THE FUNCTION OF BREAST FEEDING

BY

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The cases reported in this paper were breast-fed babies attending various Infant Centres in Croydon. The observations cover a period of six years and are limited to infants attending from the first or second month of life, totally breast fed without supplementary feeds of any sort for eight or nine months, and still under observation at the end of their first year. A larger number of cases first attending later than the second month or receiving part supplementary feeds before the age of eight months or discontinuing attendance before the end of the first year has not been included, although these were managed on similar lines and provided data similar to those recorded.

The cases are arranged in two groups :—

- (a) A series of 103 cases fed on four feeds a day from early infancy, frequently from one month onwards, never later than from the sixth month ; illustrated by a chart (Chart I) giving the average weights at birth, six months, eight months and one year.
- (b) A series of ten cases restricted to a total of three feeds per day, as a rule for reasons connected with the mother's health and her ability to continue nursing. Of these, weight-charts (Charts II-V) and individual histories are presented.

THE LACTATORY ZONE OF EFFICIENCY.

The basis of the observations was an enquiry into the functional efficiency of lactation and its action under reduced stimulation, on the hypothesis that a lactatory " zone of efficiency " might exist as in the case of other physiological functions. A few words of explanation may be advisable. We accept in talking of liver and kidney the idea of such a zone when we describe " thresholds " beyond which in the absence of organic defect certain symptoms may appear, due to purely functional irregularity, insufficiency or overstrain. In the normal person the amount of work performed daily by these organs will vary considerably, but will not ordinarily pass the limits of that " zone " within which response will go hand in hand with stimulation. In considering another example we know that a digestive apparatus which for one reason or another has continuously been working under diminished pressure due to diminished intake of food, will show a functional inefficiency to cope suddenly with an intake restored to normal level : and that, contrariwise, the function, if consistently overworked and overstimulated, will in due time retaliate with symptoms of exhaustion which will express themselves again as an inability to deal in normal time and manner with an average meal. Between the two extremes, appetite, climate, muscular exertion, variety in the dietary, accessibility to food, good or bad cooking, etc., will cause a variation in the daily intake and in the demand made on the function without producing disturbance of the mechanism. This again seems to postulate a " zone " and a " threshold."

So far as lactation is concerned, the frequency of stimulation held to be desirable for successful exhibition of the function varies considerably. The uneducated mother left to herself feeds her baby "when it wants it," half-hourly, hourly, two-hourly. The Continental school advocates frequent stimulation, every two to two-and-a-half hours. Under Variot's ⁽¹⁾ direction "Chaque nourrisson, qu'il soit débile ou normal, est mis au sein 8 fois en 24 heures (toutes les deux heures et demi). . . . C'est à tort qu'on a voulu espacer les tétées toutes les 3 heures et même toutes les quatre heures." Marfan ⁽²⁾ also recommends 2½-hourly feeding, 7 to 8 feeds per day, with a night feed if necessary. Cathala ⁽³⁾ would go so far as to say that "Au dessous du troisième mois 6 tétées par jour sont un nombre manifestement insuffisant": whereas in Germany Finkelstein ⁽⁴⁾ and others maintain that a 3-hourly interval providing six feeds "entspricht nur den natürlichen Verhältnissen wenn von den deutschen Kinderärzten diese Zahl der Mahlzeiten als die Zweckmässigste empfohlen wird." The English and American habit varies between 3- and 4-hourly, tending perhaps to 4 rather than 3, *i.e.*, 5 feeds a day rather than 6. Within these wide limits all are known to have been justified by results. The questions are:—(1) Does this circumstance point to a potential zone of activity for lactation as for other functions? If so, what are its thresholds? (2) Does the result of breast activity as evidenced in the nutrition of the child vary in any degree with the amount of stimulation? (cf. Moore and Dennis ⁽⁵⁾: "The most perfectly formed breasts will not function properly without adequate stimulation. This requires emptying of both breasts at least 5 times a day. . . . The supply varies directly with the demand.") (3) Is there within the zone of effective action any point of election which will provide the optimum for both mother and child, nervous as well as physical factors being taken into account; and if this is so, does it indicate a rationale for the management of lactation?

The cases to be recorded were tested from this point of view by an experimental adjustment of feeding times. The babies reached the Centres usually on 3-hourly, occasionally 4-hourly feeds, and the criterion of successful progress in the child, permitting or justifying a change of régime, was held to be, so far as weight was concerned, a regular gain of 6 to 8 ounces per week. No credit was assigned to any greater increase in weight for the reason that healthy babies surpassing this figure, seemed often to tend to become too heavy, suffering in consequence in appearance, alertness, activity and forward progress at the end of the first year—an opinion frankly contrary to that, for example, of Variot ⁽³⁾, who says, as many do, that the child will do well if allowed to "boire à sa soif," and of Richardson ⁽⁴⁾ who states that "the breast-fed baby never over-eats, if fed at reasonably long (3 to 4-hourly) intervals." In this series, irrespective of the number of feeds, the efficiency of lactation was held to be established so long as the child gained its 6 to 8 ounces, development was normal and mother and infant were comfortable.

In view of familiar evidence the possibilities of breast feeding under maximal stimulation were not explored. The function was tested for minimal stimulation by reducing feeds from 6 to 5 and then to 4 feeds daily: no

further reduction was attempted below 4 feeds except in the special cases recorded in Series B, when abnormal gain in weight or maternal considerations prompted the further experiment of giving only three feeds daily.

Series A (Four feeds daily).

The method of reduction is set out in Time-table 1, which includes also the

TIME-TABLE I.

The figures indicate the hours of the day.

arrangement for the 7 or 8 (Continental), and 3 feeds a day routines, the numbers on the diagram corresponding to the usual hours of feeding during the day. In the earliest cases (1920-21) the transition was not fully accomplished before the sixth month, having then been in part considered as a useful preparation for weaning: and on this account the chart giving the results (Chart I) does not show the figures for 4 feeds a day between birth and that age. As time went on the transition was accomplished more rapidly as lactation showed itself generally capable of proceeding under reduced stimulation, and the children and mothers proved well and comfortable on the smaller number of feeds. The reduction in the number of feeds was completed on occasion by the first month, in cases known to be "good milkers," and frequently by the sixth week. In no case was it attempted without the mother's full understanding and co-operation and in none was there any

record of its being necessary to return to the previous routine owing to poorer gains or the mother's disapproval of the change. As this will indicate, the questions of running away of the milk, over-distension of the breasts, etc., did not give trouble in practice, no doubt owing to the careful graduation of the reduction of feeds. One breast only was used at each feed, and the mothers were instructed to nurse for not longer than twenty minutes.

TIME-TABLE II.

Hour.	Lactation.				Routine arrangements.	Casual Duties.
	2½-hourly (8-9 feeds)	3-hourly (6 feeds)	4-hourly (5 feeds)	4-hourly (4 feeds)		
5 a.m.	X					
6 a.m.		X	X		Rise : early tea. Husband's breakfast.	
7 a.m.	X					
8 a.m.				X	School Children's breakfast. Children prepared for school.	Washing.
9 a.m.		X			Baby's bath.	
10 a.m.	X		X			Cleaning. Cooking.
11 a.m.						
12 noon	X	X		X	School Children home.	
1 p.m.					Dinner.	
2 p.m.			X		School Children leave.	
3 p.m.	X	X			Baby's walk.	Shopping.
4 p.m.				X	School Children home.	
5 p.m.					School Children's tea.	
6 p.m.	X	X	X		Husband's tea. Baby's bath.	Ironing. Mothering.
7 p.m.					School Children to bed.	
8 p.m.	X			X		
9 p.m.		X			Supper.	
10 p.m.			X			Mending and Making.
11 p.m.	X					
11 p.m.- -5 a.m.	(X)				Bed.	

Longest consecutive interval—1½ hours (10-30 a.m. to 12 noon), or if 3-hourly feeds—2½ hours (9-30 a.m. to 12 noon) in which mother has to find time for major work of house, one half-hour being allowed for each feeding, training, and "changing" of baby.

The time-table was arranged so as to procure for the mother maximum relief in the way of night interval and non-interruption of her working periods during the day. The actual transitions by half-hourly intervals were less abrupt than are the ordinary changes from 3- to 4-hourly feeds. The final routine of 4 feeds was arranged so as to correspond with the family meal times, when the mother had in any case to desist from her ordinary tasks. The baby was usually fed then, while the school children were at table, allowing the mother to have her own meal in peace afterwards. It may be noted that special interruptions on behalf of the infant, here absent, are remarkable as a feature of the ordinary 6 feeds (3-hourly) and 5 feeds (4-hourly) régimes, and a glance at the time table of the working woman's day (Time-table II) will show how in this respect the three methods compare.

A collateral enquiry into the composition of the milk and the exact daily intake under these varying régimes would have added to the completeness of the observations, but facilities were not available. Occasional test feeds where carried out showed no undue increase in the amount ingested at one nursing. An analysis of the milk in a 3 feeds a day case seen privately and not reported here showed no abnormality or change in percentage composition.

The progress of 103 cases breast fed on 4 feeds a day is shown in Chart I, where their average weight-curve is compared with the 'normal' curve.

NOTE.—The curve beginning and ending practically on normal level shows between 6 and 8 months when in all cases feeds were restricted to 4 a day, an increase of $1\frac{1}{2}$ and 2 lb. above normal. The figures (in lb. and oz.) are as follows:—

Birth (51 cases)	6 months (103).	8 months (103).	12 months (103).
7.5	16.9	19.0	21.9

Series B. (Three feeds daily).

(1) The first case of the 3 feeds a day series is illustrated by Chart II, which gives the weight curves of the 12th, 13th and 14th children respectively

CHART II.

of a multipara of 43 (Coomber). These children were each breast fed according to the routine in vogue at the Centre at the time of their birth, and the four feeds a day régime was instituted at the following ages:—12th child, Vera (1922),

6 months; 13th child, Harold (1923), 3 months; 14th child, Robert (1925), 6 weeks. The birth weight of the child Vera is not known. All previous children had been breast fed.

In all charts the mark O signifies the adoption of a 4 feeds a day routine, $\odot$ the progression to 3 feeds, and $\bullet$ the commencement of weaning.

CHART III.

NOTE.—The curves B, C and D are seen to mount rapidly on a four feeds a day régime, becoming approximately parallel to each other and to the normal when the feeds are restricted to three a day, showing that the requirements of normal nutrition were more nearly met in these cases by the smaller number of feeds.

CASE A. ROBERT COOMBER. 14TH CHILD. (Chart II.)

Mother, aged 43; very bad house in slum street: 4 rooms, 16 people: mother chronic bronchitis and dilated heart: very heavy, cyanosed and breathless: some œdema: husband out of work: milk and dinners allowed at different times.

Baby healthy, gains very well: feeds adjusted to relieve mother as much as possible: 3 feeds only from 16 weeks.

At 6 months, foot burnt.

„ 7 „ otorrhœa: 8 teeth.

„ 9 „ tries to stand.

„ 12 „ 12 teeth: stands alone.

„ 13 „ 15 teeth: walks.

„ 14 „ 20 teeth.

At 9 months the child *Harold* had 4 teeth, and at 12 months 6 teeth.

At 9 months *Vera* had no teeth.

The birth weight of the child *Robert* was less than that of his elder brother; at 7 weeks he passed him and in spite of a reduction to 3 feeds a day, continued at a higher level.

(2) Chart III shows the curves of three cases (B. C. and D.). In two supplementary feeding was eventually replaced by 3 breast feeds a day: in the third, lactation was similarly maintained in order to satisfy the mother's wishes and in spite of her repeated illness.

CASE B. NASH. (Chart III.)

Mother primipara, aged 28: previous miscarriage: supplementary feeds (Nestlé's) started in hospital during first week: mother nervous, thin and anæmic; was convinced breast-feeding was a failure; asked for treatment for her sore nipples and for directions for continuing bottle feeds.

Admitted to Infants' Nursery (special ward) when baby 3 weeks old: breast only 3-hourly (6 feeds) after few days: later 3½-hourly (5 feeds): discharged and seen at Centre at 8 weeks: baby not retaining all feeds.

At 9 weeks still sick, put on 4-hourly feeds (4 per day): mother menstruating.

At 20 weeks 3 feeds per day.

At 5 months "very good, sleeps all time between feeds": at 6½ months slight diarrhœa (hot weather): no teeth.

At 8 months 1 tooth: at 8½ months weaned: at 9 months 2 teeth.

At 11½ months 7 teeth, stands by chair: ant. font. patent.

CASE C. FITCHETT. (Chart III.)

Mother 34, 3 para.: other children 10 and 12: very nervy and thin, almost mental: anæmic, gums spongy: lactation failing: anxious to wean and threatens to discard child. Seen at 14 weeks. Baby fit but screaming with flatulence: 4 feeds only advised forthwith, simply to induce mother to postpone weaning and to minimise her duties in connection with the child. Supplementary feeds advised to follow breast as necessary.

At 15 weeks lost weight: mother has tried to breast feed and has given no supplementary feeds till last two days: continuing 4 feeds and bottle as before.

At 17 weeks breast only: mother calmer and brighter.

At 19 weeks indigestion.

At 5½ months 3 feeds daily: mother pleased with baby.

At 5½ months sits alone: in splendid condition. Mother menstruating.

At 7½ months font. small: no teeth: general condition excellent: not gaining much, but mother satisfied with progress.

At 9 months walks by chairs.

At 9½ months first tooth: "climbed 7 stairs to-day."

At 10½ months 2 teeth.

CASE D. O'BRIEN. (Chart III.)

Mother 38: 4-para. last child 9 years: bad teeth: unhealthy tonsils,

At 4 months: mother tonsillitis,

At $4\frac{1}{2}$ months : mother metrorrhagia : baby on 4 feeds.
 At 5 months : big gains : indigestion : 3 feeds. General condition excellent.
 At $5\frac{1}{2}$ months : mother tonsillitis.
 At $6\frac{1}{2}$ months : mother quinsy, child not disturbed. Very anxious to continue nursing.
 At $7\frac{1}{2}$ months : baby sits alone : tries to stand up : 2 teeth.
 At $8\frac{1}{2}$ months : mother again unwell : baby weaned.

CASE E. WHITE. (Chart IV.)

Mother 24 : 2 para : last child had spina bifida and died at one year. Dental caries.

Baby healthy.

At 11 weeks restricted to 4 feeds a day.

At $5\frac{1}{2}$ months restricted to 3 feeds a day.

At 7 months, 2 teeth.

At 8 months, 5 teeth.

Feeds restricted because of enormous gains in weight.

Did not attend after weaning.

CASE F. LANE. (Chart IV.)

Mother 39 : 6-para : big buxom type : husband ? T.B. 2 children T.B. glands, all attending T.B. Dispensary.

At $2\frac{1}{2}$ months, 3 feeds daily.

At 4 months, sits up.

At $4\frac{1}{2}$ months, font. small : very fit indeed.

At 6 months, 2 teeth.

At $11\frac{1}{2}$ months ; 9 teeth ; font. closed ; walks alone.

CASE G. COPPIN. (Chart IV.)

Mother aged 37: anæmic; tired: third pregnancy: 1 still birth: 1 child 8 years; housing conditions very good: baby ? postmature: "blue baby," 9 lbs. at birth.

At 2½ weeks: sick: diarrhœa: phimosis: to have 5 feeds only.

At 5 weeks: to have 4 feeds. Husband out of work.

At 3 months: milk granted.

At 4 months, to have 3 feeds only.

At 5½ months: mother developed mumps; child vomiting: slight ear discharge.

At 8 months: both sent to convalescent home on mother's account.

At 8½ months: no teeth: pure Cod Liver Oil started.

At 8¾ months: 4 teeth: font. very small.

At 9¼ months: weaned: 6 teeth.

At 10 months: crawls.

CASE H. KEMP. (Chart V.)

5 people: 2 rooms.

Mother 38: Irish; 3-para: 3 children born in 3½ years.

First child (girl) now aged 3: 35 lbs.: catarrhal, anæmic, numerous glands: mother thinks backward—says "Must have been overfed as infant" (on 3-hourly feeds).

Second child (girl) now 1 year and 10 months : healthy : on three breast feeds daily under the writer's supervision from 2 months to 6 months : weaned then because of mother's illness, and chart lost since.

At 12 months, walked alone.

At 1 year and 10 months very firm : font. closed : twenty teeth : very talkative.

Third child : boy, Joseph, see chart : 3 feeds routine started by mother herself arguing from satisfactory progress of last child.

At 11 weeks first attended Centre : phimosis noted : mother menstruating.

At 4 months, "splendid."

At 4½ months, sits a little.

At 9 months : 5 teeth : walks a little and tries to talk.

CASE I. MURPHY. (Chart V.)

Mother 35 : Irish : fifth child : last 7 years old : house clean, but very poor : father out of work.

At 9 weeks : first seen : excellent condition but fed any time : always crying : constantly at breast : phimosis : 4 feeds advised.

At 10 weeks : gained 12 ozs. on 4 feeds : mother very satisfied.

At 3 months, general condition excellent : start 3 feeds.

At 4 months : bronchial catarrh.

At 5 months : chickenpox : father still out of work. Mother allowed Glaxo for herself.

At 6 months : (up to date of report) very well : no teeth : "mother has plenty of milk."

CASE J. WATSON. (Chart V.)

Mother 25 ; 2-para : big, strong build, but anæmic at present : several carious teeth : housing, etc., very good. Professedly keen to nurse, but managed last child badly and difficult to reassure about anything. Fine baby.

At 3 weeks : diarrhœa : phimosis : subinvolution.

At 1 month 4 feeds started.

At 7 weeks 3 feeds.

From 11 weeks to 17 weeks in country with mother.

At 18 weeks mother had tonsillitis : smaller gains.

At 20 weeks seen by another doctor : mother insisted on weaning baby against this doctor's advice.

At time of weaning this child was 3¼ lbs. above normal weight, having been ½ lb. above normal at birth.

Remarks on Series B. The cases may be compared with each other in regard to age of mother, place in family and home conditions, and with 'normals' in regard to dental development and progress in activity as well as weight. Notes on these points are to be found in the individual histories. The first two points are perhaps of special interest, and the following table sets out the evidence relating to them.

Name.	Age of Mother.	Place in Family.
White	24	2
Watson	25	2
Nash	28	1
Fitchett	34	3
Murphy	35	5
Coppin	37	2
Kemp	38	3
O'Brien	38	4
Lane	39	6
Coomber	43	14

The variation in age of the mothers covers in the series of 10 cases two decades (24-43 years), or two-thirds of the total childbearing period : the position in family of the children ranges from 1st to 14th. There were

no individual eccentricities in the relationship of these two factors and the average works out at, age of mother 34.1, number of child 4th. It would be difficult to deduce from these figures any direct influence of either age of mother or size of family on the capacity of the individual for maintaining lactation on a régime of greatly reduced stimulation. In 4 cases out of 10, the mother menstruated during her lactation.

CONCLUSIONS.

(1) The function of lactation operates successfully within a zone of which the commonly arranged 4-hourly (5 feeds a day) method does not appear to mark the "threshold" in the direction of minimal stimulation any more than the 2-hourly marks it in the direction of maximal.

(2) The nutrition of the child may be adequately secured and lactation may be maintained on a routine of four feeds a day : as a corollary the function responds under the ordinary régimes to a stimulation in excess of what may actually be required for one child.

(3) The 2-, 3- and 4-hourly methods make a considerable demand on the time and energy of the mother considered as a whole and not only in relation to lactation (cf. time-table II.)

(4) A simple re-arrangement and restriction of the number of nursings per day may in conditions of maternal stress, mental or physical or both, have a bearing on the continuance of lactation by alleviating the total demand made on the mother without impairing the health and progress of the child. In certain cases a régime of three breast feeds per day is possible and from the point of view of both mother and child has been shown to have given satisfactory results.

REMARKS.

(i.) The condition of the child is usually regarded as the measure of success in lactation, but the comfort of the mother as the chief factor in that success receives in many cases only casual consideration. Ability to nurse has to be decided on an individual basis, and its management must be in line with individual needs. Conventional methods, nevertheless, are judged by their general success in the community, and by the reaction to lactation of motherhood as a whole. Breast-feeding, we find, has not yet been shorn of its difficulties in spite of "Infant Welfare," and professions of allegiance to it, even in Centres, show a discrepancy between creed and accomplishment. Wherein lies the hiatus? What is it that so inhibits a natural process in "Centre" as well as in "outside" mothers? Two suggestions may be made—(a) that it is the intelligent, conscientious and eager mother who typically becomes inhibited: (b) that a glance at the modern mother's time-table gives an indication of the reason.

The mother's day is composed of duties, interruptions and distractions. At the Infant Centre or elsewhere she is told that the airing and exercising, the cleansing, clothing and changing, the "mothering" of her baby are just as important as giving it its food: and while concerned about the youngest member of the family she is alive to the necessity of looking after the others, sending them clean to school, buying and cooking their proper mid-day dinner,

having the home tidy for them, mending their clothes and supervising personally their bedtime ablutions. In addition she may have a husband to see to, who expects also a reasonable amount of companionship. Anxious, conscientious, and, sooner or later, tired, she performs her duties under continuous pressure. It is in these circumstances that suggestion, not confined to advertisements, may impinge on her mind:—"—builds bonnie babies." "Mothers, nurse your babies: if you *can't*, get—." In one at least of her innumerable functions, and that not the least exacting, it appears that she, the mother, is not irreplaceable! Discouraged, she tries one, and then two, supplementary feeds, and the result is a foregone conclusion.

The type of mother who is less concerned with her function in life and who is probably unaware of all the things that are implied in really looking after a family, still finds her lactation easy, convenient and cheap. But having striven hard to arouse and educate the maternal conscience we find that this type is now less familiar than that which cannot take things easily.

Arrangements of feeding times which add to the physical and nervous strain of the mother by unnecessary interruption and repetition cannot be expected to improve breast feeding, while other things remain equal: if we do not want to retrogress we must do what we can to relieve the mother, and it is suggested that one step in the right direction may be a general adoption of an easier régime.

(ii.) The chief recommendation for breast feeding is the comparative mortality of breast- and bottle-fed babies. While this seems to ask for more strenuous efforts in promoting lactation in individual cases, it suggests also that the fullest use should be made of mothers of already proved lactatory efficiency. Wet-nursing of premature, marasmic and motherless children, and the avoidance of the dangers of artificial feeding, might become a practicable proposition if under supervision use were made in Infant Centres and elsewhere of married women whose functioning was normal and who could provide for more than their own infant by a sharing of feeds on a 2-or 3-hourly régime. The demands of this double nursing would not exceed what experience has shown that the mammary gland can perform; and the wet-nurse herself would, in these circumstances, be protected by an alleviation of her other duties and perhaps by pecuniary remuneration, thus precluding the strain which so often causes inhibition in ordinary cases. Constructive work on these and other lines might add to the value of the effort and money expended under the heading of Infant Welfare.

The writer's thanks are due to the Medical Officer of Health for Croydon for his kind permission to compile this report, and to her former colleagues, the Health Visitors, for their generous assistance in the supervision of the cases, and in collating the material for the histories and charts.

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