

## STUDIES ON BABY FOOD FROM MARINE RESOURCES

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Feeding trials on weaning babies showed that FPC made baby food is effective for feeding the weaning babies in gaining weight, height, haemoglobin. Amino acids pattern is found fairly comparable with the standard pattern of FAO. The PER values are also identical as compared to casein.

It is therefore concluded that FPC made baby food will provide adequate nutrition to weaning babies for proper nourishment.

*Key words:* Marine resources based baby food.

### INTRODUCTION

Over the years various changes have taken place both in the composition and preparation procedures of infant cereals as humerous techniques and advance knowledge regarding the infant nutrition has been developed [1].

The world as a whole suffers from malnourishment. Pakistan is the main victim, where protein intake is as low as 7g/head/day, [2]. The main sufferers are children and infants. Fish contains protein of high biological value and also a good source of Ca, Fe, P, and essential vitamins [3]. All nutritional deficiency diseases like scurvy Kawashiorkor (retarded growth) Marasmus a deficiency of both protein and calories [5] generally occur in early ages and can hardly be made good late in life by correct feeding [4]. In marasmus the mental development of child may be permanently impaired [6].

Keeping in mind the above stated importance of quality protein, a baby food from Fish protein concentrate (FPC) has been developed in the Marine Resources Lab's of PCSIR Karachi. This baby food ensures to provide protein in superior quality together with Carbohydrates and essential Vitamins and minerals, which are generally lacking or found in inadequate amounts in the existing commercial brands. biological tests on animals have confirmed that Fish Protein is almost equal to casein a milk protein [5] as it also contains amino acids like agrinine and histidine as both are important for children [3].

### MATERIALS AND METHODS

For preparing baby food, the following ingredients duly processed were used :

(1) *Wheat flour.* Wheat grains were procured from the open market and were pressure cooked for 15 mints. on 1.05 kg per square cm. pressure and dried in a Dryine oven at 70°. The dried material was ground in Barbender

(Junior Mill) so that it may pass through 60 Mesh (used 4 cutters).

(2) *Roasted gram.* Whole roasted grams were procured from th market and husk was removed manually, it was then ground in an electric grinder to a particle size of 60 mesh.

(3) *F.P.C.* Fish Protein Concentrate (FPC) prepared, in the Laboratory of PCSIR containing 80% soluble protein was used.

(4) *Spergulla plantingo.* Locally known as Isobgoul was procured form the market and was ground in an electric grinder to a consistency of 60 Mesh. It is generally used in baby food to check Intestinal disorders.

(5) *Flavour.* Vanilla powder flavour of International flavour fragrances (IFF) was used in powder.

(6) *Vitamins and minerals.* Vit. a (Palmitate) Vit. d (Calciferol) Vit. B<sub>1</sub> Vit. B<sub>2</sub>, Vit. B<sub>12</sub> Calcium pantothenate, Folic acid, Ascorbic acid etc. were added in the required quantities.

(7) *Cornflour.* Corn was procured from the open market and were pressure cooked for 15 mints. at 1.05 kg per cm. square and dried in a drying oven at 70°. The dried material was found in Barbender so that it may pass through 60 mesh.

The main ingredients wheat, gram, sugar etc. were mixed in ratio of 35, 22 and 33 gm in 100 gms.

*Procedures.* The weighed wheat flour duly processed was tranferred to a Vessel and roasted gram in powdered form was added. The mixture was then homogenized thoroughly. Corn flour together with spergulla was gradually added to the mixture with constant stirring. Subsequently flavour was also added to the mixture. Since soluble FPC is hygroscopic, care was taken while mixing 'FPC' to avoid lumps formation. Finally vitaminized mixture was sieved through 60 mesh. In the end all were mixed in a container of



electric mixer to get a bright, off white colour product called baby food. As the ingredients were precooked therefore no cooking of the baby food is further needed.

**Chemical analysis.** Determination of protein, fat, carbohydrates, ash, moisture fiber in the FPC food was done by standard analytical techniques described by AOAC [7] Table 1. The estimation of vitamins was done according to the standard methods of vitamin assay [8]. Organoleptic tests of baby food was done by a Panel of judges consisting of 8 members.

Table 1. Comparative analysis of baby foods

| S. No. | Biochemical analysis          | Baby food with FPC (dry wt. basis) (100 gm) | Controlled food without FPC (dry wt. basis) (100 gm) |
|--------|-------------------------------|---------------------------------------------|------------------------------------------------------|
| 1.     | Moisture at 105 <sup>o</sup>  | 3.92                                        | 3.74                                                 |
| 2.     | Crude protein (Nx 6.25)       | 11.20<br>(in the form of FPC)               | 9.9                                                  |
| 3.     | Fat (CHCl <sub>3</sub> )      | 2.85                                        | 2.67                                                 |
| 4.     | Ash (600 <sup>o</sup> )       | 1.44                                        | 1.22                                                 |
| 5.     | Fiber                         | 1.88                                        | 0.72                                                 |
| 6.     | Carbohydrates (by difference) | 80.59                                       | 82.47                                                |
| 7.     | Vitamin palmitate             | 0.75 mg                                     | 0.75 mg                                              |
| 8.     | Vitamin D calciferol          | 0.005 mg                                    | 0.005mg                                              |
| 9.     | Vit B <sub>1</sub>            | 0.2 mg                                      | 0.2 mg                                               |
| 10.    | Vit B <sub>2</sub>            | 0.3 mg                                      | 0.3 mg                                               |
| 11.    | Vit. B <sub>6</sub>           | 0.2 mg                                      | 0.2 mg                                               |
| 12.    | Vit. B <sub>12</sub>          | 0.8 ug                                      | 0.8 ug                                               |
| 13.    | Calcium pantothenate          | 1.85                                        | 1.85 mg                                              |
| 14.    | Ascorbic acid                 | 20.0 mg                                     | 20.0 mg                                              |
| 15.    | Potassium                     | 0.85 gm                                     | 0.85 gm                                              |
| 16.    | Iron                          | 0.007                                       | 0.007 gm                                             |
| 17.    | Calories                      | 403                                         | 395                                                  |

**Feeding trials.** The experimental weaning babies were arranged through the courtesy of Karachi Health Association (KHA). Two types of foods were supplied to (KHA) for feeding babies. Experimental baby food contained required amount of (FPC) while the food for controlled group was the same but devoid of FPC. The food was supplied in 250 gm packets. The feeding was conducted continuously for 3 months. A systematic record of food consumption was maintained. baby food may be served in a paste form like other conventional baby foods. The approximate cost of baby food has been calculated Rs. 2 per day feeding.

For assessing the impact of the baby food on the experimental babies the following parameters were studied.

- (i) Weight gain by each baby.,
- (ii) Height gain.,
- (iii) Haemoglobin content of blood serum (cynomethemoglobin method.),
- (iv) Clinical check up of the babies.

Baby food was liked equally by babies and the mothers. No. problem was experienced in its administration.

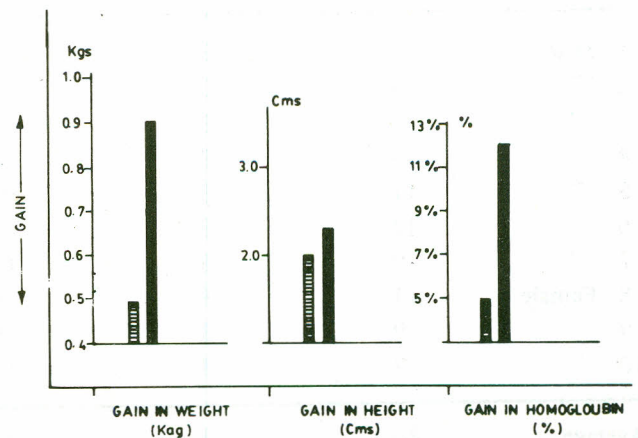


Fig. 1. Comparative study of body gain in children, ■ fed on baby food controlled. ■ fed on baby food from marine resources (FPC).

## RESULTS AND DISCUSSION

It was observed that baby food was fairly acceptable and well tolerated by the babies as no indigestion or diarrhoea was noticed during the course of study. The initial Hb. of the babies were estimated between 60%-70% and the weight between 7-9 kg. The babies gained significant increase in weight. Average weight gain by the experimental babies was about 0.9 kg as compared to 0.5 kg. wt. gain by the controlled group. Similarly 12% rise in haemoglobin was observed in the blood serum of experimental babies as compared to 5% in the controlled group. (Tables 2-4). Babies were examined clinically for their hair lusters, eyes, lips and for respiratory infections before the commencement of feeding and at the end of experiment. No adverse effect of the FPC was observed by the clinician. Amino acid pattern of FPC based Baby food was quite comparable with the standard pattern of FAO, whole egg, Human milk, [11] (Table 5).

The chemical score of FPC baby food based on 1st limiting amino acid tryptophane was found 74% and on second limiting amino acid methionine (sulphur containing) was 80%. These scores suggested that FPC baby food is quite balanced [10], (Table 6). Similarly the PER values, a parameter of Protein quality [12] (Table 2), have also been found quite comparable with casein which is considered a standard protein. The PER value has been calculated while experimenting with Rats is recorded 2.8. It is con-

Table 2. Weight gain in children fed on baby food from marine resources.

| S. No.  | Sex    | Age months | Quantity of baby food administered (kg) | Duration weeks | Gain in weight (kg) | Body gain           |                         | PER |
|---------|--------|------------|-----------------------------------------|----------------|---------------------|---------------------|-------------------------|-----|
|         |        |            |                                         |                |                     | Gain in height (cm) | Gain in haemoglobin (%) |     |
| 1       | Male   | 12         | 3                                       | 8              | 0.910               | 7                   | 15                      | 2.7 |
| 2       | "      | 9          | 3                                       | 8              | 0.771               | 2                   | No change               | 2.3 |
| 3       | "      | 8          | 3                                       | 12             | 1.046               | 3                   | 15                      | 3.1 |
| 4       | "      | 8          | 3                                       | 8              | 0.850               | 2.5                 | 10                      | 2.5 |
| 5       | "      | 11         | 3                                       | 8              | 0.900               | 1                   | 10                      | 2.7 |
| 6       | "      | 12         | 3                                       | 8              | 0.924               | 3                   | 15                      | 2.8 |
| 7       | "      | 9          | 3                                       | 12             | 0.970               | 0.5                 | 15                      | 2.9 |
| 8       | Female | 11         | 3                                       | 8              | 0.990               | 2                   | 15                      | 2.9 |
| 9       | "      | 9          | 3                                       | 8              | 0.870               | 1                   | 15                      | 2.6 |
| 10      | "      | 9          | 3                                       | 12             | 0.815               | 10                  | 10                      | 2.4 |
| Average |        | 8-12       | 3                                       | 8-12           | 0.905               | 2.3                 | 12                      | 2.7 |

Table 3. Weight gain in children fed on controlled food

| S. No.            | Sex    | Age months  | Quantity of baby food administered kg | Duration weeks | Gain in weight kg | Body gain         |                       | PER |
|-------------------|--------|-------------|---------------------------------------|----------------|-------------------|-------------------|-----------------------|-----|
|                   |        |             |                                       |                |                   | Gain in height cm | Gain in haemoglobin % |     |
| 1                 | Male   | 12          | 3                                     | 8              | 0.540             | 1                 | No change             | 1.8 |
| 2                 | "      | 9           | 3                                     | 8              | 0.460             | 3                 | 10                    | 1.5 |
| 3                 | "      | 9           | 3                                     | 8              | 0.360             | 3                 | 10                    | 1.2 |
| 4                 | "      | 12          | 3                                     | 8              | 0.351             | 3                 | 10                    | 1.2 |
| 5                 | Female | 9           | 3                                     | 12             | 0.600             | 1                 | No change             | 2.0 |
| 6                 | "      | 12          | 3                                     | 12             | 0.610             | 1                 | No change             | 2.0 |
| Average body gain |        | 9-12 months | 3 kg                                  | 8-12 weeks     | 0.486             | 2 cms             | 5%                    | 1.6 |

Table 4. Comparative study of baby gain in children

| Category | Ages of children months | Quantity of baby food intake kg | Duration weeks | Gain in weight | Body gain         |            | PER |
|----------|-------------------------|---------------------------------|----------------|----------------|-------------------|------------|-----|
|          |                         |                                 |                |                | Gain in height cm | Gain in Hb |     |
| A        | 8-12                    | 3 kg                            | 8-12           | 0.486          | 2                 | 5%         | 1.6 |
| B        | "                       | "                               | 8-12           | 0.905          | 2.3               | 12%        | 2.7 |

Fed on A - baby food controlled; B - Baby food from marine resources (FPC)



Table 5. The FAO pattern and the proteins of egg, human milk and baby food with (FPC) as compared with the amino acid requirements of infants (gm/16gm N).

|                          | FAO pattern | Hens egg | Human milk | Cow's milk | Infant |      | Baby food with FPC |
|--------------------------|-------------|----------|------------|------------|--------|------|--------------------|
|                          |             |          |            |            | (a)    | (b)  |                    |
| Threonine                | 2.8         | 5.0      | 4.5        | 4.7        | 4.4    | 6.3  | 3.9                |
| Tryptophan               | 1.4         | 1.7      | 1.6        | 1.4        | 1.6    | 1.6  | 1.0                |
| Valine                   | 4.2         | 7.4      | 6.3        | 7.0        | 6.7    | 7.6  | 5.7                |
| Alanine                  | —           | 6.6      | 4.1        | 3.7        | —      | —    | 6.2                |
| Histidine                | —           | 2.4      | 2.2        | 2.7        | 2.4    | —    | 6.0                |
| Lysine                   | 4.2         | 6.6      | 6.6        | 7.9        | 7.7    | 7.5  | 6.0                |
| Leucine                  | 4.8         | 8.8      | 9.1        | 10.0       | 10.9   | 10.9 | 8.0                |
| Isoleucine               | 4.2         | 6.6      | 5.5        | 6.5        | 6.6    | 9.2  | 5.7                |
| Methionine               | 2.2         | 3.1      | 2.3        | 2.5        | 4.8    | 3.3  | 1.9                |
| Cystine                  | 2.0         | 2.3      | 2.0        | 0.9        | —      | —    | 1.8                |
| Total sulphur amino acid | 4.2         | 5.4      | 4.3        | 3.4        | *6.2   | —    | 3.7                |
| Phenylalanine            | 2.8         | 5.8      | 4.4        | 4.9        | 6.6    | 6.5  | 5.4                |
| Tyrosine                 | 2.8         | 5.0      | 5.5        | 5.0        | —      | —    | 3.4                |

(a) Recalculated from the data given in "Evaluation of Protein Nutrition (80) (b) Revaluated from L. Emmert Holt *et al.* (81);

(c) \*Methionine requirement in absence of cystine.

Table 6. Chemical score.

|                                   |   |      |
|-----------------------------------|---|------|
| a. Tryptophan                     | = | 74%  |
| b. T. sulphur contain amino acids | = | 80%  |
| c. Lysine                         | = | 100% |
| Net protein value                 | = | 8    |

cluded that given baby food could provide adequate nutrition which is required for healthy growth.

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