Archives of Disease in Childhood, 1974, **49**, 867.

Comparison of dried milk preparations for babies on sale in 7 European countries

I. Protein, fat, carbohydrate, and inorganic constituents

E. M. WIDDOWSON, D. A. T. SOUTHGATE, and Y. SCHUTZ

From Dunn Nutritional Laboratory, University of Cambridge and Medical Research Council, Milton Road, Cambridge

Widdowson, E. M., Southgate, D. A. T., and Schutz, Y. (1974). *Archives of Disease in Childhood*, **49**, 867. **Comparison of dried milk preparations for babies on sale in 7 European countries. I. Protein, fat, carbohydrate, and inorganic constituents.** Thirty-two dried milk preparations, designed for infant feeding and obtained from 7 European countries, have been analysed for nitrogen, carbohydrate, fat, the distribution of fatty acids in the fat, and 8 inorganic constituents.

The composition of the milks differed considerably. Some were full-cream dried milks. Many had carbohydrate added in the form of lactose, sucrose, or dextrimaltose. Some were 'half-cream', others had had all the milk fat removed and replaced by a mixture of animal and vegetable fats or, in one instance, by maize oil alone. The fatty acid composition of these milks varied considerably, and linoleic acid accounted for up to 58% of the total fat in one as compared with 9% of the fat in human milk and 1 to 2% of that in cow's milk.

All the milks contained considerably more calcium and phosphorus per 100 g solids than human milk, some of them four times as much. Some milks had had an iron salt added during manufacture, and a few contained added copper.

In the developed countries of the world there must be hundreds of different dried milk preparations being produced and sold, all intended to serve as the sole source of nutrients for babies during the first months after birth. Some of these are whole or partially defatted cow's milk. Some have lactose or other carbohydrate added. Some use whey, a by-product of the cheese industry, as the protein base, and in some all the fat originally in the milk may be removed and replaced with a mixture of other fats. Vitamins A, D, and C are added to some, and they may or may not be fortified with an iron salt. A few contain added copper. We have analysed 32 of these preparations, and the results form the subject of this paper. A less detailed account was presented by Widdowson (1973) at the British Nutrition Foundation Conference.

Materials and methods

One packet or tin of each of the 32 dried milk preparations was obtained. A list of these is given in Table I.

Received 6 May 1974.

When the container was opened the contents were sampled at once for everything it was intended to measure. Residual moisture was determined by drying a portion in an oven at 100 °C till constant in weight. Total nitrogen was determined by the micro Kjeldahl method with potassium sulphate and copper selenite as catalysts. Protein was calculated as nitrogen $\times 6{\cdot}38$. Lipids were extracted from the powder with chloroform: methanol 2:1 v/v and purified with petroleum spirit as described by Southgate (1971). The extract of petroleum spirit was used for the determination of total lipid by weighing the residue after removal of the solvent. It was also used for the separation of the fatty acids by gas-liquid chromatography after methylation with BF_3 in methanol. A Pye Unicam (Cambridge) series 104 gas-liquid chromatograph equipped with a hydrogen flame ionization detector was used.

Free sugars were extracted with aqueous methanol (85% v/v) and the extracts examined qualitatively by thin-layer chromatography. Hexoses were measured in the extracts after removal of methanol by the anthrone procedure (Dische, 1955), using lactose as the standard. Where a mixture of sugars was present the extracts were evaporated to dryness and the trimethylsilyl derivatives prepared and separated by gas-liquid chromatography

TABLE I

Milks analysed

Country of origin	Name of milk	Manufacturer
U.K.	Ostermilk No. 1 & No. 2	Glaxo
U.K.	Ostermilk Complete Formula	Glaxo
U.K.	Cow & Gate Babymilks 1 & 2	Cow & Gate
U.K.	Cow & Gate V Formula	Cow & Gate
U.K. (U.S.A.)	SMA	John Wyeth
France	Lait Guigoz 1 & 2	Guigoz
France	Nativa	Guigoz
France	Galliasec 1	Gallia
France (U.K.)	Milumel 1 & 2	Milupa
France (U.K.)	Lemiel 1 & 2	Milupa
Holland	Almiron B	Nutricia
Holland	Farilacid	Nutricia
Holland	Frisolac	Co-op Condensfabriek Friesland
Holland (U.S.A.)	Similac	Ross Laboratories (Abbott Laboratories)
Germany	Milumil	Milupa AG
Germany	Nan	Nestle
Italy (Switzerland)	Pelargon	Nestle
Italy (Switzerland)	Prodieton	Nestle
Italy	Plasmolac	Plasmon
Italy	Auxolac	Carlo Erba
Denmark (Switzerland)	Eledon	Nestle
Denmark (Switzerland)	Pelargon	Nestle
Switzerland	Eledon	Nestle
Switzerland	Pelargon	Nestle
Switzerland (France)	Guigolac	Guigoz
Switzerland	Humana 1 & 2	Galactina & Swiss Milk Co.

with β-phenyl glucoside as the internal standard (Davison and Young, 1969). The interference of α-lactose in the measurement of sucrose was estimated using the β-lactose peak and the measured equilibrium between the α and β anomers. Starch and dextrins were measured as glucose after enzymatic hydrolysis with Taka-diastase (Southgate, 1969).

Duplicate portions of all the powders were ashed in a muffle furnace at 450 °C overnight, or until a white ash was obtained. The ash was extracted with HCl as described by McCance, Widdowson, and Shackleton (1936) and the acid extract of the ash used for the measurement of the inorganic constituents.

Sodium and potassium were measured by flame photometry, and calcium, magnesium, copper, and zinc by atomic absorption spectrophotometry (Unicam SP 90). Iron was measured colorimetrically with *o*-phenanthroline (Sandell, 1959) and phosphorus by the method of Fiske and Subbarow (1925).

Results

Total protein, fat, and carbohydrate in the milks and their energy value. Table II gives the percentage of moisture, total protein, fat, and carbohydrates (as monosaccharides) in the milk powders and their energy value calculated in terms of kilo-calories (kCal) and mega joules (MJ). The factors used were 4, 9, and 3·75 kCal and 0·017, 0·037, and 0·016 MJ per g protein, fat, and carbohydrate (as monosaccharides), respectively (Report of the Subcommittee on Metrication, 1972).

Total protein in the milk powders varied from 10 to 29 g/100 g. The percentage of fat varied from 8·5 to 31 g/100 g and total carbohydrate from 37 to 67 g/100 g. The dried full-cream cow's milk preparations (Ostermilk No. 2 and Cow & Gate Babymilk 2) contained the least carbohydrate, and were among those with the highest values for protein and fat.

The energy value of the milks depended largely upon the percentage of fat. The lowest value was 389 kCal (1·63 MJ)/100 g and the highest 527 kCal (2·20 MJ)/100 g. Carbohydrate provided more than half the energy in 17 of the milks. In human milk carbohydrate provides about 40%.

Distribution of fatty acids. 18 of the milks had had the cow's milk fat partly or entirely replaced with other fats. Table III shows the distribution of the fatty acids in these milks. Representative values for human milk and cow's milk fat are also shown. The distributions for the dried milks stated to contain only cow's milk fat were close to the expected ones.

As far as the saturated fatty acids were concerned, Almiron B had no measurable amounts of C10, 12, or 14, and less C16 and 18 than most of the others. The two milks of American origin, SMA and particularly Similac, had a high proportion of C12:0, lauric acid. This suggests that they contain

TABLE II

Moisture, protein, fat, carbohydrate, and energy in milk powders

Name	Moisture (g/100 g)	Protein (g/100 g)	Fat (g/100 g)	Carbohydrate (as monosaccharide) (g/100 g)	Energy/100 g	
					kCal	MJ
Britain						
Ostermilk No. 1	3·6	18·1	19·2	60·4	472	1·98
Ostermilk No. 2	3·0	25·3	26·6	39·2	489	2·04
Ostermilk Complete Formula	4·4	11·7	20·0	63·0	466	1·95
Cow & Gate Babymilk 1	3·7	18·3	14·3	63·0	438	1·84
Cow & Gate Babymilk 2	2·8	24·3	26·5	37·1	474	1·98
Cow & Gate V Formula	2·4	14·2	22·7	52·1	456	1·91
SMA	2·9	12·1	27·4	54·6	500	2·09
France						
Lait Guigoz 1	4·4	19·8	10·3	63·3	409	1·73
Lait Guigoz 2	3·9	16·6	17·3	56·5	433	1·82
Nativa	2·2	14·3	28·1	53·6	511	2·14
Galliasec 1	2·7	20·6	10·0	57·9	389	1·64
Milumel 1	4·1	16·8	13·5	60·8	416	1·75
Milumel 2	3·6	17·1	15·5	62·4	441	1·86
Lemiel 1	3·8	13·6	14·8	61·2	417	1·75
Lemiel 2	4·5	16·6	17·3	61·6	453	1·90
Holland						
Almiron B	1·6	13·5	20·5	59·7	462	1·94
Farilacid	2·5	18·1	8·5	64·0	388	1·64
Frisolac	2·7	14·4	26·8	56·8	512	2·14
Similac	6·1	12·1	22·7	53·8	454	1·90
Germany						
Milumil	3·0	14·5	12·0	64·5	408	1·72
Nan	2·2	13·2	24·6	58·8	495	2·07
Italy						
Pelargon	4·7	15·4	14·2	60·4	415	1·75
Prodieton	3·8	17·5	9·0	66·7	401	1·69
Plasmolac	4·3	21·4	20·4	51·4	461	1·94
Auxolac	2·4	14·5	18·0	62·0	452	1·89
Denmark						
Eledon	5·1	17·3	9·1	65·2	396	1·67
Pelargon	5·3	17·2	13·5	61·1	419	1·76
Switzerland						
Eledon	4·1	29·4	14·4	47·7	426	1·79
Pelargon	3·8	16·2	11·8	59·7	394	1·64
Guigolac	5·0	16·3	13·5	62·3	420	1·77
Humana 1	2·2	14·9	25·6	54·1	492	2·06
Humana 2	2·1	10·1	31·0	55·6	527	2·20

coconut oil, and, in fact, they are known to do so. Similac, like Almiron B, was notable for its low percentage of palmitic and stearic acids. All except one of these milks had a smaller proportion of stearic acid in its fat than cow's milk.

All except two milks had considerably more of their fat as linoleic acid (C18:2) than either human or cow's milk, and again Almiron B and Similac are particularly striking in this connexion. From its fatty acid composition the fat in Almiron B appears to be maize oil and nothing else. The manufacturers of this milk have clearly not tried to reproduce the fatty acid composition of breast milk, but have relied upon a fat found by experience to be well absorbed and utilized by young babies, even premature ones, and in which linoleic acid comprises more than half the total.

Carbohydrates added to the milks. Breast milk has a higher percentage of lactose than cow's milk, and the first stage in the 'humanizing' of cow's milk was to increase the carbohydrate in it, either by adding more lactose or by including other carbohydrates. As far as we can tell only two of the British milks, Ostermilk No. 2 and Cow & Gate Babymilk 2, and the Swiss milk, Eledon, had had no carbohydrate added to them. 11 had had lactose added, and among them were 4 of the 7 milks on sale

TABLE III

Fatty acids in milks containing animal and vegetable fat (g/100 g total fat)

	Saturated					Unsaturated			
	C10:0	C12:0	C14:0	C16:0	C18:0	C16:1	C18:1	C18:2	C18:3
Britain									
Cow & Gate V Formula	0·4	6·7	2·6	36·9	3·9	Trace	35·1	14·4	Trace
SMA	1·4	14·5	6·0	12·8	7·4	1·0	38·9	13·1	1·1
France									
Nativa	1·8	8·9	9·0	21·6	6·7	1·0	34·9	12·7	1·3
Holland									
Almiron B	Trace	Trace	Trace	10·7	2·0	Trace	27·2	58·2	1·6
Farilacid	1·7	2·3	9·0	25·3	14·2	1·6	35·1	6·8	1·4
Frisolac	0·5	6·4	3·0	31·7	4·4	Trace	37·6	16·4	Trace
Similac	2·1	18·7	7·3	9·4	3·1	Trace	19·2	40·2	Trace
Germany									
Milumil	1·4	4·1	7·2	34·8	7·7	1·1	31·7	10·1	Trace
Nan	2·0	4·0	10·7	30·6	8·5	1·5	24·1	15·8	0·8
Italy									
Pelargon	1·5	2·1	8·2	25·3	10·8	1·5	30·3	17·3	Trace
Plasmolac	1·7	2·2	7·8	24·6	7·6	1·6	46·6	5·9	Trace
Auxolac	1·7	2·4	8·3	25·5	10·0	1·4	37·0	11·4	Trace
Denmark									
Eledon	1·8	2·6	8·2	26·9	8·6	1·3	24·9	22·3	1·5
Pelargon	1·8	2·5	8·5	24·2	11·0	1·5	31·1	15·2	1·0
Switzerland									
Pelargon	1·4	1·8	7·8	24·0	10·6	1·3	30·2	16·6	1·5
Guigolac	0·5	5·6	3·4	33·3	5·8	Trace	37·7	13·6	Trace
Humana 1	0·8	7·0	3·9	22·8	7·7	0·8	43·6	13·2	Trace
Humana 2	0·9	7·2	3·9	23·0	7·2	0·8	41·8	14·9	Trace
Human milk fat	1·0	4·8	6·2	23·7	6·7	4·6	37·4	9·0	3·4
Cow's milk fat	2·4	3·2	11·5	30·0	14·3	2·0	31·1	1·8	Trace

in Britain (Table II). Table IV shows the percentage of various carbohydrates in milks containing sucrose, glucose, fructose, and dextrimaltose. Apart from lactose, sucrose and dextrimaltose are the most common additives, but 4 French milks include invert sugar from honey. 9 of the 13 milks containing 'dextrimaltose' or 'predigested starch' gave a positive reaction with iodine in potassium iodide. Only 8% of the Dutch milk, Almiron B, consisted of lactose, and sucrose and dextrimaltose made up 52% of the weight of the milk powder.

Inorganic constituents. Table V shows the amounts of inorganic constituents per 100 g milk powder. The concentrations in human milk per 100 g solids are shown for comparison. All the milk preparations contained more sodium and potassium than human milk, some much more. The highest values for sodium were found in the two full-cream milk powders Ostermilk No. 2 and Cow & Gate Babymilk 2, the two French preparations Milumel 1 and 2, Italian Auxolac, and the Swiss version of Eledon. 4 of the milk powders contained 1% or more of potassium—Ostermilk No. 2, Cow & Gate Babymilk 2, Italian Plasmolac, and Swiss Eledon.

All the dried milks contained considerably more calcium and phosphorus than human milk; values were sometimes about four times as high. The ratio of calcium to phosphorus, which is a little over 2·0 in human milk, varied from 1·2 in the preparations made from cow's milk to 2·6–2·7 in French Nativa and Dutch Almiron B, and 3·2 in Farilacid. Only Almiron B contained as little magnesium as human milk. Swiss Eledon contained three times as much.

Iron had not been added in 8 of the 32 milks. These included 2 of the 5 from Switzerland, 4 of the 8 from France, 1 of the 2 from Germany, and 1 from Italy. All the milks on sale in Britain contain added iron. Iron had also been added to both the Danish milks, 2, possibly 3, of the Italian ones, and the French Nativa. All the Dutch milks and 1 German milk, Nan, also contained added iron. The fortified milks contained between 3·4 and 11 mg/100 g.

TABLE IV

Carbohydrates in milks containing sucrose, glucose, fructose, or dextrimaltose (g/100 g milk powder as monosaccharides)

	Lactose	Sucrose	Glucose	Fructose	Dextrimaltose	Total
Lait Guigoz 1	25	38				63
Lait Guigoz 2	22	34				56
Galliasec 1	28	30				58
Almiron B	8	30			22	60
Milumil	23	28			13*	64
Pelargon (Italy)	29	14			17*	60
Prodieton	23	23			20	66
Auxolac	28	14			19	61
Eledon (Denmark)	28	27			10	65
Pelargon (Denmark)	31	15			15*	61
Pelargon (Switzerland)	30	16			13*	59
Ostermilk Complete Formula	21				42	63
Guigolac	38				24	62
Farilacid	23		25		15*	63
Milumel 1	32	15	6	3	5*	61
Milumel 2	37	11	6	3	5*	62
Lemiel 1	28	12	9	4	8*	61
Lemiel 2	39	11	5	2	5*	62

*Starch reaction with iodine in potassium iodide.

SMA and Nativa appear to contain added copper, and Frisolac also, which makes the concentration similar to that of human milk. The lowest values for zinc were found in Almiron B and Nan. Eledon from Switzerland contained the most.

Discussion

The composition of the milk powders included in the present study varied considerably both qualitatively and quantitatively. This was true not only of milks sold under different trade names, but also of milks sold under the same trade name in different countries. While the Pelargons on sale in Italy, Denmark, and Switzerland had very similar compositions, the Danish Eledon differed remarkably from the Eledon sold in Switzerland. The former contained sucrose and dextrimaltose while the latter did not, and the percentage of protein and fat were considerably higher in the Swiss product, and carbohydrate higher in the Danish. Swiss Eledon, which is made from buttermilk, contained considerably more of all the naturally occurring inorganic constituents, but had no added iron, whereas the Danish product was fortified with iron. Perhaps the most striking difference between the milks lay in the composition of their fats. Here again the Danish and Swiss brands of Eledon differed, for the former was a 'filled' milk, while the latter contained cow's milk fat.

The high proportion of linoleic acid in the Dutch preparation Almiron B has already been mentioned. This particular milk powder, or its liquid counterpart, provides the food of a large proportion of Dutch babies who are not breast feed. Since the fatty acid composition of body fat reflects the fatty acid composition of food fat it seems likely that the fatty acid composition of the body fat of Dutch babies will be different from that of British babies who are fed on milks containing cow's milk fat. This is now being investigated.

The dilution of the milk powders with water introduces another variable into the composition of the milk as fed to the baby. For most of the products from the European continent information is given on the packets or tins about weights of powders to be diluted with a stated volume of water, or to be made up to a stated volume, so it is easy to calculate the composition of the milk diluted according to the manufacturer's instructions. Some British manufacturer's prefer to work with scoopfuls rather than weights, and several papers have been published recently showing how difficult it is to measure scoopfuls accurately. Mothers tend to make up the milk more concentrated than they should (Taitz and Byers, 1972; Wilkinson *et al.*, 1973). We have weighed the contents of the British scoops, measured as carefully as we could according to the instructions on the packets, and calculated the energy value of all the diluted milks. These vary from 41 to 79 kCal/100 ml, but those with the lowest values all recommend that sugar be added to the milk.

The high sodium content of infant foods has caused some concern in the past few years (Taitz and

TABLE V

Inorganic constituents in milks (per 100 g powder)

	Na (mg)	K (mg)	Ca (mg)	Mg (mg)	P (mg)	Fe (mg)	Cu (μg)	Zn (mg)
Britain								
Ostermilk No. 1	353	885	700	72	497	6·9	43	1·87
Ostermilk No. 2	458	1100	845	98	690	11·0	57	1·88
Ostermilk Complete Formula	300	527	418	41	330	6·5	—	—
Cow & Gate Babymilk 1	357	845	700	72	520	4·9	101	1·41
Cow & Gate Babymilk 2	466	1100	908	93	708	5·0	117	1·87
Cow & Gate V Formula	267	652	509	43	368	6·6	290	2·40
SMA	221	626	435	45	311	9·0	362	2·21
France								
Lait Guigoz 1	276	700	695	69	493	0·5	34	1·28
Lait Guigoz 2	253	752	690	65	422	0·2	90	1·56
Nativa	174	443	739	49	269	5·2	271	1·12
Galliasec 1	276	954	845	75	531	4·0	49	1·98
Milumel 1	416	791	874	51	468	0·8	150	1·75
Milumel 2	445	795	904	53	410	0·6	135	1·84
Lemiel 1	363	679	785	46	378	5·0	150	1·60
Lemiel 2	369	725	852	53	407	5·0	172	1·75
Holland								
Almiron B	134	438	565	25	215	3·4	29	0·97
Farilacid	297	945	795	71	543	4·6	93	2·08
Frisolac	121	462	340	47	183	2·8	236	—
Similac	298	980	715	54	400	9·5	52	1·10
Germany								
Milumil	254	570	638	49	420	0·7	100	1·75
Nan	194	607	422	56	296	5·9	47	0·73
Italy								
Pelargon	244	834	690	67	415	4·2	105	1·27
Prodieton	248	850	926	62	414	4·2	—	1·58
Plasmolac	321	1134	1015	72	569	1·1	169	2·25
Auxolac	420	850	803	62	450	0·5	—	1·81
Denmark								
Eledon	282	877	845	72	555	5·4	145	1·18
Pelargon	275	765	720	69	491	5·1	105	1·34
Switzerland								
Eledon	418	1182	1065	97	824	0·3	152	2·63
Pelargon	236	815	735	61	438	3·9	115	1·29
Guigolac	235	835	645	60	447	0·3	105	1·49
Humana 1	250	662	718	48	390	1·4	99	1·44
Humana 2	145	600	635	40	303	9·0	80	1·22
Human milk (per 100 g solids)	120	440	265	32	120	1·2	320	—

Byers, 1972; Shaw, Jones, and Gunther, 1973). In the present series of milks, diluted according to the manufacturer's instructions, the concentration of sodium has varied from 16 to 76 mg/100 ml. Breast milk contains 15 and whole cow's milk 50 mg/100 ml. 8 of the milks had a higher concentration of sodium than cow's milk. There is a case for regarding the sodium in the full-cream cow's milk preparations, diluted as set out by the manufacturer, as the upper limit of safety for the feeding of infants of less than 4 to 6 months of age.

The authors wish to acknowledge the technical help given by Mrs. C. Artavanis, Mr. P. M. V. John, and Mr. W. J. Branch.

References

Davison, P. K., and Young, R. (1969). Gas chromatography of carbohydrates. The quantitative determination of free sugars of plants as their trimethylsilyl ethers. *Journal of Chromatography*, **41**, 12.

Dische, Z. (1955). New color reactions for determination of sugars in polysaccharides. In *Methods of Biochemical Analysis*, Vol. 2, p. 313. Ed. by D. Glick. Interscience, New York.

Fiske, C. H., and Subbarow, Y. (1925). The colorimetric determination of phosphorus. *Journal of Biological Chemistry*, **66**, 375.

McCance, R. A., Widdowson, E. M., and Shackleton, L. R. B. (1936). *The Nutritive Value of Fruits, Vegetables and Nuts.* Medical Research Council Special Report Series, no. 213. H.M.S.O., London.

Report of the Subcommittee on Metrication of the British National Committee for Nutritional Sciences (1972). *Metric units, conversion factors and nomenclature in nutritional and food sciences.* The Royal Society, London.

Sandell, E. B. (1959). *Colorimetric Determination of Traces of Metals*, 3rd ed. Interscience, New York.

Shaw, J. C. L., Jones, A., and Gunther, M. (1973). Mineral content of brands of milk for infant feeding. *British Medical Journal*, **2**, 12.

Southgate, D. A. T. (1969). The determination of carbohydrates in foods. I. Available carbohydrate. *Journal of the Sciences of Food and Agriculture*, **20**, 326.

Southgate, D. A. T. (1971). A procedure for the measurement of fat in foods. *Journal of the Sciences of Food and Agriculture*, **22**, 590.

Taitz, L. S., and Byers, H. D. (1972). High calorie/osmolar feeding and hypertonic dehydration. *Archives of Disease in Childhood*, **47**, 257.

Widdowson, E. M. (1973). Artificial feeding, especially in relation to composition of infant foods in Britain and the EEC. In *Nutritional Problems in a Changing World*, p. 101. Ed. by D. Hollingsworth and M. Russell. Applied Science Publishers, London.

Wilkinson, P. W., Noble, T. C., Gray, G., and Spence, O. (1973). Inaccuracies in measurement of dried milk powders. *British Medical Journal*, **2**, 15.

Correspondence to Dr. E. M. Widdowson, Department of Investigative Medicine, University of Cambridge, Downing Street, Cambridge CB2 1QN.

The following articles will appear in future issues of this journal:

Prevalence of urinary tract infection in children of preschool age. *R. Boothman, M. Laidlaw, and I. D. G. Richards.*

Vitamin B_{12} absorption after resection of ileum in childhood. *H. B. Valman and P. D. Roberts.*

Hepatitis B antigen and antibody in maternal blood, cord blood, and amniotic fluid. *G. Papaevangelou, T. Kremastinou, C. Prevedourakis, and D. Kaskarelis.*

Excretion of individual adrenocortical steroids in obese children. *D. C. L. Savage, C. C. Forsyth, and J. Cameron.*

Peak expiratory flow rates before and after exercise in schoolchildren. *M. L. Burr, B. A. Eldridge, and L. K. Borysiewicz.*

Metabolic and hormonal changes during and after exchange transfusion with heparinized or ACD blood. *A. Cser and R. D. G. Milner.*

Infantile rickets with severe proximal renal tubular acidosis, responsive to vitamin D. *M. Huguenin, R. Schacht, and R. David.*

Haemophagocytic reticulosis: a state of chimerism? *G. Blennow, B. Berg, L. Brandt, L. Messeter, B. Löw, and N. Söderström.*

Diabetic retinopathy in an adolescent with Prader-Labhart-Willi syndrome. *A. Savir, Z. Dickerman, M. Karp, and Z. Laron.*