

BIOLOGICAL EVALUATION FOR DATE IN WEANING RATS DIET

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ABSTRACT

Weaning is an important nutritional milestone with implications for present and future health. Advice on good weaning practice should be a priority and can help avoid several nutritional problems later on. Optimal timing for the introduction of complementary foods will depend on the infant's physiological and developmental status. Small, frequent meals of easily digestible, smooth, semisolid nutrient- and energy-dense complementary foods should initially be offered while gradually increasing variety in both the type and texture of food. Protein and carbohydrate intake should increase with the infant's age while preference should be given to foods rich in micronutrients.

Therefore, the nutritional biochemistry of date diet for weaning rats was investigated, in order to design a more effective program for improved child health and nutrition. This was based on gain body weight (GBW), organ weight, blood cell count and their fractions besides the liver and kidney histology. It seems that the combination of date, sweet potatoes, plant protein formula of antioxidants (ACES) in the presence of proposed additives used (AD) is the best complimentary food to be taken beside the prefeeding. For simple biological evaluation of the data received in the present study, ranking numbers that proposed for WBC, RBC, Liver histology and kidney histology, were collectively calculated to get the net figures of roughly biological assessment. The results that propounding group 6 formula as the best over all profound group 3 as the worst.

It is important to recognize in this study that BW evaluation is not the most reasonable way of assessment, hence, in terms of some biological facts such as blood cell profile and organ tissues pictures, the control is not heather one. However advice on good weaning practice should be a priority and can help avoid several nutritional problems later on, such as excessively fatty eating, faltering growth, constipation, iron deficiency anaemia and obesity. The untimely and inappropriate introduction of complementary foods, similar to that of G6, is shown to be risk factors for both under- and over-nutrition with resultant under- or overweight, stunting and micronutrient deficiencies. Optimal timing for the introduction of complementary foods will depend on the infant's physiological and developmental status.

Keywords: Weaning period, Semisolid dates, aneamia, immunity.

INTRODUCTION

The principles of nutrition may be assigned very early of man live. Nutrition in childhood influences both the child's present and future health. Health professionals need to educate parents from all socioeconomic groups about good nutrition for their children from birth onwards. Since most babies receive formula at some stage during the first year of life, health professionals also have a responsibility to be aware of current development in infant formulae, e.g. nucleotides, long chain polyunsaturated fatty acids, prebiotics, so they can give accurate information. Families should be encouraged to cook, eat and enjoy food together as often as they can, which in itself has

been shown to have nutritional benefits, as well as considering the quality of the food they eat (Harrod-Wild, 2007).

Weaning food must contain several constituents. Vitamin A is an example. Ross and Li, (2007) inferred that the lungs depend, at least in part, on the uptake of dietary vitamin A, probably from chylomicrons, to develop RE stores in the postweaning growth period. Moreover, complementary foods is essential. The untimely and inappropriate introduction of complementary foods have been shown to be risk factors for both under- and over-nutrition with resultant under- or overweight, stunting and micronutrient deficiencies. Optimal timing for the introduction of complementary foods will depend on the infant's physiological and developmental status (van der Merwe *et al.* 2007).

Vitamin A supplements, again, are administered to infants in developing countries at immunization contacts; doses of 50000 IU vitamin A are recommended. Doses of 100000 IU are given to children aged 0.5-1 y. The efficacy of these doses has not been adequately determined. They aimed to quantify liver vitamin A after the administration of vitamin A doses to piglets. Piglets are a good model for infants because of their similar size, gastrointestinal anatomy, and vitamin A requirements. It has found that this piglet model suggests that, for supplementation to infants <6 mo old, a 50000-IU dose is likely to be more efficacious in mitigating deficiency than is a 25000-IU dose (Surles *et al.* 2007).

The quantity and quality of infant's diet, as seen before, are essential. It should be observed that certain foods, such as fresh cow's milk and egg white, because of their allergenic properties, as well as fat-free and high-fibre foods, excessive fruit juice and low nutrient value drinks such as tea are not recommended. Timely introduction of appropriate complementary foods is vital for the immediate and long-term health of the infant and caregivers should be accordingly advised on feeding at this age (van der Merwe *et al.* 2007).

For this purposes, way of feeding and food ingredients, in addition, are to be considered. Emamghorashi and Heydari (2007) evaluated the growth of 597 infants < 24 months attending health centers in Jahrom according to type of infant feeding. There were no significant differences between the groups in height and weight in the first few months of birth; later, breastfed infants were significantly heavier and taller.

In order to effectively promote exclusive breastfeeding, it is important to first understand who makes child-care and child-feeding decisions, and why those decisions are made; as in most parts of the world, exclusive breastfeeding until 6 months of age is uncommon in Malawi. In a rural area of northern Malawi, 160 caregivers of children 6 to 8 months of age were asked to recall the child's age at introduction of 19 common early infant foods, who decided to introduce the food and why. Promoters of exclusive breastfeeding should target their messages to appropriate decision makers and consider targeting foods that are most harmful to child growth (Kerr *et al.* 2007).

As a food formula, in background, the use of lyophilized meat powder with iron-fortified wheat flour to produce an infant porridge with bioavailable iron, but its acceptability and safety is unknown. Dry and cooked porridges and meat ingredients were tested for microorganisms; meats were tested for pesticides. As a results, mothers gave higher acceptability scores to the no-

meat porridge, followed in order by low and high quantities of meat powder. Microbiologic safety was acceptable except for marginally acceptable molds and yeasts in dry ingredients. No pesticide residues were detected. (Pachón *et al.* 2007).

In objectives to assess the efficacy of a home made energy dense weaning food, methodology included infants attending four child health welfare clinics in the Medical Officer of Health (Ragama) area and recruited at the age of 4 months. The intervention group received a specially designed hand blender, recipe and advice to prepare a weaning food. In conclusions, a high energy density home made complementary food was effective in improving the weight gain of infants during the weaning period. (De Silva *et al.* 2007).

Contaminated water and food are major causes of malnutrition and mortality in the developing world, particularly among children. Infants are most vulnerable to diarrheas illnesses when introduced to fluids and foods as they are weaned from breastfeeding to a mixed diet. There is scant literature about the role of nutrition professionals in addressing this problem. Considerable progress has been made in identifying strategies to prevent diarrhea in children. Strategies include implementing low-technology methods of sanitizing water, emphasizing the benefits of breastfeeding, protecting prepared foods from unclean environments, and educating and motivating food prepares (Marino, 2007).

Moreover, assessment of a fortified complementary foods with or without alpha-amylase treatment found to increase hemoglobin but do not reduce breast milk intake of 9-mo-old Zambian infants. The study foods improved hemoglobin concentrations without reducing breast milk intake especially proteins and may be used to improve the nutritional status of infants in developing countries. (Owino *et al.* 2007). One of the most recent biochemical category in biological sciences is what so called bioactive proteins. Here, it focuses on the effects of milk peptides on immune function and attempts to provide an overview of the knowledge available in this field. Bioactive peptides encrypted within the native milk proteins can be released by enzymatic proteolysis, food processing, or gastrointestinal digestion. These peptides possess a wide range of properties, including immunomodulatory properties. The first months of life represent a critical period for the maturation of the immune system because a tolerance for nutrient molecules should be developed while that for pathogen-derived antigens is avoided. Evidence has accumulated to suggest that milk peptides may regulate gastrointestinal immunity, guiding the local immune system until it develops its full functionality. This data using the weaning piglet as the model suggest that several milk peptides can downregulate various immune properties at a time (one to two weeks after weaning) that coincides with immaturity of the immune system. Despite the fact that the research in this field is in its infancy, the evidence available suggests that milk protein peptides may promote development of neonatal immune competence. (Politis and Chronopoulou, 2008).

Some special formulas are examined here, based on some biological parameters, to measure the most healthful diet that support the proper growing up of infant in rats.

MATERIALS AND METHODS

Materials: The food materials: Semisolid dates, powdered sweet potatoes and skimmed milk as well as honey, apple, and spices used in preparation of special additives (AD) were obtained from local market in Cairo. The AC is an antioxidant plant protein formula first produced by Ahmed *et al.* (2005b).

Rations and Animals: Forty-two two- weeks age of average weight 50 +/- 2 g male albino rats of western strains were housed in the Ophthalmology Research Institute, Giza, Egypt. These were the offspring of pregnant females rats of 13 weeks old and average weight of 235±10 g, which have been accomplished in proper time according to UFAW (2000). Animal groups (7x6 = 42 animals) were fed partially on basal diet according to Bowman *et al.* (1990), meanwhile salt and vitamins mixtures have followed that of AOAC (1984) plus infant cereals half and half as a control, or grouped from 1 to 6 as outlined in Table (1). The food and water were given daily. Each mother was kept with its offspring of equal numbers in a separate cage.

To test the biological effect of these food formulations, rats' blood samples were taken and animals were anethetized. The organ were separated and weighed when the trial has been terminated.

For cell count :Excel 80 blood cell counter (Danam, USA) was used to count the red and white blood cells, RBC and WBC, and their fractions.

Table (1) Diet formula as weaning foods

Groups	D	SM	AC	SP	W	MIX	FAT	AD
C	50% each of basal diet and a common commercial weaning food							
G1	20	20	10	10	25	5	8	2
G2	20	10	20	10	25	5	8	2
G3	20	0	30	10	25	5	8	2
G4	10	20	10	20	25	5	8	2
G5	10	10	20	20	25	5	8	2
G6	10	0	30	20	25	5	8	2

D for semisolid dates, **SM**:skim milk, **AC**:antioxidant plant rich protein, **SP** : dried sweet potato, **W** : wheat, **MIX**: salt and vitamin mixtures and **AD**: special additives.

Histopathological examination of liver: The liver of each mother was collected and post-mortal examination was done as soon as possible. Fixation was carried out in 10% of natural formalin, dehydrated, cleared, and ended paraffin then sectioned at (4-6 mm), and stained with harris hematoxylin, and casein for histopathological examination. (Frankel and Reitman, 1963).

A value of average of 6 samples was calculated to be recorded.

RESULTS AND DISCUSSION

The formula of date's diet for weaning have been arranged as seen in Table (1). Date (D) portion was ranged between 10 to 20% with counterpartation of dried sweet potato (SP). All other ingredients, e.g., wheat (W), salt and vitamin mixtures (MIX) were fixed at their levels. Likewise, the special additives (AD) that has been added to all groups except the control. Otherwise, sckimmilk (SM) and the antioxidant plant rich protein (AC) have been varied to keep equal dietary rates of proteins, carbohydrates and fats. The biological evaluation has been ran under special biological terms since weaning practice should be a priority and can help avoid several nutritional

problems later on, such as excessively fatty eating, faltering growth, constipation, iron deficiency anaemia and obesity (Harrod-Wild, 2007). Some of these medical characteristics have been observed in the control.

However, feeding in this age cycle is seen to be very effective, through the four weeks, a great body weight (BW) variation was occurred between the control and date diets. Table (2) showed also that group 3 was the most similar group to the control among all others. It was noticed, for instance, that a high energy density home made complementary food may improves the weight gain of infants during the weaning period (De Silva *et al.* 2007).

Table (2) Infant body weight growth

Groups	0 time	1 st wk	2 nd wk	3 rd wk
C	50.0+/-1.5	67.2	118.5	121.0
G1	50.0+/-1.5	55.5	72.2	75.3
G2	50.0+/-1.5	54.2	73.3	76.2
G3	50.0+/-1.5	60.0	86.0	88.7
G4	50.0+/-1.5	54.7	75.5	78.1
G5	50.0+/-1.5	53.8	75.9	77.8
G6	50.0+/-1.5	58.8	74.3	80.2

In this concern, it is possible to say that group 6 may considered to be the next acceptable one. This acceptability is connected with some urgent metabolic factors that are more clearly seen below. In case of organs, generally similar trend is predisposed. It seems that groups from 4 to 6 are somewhat comparable to the control for liver and spleen, but heart of group 2 is the biggest one after that of C group. It is true also in Table (3) that kidney has not been changed within all date's groups and was smaller than that of C. It is also true that the C group is heavier than all other groups for all organs examined. Since catch up growth is not as important as hyperplasia one, other biological parameters should be encountered.

Table (3) Organs in gram as response to diet formula

Groups	L	S	K	H	Lu
C	5.50	0.45	0.80	0.50	0.80
G1	2.95	0.25	0.65	0.35	0.50
G2	3.80	0.25	0.65	0.45	0.65
G3	5.45	0.25	0.55	0.30	0.45
G4	5.45	0.35	0.55	0.35	0.65
G5	5.55	0.40	0.65	0.35	0.65
G6	5.50	0.35	0.55	0.35	0.55

L liver, S spleen, K kidney, H heart, and Lu lung.

The aneamia and immune system are the more appropriate selective medical tool to be considered in this case. In fact, blood cell counts were significantly affected by diet formula, Table (4) illustrated that the highest counting of platelet is recorded for the control, meanwhile, G6, G6, G1, G4, G6, and G6 are the most countable groups for WBC, %LYM, %MON, %NEU, RBC and HGB, respectively. It is to mentioned that this group, i.e., G6, is recorded the lowest number of platelet.

In accordingly, although the G6 may considered to be the best, the above mentioned biological parameters, other than the BWG, organ tissues histopathology of groups 1 may suppress that of the control. However, Tables 5 and 6 are the liver and kidney histology whose also tell us that G6, the most plant origin food sources, still the most acceptable group of feeding. In this

regard, it is stated that the untimely and inappropriate introduction of complementary foods have been shown to be risk factors for both under- and over-nutrition with resultant under- or overweight, stunting and micronutrient deficiencies. Moreover, in human, certain foods, such as fresh cow's milk and egg white, because of their allergenic properties, as well as fat-free and high-fiber foods, excessive fruit juice and low nutrient value drinks such as tea are not recommended (van der Merwe *et al.* 2007).

Table (4) Blood cell counts as affected by diet formula

Groups	WBC	%LYM	%MON	%NEU	RBC	HGB	HCT	PLT	RNWBC	RNRBC
C	9.53	67.6	16.0	5.4	6.88	14.0	44.3	1098	6	5
G1	12.43	62.7	22.9	7.3	6.78	13.7	41.9	873	4	7
G2	14.61	68.2	15.7	6.6	7.20	13.4	40.7	954	2	3
G3	9.01	72.5	12.4	5.6	6.86	13.4	39.8	865	7	6
G4	12.68	66.9	16.0	7.9	6.94	13.5	39.5	716	3	4
G5	10.10	6.37	18.4	7.4	7.45	14.9	43.2	890	5	2
G6	16.13	75.5	11.3	6.3	7.63	15.0	44.4	590	1	1

RN : Ranking number, WBC: White blood cells, LYM: Lymphoid cells, MON: Monolymphoid cells, NEU: Newlymphoid cells, RBC: Red blood cells and HGB: Hemoglobin.

Table (5): Effect of feeding date's formulations on liver histopathology.

Groups	C	G1	G2	G3	G4	G5	G6
Marked dilatation and congetion of central vein.			++				
Vacuolar degeneration of hepatocytes.			+				
Bile duct thickning wall.			+				
Kypffer cells activation of cytoplasm				+			
Slight granularity of hepatocytes.				+			
Congestion of central vein.				+			
Hepatocyte cytoplasm granularity						+	
Hepatocyte sporadic necrosis.						+	
Hepatocyte hydropic degeneration.							+
Ranking #	1	1	5	4	1	3	2

Table (6): Effect of feeding date's formulations on kidney histopathology.

Groups	C	G1	G2	G3	G4	G5	G6
Nucli pylenosis.			+				
Protein cast			+				
Renal tabules luman material.			+				
Congestion of renal blood vessels.				+			
Vacuolar degeneration of epithelial lining renal tabules						+/-	
Congestion of renal blood vessels.						+	
Pylnosis of the nuclei of epithelial renal tabules.							+/-
Ranking #	1	1	4	2	1	2	1

It is important to recognize, again, that BW evaluation is not reasonable way of assessment, hence, in terms of some biological facts such as blood cell profile and organ tissues pictures, the control might not shown as the most heather one. However advice on good weaning practice should be a priority and can help avoid several nutritional problems later on, such as excessively fatty eating, faltering growth, constipation, iron deficiency anaemia and obesity (Harrod-Wild, 2007).

For simple biological evaluation of the data received in the present study, ranking numbers that proposed for WBC, RBC, Liver histology and

kidney histology, were collectively calculated to get the net figures of roughly biological assessment. Table (7) shows the results that propounding group 6 formula as the best over all, meanwhile, group 3 as the worst.

Table (7): Calculated biological net ranking number for the effect of dietary system used.

Groups	WBC	RBC	Liver histology	kidney histology	Net ranking*
C	6	5	1	1	3.25
G1	4	7	1	1	2.75
G2	2	3	5	4	3.50
G3	7	6	4	2	4.75
G4	3	4	1	1	2.25
G5	5	2	3	2	3.00
G6	1	1	2	1	1.25

The sum of each row divided by 4.

In conclusion, the untimely and inappropriate introduction of complementary foods, again, have been shown to be risk factors for both under- and over-nutrition with resultant under- or overweight, stunting and micronutrient deficiencies. Optimal timing for the introduction of complementary foods will depend on the infant's physiological and developmental status (van der Merwe *et al.* 2007). In this concern, it is to be mentioned that G6 may convey the right food internal structure between the macronutrients, particularly proteins, and the micronutrients that facilitates the production of special bioactive proteins helps to generate the right hormonal balance of this physiological status.

The bioactive protein is one of the most important branch of biological role in nutritional biochemistry. Some plant proteins are recognized nowadays to play a great role in some pathological diseases (Ahmed *et al.* 2005a). More evidence is recently published. Likewise, and regarding WBC data in this study, evidence has been accumulated to suggest that milk peptides may regulate gastrointestinal immunity, guiding the local immune system until it develops its full functionality (Politis and Chronopoulou, 2008). More research activity is to be conducted in this field.

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التقييم البيولوجي للبلح في غذاء الفئران

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تم دراسة الدور البيولوجي للبلح في غذاء الفئران حيث أدى إضافة البلح إلى غذاء الفئران بنسبة ٢٠% إلى تحسين الظروف البيولوجية الخاصة بالرضع. كما وجد أنه عند مستوى ٢٠% للبلح في خليط نباتي و حيواني مدروس في تغذية المرضعات و في وجود بعض المنشطات الطبيعية الخاصة قد أدى ذلك إلى التحكم في الآثار الاستثنائية البيولوجية المصاحبة للرضاعة مثل الأنيميا و مظاهر سوء التغذية إضافة إلى الحفاظ على الصفات التشريحية للكبد و الكلى. و جملة ما تشير إليه النتائج أن صحة المواليد و آلام المرضعة قد قابلت إضافة مكمل غذائي لمضادات الأكسدة بنسبة ١٠% بلح، ٣٠% مكمل غذائي بروتييني مضاد للأكسدة+٢٠% بطاطا مجففة+٢٥% دقيق قمح. و كمحصلة غذائية فإن نسبة ال ١٨% بروتين مع كمية كبيرة من كربوهيدرات نباتية خاصة و دهون نباتية أقل من ١٠% في وجود هذا المستخلص الخاص بنسبة ٢% يعتبر أفضل تركيب غذائي كغذاء مكمل أو شبة كامل لمقابلة هذه الحالة الفسيولوجية الخاصة. أن هذا التوازن الهرموني الخاص بالرضاعة نتيجة ذلك التمازج بين المغذيات الكبرى و المغذيات الصغرى قد يتبلور إلى الصورة الأوضح خلال التركيز في البحث عن حقيقة الخواص الطبية للمستخلص النباتي المستخدم من حيث أهمية توازن التركيب البروتيني ميتابوليزميا في إنتاج بعض البروتينات النشطة اللازمة للوفاء بهذه الحالة الهرمونية الخاصة.