

## **Towards improved fat intake and nutrition for Malaysians**

***Tony-Kock-Wai Ng***

*Division of Human Nutrition, Institute for Medical Research, 50588 Kuala Lumpur*

### **ABSTRACT**

An examination of the fat composition of the diet of a Malaysian urban hostel population obtained by chemical analysis of representative meals prepared by a 7-day rotation menu, revealed both nutritional attributes and limitations when compared against the dietary messages contained in the American Heart Association (AHA) and World Health Organisation (WHO) models. The Malaysian diet supplies 26% kcal i.e. 66 g total fat (51 g vegetable fats, 15 g animal fats) and contains <300 mg cholesterol, which are below the upper limits for these dietary constituents in the AHA and WHO models and conflicts with the perception that Malaysians in general, may be consuming too much fat and cholesterol. The supply of essential fatty acids (EFA), however, appears sub-optimal at 3.2% kcal mainly due to the comparatively low content of both the omega-6 (linoleic acid) and omega-3 [alpha-linolenic, eicosapentaenoate (EPA) and docosahexaenoate (DHA)] fatty acids in the Malaysian diet. The estimated omega-6/omega-3 fatty acid ratio of 10 further reflects an imbalance of these two families of polyunsaturated fatty acids (PUFA), which can be corrected to a ratio of 5 to 7 by moderate increases in the consumption of fish, soyabean-based foods, and pulses and nuts. Considering the current status of knowledge on the health effects of the different families of fatty acids, the ratio of 2:3:1 for the saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and PUFA in the diet is judged to improve fat intake and nutrition in Malaysians. Such a dietary fatty acids ratio can be satisfied by the use of a cooking oil containing 28% SFA, 53% MUFA, and 19% PUFA, which may be obtained by the judicious blending of palm olein with MUFA-rich and PUFA-rich vegetable oils. Alternatively, moderate increases in the consumption of marine fish, pulses, nuts, soybean-based foods and their products would also serve the same end.

## INTRODUCTION

Total fat content in a Malaysian urban diet described by Ng (1992) approximated 66 g (26% kcal) while fat consumption in rural households in the Peninsular averaged 38 g (18% kcal) per head daily (Chong *et al.*, 1984). Despite this marked disparity in total dietary fat, the average Malaysian diet in urban and rural areas are deemed quite similar since in the Malaysian diet, rice is eaten with about three dishes (eg. two meats plus one vegetable or vice versa) cooked in and containing a pure or blended vegetable oil.

This article examines the quantitative and qualitative aspects of fat in the above urban diet, and proposes some dietary modifications towards improving fat intake and nutrition for Malaysians, particularly with respect to reduced risk to coronary heart disease (CHD). Where

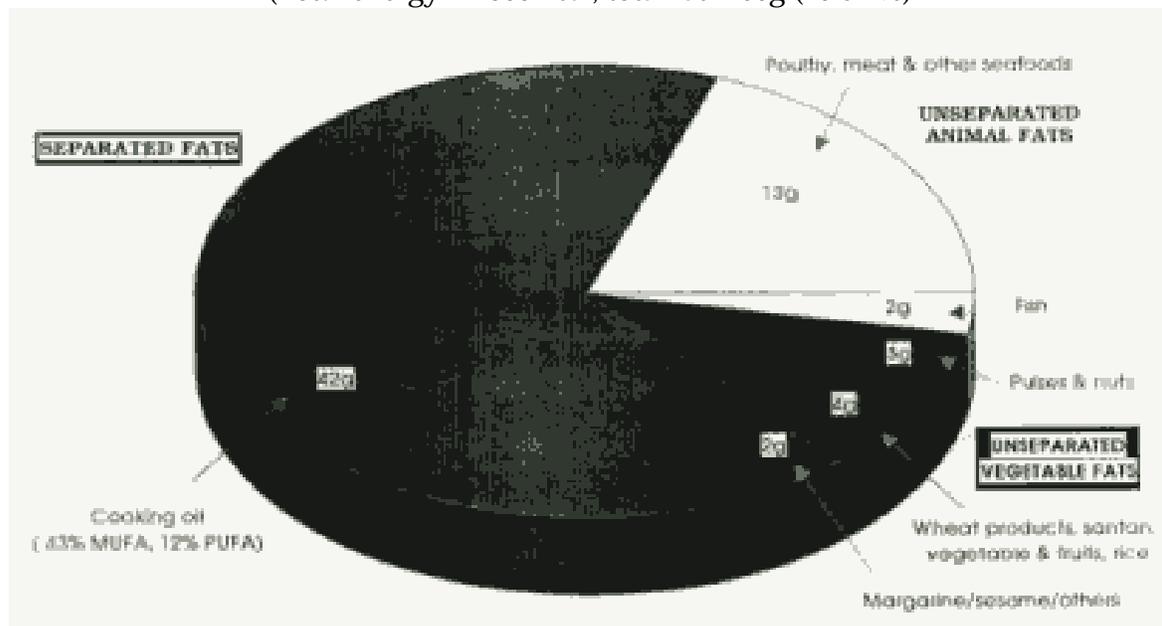
appropriate, reference shall be made of the relevance of the AHA (Poleman & Peckenpaugh, 1991) and the WHO (1988, 1990) diet models for fat intake to the general Malaysian population.

## METHODS AND DIETS

### The Malaysian urban diet

The sources of fat in this diet were averaged from two 7-day rotation menus used to prepare daily meals for an urban hostel population (Ng *et al.*, 1991). Proximate composition analysis of representative whole-day meals served to 61 moderately-active males (aged 20-35 years, mean body weight, 56.0 kg and body mass index, 20.0 kg/m<sup>2</sup>) indicated that on the average, this urban diet provided 2,300 kcal derived from 66 g total fat, 86 g protein and 340 g carbohydrate. The amount of

**Figure 1.** Sources of fat in Malaysian urban diet.  
(Total energy = 2300 kcal, total fat = 66g (26 en %))



cooking oil (palm olein) in the diet was estimated by subtracting from total fat obtained by laboratory analysis, the amount of unseparated fat (estimated from fat contained in serving size of dietary components, using food composition tables) and other separated fats. This gave a figure of 42 g of palm olein, which is slightly lower than the estimate of 50 g/head/day obtained from cooking oil disappearance data in the

hostel kitchen. The overall fat composition of this diet model is shown in Figure 1.

Average daily consumption of the various dietary components and their contents of SEA, MUFA and PUFA are presented in Table 1. The SFA, MUFA and PUFA values were obtained from food composition tables and adjusted to match the overall fatty acid profile of the diet model obtained by gas-liquid chromatography.

**Table 1.** Sources and categories of fat in the Malaysian urban diet\*

| Source of fat           | Quantity provided per day** (g) | Amount of fat (g) | Fatty acids (g)*** |             |            |
|-------------------------|---------------------------------|-------------------|--------------------|-------------|------------|
|                         |                                 |                   | SFA                | MUFA        | PUFA       |
| <b>SEPARATED FATS</b>   |                                 |                   |                    |             |            |
| Palm olein              | 42                              | 42                | 19.3               | 17.6        | 5.1        |
| Others                  | 2                               | 2                 | 0.9                | 0.6         | 0.3        |
| <b>UNSEPARATED FATS</b> |                                 |                   |                    |             |            |
| <i>Animal fats:</i>     |                                 |                   |                    |             |            |
| eggs                    | 28                              | 3.2               | 1.4                | 1.5         | 0.3        |
| chicken                 | 40                              | 6.0               | 2.7                | 2.6         | 0.7        |
| fish                    | 45                              | 2.0               | 1.0                | 0.6         | 0.4        |
| anchovies               | 15                              | 0.2               | 0.1                | 0.1         | N.A.       |
| beef                    | 15                              | 2.0               | 0.8                | 1.1         | 0.1        |
| squid                   | 10                              | 0.2               | 0.1                | 0.05        | 0.05       |
| others                  | 15                              | 0.7               | 0.3                | 0.3         | 0.1        |
| <i>Vegetable fats:</i>  |                                 |                   |                    |             |            |
| rice (cooked)           | 400                             | 0.4               | 0.1                | 0.2         | 0.1        |
| veg. & fruits           | 180                             | 0.5               | 0.1                | 0.2         | 0.2        |
| pulses & nuts           | 20                              | 3.0               | 1.2                | 1.2         | 0.6        |
| wheat products          | 40                              | 3.1               | 1.2                | 1.5         | 0.4        |
| santan                  | 3                               | 0.7               | 0.6                | 0.1         | N.A.       |
| others                  | 20                              | N.A.              | N.A.               | N.A.        | N.A.       |
| <b>Total (g):</b>       |                                 | <b>66</b>         | <b>29.8</b>        | <b>27.9</b> | <b>8.3</b> |

\* Ng (1992)

\*\* Based on edible portion

\*\*\* Estimated from tables on food composition (FAO/WHO, 1977; Tee et al., 1988)

The following features of the Malaysian diet are noteworthy:

- (a) total diet provides 2,300 kcal: 26% kcal fat, 15.0% kcal protein, and 59% kcal carbohydrates;
- (b) separated fats totalled 44 g, unseparated fats of animal origin, 15 g, and unseparated vegetable fats, 7 g;
- (c) cooking oil used (palm olein) contributes greater than half of total fat;
- (d) comparatively high (>10% kcal) in both palmitic (16:0) and oleic (18:1) acids but low in the shorter-chain fatty acids, myristic (14:0) and lauric (12:0) acids;
- (e) only marginally sufficient in essential fatty acids (EFA), viz. 8.3 g (3.2% kcal);
- (f) cholesterol content only 250-300 mg, even with the consumption of 3 to 4 eggs per week;

#### **The AHA Prudent Diet'**

In the early 1980s, the AHA recommended the prudent diet' to lower plasma cholesterol levels in the general American population (Poleman & Peckenpaugh, 1991), with the following main dietary messages:

- *reduce total fat to <30% kcal*
- *reduce cholesterol intake to <300 mg per day*
- *limit SFA to <10% kcal*

○ *dietary fat composed of approximately equal parts of saturated, monounsaturated and polyunsaturated fat*

It must be emphasised that these dietary recommendations were made for a general population that was consuming high amounts of total fat (average about 42% kcal) and cholesterol (450 mg/head daily) (Gallo, 1983). The 30% kcal cut-off selected was probably considered a realistic dietary goal for the general American population at the time, but it is noteworthy that 30% kcal is still higher than the amount of fat in the present Malaysian diet model.

The 1SFA: 1MUFA: 1PUFA ratio recommended by AHA appeared sound initially, since it suited the concept of a balance of dietary fatty acids and also fitted nicely with the upper limit of 30% kcal for total fat, and a maximum of 10% kcal for each of the SEA, MUFA and PUFA.

#### **The WHO diet model**

Subsequent WHO dietary guidelines for CHD prevention (WHO, 1986; WHO, 1990), contain somewhat similar dietary messages as the AHA prudent diet with respect to total fat, SEA and cholesterol intakes, although the 1:1:1 ratio of the three major families of fatty acids implied in the AHA prudent diet nor any PUFA/SFA ratio was mentioned, in order to avoid any promotion of a progressive increase in the consumption of PUFA in some populations. WHO has also indicated in its 1990 report that the 30% kcal total fat should be

regarded as an Interim goal for nations with high fat intakes, and that further benefits would be expected by reducing fat intake towards the lower limit of 15% of total energy.

In addition, WHO also recommended lower and upper limits for population average Intakes for several nutrients, namely total fat, SFA, PUFA, cholesterol, total carbohydrates, complex carbohydrates, dietary fibre, free sugars, protein and salt (1990). Of interest, the initial 1986 WHO upper limit for dietary PUFA of 10% kcal was reduced to 7% kcal in 1990 following reports of adverse effects associated with high intakes of PUFA (Shepherd *et al.*, 1978).

In an October, 1993 Up-date of Fats and Oils in Human Nutrition by a WHO Expert Group in Rome, the above WHO diet model remains essentially unchanged. However, in the WHO press release (WHO 1993) that followed the meeting, there were two issues that warrant attention. One was the statement that *"In non-sedentary populations a range of fat intake from 15 to about 35% of dietary energy is compatible with good health as long as the supply of essential fatty acids, fat soluble vitamins and other essential nutrients is adequate, and the saturated fatty acids provide less than 10% of energy."*

It is recognised that WHO recommendations are guidelines for general populations and these are bound to be different between countries after taking into consideration many factors. However, local nutritionists and dietitians should be aware that dietary fat levels of 30-35% kcal, although within the above 'new' WHO upper limit (35% kcal) for

total fat, are actually moderately high and therefore inconsistent with "healthy eating", when applied to Malaysians. Also, the term "non-sedentary" would require clarification or definition, and the limit of 10% kcal for SEA appear harsh, especially when the principal hypercholesterolemic 'villain', 14:0, is present in insignificant amounts.

Another issue of concern in the above WHO Press Release (FAO/WHO, 1993) is that there was no mention of an upper limit for dietary PUFA. It is hoped that this is a case of "editorial omission", otherwise, it would appear inconsistent to impose a very strict upper limit for SEA and at the same time ignore the potential health hazards associated with high intakes of PUFA.

## DISCUSSION

### **Fatty acid profile of the Malaysian urban diet**

Since cooking oils serve as the major source of fat in the Malaysian diet, the dietary fatty acid profile can be manipulated to a large extent simply by switching the type of cooking oil used. Table 2 shows the effects of using different common cooking oils on the fatty acid profile of the average urban Malaysian diet when the contributions to total fat from the other dietary components remain unchanged.

When palm olein is used as the sole cooking oil, the average Malaysian diet contains about 3.2% kcal PUFA, with a fatty acid profile

**Table 2.** Fatty acid profile of the average Malaysian urban diet when prepared with different cooking oils\*

|                                   | Contribution from<br>triglyceride fats +<br>other separated<br>fats<br>(% kcal) | Contribution from the sole<br>cooking oil used |             |               |                             |
|-----------------------------------|---|--|-------------|---------------|-----------------------------|
|                                   |   | Palm<br>olein                                  | Corn<br>oil | PO<br>blend** | Recommended<br>oil blend*** |
| SFA                               | 3.9   | 7.7  | 2.9         | 6.9           | 4.8                         |
| MUFA                              | 4.0   | 7.3  | 5.6         | 7.7           | 9.0                         |
| PUFA                              | 1.3   | 2.0  | 8.5         | 2.4           | 3.2                         |
| Total:                            | 9.2   | 17.0   | 17.0        | 17.0          | 17.0                        |
| SFA : MUFA : PUFA<br>(Total diet) |   | 3.5 : 3.4 : 1                                  |             | 2.9 : 3.2 : 1 |                             |
|                                   |   | 1 : 1.4 : 1.4                                  |             | 2 : 3 : 1     |                             |

\* Based on a 7-day rotation menu (Ng *et al.*, 1991)  
 \*\* Popular blend of palm olein/groundnut/sesame in the market  
 \*\*\* Equivalent to 28% SFA, 53% MUFA and 19% PUFA

slanted towards the SEA and MUFA (SFA:MUFA:PUFA ratio of 3.6:3.4:1.0). Although this palmitic acid- and oleic acid-rich diet was demonstrated to be non-hypercholesterolaemic in healthy Malaysian volunteers when dietary cholesterol intake is low (Ng *et al.*, 1991) its EFA content is only sufficient to meet basic physiological needs of 3% kcal advocated by WHO (1986). On this point, the dietary fatty acid profile of the Malaysian diet can be improved appreciably by consuming a more balanced diet, particularly by moderate increases in the intake of pulses and nuts which are rich in linoleic acid (FAO, 1977). However, it is recognised that modification of the dietary habits of the general population is not an easy task.

At the other end of the spectrum, the use of corn oil or other similarly linoleic acid-rich (>50%) vegetable oils as the sole cooking oil results in a diet with >9% kcal PUFA, which exceeds the supposedly safe

upper limit of 7.0% kcal set by WHO (1990), as well as the dietary linoleate threshold level for maximal plasma cholesterol-lowering potential estimated to be approximately 6.5% kcal (Hayes & Khosla, 1992). Thus, based on the abundant supplies of polyunsaturated vegetable oils (eg. corn oil and soyabean oil) at retail outlets and supermarkets, as well as information from food balance sheet (FAO, 1986-88), it would appear that a significant number of affluent Malaysians are habitually using polyunsaturated cooking oils for food preparation in their homes. This seems to contradict the opinion of the WHO Expert Group (1986) which implied that long-term high intakes of PUFA by a population group is unlikely since population average intakes seldom exceeded 7% kcal PUFA. It must also be emphasised here that no one really knows what the "safe" upper limit for dietary PUFA should be, and that 7% kcal PUFA per se is actually high when one considers

the average PUFA intakes in both developed and developing nations.

Based on the information provided in Tables 1 & 2, and the current knowledge of the health impact of total fat and the different fatty acid species, “healthy eating” in Malaysian adults with a view towards Improved fat intake and nutrition should target the following dietary fat profile:

- 1) 20-25% kcal total fat (50-65 g total fat):
  - o >10% kcal from MUEA,
  - o 4% to 6% kcal from PUFA
  - o <10% kcal from SEA, with minimal amounts from 14:0
- 2) dietary fatty acid profile of 2SFA: 3MUFA: 1PUFA

Reductions In total fat intake may be achieved by using less cooking oil in food preparation (eg. from the present 42g/head to 27g/head daily) or adopting alternative methods in cooking such as steaming or grilling in preference to frying.

The use of palm olein, which contains a safe but comparatively low level of linoleic acid (12%), as cooking oil, coupled with a low consumption of linoleic acid-rich pulses/nuts/seeds, are contributory factors to the marginal level of PUFA In the palm olein-based diet. However, the current average consumption of pulses/nuts of 20 g per head daily versus the 30 g recommended by WHO (1986) appears a practical gap to bridge and should pose one of the nutrient goals as we head towards year 2020.

### The n-6/n-3 fatty acid balance

Currently, the level of n-3 (omega-3) fatty acids in the Malaysian diet is low, estimated to be 0.3% kcal, with about two-thirds (480 mg) from alpha-linolenic acid (vegetable-oil source) and the rest (200 mg) from eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) from fish. This means that the n-6/n-3 ratio in the average Malaysian diet is about 10, and in line with recommendations elsewhere (Simopoulos, 1991), the intake of n-3 fatty acids (particularly EPA and DHA since they are more efficiently metabolised than alpha-linolenic acid) should be increased so that the ratio is closer to 5. This recommendation entails marked, although not impossible, changes in Malaysian food habits.

From Ng's urban diet, about 70 g (equivalent to approx. 45 g edible portion) of fish is consumed per head daily. This amount of freshwater fish contains only about 200 mg combined EPA plus DHA (Endinseau & Tan, 1993), since marine fish of tropical waters are reported to contain much less n-3 fatty acids than fish of cold deep-sea waters.

Since the EPA and DHA, and fish *per se* have a cardio-protective effect (Anon., 1985; Kromhout *et al.*, 1985), the increased consumption of fish should be encouraged. A realistic target would be to increase the present level (70 g) of fish consumption to at least 100 g which compares favourably with that of high-fish consuming populations, such as Japanese

coastal populations, which experience a low incidence of CHD (Kagawa, 1982). This approximately 50% increase in fish consumption by Malaysians would push the dietary EPA + DHA level to 400 mg, and coupled with a concomitant moderate increase in the consumption of soyabean-based products, would raise the n-3 fatty acid content to about 1 g, giving a net n-6/n-3 fatty acid ratio of 5 to 7.

### **Complex carbohydrates and dietary fibre**

It is noteworthy that the current Malaysian diet appears to be low in both complex carbohydrates [mainly starch, the rest referred to as “non-starch polysaccharides” (NSP) which is a component of dietary fibre] and total dietary fibre. Based on the quantities of the food items concerned provided per day, crude estimates for complex carbohydrates and total dietary fibre yielded figures of 240-280 g (42-49% kcal) and 13-16 g, respectively. These figures are substantially lower than the WHO (1990) recommendations of 50-70% kcal for complex carbohydrates and 27-40 g total dietary fibre, which appear difficult targets based on current dietary habits of Malaysians.

The low intake of dietary fibre can be explained by the mere 180 g of vegetables and fruits in the present Malaysian diet as compared to the 400 g of vegetables and fruits daily recommended by WHO, of which 30 g should be from pulses and nuts (1990). It appears that WHO's recommendation for vegetables and fruits would be beyond the reach of the majority of Malaysians unless there is a marked

change in dietary habits and that salad-type meals feature more regularly in their diet.

### **CONCLUSION**

Although the Malaysian urban diet described is low in fat and cholesterol when compared to the AHA and WHO dietary guidelines for general populations, its fat profile is sub-optimal with too large a proportion of fat being contributed by the cooking oil used and insufficient amounts of n-3 fatty acids (EPA, DHA and alpha-linolenic acid).

Based on current knowledge on the nutritional and health aspects of dietary fats, dietary modifications are proposed for the Malaysian diet which serve to improve fat intake and nutrition. These include reducing the amount of cooking oil used (42g/head to 27g/head daily) and increasing fish consumption by 50% (70g to 100g) which should automatically also reduce the intake of ‘red meats’ and saturated fats contained therein.

A dietary fatty acid profile of 2SFA: 3MUFA: 1PUFA for the Malaysian diet is suggested here as an improvement over the 1:1:1 ratio in the AHA diet model, which should serve to maintain desirable serum cholesterol levels and reduce CHD risk in the local population. The use of a blended cooking oil containing about 50-55% MUFA and 15-20% PUFA would contribute towards this end. Alternatively, a well-balanced diet containing generous amounts of fish, pulses and nuts, soyabean-based foods

and their products should contribute to an improved n-6/n-3 ratio of 5 to 7 with accompanying beneficial health outcomes.

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### REFERENCES

- Anonymous (1985). Mortality from coronary heart disease is inversely related to fish consumption in the Netherlands. *Nutr Rev* 43(9):271-273.
- Chong YH, Tee ES, Ng TKW, Kandlah M, Hanis RH, Teo PH & Siti MS (1984). Status of community nutrition in poverty kampungs. *Bull No.22, Institute for Medical Research, Kuala Lumpur, ISSN: 0127-273X.*
- FAO (1977). Dietary fats and oils in human nutrition. A Joint FAO/WHO Report. *Food and Nutrition Paper 3, FAO, Rome.*
- Endinkeau K & Tan KK (1993). Profile of fatty acid contents in Malaysian freshwater fish. *Pertanika J Trop Agri Sci* 16(3):2 15-221.
- FAO/WHO (1993). Recommendations on fat and oils in human nutrition, *WHO Press Release WP/60, 9 December 1993, Geneva.*
- Food Balance Sheet for Malaysia 1986-1988. FAO of the United Nations. Gallo LL (1983). Cholesterol and other sterols In: *Nutrition and Heart Disease, Feldman EB (ed).* Churchill Livingstone: 1983.
- Hayes KG & Khosla P (1992). Dietary fatty acid thresholds and cholesterolaemia. *FASEB J* 6(8):2600-2607.
- Kagawa YM, Nishizawa M, Susuki M, Miyatake T, Hamamoto T, Goto K, Motonaga Izumikawa H, Hirata H & Ebihara A (1982). Eicosapolyenoic acids in serum lipids of Japanese islanders with low incidence of cardiovascular disease. *J Nutr Sci Vitaminol* 28:441-453.
- Kromhout D, Bosschieter E & del Coulander C (1985). The inverse relationship between fish consumption and 20-year mortality from coronary heart disease. *N Engl J Med* 312:1205-1209.
- Ng TKW, Khalid H, Lim JB, Lye MS & Roshidah I (1991). Non-hypercholesterolaemic effects of a palm-oil diet in Malaysian volunteers. *Am J Clin Nutr* 53: 1015S-1020S.
- Ng TKW (1992). Edible oils and fats in the Malaysian diet. *Asean Food J* 7(2):73-78.

- Poleman CM & Peckenpaugh NJ (ed) Cardiovascular Disease In: *Nutrition Essentials and Diet Therapy*, Sixth Edition, eds Poleman CM & Peckenpaugh NJ, W.B. Saunders Comopany.
- Shepherd J, Packard CJ, Patsch JR. Gotto AM Jr & Taunton OD. (1978). Effects of dietary polyunsaturated and saturated fats on the properties of high density lipoproteins and the metabolism of apolipoproteins A-1. *J Clin Invest* 61:1582-1592.
- Simopoulous AP (1992). Evolutionary aspects of diet and the omega 6/ omega-3 balance. *Proc 6<sup>th</sup> Asian Congress of Nutrition 1991*. Nutrition Society of Malaysia: 1992, 449-452.
- Tee ES, Ismail MN, Mohd Nasir A & Khatijah I (1988). *Nutrient composition of Malaysian foods*. Asean Food Habits Project, National Sub-Committee on Protein: Food habits Research and Development, Malaysia.
- WHO (1986). Community prevention and control of cardiovascular diseases. Report of a WHO Expert Committee. *Technical Report Series 732*, WHO, Geneva.
- WHO (1990). Diet, nutrition and the prevention of chronic disease. Report of a WHO Study Group. *Technical Report Series 797*