

CHOLESTEROL CONTENT AND FATTY ACID COMPOSITION OF SOME MALAYSIAN FOODS

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INTRODUCTION

THERE IS NOW little doubt that dietary fats and exogenous cholesterol are major determinants of the level of serum cholesterol, which is positively correlated to the development of coronary atherosclerosis. Professor K.R. Norum of Oslo recently asked over 200 experts in atherosclerosis and lipid research from Europe, North America, England and Australia on their opinion concerning diet and the prevention of coronary heart disease. Almost all agreed that there is a connection between diet and the development of coronary heart disease, between diet and plasma lipoprotein levels and between plasma cholesterol and the development of coronary heart disease (Norum, 1978).

For those people at risk, and others who subscribe to taking a prudent diet as an early preventive measure, a knowledge of the fatty acid composition and the cholesterol content of local foods is thus absolutely essential. For this purpose, this paper reports on the fatty acid composition and cholesterol content of some Malaysian foodstuffs and commonly eaten cooked meals.

METHODS AND MATERIALS

Ready-to-eat meals were bought from eating places around Kuala Lumpur and Petaling Jaya. These foods were precooked, served in coffee shops or in adjoining stalls. Where possible, three samples were bought from three such different eating places to enable triplicate analyses of a food. No samples were taken from restaurants or restaurants in hotels as such samples would be quite different in portion size and price, and hence not comparable with the more widely consumed foods at the coffee shops and/or eating stalls. The

raw foodstuffs studied were purchased from markets in the city.

Edible portions of all foods were well blended and aliquots taken for the various analyses. Analysis of proximate composition, using conventional methods, was carried out only for the cooked meals. Calorie values were calculated using the factors 4, 9, 4 for carbohydrate, fat and protein respectively.

The extracted fat was next used for the determination of cholesterol content and fatty acid composition. The fat was treated as described below (procedure modified from various methods given in Association of Official Analytical Chemists, 1970), prior to gas-liquid chromatography. After saponification using ethanolic potassium hydroxide, the saponified product was extracted with petroleum ether. The pooled petroleum ether extract was washed with water, dried (over anhydrous sodium sulphate) and evaporated to dryness. The cholesterol residue so obtained was made up to a suitable volume of ethyl acetate for injection into the gas-liquid chromatograph.

The aqueous fraction after saponification was acidified with sulphuric acid. The precipitated fatty acids were extracted into petroleum ether and after evaporation to dryness, were esterified with boron trifluoride-methanol (premixed, from Sigma). The methyl esters were then extracted into petroleum ether, evaporated to a suitable volume for chromatography.

Gas-liquid chromatography was carried out using a Pye Unicam Series 104 instrument, fitted with a hydrogen flame ionization detector. Trifluoro propyl methyl silicone and polyethylene glycol adipate columns were used for the chromatography of cholesterol and fatty acids respectively (prepacked from Pye Unicam). Quantitation of cholesterol in the foods was made by comparison

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of the peak areas obtained with that given by a cholesterol standard (chromatographic grade, from Sigma). The percentage of each fatty acid was obtained by comparing peak area of that acid to the total area for all peaks obtained for the particular food. For both lipids, peak areas were resolved with an integrator built into the recorder (Elektronik 194, Honeywell).

RESULTS

Raw Foodstuffs

Table I gives, in descending order, the cholesterol content of some Malaysian foodstuffs (raw). It shows that brain and eggs are rich sources of cholesterol, as is well known. Prawns and other seafoods, such as cuttlefish and crab meat are moderately rich sources. At 383 mg per 100 g, the cholesterol content of whole *ikan bilis* appears unusually high, but it must be borne in mind that this is a dried product and therefore a very concentrated form of food. When calculated on a wet weight basis (assuming a moisture content of 70% in *ikan bilis*), the cholesterol content of the fresh *bilis* amounts to about 115 mg per 100 g, which is still about three times greater than that of a common marine fish, *ikan kembong*. However, when the heads and entrails of *ikan bilis* are removed the cholesterol content is reduced to 58 mg per 100 g of the dried *bilis*. Surprisingly cockles are not cholesterol-rich; neither are pork, mutton and beef. Fish have the lowest value for cholesterol and in *kurau* and *tenggiri*, the amounts present are minimal.

The fatty acid composition of the foodstuffs analysed is given in Table II. It may be seen here that certain foods, such as brain, liver and the sea-foods (like the cuttlefish), contain comparatively large amounts of arachidonic acid. Other investigators have observed a similar finding for organ foods and the marine oils (cod liver oil, herring oil and menhaden oil) (Anderson, 1969; Sober, 1970).

Ready-to-eat Meals

The mean cholesterol contents of cooked foods are given in Table III. It is seen that the foods richest in this lipid component are *rendang hati*, fried *mee* Indian style, *dosai* with egg, *sambal udang* and fried *kueh tiau* with cockles. This is to be expected since they contain ingredients that are rich in cholesterol (see appendix 1 for ingredients of foods analysed).

Table I
Cholesterol content of some Malaysian foodstuffs

Foodstuff	Cholesterol (mg) in 100 g edible portion
1 Brain, pig	800
2 Egg, duck	650
3 Egg, hen	415
4 Egg, quail	415
5 Anchovies (whole) dried (<i>ikan bilis</i>)	383
6 Prawns, dried	353
7 Liver, pig	180
8 Prawns, fresh	130
9 Cuttlefish	120
10 Butter	120
11 Crab, meat	100
12 Chicken, meat	85
13 Pork, fat	63
14 Anchovies (minus head and entrails), dried (<i>ikan bilis</i>)	58
15 Mutton	55
16 Pork, lean	50
17 Beef	45
18 Cockles (<i>kerang</i>)	45
19 Fish, <i>kembong</i>	35
20 Fish, <i>kurau</i>	4
21 Fish, <i>tenggiri</i>	3

The fatty acid composition of each food is given in Table IV, together with their content of polyunsaturated fatty acids and their ratios of polyunsaturated to saturated fatty acid (P/S). The highest P/S ratios are found in *satay*, *Lor Mai Kai*, big dumpling and chicken rice. This ratio is of course governed by the fatty acid composition of the ingredients and the type of cooking oil used in the preparation of the food.

Some variations in cholesterol content are observed for the same food bought from the different eating places (Table III). This is to be expected since portion size and amounts of ingredients vary. In spite of such variations, results expressed as a mean permit comparison with other foods. The difference in cholesterol content between, for example, big dumplings (with egg as one of the ingredients) and *char siew* dumplings is clearly evident. On the other hand, chicken rice and *char siew* rice, two similar foods, are shown to contain similar amounts of cholesterol.

Table II
Fatty acid composition of some Malaysian foodstuffs

FOODSTUFF	Each Fatty Acid As A Percentage of Total Fatty Acids											Percent Polyunsaturated fatty acid	P/S ratio	
	Lauric C12:0	Myristic C14:0	Myristoleic C14:1	Palmitic C16:0	Palmitoleic C16:1	Stearic C18:0	Oleic C18:1	Linoleic C18:2	Linolenic C18:3	Arachidic C20:0	Arachidonic C20:4			
1 Bram, pig	0	0.7	0	21.0	2.2	25.4	39.1	0	0	0	0	11.6	11.6	0.25
2 Egg, duck	0.3	0.6	0	26.8	4.3	5.9	60.9	1.2	0	0	0	0	1.2	0.04
3 Egg, hen	0	0	0	26.0	3.0	6.2	55.0	9.8	0	0	0	0	9.8	0.30
4 Egg, quail	0.5	1.0	0.5	26.2	7.1	9.5	40.9	14.3	0	0	0	0	14.3	0.38
5 Anchovies (whole) dried (ikan bilis)	0.3	12.9	1.3	37.6	13.9	12.4	13.2	3.2	0.4	2.2	2.8	6.4	6.4	0.10
6 Prawns, dried	1.5	5.1	1.9	24.5	11.3	18.6	14.9	3.5	0	0.6	18.0	21.5	21.5	0.43
7 Liver, pig	0	0	0	24.5	1.9	27.9	20.4	14.1	0	0	11.2	25.3	25.3	0.48
8 Prawns, fresh	3.2	2.8	0	33.1	3.4	9.3	29.8	18.4	0	0	0	18.4	18.4	0.38
9 Cuttlefish	0	5.1	0	40.8	2.5	20.2	10.4	0	0	0	21.0	21.0	21.0	0.32
10 Butter	8.5	9.4	0.4	33.5	0.4	12.4	31.8	3.6	0	0	0	3.6	3.6	0.06
11 Crab meat	2.0	6.8	0	32.7	11.7	16.2	19.4	3.7	0	0	7.5	11.2	11.2	0.19
12 Chicken meat	0	1.0	0	18.8	10.6	10.0	37.9	21.7	0	0	0	21.7	21.7	0.73
13 Pork, fat	0.5	1.4	0	23.8	3.0	16.0	48.4	6.0	0	0.6	0.2	6.2	6.2	0.15
14 Anchovies (minus head and entrails), dried (ikan bilis)	0	9.1	0.3	34.9	13.0	14.4	16.5	3.5	0	0.4	8.0	11.5	11.5	0.20
15 Mutton	0.5	2.9	0	20.8	3.9	19.3	47.8	3.9	0.9	0	0	4.8	4.8	0.11
16 Pork, lean	0.2	1.3	0	23.0	2.8	13.0	49.7	10.0	0	0	0	10.0	10.0	0.27
17 Beef	0.4	1.4	0	20.7	2.3	33.1	37.6	4.5	0	0	0	4.5	4.5	0.08
18 Cockles (kerang)	6.3	10.0	0	26.3	11.3	21.3	11.9	5.7	0	0	7.2	12.9	12.9	0.20
19 Fish, Kembong	3.1	9.7	1.2	29.3	14.4	12.3	12.5	4.7	3.9	3.3	5.6	14.2	14.2	0.25
20 Fish, Kurau	2.2	2.8	0.1	33.9	5.4	16.4	25.0	2.9	0.4	0.5	0.5	3.8	3.8	0.07
21 Fish, Tenggiri	0.6	6.0	0.3	40.0	7.4	15.1	29.1	1.3	0	0	0	1.3	1.3	0.02

■ Polyunsaturated fatty acids = C18:2, C18:3 and C20:4

■ P/S ratio = $\frac{\text{polyunsaturated fatty acids}}{\text{saturated fatty acids}}$

$$= \frac{\text{C18:2} + \text{C18:3} + \text{C20:4}}{\text{C12:0} + \text{C14:0} + \text{C16:0} + \text{C18:0} + \text{C20:0}}$$

Table III

Cholesterol content of some Malaysian ready-to-eat meals

NAME OF FOOD	In 100 g edible portion (mg)	In each serving (edible portion) *** (mg)
1. Dumpling - big	46.3*	86.7
	20.2-84.8***	39.4-146.7
2. Dumpling - char siew	13.0	8.9
	8.2-17.4	5.7-17.4
3. Dumpling - sang yoke	17.3	17.3
	11.5-28.3	7.8-21.2
4. Lor mai kai	10.5	16.3
	7.9-12.8	13.4-23.0
5. Fried kueh tau with cookies	64.8	194.8
	63.6-67.1	165.4-211.2
6. Chicken rice	13.7	47.0
	9.5-18.0	29.8-55.3
7. Char siew rice	10.9	34.9
	6.1-20.0	21.0-62.0
8. Fried rice (Chinese style)	4.7	18.0
9. Fried kueh tau (kong too chow Cantonese style)	18.3	109.7
	13.0-19.6	67.3-133.7
10. Fried mee (Fukien chow Hokkien style)	16.9	128.1
	11.8-26.9	74.3-209.8
11. Lup cheong (Chinese sausage)	55.8	-
	49.8-63.8	-
12. Curry laksa	6.8	43.0
	5.6-8.6	40.5-47.5
13. Nasi lemak	7.0	22.0
	5.7-8.3	15.0-28.9
14. Salay	54.8	193.0
15. Nasi beriyani	11.0	50.6
	10.5-11.5	40.2-61.0
16. Fried mee - Indian style	159.4	547.0
	55.7-263.0	165-928
17. Rendang hati	215	-
	208.0-221.0	-
18. Mutton curry	46.8	-
	34.0-59.5	-
19. Sambal udang	79.0	-
	49.0-109.0	-
20. Thairuaddar	9.2	8.3
	4.5-5.9	8.0-8.6
21. Boli	0.7	0.6
22. Dosa! with egg	64.8	165.0
23. Dosa!	0	0

* Mean

** Range

Where range not given single analysis was performed.

*** Calculated from weight in each serving (see appendix 2)

For example, foods containing curry with coconut milk as an ingredient possess relatively high percentages of the short chain saturated fatty acids, such as capric, lauric and myristic acids, found in abundance in coconut oil.

The energy content and the proximate composition of the cooked foods, such as their moisture, protein, fat, carbohydrate and ash content are given in appendix 2.

DISCUSSION

There is continuing interest in the relationship between dietary fats, cholesterol and coronary heart disease. However little is known of the cholesterol content or the fatty acid composition of local foods. This report, although not wholly comprehensive, is a preliminary attempt to fill this gap of knowledge.

Most published reports on the cholesterol content of foods have been made using colour reactions, which are non-specific and hence may be misleading. This study used the gas-liquid chromatographic procedure which gives greater accuracy and is the method of choice (Sweeney and Wehranch, 1976).

The ready-to-eat meals are of particular interest. As far back as in 1940, Canton *et al.* in Singapore had described the proximate composition of 770 types of cooked foods. However, cholesterol and fatty acids were not given special attention in this monumental work which must be ranked as a nutritional classic. Standal *et al.* (1970) reported the fatty acids, cholesterol and proximate composition of 218 types of foods and prepared dishes. These however were "western" foods, unfamiliar to us in Southeast Asia. The present study is a somewhat similar study on Malaysian ready-to-eat meals.

Fatty acid composition appears to be the most variable for the same type of meal. Thus, the fatty acid composition of fried *mee* Indian style, appear quite different in two separate samples, though their proximate composition is similar. This would suggest that two different types of oils were used in the preparation of this food at the two different eating places. This is also true for the two samples of *rendang hati*. Nevertheless, most foods have their own characteristic fatty acid composition.

It is hoped that the various tables in this report are of use to nutritionists, food scientists, dietitians and those conscious of their diet, like the enlightened executives or office workers in the highly urbanised Kuala Lumpur and Petaling Jaya who have to rely on part, if not all, of their daily meals on the away-from-home foods. For those who are at risk to coronary heart disease, it may well be remembered that there is no need to develop a pathological fear of all foods known to

Table IV
Fatty acid composition of some Malaysian ready-to-eat meals

NAME OF FOOD	EACH FATTY ACID AS A PERCENTAGE OF TOTAL FATTY ACIDS DETECTED											* Per cent Polyunsaturated fatty acids	** P/S ratio		
	TOTAL FATTY ACIDS DETECTED														
	Capric C10:0	Lauric C12:0	Myristic C14:0	Myristoleic C14:1	Palmitic C16:0	Palmitoleic C16:1	Stearic C18:0	Oleic C18:1	Linoleic C18:2	Linolenic C18:3	Arachidonic C20:4			Unconfirmed fatty acids	
1 <u>Dumpling - big</u>	0.1	0.5	2.1	0	23.6	4.2	10.8	43.0	14.2	0.6	0.2	0	0.7	14.8	0.40
2 <u>Dumpling - char siuw</u>	0.1	0.9	3.4	0	27.2	3.0	13.4	41.1	7.8	0.6	0.2	0	2.2	8.4	0.19
3 <u>Dumpling - sang yoke</u>	0.1	0.4	2.0	0.1	25.3	3.3	11.9	44.1	10.7	0.4	0.2	0	1.5	11.1	0.28
4 <u>Lor mai kai</u>	0	0.8	2.0	0	24.7	3.8	9.9	43.7	14.5	0.7	0	0	0	15.2	0.41
5 <u>Fried kueh tiau with cockle shells</u>	0.1	0.4	1.8	0	26.3	2.8	10.8	43.2	12.8	0.3	0	0	1.6	13.1	0.33
6 <u>Chicken rice</u>	0	0.7	1.6	0.3	30.2	5.6	6.8	38.7	14.3	0.7	0	0	1.2	15.0	0.38
7 <u>Char siuw rice</u>	0.1	1.3	2.1	0	32.3	2.8	10.8	37.8	7.9	0.1	0.2	0	4.6	8.0	0.17
8 <u>Fried rice (Chinese style)</u>	0	0.1	1.6	0	26.2	2.6	12.1	46.6	10.4	0.1	0.4	0	0	10.5	0.26
9 <u>Fried kueh tiau (kong too chow - Cantonese style)</u>	0.2	0.5	1.9	0	26.7	3.2	11.2	42.9	12.6	0.2	0.1	0	0.5	12.8	0.32
10 <u>Fried mee (Fukien chow - Hokkien style)</u>	0.1	0.5	1.8	0	26.7	2.6	11.3	42.5	12.9	0.3	0	0	1.2	13.2	0.33
11 <u>Lup cheong (Chinese sausage)</u>	0	0.5	2.1	0	25.3	3.7	13.4	43.1	7.6	0.4	0.1	0	3.8	8.0	0.19
12 <u>Curry laksa</u>	4.3	29.5	12.3	0	18.2	1.0	5.1	20.4	8.9	0.2	0.1	0	0	9.1	0.13
13 <u>Nasi lemak</u>	1.5	13.0	5.6	0	30.8	0.9	6.0	29.1	13.1	0.1	0.1	0	0	13.1	0.23
14 <u>Salay</u>	0.4	2.4	1.6	0.1	22.0	3.2	6.1	38.5	23.5	0.6	1.1	0	0.6	24.1	0.72
15 <u>Nasi beriyani</u>	3.4	6.8	10.9	2.5	26.7	3.7	11.7	26.1	7.1	0.2	0	0	1.1	7.3	0.12
16 <u>Fried mee - Indian Style</u>	2.7	12.8	11.6	0.3	22.8	6.2	10.2	17.8	7.9	0.4	0.4	3.1	4.0	11.3	0.19
17 <u>Rendang hati</u>	0	11.0	6.0	0.2	22.4	1.9	14.2	24.9	11.3	2.4	0.3	3.4	2.3	17.0	0.32
18 <u>Mutton curry</u>	4.0	16.9	13.2	0.3	16.9	1.7	13.0	25.5	6.8	0.9	0	0	1.1	7.6	0.12
19 <u>Sambal udang</u>	8.9	27.1	24.5	0	13.6	0.3	5.2	12.6	7.1	0.3	0.2	0	0.5	7.4	0.09
20 <u>Thairuvaddai</u>	7.1	16.4	18.6	0.6	19.2	1.4	10.0	19.6	3.4	0.6	0	0	3.4	4.0	0.06
21 <u>Boli</u>	15.7	18.8	23.0	0	13.7	0	4.1	12.4	10.8	0.5	0	0	1.1	11.3	0.15
22 <u>Dosai with egg</u>	8.8	20.7	23.6	0	15.7	1.4	4.3	18.7	5.4	0.5	0	0	0.9	5.9	0.08
23 <u>Dosai</u>	0	6.0	16.3	0.8	18.8	1.8	9.1	20.5	4.8	0.5	0	0	3.7	5.3	0.08

All values mean of three samples, except for numbers 8, 14 and 21 - 23.

* Polyunsaturated fatty acids = C18:2 + C18:3 + C20:4

** P/S = polyunsaturated (i.e. C18:2 + C18:3 + C20:4) saturated (i.e. C10:0 + C12:0 + C14:0 + C16:0 + C18:0 + C20:0)

be rich in cholesterol or saturated fatty acids, or withdraw totally from them. It is important that the risk incurred in the occasional consumption of such foods be weighed against the valuable nutrients found in these foodstuffs. For instance, eating several eggs a day may well raise serum cholesterol level, but one egg a day may have no effect (Porter *et al.*, 1977). Cow's milk is well known to contain saturated fatty acids. Yet recently, a Cambridge study showed that consumption of 4 pints of whole milk daily for three weeks not only failed to raise serum cholesterol, but actually depressed the level (Howard *et al.*, 1977). These examples do not contradict the dietary fat and cholesterol hypothesis of atherosclerosis, but merely illustrates the complexities of food and serve to remind us that in some foods both hypercholesterolemic and hypocholesterolemic factors exist.

SUMMARY

This study has provided some data on the cholesterol content and fatty acid composition of some local foods, both raw as well as ready-to-eat meals. A gas-liquid chromatographic procedure has been used. The results obtained were discussed with reference to the contribution of cholesterol and fatty acids to the Malaysian diet.

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Appendix I

Description of ready-to-eat meals analysed

	Cost perserving (in M\$)	Ingredients	Remark
1. Dumpling — big	0.60 — 0.70	wheat flour, pork, chicken, half-boiled egg	usually eaten by Chinese for breakfast or tea-break
2. Dumpling — <i>char siew</i>	0.30	wheat flour, roasted pork (lean)	as above
3. Dumpling — <i>sang yoke</i>	0.30	wheat flour, pork	as above. Size and ingredients similar to (2). Differ from (2) only in the way the pork is prepared
4. <i>Lor mui kai</i>	0.50	glutinous rice, roasted pork, chicken, sometimes mushroom	the Chinese usually consume this either for breakfast or tea. Usually served in the same stall selling dumplings
5. Fried <i>kueh tiau</i>	0.80	<i>kueh tiau</i> (rice flour noodles), egg, cockle-shells, <i>tau-geh</i> (bean sprout, pork lard)	may be taken for lunch; usually consumed by the Chinese
6. Chicken rice	1.50	rice, chicken (leg meat), cucumber	taken for lunch/dinner by all races
7. <i>Char Stew</i> rice	1.00	rice, <i>char siew</i> (roasted pork-lean), cucumber	another popular quick lunch/dinner; only by non-Muslims, especially Chinese
8. Fried rice	1.50	rice, pork, shrimps, green-peas, egg, spring onion. (ingredients can vary considerably in different eating places)	served for lunch/dinner, taken by all races. For the Muslims, pork is replaced by other meat
9. Fried <i>kueh tiau</i> (<i>kong foo chow</i> -Cantonese style)	1.20	<i>kueh tiau</i> , pork, egg, prawns, vegetable	popular among the Chinese, taken for supper
10. Fried <i>mee</i> (<i>Fukien chow</i> — Hokkien style)	1.20	<i>mee</i> (noodles), pork, prawn, vegetables	supposedly introduced by the Hokkiens; popular among the Chinese; taken for supper. More non-Chinese (except Muslims) are taking such foods introduced by the Chinese
11. <i>Lup cheong</i> (Chinese sausage)	2.00 per 100 g (price vary according to type)	pork	taken by the Chinese together with rice (e.g. together with "char siew" in "char siew" rice)
12. <i>Curry laksa</i>	0.70 — 0.90	curry, <i>mee</i> , <i>tau-foo-pork</i> (soya bean curd), cockle-shells, bean sprout, chicken	a widely eaten food, taken for breakfast/lunch
13. <i>Nasi lemak</i>	0.60 — 0.80	rice (cooked with coconut milk), <i>ikan bilis</i> (small anchovies), egg, swamp-cabbage, cucumber, chilli, groundnuts	introduced by the Malays, now popular as a food for breakfast/tea-break for all races
14. <i>Satay</i>	0.20 per stick	chicken meat (also available beef); gravy of ground pea nuts and chilli. (analysis includes gravy)	originated from the Malays. Much liked by all races. As much as 10 sticks may be taken for supper
15. <i>Nasi beriyani</i>	2.50	rice, chicken, green-peas, carrot	served by Indian Muslims. Popular among the Indians and Malays. Usually for lunch/dinner
16. Fried <i>mee</i> — Indian style	0.80	<i>mee</i> , egg, <i>tau-ku</i> (soya bean curd), vegetable, tomato	also served by Indian Muslims. Usually taken for breakfast by Indians and Muslims. However, such Indian and Malay foods are now also popular with the Chinese
17. <i>Rendang hati</i>	1.00 per plate of 140 g	ox liver	served by Malays/Indians. Taken with rice (with other dishes, e.g. mutton curry, vegetables, etc.)
18. <i>Sambal udang</i>	1.00 per plate of 150 g	prawns in chilli	as above
19. Mutton curry	1.00 per plate of 200 g	mutton, cooked in curry (pungent gravy of coconut milk and chilli)	as above
20. <i>Thairuvaddai</i>	0.40 for two <i>vadai</i> in fermented milk (total 250 g)	black grams, grounded and then roasted in oil	the Indians like to take these for breakfast/tea-breaks
21. <i>Boli</i>	0.25 each	rice flour and green gram cooked in oil	as above
22. <i>Dosai</i> with egg	0.40 each	egg, rice flour and black grams fermented and then cooked with oil	as above
23. <i>Dosai</i>	0.20 each	ad above except without egg	as above

Appendix 2

Proximate composition of some Malaysian ready-to-eat meals

NAME OF FOOD	In 100 g (edible portion)					In each serving (edible portion)			
	moisture (g)	fat (g)	protein (g)	carbohydrate (by difference) (g)	ash (g)	calories	weight (g)	fat (g)	calories
1. <u>Dumpling - big</u>	49.1*	11.4	9.7	28.6	1.3	255	196	22.1	498
	46.1-51.2	9.8-13.4	8.8-10.1	27.6-29.1	1.2-1.3	239-277	173-219	19.1-23.9	466-548
2. <u>Dumpling - char siew</u>	34.3	15.4	8.5	40.5	1.4	314	71	10.7	735
	30.7-36.3	11.8-22.0	8.3-8.6	37.5-42.6	1.2-1.5	311-381	63-82	7.7-14.7	196-255
3. <u>Dumpling - sang yoke</u>	46.7	8.5	7.9	35.7	1.3	250	78	6.7	195
	44.4-49.7	5.9-12.8	6.3-10.0	34.1-37.0	1.1-1.7	241-282	68-90	4.7-11.5	154-252
4. <u>Lor mai kai</u>	49.6	5.0	5.5	38.4	1.5	221	173	8.8	383
	47.6-53.1	3.2-6.8	4.3-6.9	34.2-40.6	1.4-1.6	215-230	170-180	5.4-12.2	371-391
5. <u>Fried kueh tiau with cockles</u>	67.0	9.7	5.1	17.1	1.1	177	300	20.2	530
	66.3-67.9	8.3-11.7	4.6-5.6	15.8-18.4	0.8-1.4	167-189	280-331	23.9-36.3	452-586
6. <u>Chicken rice</u>	66.9	4.6	6.4	21.1	1.0	151	315	14.3	476
	64.6-68.1	2.7-6.2	6.0-6.7	19.4-22.2	0.4-1.8	140-169	307-325	8.8-19.0	454-518
7. <u>Char siew rice</u>	63.3	6.5	7.1	22.0	1.1	174	329	21.0	571
	60.3-65.5	2.1-10.1	6.7-7.3	20.7-24.3	1.0-1.2	144-205	310-344	7.0-31.3	479-636
8. <u>Fried rice (chinese style)</u>	54.8	13.2	7.2	23.5	1.3	242	302	51.7	949
9. <u>Fried kueh tiau (long foo chow - Cantonese style)</u>	74.8	5.5	3.8	15.1	0.9	125	652	34.1	800
	68.4-79.7	2.3-9.3	3.0-4.8	14.1-16.8	0.7-1.0	89-170	518-785	15.7-48.2	607-911
10. <u>Fried mee (Fukien chow - Hokkien style)</u>	68.9	6.6	4.6	18.8	1.1	153	751	48.5	1177
	66.5-70.1	5.1-7.5	4.3-5.0	17.4-19.9	1.1-1.2	140-167	624-848	43.2-55.4	1042-1302
11. <u>Lup cheong (Chinese sausage)</u>	14.4	43.4	22.5	14.0	5.7	536	-	-	-
	13.4-16.0	41.8-44.3	20.6-25.8	13.0-15.4	4.9-6.1	533-542	-	-	-
12. <u>Curry laksa</u>	77.3	6.4	3.5	11.3	1.5	117	650	40.9	752
	75.7-78.2	5.4-7.6	3.2-3.8	11.1-11.6	1.3-1.7	109-128	552-734	39.6-42.0	707-800
13. <u>Nasi lemak</u>	62.4	3.6	4.8	28.3	1.0	165	306	10.1	492
	57.9-66.8	1.5-5.7	4.2-5.3	26.6-30.0	0.9-1.1	137-193	263-348	5.2-15.0	477-506
14. <u>Satay</u>	66.7	10.8	8.8	12.4	1.3	182	353 (10 sticks)	38.0	642
15. <u>Nasi beriyani</u>	65.7	2.6	6.4	24.4	1.0	147	457	11.8	664
	64.0-67.3	2.5-2.7	6.3-6.4	22.7-26.1	0.9-1.1	139-154	383-530	10.3-13.3	590-737
16. <u>Fried mee - (Indian style)</u>	63.4	9.0	6.6	19.1	2.1	194	325	31.8	595
	62.6-64.1	8.8-9.2	6.5-6.6	18.0-20.1	1.6-2.5	178-189	297-353	31.1-32.5	561-628
17. <u>Rendang hati</u>	65.0	8.8	20.1	2.1	2.1	176	-	-	-
	62.8-67.1	7.8-9.8	19.3-20.8	2.3-5.9	2.0-2.2	163-189	-	-	-
18. <u>Mutton curry</u>	68.7	14.1	11.1	4.3	2.0	188	-	-	-
	67.1-70.2	8.7-19.4	5.1-17.0	3.8-4.8	1.5-2.4	166-210	-	-	-
19. <u>Sambal udang</u>	76.0	7.8	9.8	3.9	2.6	125	-	-	-
	75.0-76.9	4.4-11.2	6.6-13.0	2.8-5.0	2.2-2.9	103-147	-	-	-
20. <u>Thairuvaddai</u>	82.2	6.9	3.5	6.4	1.2	101	164	11.2	163
	81.3-83.1	6.6-7.1	2.9-4.0	6.0-6.7	0.9-1.4	95-107	135-192	9.6-12.7	143-182
21. <u>Boli</u>	42.5	8.1	7.0	41.5	0.0	267	84	6.8	224
22. <u>Dosai with egg</u>	56.5	11.8	6.8	29.6	1.3	228	195	23.0	443
23. <u>Dosai</u>	70.1	0.7	3.5	24.2	1.5	117	132	0.9	154

* Mean

** Range

Where range not given, single analysis was performed.