these children should have developed rickets at all. A sensitivity to vitamin D has been suggested as causing the syndrome of idiopathic hypercalcemia, following the prophylactic fortification of foodstuffs with this vitamin in Britain.11-15 No child in this series developed hypercalcemia following vitamin-D therapy.

An individual variation in sensitivity to vitamin D may also explain differences in the rate of healing. Most children showed radiological evidence of healing after 1 month, probably earlier, but there were some children, especially with moderate or severe rickets, who took longer.

Calciferol therapy, irrespective of the mode of administration, appeared to be superior to AT 10 in healing rickets. Only half the children receiving AT 10 healed satisfactorily, while all of those who failed to respond to AT 10, and were then given equivalent doses of calciferol, healed satisfactorily. Apart from postulating individual variations, we see no obvious explanation for the fact that only some children healed on AT 10. Serum chemistry, social habits, and the dose of AT 10 administered, were similar in all patients.

The actions of AT 10 and calciferol differ. AT 10 is said to produce greater phosphorus diuresis (similar to parathyroid hormone) and to have less effect on gastrointestinal absorption of calcium. It is therefore not surprising that it is less efficacious in healing rickets.

SUMMARY

The effects of various therapeutic agents containing vitamin D and of AT 10 (dihydrotachysterol) were compared in 59 children with active rickets.

There appeared to be an individual variation in response to vitamin D. Five out of 28 children with ordinary vitamin-D-lack rickets were resistant to a single intra-

muscular dose of 600,000 units. The remainder healed satisfactorily on this dose, and some others healed on much smaller doses. The rate of healing also varied—some patients showed good healing after 1 month, others taking 3 or more months to show the same effect.

AT 10 was found to be distinctly less active than vitamin D in curing rickets. Hake liver oil, while certainly active in large doses, proved ineffective in doses which would have been expected to be therapeutically satisfactory.

We should like to thank Prof. F. J. Ford, Dr. J. Burger, and Dr. J. Mostert, for allowing this investigation to be undertaken at Groote Schuur Hospital and the Red Cross War Memorial Children's Hospital; Dr. L. Wobellof and the Radiology Department for X-ray facilities; Prof. J. Kench and the Department of Clinical Pathology of the University of Cape Town for the estimation of alkaline phosphatase, and Miss M. Lloyd and Mrs. E. King for the estimations of calcium and phosphorus; and Mrs. E. Orkin for preparing the manuscript.

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REFERENCES


BASIC INFANT FEEDING*

WILLIAM EMDIN, M.D., D.P.H., PH.D., B.A.

Paediatrician to Groote Schuur Hospital, Red Cross War Memorial Children's Hospital, and Victoria Hospital, Cape Town; Lecturer to the South African Mothercraft Training Centre

Too often breast feeding is decried these days on the grounds that modern artificial feeding is so efficacious that the irksomeness of natural feeding is unnecessary. The fact remains, however, that among artificially fed babies the incidence and severity of gastro-enteritis and, indeed, the death rate are appreciably higher than in breast-fed infants living under similar socio-economic conditions. This applies particularly to our non-White population. Breast feeding is still the "feeding system" of choice. In this paper, however, only basic artificial feeding will be considered.

ARTIFICIAL FEEDING SYSTEMS

In the early decades of this century rigid and complicated artificial feeding systems, said to be scientifically exact, were preferred to simple methods. It was not unusual for scientific enthusiasts to spend weary hours computing diets mathematically, but infants thrived on these no better than they do under the simpler and more flexible feeding methods in vogue to-day. In discussing the history of infant feeding, Wickes' mentioned a book by Tuley which recommended that feeds for normal infants be worked out algebraically!

Methods of artificial infant feeding may be conveniently discussed under 3 headings: (1) percentage feeding, (2) computed formulas, and (3) simple feeding involving a minimum of calculation.

1. Percentage Feeding

It was Rotch who advocated feeding infants by prescribing the exact quantities of carbohydrate, protein and fat for each individual baby. He believed that the slightest variation from the optimum composition of such feeds was sufficient to interfere with their proper digestion.
centage feeding has its counterpart in the fixed-formula, so-called 'humanized milks' in use today (see later).

2. Computed-formula System

Scientific enthusiasts in the past have stressed the desirability of computing infant formulas on a mathematical basis. The most practical of these methods, and one used at the present time by many paediatricians, is the calculation of infant feeds based on energy requirements in terms of calories. This calorie feeding has in recent years been simplified by making calculations on a basis of 45-50 calories per lb. of expected body weight per day, and expressing the calorie values of important foods in round figures: for example, milk and sugar as 20 and 120 calories per oz. respectively. Nevertheless, many general practitioners appear to have difficulty in applying the calorie system to infant feeding, especially for the undernourished infant.

Systems of varying complexity have appeared from time to time. Clemens von Pirquet is famous for the discovery of allergy, but his feeding system is scarcely known today. Its interest lies in its complexity and unusual basis, and because it emphasized the use of highly concentrated feeding for certain conditions such as prematurity, neurotic vomiting, rumination, pyloric stenosis, pylorospasm, and failure to thrive. Pirquet used highly concentrated feeds at a time when Truby King and others were vociferously denouncing the use of strong infant-feeding mixtures under any circumstances! Among the concentrated feeds advocated for the type of case mentioned above were the 3-fold concentrated gruel with a calorie value of 60 to the oz. (designated *Trifa*) and the better-known *Dubo* ('duplex lac bovinum'). *Dubo* is prepared by adding 17% of sugar to whole cow's milk. Strong mixtures are commonplace now, but in the early twenties these must have been revolutionary.

Pirquet's system. Pirquet used milk as his standard physiological nutrient, the nutritive value of 1 G. of milk being expressed as 1 nem ('nutritional element milk'). The nutritional value of other foodstuffs is compared with milk — so many nem per gram of a particular food. Formulas are calculated not on weight, but on the square of the sitting-height in centimetres, because theoretically this bears a relationship to the body weight and to the absorptive capacity of the intestines. The sitting-height (top of head to sitting area) is measured and feeds are calculated on a nem basis, 1 nem per sq. cm. of sitting height being the amount of food which the human body can consume within 24 hours without overloading digestion. The complexity of the system is apparent but it 'works'. Of this system Abt has written: 'A plan of feeding conceived in the mind of a genius who showed precision in detail and mathematical accuracy'.

3. Simple Feeding

The revolt against rigid and complicated feeding systems is not new. About 40 years ago Pfaundler was using the following scheme: cow's milk 1/10th, and carbohydrate (maximum 50 G.) 1/100th of the infant's body weight per day, with water to 1 litre, divided into 5 feedings; the baby to take as much at each feeding as it desired. Today the emphasis is on simple feeding.

The question arises — should milk for artificial feeding of infants be diluted with water and sugar added, or not? Babies have been fed from birth on whole cow's milk and even undiluted double-strength evaporated milk mixtures, with no apparent ill effect.

Nevertheless, Calcagno and Rubin, Pratt and Snyderman, Hansen and Smith, and others have shown that in newborn and premature babies, because of the higher protein and mineral content of whole and concentrated milks, the renal solute load is raised, i.e. an excessive amount of water is needed to excrete urea and mineral salts in the urine. Carbohydrate puts no added load on the kidneys; in fact, where carbohydrate is added to milk, not only does water tend to be conserved in the body, but also there is a better weight gain. Under normal conditions the body can cope with whole milk, but where there is excessive water loss, as in fever, renal impairment or during hot weather, limited dilution of whole milk plus carbohydrate would appear to be preferable, because this type of mixture tends to raise the safety margin against dehydration.

FEEDING-MIXTURE CONSTITUENTS

In the past, weak mixtures were customary, often leading to undernutrition. Today, the tendency is to use a milk mixture approaching full-strength cow's milk or its equivalent in proprietary milk products. Lactose (sugar of milk), sucrose (cane sugar) and dextrose are the sugars in common use; cane sugar is the cheapest of these and is the sugar of choice for the healthy baby. Readily available proprietary milk products are the evaporated (condensed) liquid preparations and the powdered milks (full-cream, half-cream and 'humanized').

Sweetened condensed milk contains 45% of added cane sugar, and when reconstituted with water to full-strength, has a high carbohydrate content. The unsweetened evaporated milks now marketed locally are cow's milk preparations condensed to half their original volume, so that the addition of an equal quantity of water reconstitutes the product to full-strength cow's milk. The so-called 'humanized milks' have an adapted percentage composition similar to that of breast milk, and most of these products are reinforced with essential vitamins; the formula is fixed and is usually kept unaltered irrespective of the age of the infant. Humanized milks are issued with a special measure and the full-strength mixture is obtained by dissolving 1 measureful of powder in 2 oz. of water (humanized milk, type 'A'), or 1 measureful of powder in 1 oz. of water (humanized milk, type 'B').

Sugar and powdered milk have to be measured. The suggested standard measure for this purpose is the packed, level, regular household teaspoon, obtainable everywhere, and of 5 ml. fluid capacity. This measure is used for sugars and powdered milks other than humanized milks.

The following milks are in common use for infant feeding:

1. Natural cow's milk.

2. Condensed (evaporated) milks:
   (a) Full-cream unsweetened (e.g. Ideal Milk, Carnation Milk).
   (b) Full-cream sweetened (e.g. Nestle's Milk).
TABLE I. FEEDS FOR AN INFANT OF 3 MONTHS WHOSE WEIGHT IS 12 LB.

<table>
<thead>
<tr>
<th>1. Natural cow's milk</th>
<th>3. Unsweetened evaporated milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow's milk (4) = 22½ oz.</td>
<td>Ideal Milk</td>
</tr>
<tr>
<td>Water = 7½ oz.</td>
<td>Carnation Milk</td>
</tr>
<tr>
<td>Cane sugar = 7½ teaspoons</td>
<td>Water = 19 oz.</td>
</tr>
</tbody>
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<tr>
<th>2. Full-cream dried milk</th>
<th>4. Humanized (fixed-formula) milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klim (1(12\times3)) = 36 teaspoons</td>
<td>Type 'A':</td>
</tr>
<tr>
<td>Nespray (\frac{1}{2}(12\times3)) = 36 teaspoons</td>
<td>Bremil</td>
</tr>
<tr>
<td>Water = 30 oz.</td>
<td>Lactogen</td>
</tr>
<tr>
<td>Cane sugar = 7½ teaspoons</td>
<td>Olac</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>3. Powdered milks:</th>
<th>5. When changing from one type of milk to another, diminish the quantity temporarily by calculating the mixture on the infant's weight minus 1 lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Full-cream: 3·5% fat (e.g. Klim, Nespray).</td>
<td>Full-cream dried milk: 3 teaspoons per lb. body weight, plus sugar.</td>
</tr>
<tr>
<td>(b) Half-cream: less than 3·5% fat (e.g. Semilko, Dryco, acidified Eleon, Cow &amp; Gate Half­cream, Cow &amp; Gate Tropical).</td>
<td>Humanized milk (type 'A'): 1 measure per 2 oz. of water, no sugar.</td>
</tr>
<tr>
<td>(c) Humanized milk, type 'A' (e.g. Lactogen, Olac, Bremil).</td>
<td>Humanized milk (type 'B'): 1 measure per 1 oz. of water, no sugar.</td>
</tr>
<tr>
<td>(d) Humanized milk, type 'B' (e.g. SMA, acidified Pelargon).</td>
<td>Table I illustrates how basic feeds are calculated. It applies to an infant 3 months old whose weight is 12 lb., to be fed on unsweetened evaporated milk, full-cream powdered milk, or type 'A' or type 'B' humanized milk.</td>
</tr>
</tbody>
</table>

This basic scheme is by no means perfect. It does not take into account the individuality of the baby or the problems associated with difficult feeders. Nevertheless, the scheme should succeed with the majority of healthy babies. Where weight gain is inadequate, a slight adjustment of feed concentration or the addition of a little extra sugar should suffice to augment the weight. Vitamins are given towards the end of the first month of life; cereals and vegetables at 4 months or when the weight is 14 lb., whichever is the earlier; and a fuller mixed diet from about 7·8 months.

A historical review of infant feeding indicates that there have always been paediatricians who were convinced that their particular feeding 'system' is the one best suited to humanity. Experience teaches that any sensible feeding method based on modern concepts is likely to be satisfactory. Therefore, the feeding scheme employed might just as well be a simple one.

**SUMMARY**

1. Methods of infant feeding are discussed under 3 headings: percentage feeding, computed formulas, and simple feeding involving a minimum of calculation.
II. VACCINIAL KERATITIS TREATED WITH INTERFERON


From The Lancet, 28 April 1962 (1, 875)

This is a study of cases of vaccinial keratitis that occurred in January and February 1962 during mass vaccinations in Britain. The authors applied other therapies besides interferon, but it is mainly the observations on the effects of interferon that are here abstracted.

In vaccinial keratitis, as in virus keratitis in general, a distinction is to be drawn between the epithelial lesions (granular opacity and ulceration) which result from proliferation of the virus in the epithelium, and the oedema, infiltration and opacification that follow in the corneal stroma. The stromal lesions have been regarded as toxic or immunological sequelae rather than manifestations of virus invasion of these deeper layers. This view is supported by the finding in this trial that the therapeutic action of interferon was limited to the epithelial lesions.

The study deals with 7 patients with vaccinial keratitis, who were referred by the surgeons of Moorfields Eye Hospital, London, and includes cases of primary ocular vaccinia and of autovaccination of the eye either following or simultaneous with the lesion of ordinary vaccination. Topical interferon (with topical vaccinia-convalescent gamma-
globulin and oral tetracycline with vitamin B) was used in 6 of these (cases numbered II - VII), aged 7, 12, 23, 26, 32, and 60 years. It was the same monkey interferon that the Scientific Committee on Interferon used in their trials. One drop of it was instilled into the eye each half-hour when awake. Other treatment had been used before the patients were put on this therapy.

The granular opaque epithelial lesion became smaller, and the ulcer began to heal, when interferon therapy was started. In 5 cases (II, III, V, VI and VII) out of the 6, improvement followed within 12 hours of the start of interferon therapy; the remaining one subject showed a take at the interferon site and none at the control site, which "could be due to an interferon failure plus a failure of vaccine to take at the control site, or to an error in the recording of which site was to receive interferon or control fluid; an error in the observations is not likely because the results were checked with photographs."

The proportion injected was therefore 37/38 at the control site and 14/38 at the treated site, and the probability that these two proportions could be selected from the same population by chance is 4.76 x 10^-3. This is an underestimation of the probability that interferon is effective, "for no account is taken of the fact that each person acts as his own control."

In addition, the partial protections were only credited in the same way as double takes.

Thus the trial furnished definite evidence of protection by interferon. It is not surprising that some of the volunteers were not protected, since in this first trial in man there was no means of knowing in advance whether the dose of interferon chosen would be sufficiently potent. Moreover the possibility cannot be excluded that, owing to error in inoculation technique, the interferon did not reach the cells which the virus infected, or that the individual possessed a resistance to interferon. The proportion injected was therefore 37/38 at the control site and 14/38 at the treated site, and the probability that these two proportions could be selected from the same population by chance is 4.76 x 10^-3. This is an underestimation of the probability that interferon is effective, "for no account is taken of the fact that each person acts as his own control."

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