

INFLUENCE OF A NUTRITIONALLY-INDUCED DIFFERENCE IN THE BODY LIPID CONTENT OF THE BABY PIG ON SUBSEQUENT CHANGES IN BODY COMPOSITION

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The body lipid content of the baby pig increases rapidly during the first few weeks after birth. However, little is known of the effect of degree of fatness at this stage on subsequent developmental changes. Williams (1976) showed that large differences in lipid content can be produced in artificially reared pigs of 6 kg live weight by manipulation of the dietary protein:energy ratio. Some results are presented of an experiment concerning the influence of such early differences in lipid content on subsequent body composition.

Nineteen entire male pigs were reared from 1.8 to 10 kg on each of two isocaloric liquid milk diets in which 37% and 13% respectively of the gross energy was provided as protein (in amounts to provide a daily gross energy allowance of 4 - 4½ x maintenance). From 10 kg, when three pigs from each group were slaughtered, all pigs were fed the same cereal-based diet (containing per kg, 180 g crude protein, 8.5 g total lysine, 14.1 MJ DE) at a rate to provide a daily DE intake of 3 x maintenance (designated "full-fed") and were killed serially at weight intervals of 16 kg up to 90 kg. From 42 kg, subsequent increases in daily feed intake of half the pigs remaining from each of the original treatment groups were limited to 20% of that of the remainder.

TABLE 1. Total lipid contents (kg) of pigs slaughtered at successive weights (means of three pigs per group at 10 kg and two pigs per group at remaining weights).

Live weight (kg)		10	26	42	58	74	90
Protein level to 10 kg (MJ %)	Feed level from 10 kg						
	'Full'	1.26	3.49	7.57	15.45	16.99	25.51
37	'Limited'				11.24	15.91	22.33
13	'Full'	3.13	5.00	8.23	13.04	16.51	25.51
	'Limited'				12.10	16.80	22.13

A relatively large and highly significant ($P < .001$) difference in weight of body lipid between groups at 10 kg declined progressively as weight increased (Table 1). Analysis of variance of total lipid weight in pigs slaughtered at 58, 74 and 90 kg disclosed a negligible effect of the original dietary treatments but significant differences ($P < .01$) due to slaughter weight and level of feeding from 42 kg.

WILLIAMS, I.H. (1976). Ph.D. Thesis, University of Melbourne.

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SURVEY OF INFANT FEEDING PRACTICES IN SYDNEY 1976-1977
INTERIM REPORT

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There is little current information on infant feeding practices in Australia. The information which is available is based on Baby Health Centre records in Victoria (Newton 1966; Dept of Health, Victoria 1975). It is doubtful whether the subjects included in these studies are representative of the infant population generally. Consequently, a survey was designed to ascertain the feeding patterns of infants under 1 year of age in the Sydney metropolitan area. We report here interim results on the first 160 subjects in the survey, which will eventually include a sample of 320 infants.

A representative sample of infants was selected from obstetric hospitals in Sydney metropolitan area using a cluster sample technique. Within each cluster, the probability of a hospital being included was proportional to its contribution to total births.

The babies were chosen randomly from the hospital records according to the following criteria:

BABIES - well at birth, ≥ 2500 g birth weight, equal sex and age distribution.

MOTHERS - no known illnesses which could influence method of feeding, born in Australia, aged between 20-29 years, equal distribution between primiparae and multiparae.

The hospital sent out a letter to each mother explaining the survey and encouraging them to post the reply back to us. Non-responders were checked to see if they were true non-responders, because often mothers were no longer living at the given address.

Each interview was carried out in the home by the same interviewer. The following anthropometric data were obtained - naked weight, length and triceps skinfold thickness. A pretested questionnaire was administered to obtain information on hospital stay of mother, feeding history of the infant, attitudes of mother to breast - and bottle-feeding and socioeconomic data.

Breast-feeding was attempted by 77% of the mothers, but 50% changed to bottle-feeding during the first five weeks. The most common reason (50%) for stopping breast-feeding was "low milk supply" followed by "sore nipples" and "inconvenience". The most common reason for starting bottle-feeding (80%) was unsuccessful breast-feeding either with this baby or with previous children. The main reason for initially breast-feeding was "good for the baby".

In 50% of the subjects in which solids had been introduced, this had occurred in the first 2 months of life. The most common first solid was cereal and milk. There was a high usage of sweetened fluids, for example rosehip syrups; 58% of the total sample gave their babies one of these sweetened fluids as the first food other than milk.

Although a high percentage of mothers started breast-feeding the duration was short. The real reason behind "low milk supply" needs to be explored.

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THE NUTRITIONAL STATUS OF OVO-LACTO-VEGETARIAN
AND NON-VEGETARIAN PRESCHOOL CHILDREN

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There is growing awareness of the influence that early dietary habits have on health later in life. It is known that Seventh Day Adventists, a majority of whom are ovo-lacto-vegetarians, have a lower incidence of cardiovascular disease than the general population (Wynder *et al.* 1959) and that their serum cholesterol and intake of animal fat is also lower (Walden *et al.* 1964). Most of these studies have been in adults - knowledge about young children is scarce. Indeed, information on young children generally is lacking (Owles 1975). These reasons have motivated the study of such a group.

Twenty 2 to 4 year old ovo-lacto-vegetarians (hereafter vegetarians) were matched for age and sex with twenty non-vegetarians. A 7 day record of weighed food intake was kept by one or both parents of each child. A 10 ml. sample of blood was collected by venipuncture for determinations of haemoglobin and serum B12, folate, cholesterol and triglyceride. At the same time height and weight were measured.

There were no differences between vegetarians and non-vegetarians for height, weight, haemoglobin and serum triglyceride.

Statistically significant differences ($P \leq 0.05$) between the groups were found for the variables in table 1.

TABLE 1 - Differences between vegetarians and non-vegetarians

Variables	Vegetarians	Non-vegetarians
Fat intake (g/day)	42	52
Cholesterol intake (mg/day)	132	313
Carbohydrate intake (g/day)	164	144
P/S ratio	.77	.33
β -carot. equiv. intake ⁺ (μ g/day)	1933	1309
Retinol intake ⁺⁺ (μ g/day)	247	422
Serum cholesterol (mg%)	164	186
Serum B12 (pg/ml)	381	576
Serum folate (ng/ml)	17.9	11.5

⁺significant for males only ⁺⁺significant for females only

No significant correlation was found between serum cholesterol and any parameter of fat or cholesterol intake for the group as a whole.

Intakes of the study group were compared with the recommended dietary allowances (N.H. & M.R.C. 1970). Energy consumption failed to meet recommendations while intakes of iron, retinol activity, thiamine, riboflavin, niacin equivalent and ascorbic acid all exceeded them.

This study attempted to assess the nutritional status, by means of dietary, anthropometric and biochemical measurements, of two groups of children with dissimilar food habits but alike in many other characteristics. According to these parameters both groups were found to be adequately nourished, but vegetarians had a lower mean serum cholesterol and lower intakes of saturated fat and cholesterol.

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DIET AND SERUM LIPID LEVELS IN AUSTRALIAN ADOLESCENTS

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The purpose of this study was to correlate the dietary habits of Australian adolescent children with serum lipid levels. 370 randomly selected school children aged 14 years from 13 High Schools in the Sydney metropolitan area have been studied. A retrospective 24 hour food analysis and a retrospective one week general food programme has been completed.

There were 195 boys and 175 girls. The mean serum cholesterol level for all children was 4.87mmol/l (190mg%); boys 4.7mmol/l (180mg% \pm 0.76), girls 5.05mmol/l (195mg% \pm 0.67). 26% exceeded 5.2mmol/l (200mg%) and 4% exceeded 6.2mmol/l (240mg%). The mean level in boys was significantly lower than in girls. The serum triglyceride level for all children was 0.85mmol/l (76mg%); boys 0.8mmol/l (72mg%), girls 0.91mmol/l (82mg%).

The girls had a greater body mass, 38% exceeding the 75th percantile than the boys in whom 21% exceeded the 75th percantile (NHMRC 1975). The mean serum cholesterol in these girls was 5.0mmol/l as compared with 4.6mmol/l in the boys. The girls, despite a greater body mass and higher serum cholesterol, had a lower caloric (2248 calories versus 3264), saturated fat (47gm versus 72gm), lipid(105gm versus 153gm) and cholesterol (367gm versus 517gm) intake as compared with the boys. There was no individual correlation between the caloric, cholesterol, fat content and polyunsaturated fat intake and individual serum cholesterol and triglyceride levels.

The relationship of caloric intake, serum cholesterol levels and indices of physical fitness will be discussed. 85% of meals were brought from home and school canteens and tuck shops were of less influence than expected. The confidence limit of the study was 11%.

NHMRC, Australian Department of Health, 1975.

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DEFLEECING SHEEP WITH MIMOSINE : EFFECTS OF NUTRITION

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Mimosine is potentially useful as a chemical defleecing agent for sheep (Reis *et al.* 1975). Evidence is presented in this paper that the nutritional state of sheep can influence the amount of mimosine required to defleece them. Sheep were given ground and pelleted diets consisting of either (1) lucerne (3 parts) and oat grain (2 parts), or (2) diet 1 (6 parts) and formaldehyde-treated casein (1 part). Intravenous infusions of mimosine were given for 2 days at a steady rate (Reis *et al.* 1975), following various nutritional treatments.

TABLE 1. Effectiveness of mimosine for defleecing sheep.

Nutritional treatment prior to mimosine infusion	Mimosine infusion rate (mg/kg/d)	No. of sheep dosed	No. of sheep defleeced
Diet 1, 600 g/d, 6 weeks	80	8	8
Diet 2, 1200 g/d, 3 weeks	80	10	0
Diet 1, 1030 g/d plus casein/abomasum, 170 g/d } 3 weeks	80	4	0
Diet 2, 1200 g/d, 1 week	80	4	0
Diet 2, 600 g/d, 1 week	80	3	3
Diet 2, 1200 g/d, 1 week	120	3	2
Diet 2, 1200 g/d, 2 weeks; 4-day fast	80	4	4
Diet 1, 600 g/d, 6 weeks; 4-day fast	40	4	3

With sheep consuming 600 g/d diet 1, an intravenous infusion of mimosine (referred to as the standard infusion) produced consistent defleecing when given at a dose rate of 80 mg/kg/d for 2 days (Table 1). Lower amounts of mimosine were not effective for defleecing. A 3-week pre-treatment period of feeding diet 2 (1200 g/d), or of infusing an equivalent amount of casein (170 g/d) into the abomasum, completely prevented defleecing with the standard mimosine infusion (Table 1). The same effect was obtained, in four sheep, with a 1-week pre-feeding period of diet 2 (1200 g/d), but the pre-feeding of only 600 g/d of diet 2 to three sheep for 1 week failed to prevent defleecing with the standard infusion (Table 1). Preliminary results indicate that the failure of the standard infusion to produce defleecing following these nutritional treatments was associated with reduced levels of mimosine in blood plasma. Defleecing could be achieved following pre-feeding with 1200 g/d of diet 2 by increasing the amount of mimosine infused to 120 mg/kg/d, or by fasting the sheep for 4 days, commencing the fast 3 days before the start of mimosine infusion (Table 1). Fasting for 4 days as described above reduces the amount of mimosine required to defleece a sheep; three out of four sheep previously consuming 600 g/d diet 1 were defleeced following an infusion of only 40 mg/kg/d (Table 1).

These results indicate that, compared with sheep on moderate feed intakes, sheep on high intakes, especially those absorbing large amounts of amino acids, will require larger amounts of mimosine to defleece them. Fasting prior to dosing obviates the effects of previous nutrition.

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METABOLIC STATE AND ROUGHAGE CONSUMPTION IN SHEEP

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The major factor limiting the intake of roughage diets by the non-pregnant, non-lactating sheep is the rate of removal of dietary organic matter from the rumen, the resultant of the rates of absorption or eructation of digestion end-products and of propulsion of undigested materials to the omasum. Roughage consumption may increase, however, with increase in energy demand such as occurs during cold exposure and lactation. The importance of different physiological processes in effecting the increased rate of removal of organic matter from the rumen under these conditions has not been established; accordingly, the studies reported here are concerned with the effect of the metabolic state of the sheep on processes relating to ruminal digestion. Cold exposure and thyroxin administration were used to create metabolic states consistent with enhanced feed intake, whereas the administration of fluoracetate and various amino acids in excessive amounts were used to create the reverse situation.

The adult sheep used had been prepared surgically with rumen and abomasal fistulae and received 100 g of medium quality roughage each 3 hr. Cold exposure was imposed by maintaining sheep with short fleeces at 8° or 10°. Amino acids or fluoracetate were administered for 4 days or more by a continuous infusion pump. Liquor volume in the rumen and the residence time of the marker ⁵¹Cr-EDTA were measured as described by Weston & Hogan (1967).

Total chewing time (ruminating + eating) and the size of feed particles that passed to the abomasum in digesta were not affected by cold exposure. However, rate of propulsion of digesta to the omasum appeared to increase as marker residence time and rumen liquor volume were 22-26% lower ($p < 0.01$) and more dietary fibre was excreted in the faeces. Changes in volume and residence time persisted for at least 5 weeks. Intramuscular injection of DL-thyroxin for 16 days in sheep (> 10 cm fleece) maintained at 24° also decreased liquor volume and residence time. During the period 15-28 days after the start of thyroxin treatment, heart rate was elevated ($p < 0.01$) and liquor volume and residence time were 26-28% lower ($p < 0.05$).

In contrast, the administration of amino acids in amounts to cause an imbalance increased liquor volume and residence time. A mixture (2:3) of glycine and glutamic acid given either per abomasum or intravenously at 40-60 g/day increased ($p < 0.05$) both liquor volume (16%-20%) and residence time (45%-50%); similar effects were observed with methionine given via the same routes at 10-15 g/day. The metabolic antagonist fluoracetate, when given intravenously at 1.0-1.5 mg/day also caused increases (16%-20%) in both parameters in the two sheep studied.

The data suggest that change in roughage intake with varying metabolic state could be mediated in part by change in the rate of digesta propulsion to the omasum.

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NATURE AND DISTRIBUTION OF PHOSPHORUS IN RUMEN DIGESTA OF SHEEP

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Although the phosphorus in phytic acid, a major P compound in plants, is readily available to ruminants, it is not known if the P in other organic compounds (PO) is well digested (Playne, 1976). Since availability of dietary P presumably depends on conversion to inorganic form (PI) before reaching the absorption sites in the small intestine, I determined the nature of P in liquid and solid phases of rumen digesta from sheep in preparation for studies of the kinetics of P digestion and absorption.

Three mature, crossbred wethers, each fitted with a rumen fistula, were fed pelleted lucerne hay at 3 hr intervals (712 g DM/24 hr; 0.17% P). Digesta samples were filtered through nylon gauze and the solid residue washed with 0.9% saline. A particulate fraction was separated from the filtrate by centrifugation at 21000g for 15 min. The washed solids were extracted with 0.2N HCl for 2-4 hr at room temperature before being dried and ignited. The separated fractions were treated with trichloroacetic acid (final concentration 5%, w/v) and filtered. Coloured samples were treated with acid-washed charcoal before determination of PI by the molybdenum blue reaction. Total P, Ca and Mg was determined after digestion with nitric-perchloric acid (Ca and Mg by atomic absorption spectrophotometry).

Distribution of P between soluble and particulate phases of rumen digesta is shown in Table 1. The P in clear rumen fluid was largely PI (PO, 3-23%). Composition of the particulate fraction was variable (PI, 9-64%; acid soluble PO, 5-13%; acid insoluble PO, 31-78%). Acid extracted 85% of P from washed rumen solids. The (Ca + Mg)/P and Ca/Mg ratios (molar basis) in the latter extract were 1.45 and 8.3, respectively.

TABLE 1. Distribution of phosphorus in rumen digesta from sheep (mg P/kg digesta).

Sheep No.	1	2	3	Mean
Clear fluid	456	366	560	461
Particulate fraction	145	123	463	244
Washed solids	154	571	923	549
Acid insoluble P (all fractions)	205	Not Done	294	-

After intravenous injection of ^{32}P in one sheep, radioactivity appeared rapidly in all fractions of rumen digesta. Comparison of specific activities suggested that at least two thirds of the PI in both rumen liquor and washed rumen solids was of endogenous origin. The results suggest that two thirds of the soluble P in the rumen came from saliva and that most of the P associated with solids in the rumen was precipitated $\text{Ca}_3(\text{PO}_4)_2$.

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