

Infant Formulae available in Saudi Arabia

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Saudi Medical Journal 1986; 7(3): 218-226

هنالك مجموعة من أنواع حليب الرضع متوفرة في المملكة العربية السعودية (٣٦ على الأقل) توضح المراجعة الحالية لعدد من حليب الرضع وتقرن محتواها مع التوصيات الدولية وتحدد مدى مطابقتها للاحتياجات الغذائية للرضع. وضعت عدة اقتراحات للأطباء والهيئات الحكومية وللشركات المصنعة.

Summary: There is a bewildering array of at least 36 infant formulae available in Saudi Arabia. This review details many of the available formulae and compares their composition with international recommendations to see whether they meet the nutritional needs of infants; a few suggestions are made to physicians and governmental bodies as well as to manufacturers.

Résumé: Une variété incroyable de formules de lait pour nourrissons en Arabie Saoudite (au moins 36). Cette revue décrit en détail un grand nombre de ces formules et compare leur composition avec les recommandations internationales, pour déterminer si elles satisfont les besoins nutritionnels des nourrissons. Quelques suggestions sont proposées aux praticiens et organismes gouvernementaux, aussi bien qu'aux fabricants.

Introduction

Whenever possible, babies should be breast fed since this is associated with a number of metabolic, immunological and possibly emotional advantages when compared to the alternatives. The wisdom of this has been endorsed by numerous reports and papers throughout the world.¹⁻⁵ For various reasons, however, many mothers throughout the world, including Saudi Arabia, solely breast feed their babies only for a few months.^{8,18} Surveys of infant feeding practices in Saudi Arabia have shown that breast feeding is more common in rural villages than in towns but even there 40% of babies would have received some bottle feeds.⁶⁻⁸

Health education should promote and encourage breast feeding and this is the policy of the Ministry of Health.⁹ Nevertheless, it is clear that many mothers will also offer bottle feeds. If the mother does not completely breast feed her baby a suitable alternative for breast milk should be used. For many years the alternative was unmodified cows' milk, but this may lead to a number of metabolic problems.

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Date submitted: 18.3.85

Date accepted: 1.7.85.

Therefore recently cows' milk has been modified in various ways to make it more suitable for the infant, and guidelines on the composition of these infant formulae have been issued by various national and international bodies. There is a bewildering array of infant formulae available in the country — at least 36 in Riyadh⁸ and 12 even in remote villages.⁷ This review gives details of many of the available formulae and compares their composition with the recommendations of various bodies.

Methods

It is often difficult to be certain of the exact composition of a formula available in Saudi Arabia. Product information is not always available from the agents, the details given on the packaging are necessarily limited by space and information in publications from other countries may not be applicable to Saudi Arabia because the same formula may have different names in different countries and the exact specifications of formulae of the same name vary depending on the country of production and the country of sale.

The information presented in this paper was collected mainly from the contents list on the packaging (necessarily limited by space). Information from publications was checked, where possible, with the manufacturer's product information.

Choice of Compositional Standards

The obvious standard for comparison is that of the Codex Alimentarius of WHO and FAO,¹⁰ and Lawson¹¹ used this in her useful review of infant formulae available in Riyadh some years ago. However, the Codex is now 8 years old and some of its recommendations are not in keeping with current paediatric opinion, e.g. the wide variation in protein content, the lack of an upper limit on phosphorus content etc. Therefore the standard published as a draft directive of the European Economic Community (EEC) is also included.⁴ This is recent; it represents the combined views of paediatricians from many countries of the Community; it reflects the contents of a number of other reports,¹²⁻¹⁵ and it distinguishes between those formulae suitable immediately from birth (as a substitute for breast milk), and those suitable for later infancy when the gastrointestinal and metabolic tolerance of the baby is much greater and often he/she is eating other foods as well.

Choice of Nutrients

Some details of reconstitution, and the contents of the major nutrients (protein fat and carbohydrate) are given for each formula. The contents of six other nutrients are given because of their potential clinical importance:

Linoleic Acid

Although there are different views concerning the exact requirements of linoleic acid it is regarded as an essential nutrient and the concentration in cows' milk is only a fifth of that in most mothers' breast milk.

Calcium and Phosphorus

The high intake of phosphorus of bottle fed babies receiving unmodified cows' milk may lead to hyperphosphataemia, causing hypocalcaemia and convulsions.

Sodium

The high intake of protein and the major electrolytes, particularly sodium, may embarrass the concentrating of urea and sodium. If the child has gastroenteritis he may develop the hypernatraemic variety of dehydration which is more severe and has more complications than isotonic or hypotonic dehydration. Potassium and chloride also

contribute to the embarrassment of renal concentrating ability but their concentrations are broadly proportional to the sodium concentration.

Vitamin D and Iron

Deficiencies of these nutrients are common during the early years of life. In particular, work in this department has shown rickets to be a major problem in Saudi Arabia.¹⁶⁻¹⁷

Results

Infant Formulae – "Starting" or First Age

Table 1 shows the composition of those infant formulae which are marketed as suitable from birth, i.e. they are intended to be used either as a complete substitute or a supplement for breast milk. They will meet the normal nutritional needs of the infant during the first 4–6 months of life and, if enriched with iron, can satisfactorily be used for infants throughout the first year of life.

In the manufacture of infant formulae, cows' milk has been modified in various ways to bring its composition closer to that of breast milk.¹³ Two major types of starting formulae are available in Saudi Arabia.

Substituted Fat

The fat of cows' milk is partially or completely replaced with a mixture of vegetable (and sometimes animal) fats so that the fatty acid composition more closely resembles breast milk fat. Extra carbohydrate is also added. The extra carbohydrate increases the overall concentration of carbohydrate to the levels in breast milk and it also reduces the concentration of protein and minerals per unit energy intake. The extra carbohydrate may be lactose only or other carbohydrates such as maltodextrin (hydrolysate of starch) and sucrose may be used. Fat absorption from these formulae is greater than from cows' milk and the concentration of protein and electrolytes are about midway between breast and cows' milk. The protein remains as unmodified cows' milk protein, i.e. predominantly casein.

Demineralized Whey

Demineralized whey, containing whey proteins (mainly lactoglobulin), lactose and small amounts of minerals, used as the base; to this is added a small amount of skimmed milk (introducing casein, more lactose, and some minerals), a fat mixture as described above and other minerals as required. In these formulae there is more whey protein than casein (just as in breast milk) and the concentrations of calcium, phosphorus and the major electrolytes are fairly close to those in breast milk.

The compositions of the formulae are compared with the Codex and the European recommendations and the composition of breast and cows' milk. The formulae mostly fall within the recommendations but there are exceptions.

Figures in italics (Table 1) show deviation from Codex and European recommendations, or the sodium content is relatively high.

The table also shows which formulae are made up as 1 scoop plus 30ml water (European pattern) or 1 scoop plus 60 ml water (USA pattern).

Follow-up Milks

Table 2 shows the composition of the formulae which are promoted as suitable for infants over the age of 4 months or are often drunk by them. Again they are compared to the recommendations and the composition of cows' milk.

They do not necessarily have to provide all of the infants nutritional requirements since they should form part of a diversified diet. Even if these formulae meet the recommendations for a "follow-up milk" they often do not necessarily meet the recommendations for composition of a starting formula and they should not be given to infants below 4 months.

All contain extra iron and vitamin D which will be a useful safeguard while the older infant is transferring to family foods.

Special Formulae

Table 3 shows the composition of special formulae. These should be used only where there is a specific paediatric indication.

Water used for Reconstitution

Table 4 shows the mineral content of tap water from various parts of Riyadh. The sodium content is relatively high. However, if one of the demineralized whey formulae with a low sodium content were made up with water from Malaz the resulting sodium concentration (18 mmol/litre, 414 mg/litre, 62mg/100 kcal) only just exceeds the upper recommendations of Codex and the EEC.

Discussion

The vast number of available formulae is bewildering but nine practical points may be made.

For Paediatricians and Other Health Workers

1. As with therapy the paediatrician should get to know two or three products very well (e.g. method of reconstitution, nutritional composition, type of protein, variety of carbohydrate etc) rather than have a superficial and inadequate knowledge of many products. We can then give accurate informed advice to mothers.
2. There is little to choose between many formulae, but for the young infant living in an area where water sodium content is so high there are advantages in choosing a demineralized whey formula with a composition conforming to both Codex and EEC guidelines.
3. A starting formula may be continued throughout infancy. Alternatively, a follow-up milk conforming to the guidelines may be introduced from 4 months or so. Cows' milk alone without added iron and vitamin D, is best avoided during infancy.

For Agents and Manufacturers

4. It proved very difficult to obtain adequate product information from the agents of many manufacturers; this should be made readily available.
5. It would be useful if the reconstitution instructions were similar for all formulae. Since "1 scoop plus 30 ml of water" is the most common method this should be adopted as the standard. Formulae originating from the USA use "1 scoop plus 60 ml" but when the same formulae are used in Europe the manufacturers supply a different size scoop to fit the European norm. It should present no problems to do the same in Saudi Arabia.

	(a)	(b)	(c)	(c)	(c)	(c)	(d)
EECDraft Directive	60-75	3.3-3.0	300-1200	7-14	23-60	50-	1-2
Breast milk	-	6.5	430	10.0	21	50-	(c)
Unmodified (f)	-	5.1	80	7.2	78	180	0.06
Cows' milk	-	-	-	-	-	-	0.08

*No recommendation

Table 2
Follow-up Formulae
Composition Content per 100 kcal

Formulae Standard	Reconstitution Kcal 100 ml	Water (ml) per scoop	Protein g	Fat g	Linoleic acid mg	Carbohydrate g	Sodium mg	Calcium mg	Phosphorus mg	Vitamin D µg	Iron mg	Potassium mg
Guigos II	67	30	3.73	3.80	343.28	12.76	55.22	134.33	104.48	1.49	1.79	168.66
My Boy Half Cream	62	33	4.27	2.55F	-	15.22	64.51	158.06	112.90	2.37	1.66	196.77
My Boy Full Cream	62	33	3.61	3.71F	-	13.01	54.84	141.93	112.90	2.18	1.53	174.19
Nektarmil II	73	Varies	3.51	3.40	-	13.56	-	141.09	105.48	1.37	-	-
Nestogen II	67	30	4.10	4.48	567.16	10.75	61.19	146.27	113.43	1.49	1.79	186.57
Nido	-	-	-	-	-	-	-	-	-	-	-	-
CODEX Recommendation (c)	-	-	1.8-4.0	3.3-6.0	300-	20-60	50-	25-	1-2	-	1	-
EECDraft Directive	60-80	-	2.25-4.5	3.3-6.5	(a) 300-	(c) 7-14	(d) 15xp	(d) 35xp	(d) 28xp	(d) 1-2	1-2	1-2
Unmodified (f)	67	-	4.9	5.5	80	7.2	80	180	150	0.06	0.08	-

- No information available.

Notes to Tables 1 and 2

- (a) when the protein has a higher whey: casein ratio e.g. as in demineralized whey formulae the lower limit is reduced to 1.8g as the formula contains the same amount of each essential amino acid as in human milk.
- (b) The percentage of lauric acid and myristic acid must not exceed 15% of the total fatty acids.
- (c) Lactose should not be less than 3.5g and sucrose should not exceed 20% of total carbohydrate.
- (d) Content for formulae to which iron is added during manufacture, formulae without added iron are permissible.
- (e) Small amounts present, previous suggestions of a water soluble vitamin D sulphate are probably analytical errors.
- (f) Composition varies a little according to the breed of cow and the seasonal variation in her diet. Composition of goats milk and camels milk is broadly similar to cows milk.

Table 3
Special Formulae
Composition Content per 100 kcal and Source of Nutrient

Formulae or Standard	Kcal 100 ml	Reconstitution Water (ml) per scoop	Protein g	Fat g	Linoleic acid mg	Carbohydrate g	Sodium mg	Calcium mg	Phosphorus mg	Vitamin D µg	Iron mg	Potassium mg
AL 110	67	30	4.4 Casein only	4.2 Veg. oils	—	G	—	—	—	—	—	—
Bebelac FL	69	30	2.46 Casein only	4.35 Veg.	1428.98	12.68 M.D G	28.98	78.26	52.17	1.59	0.58	82.60
Isomil	67	60	2.98 Soya + Methionine	5.37 Veg. oils	1044.77	10.15 M.D. Sucrose	44.78	104.48	74.63	1.49	1.79	105.97
Nutri SOYA	68	Varies	3.24 Soya + Methionine	4.41 Veg. oils	180.88	12.06 M.D. G	30.88	92.65	45.59	2.94	0.73	82.35
Pregestimil	68	60	Hydrolysed casein	Veg. med. chain Triglycamide	—	—	47.06	92.65	61.76	1.47	1.91	108.82
S Formula	67	30	2.78 Soya + methionine	3.98 Veg. oils	1940.00	11.94 M.D. G	29.85 19	89.55 14	44.78 73	1.94 Nil	0.75 Nil	82.09
Dominated (d) chicken			12.7 Chicken	4-7 Chicken								

G = glucose.

M.D. = maltodextrin.

Table 4
Chemical Contents in Drinking Water in Various Administrative Areas of Riyadh

Various Administrative areas of Riyadh		Malaz	Schumaisy	Manfoha	Salbooch	Buwayab	Wasi'e
Chemical contents in drinking water							
Ca	meq/l	1.5	4.1	2.3	2.3	2.5	4.4
Mg	meq/l	3.5	3.6	2.8	2.1	1.8	2.9
Na	meq/l	12.0	7.0	13.0	11.0	6.0	8.0
L	meq/l	0.8	0.1	0.0	0.5	0.2	0.1
Fe	meq/l	0.0	0.0	0.0	0.0	0.0	0.0
Cl	meq/l	7.6	4.8	6.9	5.2	6.9	5.5

Source: Department of Water & Sewage, Riyadh Region:
Program for Maintenance & Operation of Riyadh Water Supply

For Central Government

6. Eventually, standards for the composition of infant formulae should be introduced. Although the standards of the Codex Alimentarius are a useful starting point they should not be accepted without modification for use in Saudi Arabia.
7. Manufacturers should be asked to agree to a uniform method of reconstituting the formula.
8. Agents supplying formulae should be required to provide adequate product information to any member of the health care profession who requests it.
9. If possible the sodium content of drinking water should be reduced, thus allowing a free choice of formula. If this is impossible mothers should be advised to use a demineralized whey formula or to reconstitute feeds with bottled water known to have a low sodium content.

Acknowledgement

I am grateful to many people who helped me in the preparation of this paper: Dr B. A. Wharton (current address Sorrento Maternity Hospital, Birmingham, UK); Mrs Vanessa Moore, Department of Nutrition, King Khalid University Hospital Riyadh, Saudi Arabia; Mr Saleh Al-Owain, Department of Consumer Protection, Ministry of Commerce; and Mr Ali S. Al Serhan, Program for Maintenance and Operation of Riyadh Water Supply.

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