NFI BULLETIN

JANUARY 1981

Bulletin of the Nutrition Foundation of India

FOUNDATION NEWS

Research Programmes: Current Status

The four research projects which the Foundation has identified as part of its current research programme were set out in the earlier issue of this bulletin. In order to formulate the detailed study designs and to draw up the questionnaires and protocols for each of these studies, the Foundation has set up a task force for each project. These task forces will also be concerned with the monitoring and periodic evalution of the projects.

I. Study of infant feeding practices with special reference to the use of commercial baby foods:

The task force is headed by Prof M.S. Gore, Director Tata Institute of Social Sciences, Bombay.

The task force has held three meetings—one in New Delhi and two in Bombay. The detailed study design has now been formulated and the questionnaire for the study has been prepared and pre-tested. The study will be initially carried out in Bombay, Madras and Calcutta and may be extended, if necessary, to other centres later. Besides these metropolitan cities, two medium-sized towns in the three areas and the surrounding rural areas also will be included in the study. The questionnaire that has been drawn up is a comprehensive one and the sample size is fairly large. It is expected that the study will yield leads with regard to trends in infant feeding practices in the context of urbanization, industrialization, increasing employment opportunities for women, and aggressive advertising practices of commercial baby food manufacturers. The study is expected to be completed in18months.

II. Development of effective programmes of nutrition education at the community level:

The task force on this subject is headed by Dr Rajamal Devdas.

The task force has held two meetings in New Delhi. The studies taken up in this area will include:

1. The examination of the content and efficacy of nutrition education programmes within the major ongoing health, social welfare and nutrition programmes in the country;
2. An examination of the current status of nutrition education in the school system; and
3. Study of the current status of nutrition education programmes through the media.

These studies will be directed towards identifying the nutrition messages appropriate to each region and the best communication methods.

A detailed study-design with regard to the first study has now been drawn up. This study will be undertaken by the University Department of Home Science, and the Vikram Sarabhai Institute in Baroda.

III. Studies of the health and nutrition consequences of rural development activities:

The task force is headed by Dr S.G. Srikantia, former Director, National Institute of Nutrition.

The task force has held two meetings and has now prepared a detailed study design for the investigations to be carried out in the Punjab and UP regions to answer these questions:

1. Do agricultural development programmes designed to increase food production also succeed in increasing food consumption and improving the nutritional status of poor income groups within the population?
2. In a heterogenous population group, such as the inhabitants of a village or group of villages, how are the benefits of increased agricultural production distributed? Do they flow primarily to those—the wealthy landed class, the high and middle-income farmers—who already enjoy many health advantages, and exclude the small or marginal farmers—the landless labourers and artisans—who grow little or no food? The latter group makes up a sizeable proportion of the rural population; it also suffers more from malnutrition and poverty-related diseases.
3. What are the effects of different seasons ? Food availability is highest in the post-harvest seasons and tends to be low just before a harvest, which is also a period of high work requirements. If agricultural development schemes do not increase the amount of income, or food stocks available during lean periods, they may not result in net nutritional gain.

IV. The development of health and nutrition component as an integral part of rural employment programmes:

The object of this study is to develop models for integrated rural programmes where health and nutrition programmes will find adequate focus. The Planning Commission has agreed in principle to support the Nutrition Foundation in carrying out these studies in two states of India. Since the pattern of rural employment programmes varies in different states, it has been found necessary to structure the studies to suit the local needs. The Foundation has held discussions with the concerned officers of the states to finalize the study design

How short are we of edible oil?

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Production of all vegetable oils in the country has hovered at 20-25 lakh tonnes over the last decade, with an average annual increase of just about 1.2 per cent. On the other hand the demand for oils has gradually been rising, partly because of the increase in population by 2.5 per cent annually, and partly because of the rising standard of living of the upper-income groups. As a result we have been forced to import from the world market an increasingly larger quantity of oils. The amount being spent for such buying from abroad has now reached a figure of Rs 800 crore annually.

Sources of edible oils

The groundnut is our major oilseed, and accounts for about half the total vegetable oil in India. Hence any increase in yield through genetic engineering would be of vital importance. As a cross-pollinated crop, hybrid breeding is difficult to effect. Using seed irradiation, mutants have been developed with several plus points such as large seed size, high yield per hectare and high oil content, which could serve to bring about a green revolution in this important oilseed. A constant fear with the groundnut is the aflatoxin problem to which the oilcake is prone, which has led to some reluctance in markets abroad to use of this cake as an animal feed. Varieties innately resistant to growth of the mould have been identified, but there are other regional eco-agricultural parameters that must be maintained as well.

New oilseeds have been suggested that might improve the oil position. The sunflower has been developed as a very rich source of oil especially in the USSR and East European countries. The sunflower is a cross-pollinated crop which requires that each individual floret in a head be pollinated through extensive bee activity, and there have been disappointments with poor seed filling when the crop has been grown in South India. Cross-pollination has been achieved through labourers with cloth gloves on their hands walking between the rows brushing pollen from flower to flower, and some self-pollinating varieties have also been developed. The sunflower has a deep tap root and is thus much less affected by drought than is the shallow-growing groundnut; this is important since drought years result in low groundnut yields.

The spectacular success in Malaysia of palm oil and palm kernel oil (a rare case of two oils from the same fruit, one from the flesh and another from the seed kernel, each with different characteristics and end-uses) is unlikely to solve India's edible oil problem, since climatic factors would confine any palm oil plantations to Kerala, the Little Andaman Isle and a few other hot, humid areas.

The soyabean has been much advertised, but does not really suit India's requirements. It is a poor source of oil (16-18 per cent only), and after processing gives rise to a huge quantity of protein cake. This will have to go into processed protein foods for which markets are small and lie in the upper economic brackets who are not short of protein in their diets. Thus soyabean oilcake will end up as an Indian export item, hardly the best use of our scarce cultivated land area.

How much fat does an Indian consume?

Developing countries are characterized by low intakes of fat, since of all basic foodstuffs, fat is one of the most expensive. Figures for consumption of fat in the various states of India are to be had from various dietary surveys, and these show quite wide variations. States like Karnataka and Tamil Nadu consume low quantities of fat (nine and 10g/day per head), Maharashtra and Andhra Pradesh are medium consumers (11 and 14g), and Gujarat and Kerala are high consumers (18 and 21g). Urban dwellers consume more per head than do rural, and metropolitan cities have the highest intake of all: Calcutta city dwellers for example, average 26g daily.

Income is a major determinant regulating use. As income goes up, so does the consumption of fat almost proportionately. Thus in Calcutta city, both poor and rich spend six to seven per cent of their income on purchase of edible oil. But cultural factors also seem to play a part. Thus the proportion fo families who use no fat at all ranges from low figures of zero to five per cent of all families in Maharashtra, Gujarat and Tamil Nadu to as high as 43-60 per cent in Karnataka, Kerala and Andhra Pradesh. Income differences cannot explain these very vast disparities in fat usage. Nor will a factor like vegetarianism, because in Gujarat, which is 69 per cent vegetarian, practically all families buy and use fat, and Tamil Nadu, which is only 16 per cent vegetarian, also has nearly universal fat usage. The most likely explanation is that regional culinary practices are reflected in fat usage patterns.

Aboriginals represent a special group. Dietary surveys show that daily calorie intakes can range from as high as 2,600 to just half that figure, but fat intakes *per se* are always below five gram/day, and frequently non-existent.

Invisible fat

Almost all foodstuffs contain some amount of fat. Oilseeds and nuts, milk, meat, fish and eggs are obvious examples, and rice, wheat, pulses, grains, tapioca, tubers and vegetables are less apparent ones. Detailed dietary surveys which list individual foodstuffs permit the quantities of such invisible or unseen fats to be calculated. Such calculations for average diets in the north, south, east and west of India show that some 16 to 24g of fat is present invisibly in the food items (other than fat *per se*) that are consumed. Nearly half of this comes from the staple food, usually cereals and tubers (such as tapioca in Kerala), since these are eaten in large amounts of over 400g/day. Taken together with visible fat in these same regions, the total fat intake varies from 36 to 44g/day. This would make a contribution to calorie intake of between 13 and 27 per cent, average 18 per cent, which is not a low figure.

It is also noteworthy that even very poor diets, containing no visible fat

and furnishing only 1,000-1,300 calories daily, will still carry about 10g of invisible fat, making a calorie contribution of about nine per cent. Many poor tribal diets would fall in this category.

Role of oils

Till fairly recently, fats were viewed in nutritional terms as concentrated sources of calories, as carriers of fat-soluable vitamins and as adding palatability to the diet. A little later the role of linoleic acid as an essential fatty acid was revealed, first in preventing skin scaliness, particularly in children, then as a protective factor in stress situations, and thereafter as a dietary factor that appeared to be implicated in preventing the deposition of plaques of cholesterol esters on the aorta walls. In the last two decades, the importance of dietary linoleic and even linolenic acid has been dramatically highlighted following a realization of their role as precursors of the prostaglandins. These compounds are synthesized from the two essential fatty acids (EFA), and there are twenty or more prostaglandins, all closely related in structure. Prostaglandins perform a variety of vital functions such as muscle contraction, blood platelet aggregation, relief of pain, fertility in the male; conception and reproduction in the female.

An FAO/WHO Expert Consultation on Dietary Fats held in October 1977, after reviewing the evidence available, felt that three per cent of the energy level in adult diets should derive from dietary essential fatty acid.

The total visible and invisible fat intakes of average diets in the four cardinal areas of the country furnish a linoleic acid content that ranges from 17 to 28 per cent of the fat present, four-fifths coming from the invisible fat components. In terms of weight this works out to seven to 10g of linoleic acid daily, or 3.5 to 4.5 energy per cent. For the upper income groups, the figure is 11 to 15g (about six energy per cent), and for the low-income groups six to 11g or 3.6 to 5.7 (average 4.5) energy per cent.

In various parts of the world, fats furnish very varying proportions of the total calories. In developing countries the figure is 35 to 45 per cent and since calorie levels are also high, the quantity of fat exceeds 10g daily. Eskimos derive over 50 per cent of their energy from fat, without apparent evidence of degenerative disease. Developing countries show wide variations. In India very low-income and deprived groups, with inadequate intakes of 1,300 to 1,500 calories, get all their fat invisibly, and this constitutes some eight energy per cent. At the other extreme affluent groups in many regions average 70g of total fat a day, constituting 32 energy per cent, and many individuals may go even higher. Constant intake of diets that are high both in total calories and in fats, as now prevalent in most advanced countries, taken together with the stresses of modern living appear to be associated with increasing risk of coronary heart disease. More moderate levels, say of about 18-20 energy per cent as fat, appear to be indicated.

At all income and consumption levels in India, the contribution of invisible fats is almost exactly nine energy per cent. Thus a visible fat consumption which will furnish an equal nine to 10 energy per cent is called for. For an average adult male optimally requiring 2,800 calories, this would mean about 30g of visible fat *per se* a day. For average diets as they stand at present, with calorie intakes that are about 20 to 30 per cent below par, the fat contribution to calories now averages 18 per cent, and no increase in fat consumption appears to be called for. Pregnant and lactating women, provided they consume the levels of calories recommended, would also get enough fat.

The quantity of three energy per cent of essential fatty acids believed to be adequate is met by average Indian diets, these carry 3.5 to 4.5 energy per

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REVIEWS AND COMMENTS

Seasonal changes in rural dietaries

The average rural Indian woman subsists on diets low in energy and poor in many essential nutrients. Nearly two-thirds of her reproductive life-span is spent in pregnancy and lactation. Yet, there is neither quantitative nor qualitative improvement in her diet during these states. Not only is the incidence of nutritional deficiencies high among such women, but also the incidence of low birth weight babies is high. Therefore supplementary feeding programmes for pregnant and nursing mothers have been suggested and initiated. Such programmes are not always as successful as one hopes for (N.P. Rao and K. Vijayaraghavan, Indian J Med Res 64; 1107, 1976; J.O. Mora *et al*. Nutr Rep Intntl 17: 217, 1978). A defect in such programmes, *inter alia*, is that they do not take into account the considerable seasonal fluctuations in the dietaries.

It is well-known that the pattern of gainful employment and wage earning is not constant throughout the year. Consequently, food intake may also vary seasonally. Dietary and nutrition surveys of pregnant and nursing women have hitherto not adequately taken into consideration the impact of seasonal variations in employment and income on food intake. Such an exercise may be useful in formulating supplementary feeding programmes.

A recent study from Gambia (A.A Paul, E.M. Muller and R.G. Whitehead, trans R Soc Trop Med Hyg 73:686, 1979) has brought out some interesting observations.

1. Although energy intakes of pregnant and nursing mothers were low throughout the year, they fell much further in the rainy season, when farm work was also heaviest. While the intakes ranged from 1470-1650 Kcal between October-June, they were only 1325-1390 Kcal in July-September.

2. When maternal energy intake in the third trimester was less than 1,600 Kcal the birth weight was less than 2.5 kg.

3. Between July-September, pregnant women gained virtually no weight; some even lost weight. Loss of body weight by pregnant women in Gambia was also reported by Thomson *et al* (J Ob Gyn Brit Comnwlth 73,724, 1966). During other seasons the women gained about three kilograms.

4. Women whose first trimester of

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lactation fell in July-September lost body weight while in other periods such women actually gained weight.

A similar seasonal variation in body weights of rural mothers was also observed in Bangladesh (L.C. Chen *et al* Ecol Fd Nutr 8: 175, 1979). August-October is the lean season in this country. Peak farm activity occurs in June-July and again between November-January. The women lost weight in August-December and started putting on weight from January.

A disconcerting observation in this study was that the time spent in breast feeding came down markedly during November-February, the period when post-harvest work load on the mothers is very high. A question that has often baffled nutritionists is as to why in any household, whose socio-economic status is consistently similar over a long period, only one child or some children suffer from the extreme forms of protein-energy malnutrition. The answer perhaps could lie in the season of birth of the child and consequently the age of weaning or of reduction in suckling time. A seasonal variation in the incidence of Kwashiorkor is known (P.S. Venkatachalam *et al* Indian J Med Res 42: 555, 1954).

Seasonal variations in food intake have also been reported in pre-school children (R. Sunderraj *et al* Indian J Med Res 57:248, p 375, 1969). Energy deficit was highest and the intakes of retinol and vitamin B-Complex lowest in July. This may be an important factor that may precipitate the development of Kwashiorkor in children.

While supplementary feeding programmes may kindle a sense of morality and wipe out feelings of guilt in the urban, affluent sections, they are collossal projects which no developing country, particularly of India's size, can afford. On the other hand, seasonal programmes, when the need for food is the greatest may help ameliorate the situation to some extent. It is, therefore, necessary that in-depth studies on the seasonal incidence of low birth weight maternal nutrient deficiencies, kwashiorkor, and variations in food intake are undertaken.

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cent of EFA, because of the fortunate circumstance that the invisible fats in cereals and pulses are rich in this component. If calorie and fat intakes are both raised, it would seem prudent to use unsaturated oils rich in EFA like safflower, sunflower, sesame and groundnut.

Needs of EFA during pregnancy go up from three to 4.5 energy per cent, and during lactation to five to seven per cent. Again use of unsaturated oils is advisable, apart from extra food as a whole.

How do our children fare fat-wise?

Not badly at first, but not too well as they grow older. When breast milk is available in adequate amounts, in the first year of life an Indian baby gets 20 to 27g of fat daily, and in the second year 12 to 16g, from this source alone. Thereafter both income and region begin to play their part. In a state characterized by a generally high fat consumption such as Gujarat, daily fat intakes are between 16 and 17g in the third, fourth and fifth years of life. In a low-fat state such as Karnataka, the figures only lie between five and 12g. High-income groups in Calcutta city, who can afford to buy animal milk, show an average fat intake of about 25g a day for these three post-weaning years, against just nine grams for low-income groups in the same city. However, since breast feeding is less show lower fat intakes in the early years than the lowest-income, breast-feeding segment.

Thus on grounds of fat intake, as for many other reasons, breast feeding is undoubtedly the best feeding. Artificial foods which substitute for breast milk should be so formulated as to ensure the high level of 50 to 60 energy per cent through fat that is required by infants. By the time of weaning the fat requirement and tolerance drop sharply, and weaning diets require about 25 energy per cent as fat, or about 17g daily. Weaning food formulations must need take this into account, as should supplementary weaning foods that are made at home.

In terms of essential fatty acids, children on breast milk during their first year obtain from this source two grams/day (or 3.6 energy per cent) of linoleic acid and one gram/day (or 1.8 energy per cent) of other polyunsaturated fatty acids. In the second year these figures drop to 1.5 to 2.5g/day (two to three energy per cent), and 0.4 to 0.7g/day (0.4 to 0.8 energy per cent). By the fifth year the actual linoleic acid intake drops to just 1.5 to 2.8 energy per cent, after which the levels gradually move up to the adult patterns of 3.5 to 4.5 energy per cent. Thus weaning and the pre-school years mark a low point in respect of EFA intake, as it does in other nutritional respects. Fats provide energy without undue bulk, and use of unsaturated liquid oils in large amounts in weaning foods, though costly, seems to be called for.

NUTRITION NEWS

The setting up of the **Nutrition Foundation of India** has stimulated the formation of similar Nutrition Foundations in Asian countries. Thus, a Nutrition Foundation has been set up in Bangladesh under the leadership of Dr Kamal Ahmed. The setting up of a Nutrition Foundation in Indonesia has been initiated by Dr Darwin Karjadi.

The Foundation welcomes:

(1) The appointment of **Mr David Haxton** as the Chief of UNICEF in India. Mr Haxton has had several years of experience of working in developing countries like Indonesia and Brazil. (2) The election of **Dr Ko Ko** as Regional Director, WHO (SEARO). Dr Ko Ko brings to the office several years of rich experience in the field of public health and an intimate knowledge of health problems.

The Third Asian Congress of Nutrition conducted on October 6-10, 1980 in Jakarta, Indonesia, was attended by 453 participants from 12 Asian countries, nine from non-Asian countries and five from international agencies. There were 87 scientific papers submitted, and 54 of these were presented in free-communication sessions. Twenty-five scientists from India participated in the Congress.

Edited by Dr (Mrs) S. Malhan, Ph D, for Nutrition Foundation of India, B 37 Gulmohar Park, New Delhi, Designed and produced by Media Workshop and printed by Veerendra Printers.