The woman—at any rate the working woman—gets up on the tenth day and resumes almost full household responsibilities and anxieties. This in itself is quite sufficient to diminish secretion. With her influx of work and worry there is increased loss of heat, because hitherto she has been lying warm in bed. All this means a largely increased need for food; does she get it? Are we sure that she has had sufficient rest after the mental and physical strain of her confinement? If we could keep the working-class women a few days longer in bed (and in this respect the provision of "home helps" might be useful) might we not be doing something towards the prolongation of breast-feeding? Another point: at or about the tenth day, as has been pointed out to me, there is often a slight loss of blood from the uterus; we know that if a menstrual flow occurs during lactation the milk is often altered in quality and diminished in quantity. Is it not possible, therefore, that if this slight loss occurs at or about the tenth day there may be such an interference with the milk production as to add one more factor to those already mentioned?

Then, too, the baby is undergoing new experiences; he is being introduced to a larger world, his mentality is disturbed; possibly he is now in a cot instead of lying warmly in bed beside his mother. Is he kept as warm as he was? Add to all this the effect of two-hourly feeds, and quite possibly of too frequent night feeding (for it is surprising how often in investigating a case of indigestion we find by close questioning that even babies fed quite properly in the day are fed too often at night), and we arrive at a sum which may account, in many instances, for the failure which undoubtedly does occur at about the end of the first fortnight—in many instances, but not in all, for I have met with more than a few cases in which careful inquiry on the lines I have suggested has failed to account for the failure. Is it a failure common to all grades of society, and, if so, is it a stage in a greater affliction, the inability to suckle at all? Are there any women so constituted? Budin states that there are, and gives an example in his book *The Nursling*. I have never, in my private practice, met with such a case in a woman with normal breasts and nipples, but in my work as medical officer to infant welfare centres I have come across so many women who have solemnly assured me that they have never been able to suckle a child from the first day onwards that I am constrained to believe that there may be a very few cases of this type; in many of these, however, it might be found that the suction of an older and more robust child would be a solution even of this difficulty; and it is significant to note that in the

small amount of milk taken, as shown by test feeds, up to the seventh week. During that week the mother was persuaded to limit the feeds to six in twenty-four hours and in a fortnight to five feeds; the child became quiet and contented, and you will note the immediate improvement in the weight curve and in the quantity of milk taken at a meal.

Failures at the Third Week.

Why is it that so many failures occur early, say at about the third week? Constantly I am being told, "The milk went

case described by Budin he states that the nipples were "umbilicated," a physical condition rendering it almost impossible to apply efficiently the necessary suction stimulus.

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THE RELATION BETWEEN TRAUMA AND TUBERCULOSIS:

FROM THE PHYSICIAN'S POINT OF VIEW.*

BY

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IN discussing the relationship of trauma and tuberculosis from the point of view of the physician I intend to confine my remarks almost exclusively to pulmonary tuberculosis, but there are two other types of tuberculosis associated with injury which may first be briefly mentioned.

1. *Inoculation tuberculosis*.—This is probably the only true form of traumatic tuberculosis, and includes such conditions as butchers' and pathologists' warts, also those cases in which a tuberculous condition follows a cut by a broken sputum flask or other infected agent. Such cases are uncommon, but are true examples of traumatic tuberculosis, as they involve injury to the skin and the introduction of the tubercle bacillus from without. Their pathogenesis is so straightforward that they should not lead to any difficulty from the accident insurance standpoint.

2. *Acute miliary tuberculosis*.—This may occur as an immediate sequel to such injuries as a blow on a tuberculous testis, forcible movement of an old tuberculous joint, or operative measures on tuberculous glands, etc. In such cases it is obvious that the trauma has caused rupture into the blood stream of a tuberculous focus, and in spite of the necessary presence of the tubercle bacillus in such a lesion the trauma is still the essentially responsible factor in the ensuing train of events.

Passing to the relationship between pulmonary tuberculosis and traumatism, the first question which arises is the frequency of such occurrence. I have recently surveyed the histories of 300 consecutive cases of definitely diagnosed pulmonary tuberculosis, and find that whilst injury was suggested as a cause in six cases, there were four in which the evidence clearly linked up the onset of symptoms and the fact of injury. Small though this figure may appear, considerable sums of money may be involved owing to the liability of employers under the Compensation Acts, and it is important, therefore, that we should hold definite opinions as to the part played by trauma in such cases.

Dr. Parkes Weber, writing on this subject in 1910, grouped the cases into:

- Those cases in which no tuberculosis was known or suspected to exist prior to the injury.
- Those cases in which tuberculosis was known to be present before the injury.

This grouping may conveniently be followed, and may be compared with the classification of "due to" and

* Read in opening a discussion in the Section of Tuberculosis of the Annual Meeting of the British Medical Association, Cardiff, 1928.