

THE MANIPULATION OF MATERNAL DIET AND ITS EFFECT ON THE INFANT WITH PARTICULAR REFERENCE TO GASTROINTESTINAL DISTURBANCE ...A SERIES OF CASE STUDIES

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ABSTRACT

These nine cases were chosen as a representative sample from a large case load amassed throughout a three year period, where symptoms of gastro-intestinal disturbance in the infant were successfully treated by manipulation of maternal diet; the emphasis being on optimal intake of protein, complex carbohydrate and polyunsaturated fats at the expense of simple carbohydrates.

KEYWORDS

colic; lactose; protein; complex carbohydrate; fats.

INTRODUCTION

Infantile colic is the term popularly ascribed, by both parents and health professionals alike, to behaviour ranging from the sudden onset of irritability and fussiness to extended bouts of inconsolable crying.¹ Often there is noticeable tension and distension of the abdomen associated with borborygmi leading to the passage of excessive amounts of flatus and stool, and a tendency to draw up the legs. Excessive crying is a symptom that homeostasis has been breached and warrants thorough investigation in order to obviate any acute medical or surgical condition.² Once the possibility of serious illness has been ruled out, the cause of crying can then very likely be attributed to gastro-intestinal upset. In one third of cases, symptoms of colic in the infant who is fully breast-fed, may be attributed to cow's milk consumption by the mother.^{3,4} In this situation there is usually a family history of cow's milk intolerance; and these babies are reacting to the presence of cow's milk protein fragments in the mother's milk. The avoidance of dairy products during the lactation usually suffices in restoring order in these cases. Most other babies are loosely described as suffering from 'transient lactose intolerance'.⁵ True lactose intolerance (often diagnosed in the clinical setting by virtue of testing faecal pH and faecal reducing sugars or by the breath hydrogen test; but only truly diagnosed through a biopsy of the small intestine)⁶, is the term commonly used to describe the situation whereby the infant is producing copious amounts of frothy, watery stools accompanied by the common colicky symptom of crying. These babies often respond favourably when their lactose load is reduced, usually by the use of lactose-free formula. Their symptoms are attributed to a deficiency of lactase. This enzyme, responsible for the digestion of lactose (or milk sugar) develops in the neonatal gut mainly throughout the last trimester. By 34 weeks gestation, lactase activity is approximately one third that of the full term infant, reaching 70% of full term level by 38 weeks.⁷ Babies born preterm may, therefore, be at risk for being marginally lactose intolerant.

CASE PRESENTATION

In all instances the mothers presented seeking help for their very unsettled babies. All babies but one were fully breast-fed. That is they derived their total nutritional requirements from breastmilk alone. In the one case (dyad # 6) of paediatric diagnosis of lactose intolerance, the baby had been supplemented with a series of lactose-free formulas. The common presenting symptoms included apparent pain (excessive crying; abdominal distension; tendency to draw up the legs or to stiffen); extended periods of wakefulness during which the baby was not content; several dirty nappies daily containing thin watery stools (sometimes with mucous) passed with excessive flatulence; and vomiting. These symptoms, elicited during the initial consultation, are outlined in Table 1. In most instances, maternal dietary intake (as outlined in Table 2), fell short of the Recommended Daily Allowance (RDA) for protein. Carbohydrate intake favoured the ingestion of simple carbohydrates at the expense of complex; and fat intake was minimal. The avoidance of

fats was most commonly associated with an anxiety to return to the pre-pregnancy weight.

METHOD

All mothers were advised to eat five times daily; to increase daily protein intake to at least the level of the RDA with a maximum intake of protein not exceeding 20 grams above the RDA; to maximise the ingestion of complex carbohydrate at the TOTAL expense of simple carbohydrate (until all symptoms of infantile colic had subsided); and to ensure a polyunsaturated fat intake of between 1-2 tablespoons daily. Menu choices included the following:

Breakfast: Cooked cereals or grains; eggs; meats (steak; chops; devilled kidneys or liver); beans or legumes; herrings; kippers; sardines; complemented with dairy products;

Am/snack: Yoghurt; cheese and crackers; milk (if well tolerated) home-made dips including tinned seafood; eggs; avocado; home-made mayonnaise (using a good quality cold pressed oil); pate; hommus; potpourri of nuts and seeds;

Lunch: Quiche (or other egg dishes); chicken; beef or lamb; Fish (especially tinned oily fish such as tuna and salmon with bones) WITH A GENEROUS SERVING OF SALAD OR STEAMED VEGETABLES complemented by home-made mayonnaise or salad dressing or 'super butter'. Home-made pies; soups; casseroles or 'leftovers'. Pasta or vegetarian dishes which incorporate protein and vegetables. Protein and salad sandwiches or rolls (occasionally);

Pm/snack: same as am/snack. However, if desired, 'treats' in the form of home-made biscuits such as Anzacs, using wholesome ingredients especially oatmeal, nuts/seeds and golden syrup as a sweetener were suggested. In addition, the mothers were allowed home-made (fruitless) muffins and carrot or zucchini cake or pumpkin scones or pikelets;

Dinner: Same as lunch, excluding sandwiches.

Supplements: For convenience, it was suggested that mothers with a strong aversion to tinned fish (a reliable source of Omega 3 fatty acids), may have preferred to take two capsules daily of Evening Primrose Oil (a good source of Omega 6 fatty acids, and easily obtainable at Health Food stores). Changes in feeding management, incorporating an upright or enface position, usually accompanied dietary advice. I have found, through clinical experience, that the use of an upright feeding position is useful in those cases where maternal letdown and milk flow are extremely vigorous. Also, one sided feeding (or the 'finish the first breast first' technique) allows for maximal fat drainage, especially in those cases where oversupply seems to be problematical.

DISCUSSION OF THE METHOD

In every instance a complete history was taken with particular emphasis given to maternal dietary intake and feeding practices. Advice was always tailored to meet the specific demands of each given situation; care being taken to determine that the mother was free of any medical condition which would contraindicate dietary manipulation along the guidelines outlined in this paper. Women who have pathologies involving bleeding need to exercise care with the ingestion of pure fish oil and individuals with epilepsy cannot tolerate Evening Primrose Oil.⁸ Also, individuals with nephrotic syndrome may need to keep protein intake at a low level.⁹ The use of basic minimal disaccharide dietary guidelines formed the basis of case management. This diet encourages the ingestion of adequate protein depending on each mother's weight.

Current Australian guidelines suggest that the desirable daily intake of protein corresponds to approximately a gram per kilogram of each mother's ideal weight. Complex carbohydrates in the form of cereals, grains and non-starchy vegetables were recommended over the ingestion (until symptoms subsided) of simple carbohydrates (which included most fruits and alcohol), along with ALL things containing 'empty calories'. Care was taken to ensure that the suggestion of dietary increases in protein and polyunsaturated oils encouraged a similar increase in Vitamin E and calcium and magnesium, to maintain electrolyte balance, optimise calcium uptake and prevent damage by oxidation. (A liberal intake of whole grains, legumes, nuts and vegetables minimised dietary imbalances in this situation.) The importance of adequate hydration (preferably in the form of water), was also emphasised to prevent kidney damage. In those cases where polyunsaturated fat intake was assessed as being insufficient, mothers were encouraged to use 'super butter', that is one to which has been added (by whipping in a blender) a cold-pressed oil of their choice. Home-made salad dressings and mayonnaise using cold-pressed oil were recommended; as was also the use of nuts, seeds, avocados and oily fish. For convenience some mothers preferred to take two capsules of Evening Primrose Oil daily as a supplement. Where the colic symptoms were associated with antibiotic use by either the mother or baby, (as in dyad #6), I recommended that

the baby be given a small amount (namely, one or two teaspoons) of Acidophilus yoghurt in order to re-introduce some lactobacilli into the gut, which may have been affected by the medication.¹⁰

I have found this to be useful in cases where there is no family history of cow's milk intolerance. However, the use of acidophilus and cytotifidus powders in this situation would perhaps minimise the risk of allergy to cow's milk proteins and is, therefore, a more preferable option. As far as I can ascertain there is, as yet, no clinical evidence to support this procedure.

RESULTS

These are outlined in Table 3. I found that the remission of symptoms was both individual and variable. Apart from the obvious and immediate symptoms of less crying and more periods of settled behaviour, mothers were advised that the definitive symptom heralding a return to digestive homeostasis, would be the development of a pattern of one to two stools daily which would be golden yellow and of the consistency of clotted cream. In some cases, (dyads # 2, 3, 4, 6 & 8) the babies settled within days; in other cases, (dyads # 1, 5, 7 & 9), especially where there were additional symptoms of oesophageal reflux, it took longer for the symptoms to subside. Although the emphasis in this form of case management is to reduce the lactose load on the neonatal gut and,

Table 1 - Infant Profile: Pre-Dietary Intervention

Dyad#	Birth Weight Present Wght	Age of Baby	Behaviour Reported by Mother	# and Type of Stool (daily)
1	8lb 9 8lb 7	2½ weeks	'fussing at breast'	6-8: 'smears passed with much flatulence'
2	6lb 10 12lb 8	15 weeks	'crying++; drawing legs up; unsettled between feeds'	2: 'yellow & runny with curds'
3	6lb 6 12lb 7	17 weeks	Hx: oral & anal thrush; weeping eczema 'always distressed and uncomfortable'	6-8: 'liquid curds; passed with lots of wind'
4	8lb 8 14lb 10	8 weeks	'can never settle him in evening; he wants to feed constantly; fusses; has to be driven in car to get to sleep'	3: 'yellow with curds; or green, frothy & passed with much flatulence'
5	8lb 3 15lb 4	12 weeks	Hx: ear infections; eczema. 'never sleeps; wants to suck constantly in evenings; screams much; doesn't seem to know what he wants'	12-14: 'with lots of wind & pain'
6	6lb 7 12lb 13	16 weeks	Hx: lactose intolerance diagnosed week 3; managed with breastmilk & soy-based formulas. 'he sleeps little; cries much; fights the breast; weak suck; wants to feed 2-hourly'	12-14: 'loose, thin, frothy; passed with much flatulence'
7	6lb 7 7lb	3 weeks	Hx: anal thrush. 'unsettled at breast; feeds stressful with baby on and off throughout feed'	4: 'thin, runny consistency with a few curds and strings of mucous; sounds like water coming out'
8	7lb 9 13lb 4	12 weeks	'unsettled; fussy; always on & off breast; passes wind while feeding; sleeps little'	6-8: 'very liquid with curds; often green & containing strings of mucous'
9	6lb 10 9lb 4	8 weeks	'unsettled all the time; cries inconsolably; will only sleep during day in sling or pram'	12: 'brown-yellow; very liquid with curds & passed by spurting out; breaks wind during feeds'

therefore, reduce the symptoms of colic associated with transient lactose intolerance, I have observed that reflux symptoms also often subsided. That there may be a connection between the buildup of intestinal gases and reflux is, in my opinion, an area worthy of investigation.

RATIONALE

Studies by Prentice et al.,¹¹ Abakada and Hartmann¹² and Siber et al.¹³ have demonstrated that maternal diets which are low in energy, produce milk which is higher than normal in lactose. This, I have found in clinical practice, to be of great significance in treating cases of colic in instances where maternal nutrition is suboptimal, especially with respect to protein and complex carbohydrate intake; tending instead to favour a high intake of simple carbohydrate. This apparent need for more complex forms of nutrition seems to be well understood in Eastern cultures where, throughout pregnancy and lactation, women traditionally prefer to include 'hot' (yang) foods in their diet, at the expense of 'cold' (yin) foods.¹⁴ The former refer to essentially protein foods; the latter to carbohydrates. Interestingly also, is the fact that the concept seems to have been well understood at the turn of the century, as evidenced by this dietary advice given to lactating mothers by a 'Dr. Ruddock' Licentiate of the Royal College of Physicians; Member of the Royal College of Surgeons; Licentiate in Midwifery, London and Edinburgh': *"Experience has taught mothers that if they eat anything acid, and partake freely of fruits and vegetables, the milk brings on colic in the infant and causes diarrhoea. Animal food, varied from day to day - beef, mutton, chicken, game and fish, and any kind of vegetable that has*

*not been found to disagree with herself or her infant, may be eaten, but such kinds of meat as goose, duck, salted beef, shellfish, rich or highly seasoned dishes, pastry, etc., should not be taken."*¹⁵ In addition, the importance that fat plays in reducing neonatal digestive upset cannot be underestimated. That the stomachs of newborn infants contain significant amounts of gastric lipase and rennin designed specifically (along with the serum stimulated lipase present in the milk itself) for primary phase digestion of the butterfat of milk,¹⁶ leads one to consider that human babies, therefore, should receive significant amounts of fat in their breastmilk. Fat slows down gut motility. Research has shown that it is long chain fatty acids, in particular, which enhance the effect of gastric lipase¹⁷ and calcium absorption^{18,19} and are implicated in optimal brain development^{20,21,22} and myelin synthesis,²³ and may have an important role to play in inflammatory mediation.²⁴

The long chain fatty acid content of breastmilk is enhanced when mothers consume diets rich in polyunsaturated fats. When the mother is calorie deficient, depot fats are mobilised and the milk then contains a preponderance of short and medium chain fatty acids.²⁵ The presence of appreciable amounts of fat in breast milk assumes added importance when one considers the fact that diets free from added fats induce deficiency symptoms in infants. These symptoms include skin lesions, insufficient weight gain and poor wound healing.²⁶ Of added interest is recent research comparing the usage of margarine to butter. Use of the latter results in a significantly lower level of trans oleic acid (C18:1;trans) in breastmilk. This unnatural isomer inhibits essential fatty acid

Table 2 - Maternal Profile: Pre-Dietary Intervention

Dyad#	Breakfast	AM Snack	Lunch	PM Snack	Dinner	Avg Daily Protein	Maternal Weight
1	cereal with trim milk	nil	s/w: salmon or cheese & salad	nil	meat & veg or salad	57 g	73 kg
2	porridge	nil	occasional s/w: usually 'grabs a biscuit or muffin'	nil	meat & veg	39 g	53 kg
3	2 bowls of Cornflakes; large glass of Milo	large glass Milo; biscuits	s/w; white bread & vegemite; glass cordial	nachos & Cherry Ripe	pasta: creamy cheese & bacon sauce or stir-fry with min veg & max noodles	62 g	80 kg
4	crumpet & jam or avocado on toast	usually nil; occasional banana	s/w: meat & salad	nil	meat & veg; usually braise or stew; 3 sherries	46 g	70 kg
5	rice cakes with vegemite, peanut butter or tomato	nil	s/w: ham or cheese & salad; or vegemite or peanut butter, occasional banana	nil	fish or chicken with rice & veg; banana	49 g	65 kg
6	weet-bix or muesli with stewed apple	s/w: vegemite	s/w: vegemite	nil	fish or chicken with rice & veg; banana	55 g	50 kg
7	big bowl fruit	muesli; almonds; yoghurt	s/w: meat & salad or 'leftovers'	cheese & crackers	meat, rice or pasta with veg	73 g	57 kg
8	nil	big bowl of fruit	yoghurt fruiche	s/w: meat & salad or 'leftovers'	9 pm: meat & veg	53 g	65 kg
9	sultana bran; trim milk	biscuits	s/w: ham & salad or vegemite	cheese & crackers	red meat, quiche or chicken & salad; champagne	55 g	60 kg

metabolism by competitive inhibition of the enzyme delta-6-desaturase.²⁷

CONCLUSIONS

It would appear then, that there has always been a traditional body of information that acknowledges what is good dietary advice for mothers and babies. We, in Western, modern-day cultures seem to have lost touch with this knowledge. This has perhaps been due to concerns presently expressed in the medical literature and popular press regarding excess protein and saturated fat consumption, and their possible links to modern disease states. However, in light of recent research findings it seems that, while the recommended dietary guidelines for the community at large suggesting that a balanced diet tending more towards the consumption of carbohydrates at the expense of large amounts of proteins and fats is advisable, lactating mothers (as evidenced by the facts presented in this paper) may need further investigation in this regard, with more emphasis given to optimum, balanced nutrition which more specifically addresses the unique needs of babies and their mothers.

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Table 3 - Infant Profile: Post-Dietary Intervention

Dyad#	Follow-up After After Dietary Intervention	Behaviour Reported by Mother	# and Type of Stool (daily)
1	8 days	'settled; feeding well'	2: 'golden-yellow; consistency of shaving cream'
2	6 days	'a changed child within 24 hours; no longer cries for extraordinary amounts of time'	1: 'creamy consistency'
3	7 days	'within a few days of changing my diet, her rash disappeared and she stopped screaming all the time'	2: 'thick pasty consistency, a golden colour'
4	4 days	'more settled, especially in the evenings'	2: 'golden; pasty'
5	9 days	'settling well; having daytime sleeps'	'count going down'; (within 3 weeks, down to 1: thick, golden)
6	7 days	'no longer pulling off breast; feeding longer; has stronger suck; now for 1st time ever, is having 2-hour morning sleep'	1: 'golden, thick'
7	10 days	'feeding more leisurely; attaching well, both sides; anal thrush gone'	1: 'pasty; golden-yellow'
8	7 days	'more settled between feeds; feeding well; no more fussing at the breast'	2: 'thick; golden yellow'
9	17 days	'very settled; sleeping; feeding in a regular pattern'	1: 'pasty'