Cross-cultural comparisons between Taipei Chinese and Framingham Americans: dietary intakes, blood lipids and apolipoproteins

Li-Ching Lyu*, Barbara M. Posner†, Ming-Jer Shieh§, Alice H. Lichtenstein*, L. Adrienne Cupples†, Johanna T. Dwyer‡, Peter W.F. Wilson¶ and Ernst J. Schaefer*

*Lipid Metabolism Laboratory, USDA Human Nutrition Research Center on Aging at Tufts University, Boston, MA, USA; †School of Public Health, Boston University, Boston, MA, USA; §Department of Nutrition and Health Sciences, Taipei Medical College, Taipei, Taiwan, ROC; ‡Frances Stern Nutrition Center, New England Medical Center, Boston, MA, USA; ¶Framingham Heart Study, Epidemiology and Biometry Program, Framingham, MA, USA.

Dietary intakes (24–hour recall), total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL–C), high density lipoprotein cholesterol (HDL–C), apolipoprotein (apo) A–1 and apo B were assessed in healthy middle–aged subjects in Taipei, and in sex–age–menopause matched subjects in the Framingham Heart Study. Taipei subjects consumed a diet consisting of 16%, 48%, 35% and 1% of calories from protein, carbohydrate, fat, and alcohol, vs 17%, 40%, 39%, and 4% in Framingham subjects, respectively. The saturated, monounsaturated, and polyunsaturated fatty acid content of the diet was estimated to be 9%, 13%, and 13% of total calories in Taipei subjects and 16%, 15%, and 8% in Framingham subjects, respectively. The differences between Taipei and Framingham subjects were quite substantial for lipid parameters but less so for apolipoprotein levels. Gender differences for TG, HDL–C, apo A–1, and apo B were more profound than differences due to nationality. Taipei male and female subjects had significantly lower TC, LDL–C, and significantly higher HDL–C concentrations than Framingham male and female subjects. After adjusting for body mass index (BMI), TC and LDL–C levels remained significantly different for both sexes between populations, probably attributable to differences in saturated fat intake. This study documents that urban workers in Taipei consumed a diet with a relatively high polyunsaturated and low saturated content and had more favorable lipid profiles than Framingham Americans.

Introduction

Taiwan is a newly industrialized society and the nutritional status of the people in Taiwan has been greatly improved and altered since the end of the Second World War. Food availability studies show that total available energy has increased about 2.5 times since the post–war (1277 kcal) to 1988 (2955 kcal)[1]; the available fat for consumption has increased tremendously both in quantity and as a percent of total calories. An increase in coronary heart disease (CHD) mortality rate has been documented following economic development. The crude annual death rate for heart disease in Taiwan was 42 per 100 000 people in 1977, and 57 per 100 000 in 1990, an increase of 35%[2]. The crude death rate for heart disease has increased since the 1970s, probably due to the increase in total calorie consumption and fat intake. However, Taiwan still has a relatively low CHD mortality compared to the USA. The age–standardized mortality for heart disease in 1990 was 70 per 100 000 in Taiwan[3] and 156 per 100 000 in the USA[4]. This cross–cultural study was designed to compare dietary intakes, plasma lipoprotein cholesterol and apolipoprotein levels in the two populations at low and high risk of CHD by standardized protocols and laboratory assays.

Methods

Population samples

We collected data from 440 government employees who participated in an annual health examination in the Government Employees' Clinic Center in Taipei, Taiwan from 1990–1991. Participation was restricted to those individuals aged

Correspondence address: Li-Ching Lyu, MPH, PhD, Epidemiology Program, Cancer Research Center of Hawaii, 1236 Lauhala Street, Honolulu, HI96813, USA.

40–59 years, who were healthy and not taking medications known to affect lipid levels. The height and weight were measured with light cloths and without shoes using a calibrated balance scales (Detecto, Webb City, M, USA). Body mass index (kg/m^2) was calculated as a measure of weight relative to height[5]. The procedures used in this study were approved by Taipei Medical College, and the Central Trust of China Government Employee Insurance Department.

American subjects were selected from participants in cycle 3 (1984–88) of the Framingham Offspring Study. They were matched with the Chinese subjects for sex, age within a five–year age range, and menopausal status in women after eliminating those with previously diagnosed cardiovascular disease (myocardial infarction, angina pectoris, or stroke) and those currently taking medication known to affect plasma lipid levels. A portion of these data derived from the two sample populations, addressing an alternative hypothesis, has been previously published by Lyu et al.[6].

Twenty–four hour recalls

A total of 212 Taipei males and 211 Taipei females had complete dietary information and were compared to 211 males and 209 females from the Framingham study. Nutrient intakes were obtained from single 24–hour recalls for all subjects. Similar protocols were used in dietary interviews which asked for detailed consumption of all food and drink, except water, during the prior day midnight to midnight in the two study populations. In Taiwan, 24–hour recall data was obtained from a questionnaire using visuals to estimate portion size. A standardized protocol was then used to determine the weight of the food consumed from the portion size[7].

A food–grouping system was developed to categorize the food consumption pattern from this middle–aged Chinese population. All food items coded from 24–hour recalls of the Chinese subjects were grouped into 36 food groups to generate the distribution of macronutrients from each food group. The coding procedures were standardized for mixed dishes and the substitutes developed for those food items which were not available in the food composition table. A Taiwan food composition data bank[8–10] was used in calculating nutrient intakes for Chinese subjects. Three mixed food samples from high, medium, and low fat diets were prepared in Taipei and analyzed by Hazleton Laboratories America, Inc. (Madison, WI, USA) for macronutrient composition compared with the calculated values.

The dietary intakes of the Framingham subjects were obtained from 24–hour recalls and documented in detail by Posner and co-workers[11]. Predetermined standards for portion sizes and coding protocols were employed[12]. Nutrient compositions of their diets were calculated using the Michigan State Nutrient database. A detailed description of the dietary assessment methodology in the Framingham Offspring Study has been reported[13]. A portion of these data regarding daily nutrient intakes which addressing an alternative hypothesis has been documented[14].

Laboratory measurements

Blood was drawn into tubes containing 0.1g ethylenediaminetera–acetic acid (EDTA) as an anticoagulant after a 12 to 14 hour overnight fast concomitantly with the collection of routine urine and blood samples in the Taipei Government Employees' Clinic Center. Blood tubes were immediately placed on ice and plasma was separated by centrifugation at 2500 rpm for 20 minutes at 4 °C within 4 hours. Supernate containing high density lipoprotein (HDL) was prepared after precipitation of apo B containing lipoprotein from plasma with dextransulfate and magnesium chloride as previously described[15]. Samples of plasma and the supernate containing HDL were aliquoted and stored at 70 °C. Samples from Taipei were delivered on dry ice to Boston and all determinations of lipid and apolipoprotein concentrations were performed in the Lipid Metabolism Laboratory of USDA Human Nutrition Research Center on Aging at Tufts University. Lipid assays were standardized through the Lipid Standardization Program of the Centers for Disease Control (CDC, Atlanta, GA, USA). Total cholesterol (TC), triglyceride (TG), and high density lipoprotein cholesterol (HDL–C) levels were measured by enzymatic methods. Low density lipoprotein cholesterol (LDL–C) was estimated by the Friedewald formula from subjects whose triglyceride was less than 4.5 mmol/l (400 mg/dl)[16].

LDL–C(mmol/l) = TC(mmol/l) – HDL–C(mmol/l) – TG (mmol/l)/2.18

Apo B concentrations were determined with a non–competitive enzyme–linked immunosorbent assay (ELISA) using affinity purified polyclonal antibodies[17]. The apo A–1 assay was performed with the same assay, except for the use of apo A–1 polyclonal antibodies and different plasma dilutions.

Statistical analysis

The distributions for plasma variables were illustrated by cumulative frequency in Taipei males (TM), Framingham males (FM), Taipei females (TF), and Framingham females (FF). Dietary variables selected for this study were energy, carbohydrate, protein, total fat, saturated fat, polyunsaturated fat, monounsaturated fat, alcohol, cholesterol, and crude fiber intakes; plasma variables selected for this study were TC, TG, LDL–C, HDL–C, apo A–1 and apo B concentrations. Student's t–test was used to compare mean values of the two populations by sex. Since plasma TG, alcohol intake, and polyunsaturated fat/saturated fat (P/S) ratio had skewed distributions, natural log transformation for TG, square root transformation for alcohol and for P/S ratio were applied in the actual analyses. However, untransformed values are presented in tables and text. All data analyses were performed by using SAS, version 6.07 (SAS Institute, Cary, NC, USA)[18]. Results are considered statistically significant if the nominal two-tailed significant level (*P*–value) was < 0.05.

Results

For both the Taipei and Framingham sample populations, the mean age for men was 49±6 years old, and for women 48±6 years old. Taipei subjects had significantly lower mean height (167 cm vs 176 cm for men; 156 cm vs 162 cm for women), body weight (68 kg vs 81 kg for men; 55 kg vs 65 kg for women), and BMI (24 vs 26 for men; 23 vs 25 for women) than Framingham subjects ($P<0.01$).

The distribution of biochemical parameters are shown in Figures 1–6. Taipei females and males tended to have lower TC and LDL–C distribution than Framingham females and males (Figure 1 and 2). However, females in both populations had lower TG concentration distributions than males (Figure 3). Additionally, Figures 4–6 illustrate the gender difference in HDL–C, apo A–1, and apo B levels. These differences are more profound than the differences attributed to nationality.

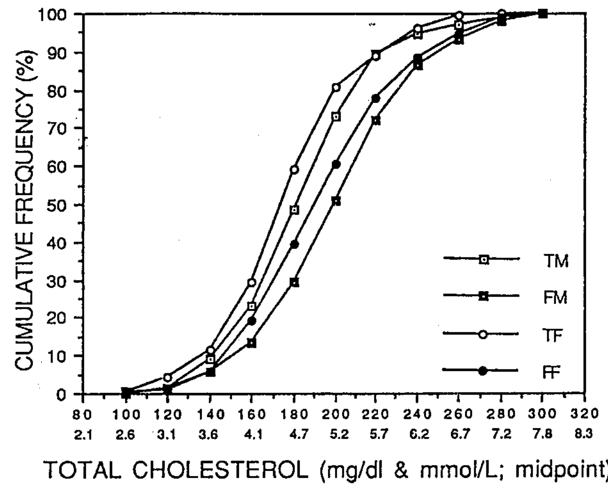

Figure 1. Total cholesterol distributions (Taipei/Framingham).

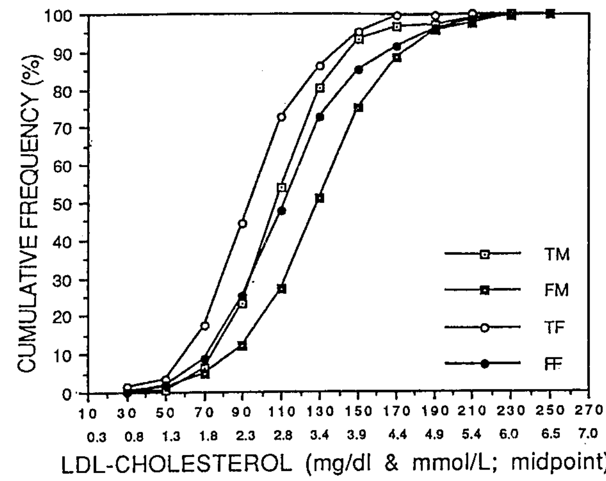

Figure 2. LDL-cholesterol distributions (Taipei/Framingham).

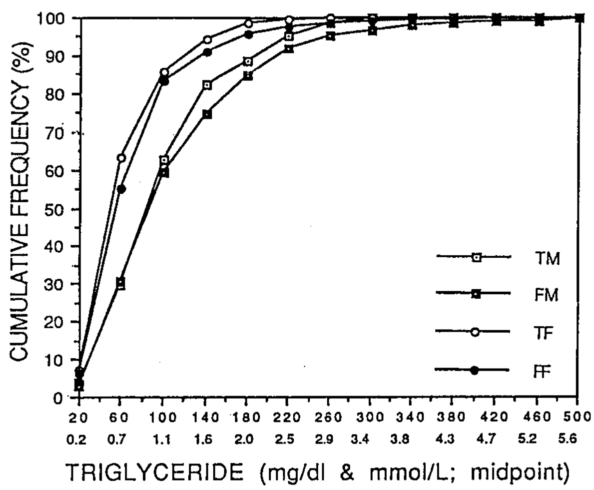

Figure 3.Triglyceride distributions (Taipei/Framingham).

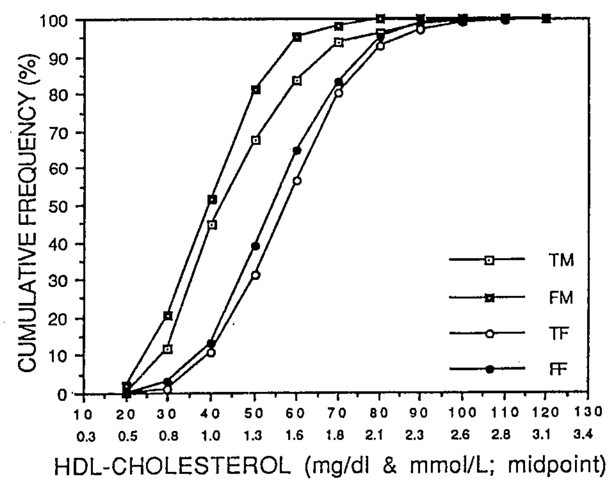

Figure 4. HDL-cholesterol distributions (Taipei/Framingham).

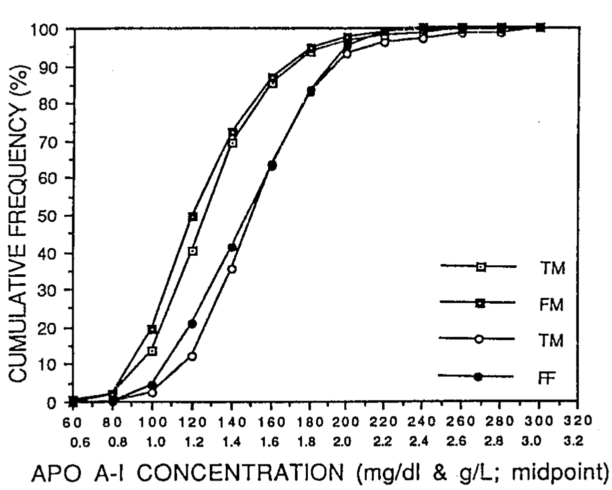

Figure 5. APO A-1 distributions (Taipei/Framingham).

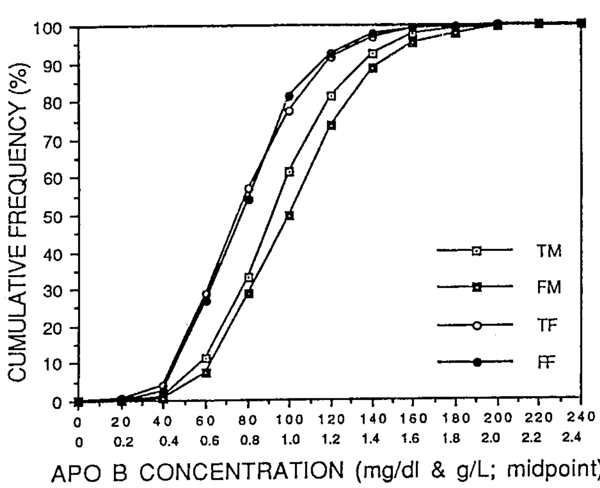

Figure 6. APO B distributions (Taipei/Framingham).

Table 1 shows the mean dietary intakes including total energy, fat, carbohydrate, protein, alcohol, crude fiber, and cholesterol for males and females in the two populations. Framingham males consumed significantly more total energy per day than Taipei males; however, females in the two populations consumed a similar level of total energy per day. The distribution of total energy from fat, carbohydrate, protein, and alcohol for Taipei males were 34.0%, 49.4%, 15.5%, and 2.1% for Framingham males were 40.5%, 39.7%, 16.3%, and 4.8%; for Taipei females were 37.2%, 47.9%, 15.9%, and

Table 1. Dietary intakes (means±standard deviation) in the two populations by sex.

	Males (Mean±SD)		Females (Mean±SD)	
	Taipei	Framingham	Taipei	Framingham
Energy (joules)	9200±2500	10260±4630[a]	6750±1720	6610±2930[a]
Total fat (g)	83±29	114±66[a]	67±25	67±36
Sat(g)	20.7±8.5	41.1±27.1[a]	16.8 ±7.4	23.0±15.5[a]
Mono(g)	29.9±12.2	36.4±24.6[a]	23.9±10.4	19.9±13.3[a]
Poly(g)	26.0±8.6	15.7±11.8[a]	21.2±8.1	10.2±9.6[a]
Carbohydrate(g)	268±86	236±112[a]	192±58	165± 76[a]
Protein(g)	84±30	99±54[a]	63±20	67±36
Alcohol (g)*	7.4±25.9	15.5±23.2[a]	0.3±2.6	5.8±11.4[a]
Crude fiber(g)	5.5±4.5	4.6±3.1[b]	4.8±4.2	3.5±2.5[a]
Cholesterol (mg)	338±212	415±336[a]	258±195	260±218
%Total fat	34.0±7.4	40.5±10.1[a]	37.2±8.5	38.0±10.5
%Sat	8.5±2.5	14.3±5.5[a]	9.2±3.0	12.6±5.2[a]
%Mono	12.2±3.4	12.7±4.7	13.1±3.8	11.0±4.4[a]
%Poly	10.8±2.6	5.7±3.3[a]	11.8±3.4	5.6±3.8[a]
%Carbohydrate	49.4±9.3	39.7±12.2[a]	47.9±9.8	43.1±1.1[a]
%Protein	15.5±3.8	16.3±5.0	15.9±4.3	17.4±6.0[a]
%Alcohol*	2.1±7.5	4.8±8.1[a]	0.1±0.9	2.5±5.2[a]
P/S*	1.39±0.55	0.47±0.37[a]	1.4±0.56	0.50±0.40[a]

Sat = saturated fat: Mono = monounsaturated fat; Poly = polyunsaturated fat; P/S = polyunsaturated fat/saturated fat ratio.
**P*-values were obtained through square root transformation.
a) $P<0.01$. b) $P<0.05$

0.1%; for Framingham females were 38.0%, 43.1%, 17.4%, and 2.5%, respectively. Mean intake of saturated fat was significantly higher in Framingham males and females than Taipei males and females; however, polunsaturated fat intake was significantly lower than their Taipei counterparts. The P/S ratio was 1.4 in Taipei subjects and 0.5 in Framingham subjects and the difference was statistically significant. Taipei males and females had significantly higher intakes of crude fiber than Framingham males and females. Dietary cholesterol intake of Framingham males was significantly higher than Taipei males, but Framingham and Taipei females had similar dietary cholesterol intakes. Both Taipei males and females had significantly lower alcohol intakes than their Framingham counterparts.

Table 2 displays selected nutrient distributions from 36 food groups for Taipei subjects. In general, rice and rice products had the highest contribution in total energy, protein and carbohydrate. Pork products contributed the most in terms of saturated fat and monounsaturated fat, and were the second-highest contributor in protein, polyunsaturated fat, and dietary cholesterol. More than 60% of polyunsaturated fat consumed was from soybean oil used in cooking. Egg products were the major sources for dietary cholesterol, and fruits and vegetables were the major sources for crude fiber. Using our grouping system, 67% of total energy came from plant and 33% from animal sources in this population. For protein food sources, 46% was derived from plants and 54% from animals; for fat, 51% was derived from plant sources and 49% from animal sources.

Table 3 represents means and standard deviations of TC, TG, LDL–C, HDL–C, apo A–1, and apo B concentrations for males and females in the two populations. Framingham males and females had significantly higher TC (by 0.40 mmol/l and 0.44 mmol/l, respectively), and significantly lower HDL–C (by 0.13 mmol/l and 0.1 mmol/l, respectively) concentrations than Taipei males and females. Taipei males had significantly lower mean apo B concentrations than

Table 2. Energy and nutrient contributions from 36 food groups from Taipei Chinese.

	Energy (%)	Protein (%)	Carbo-hydrate (%)	Total fat (%)	Sat fat (%)	Mono fat (%)	Poly fat (%)	Cholest-erol (%)	Crude fiber (%)
1 rice products without oil	28.36	14.39	47.17	1.79	2.00	1.65	1.48	0.02	8.00
2 rice products with oil or sugar	0.14	0.09	0.22	0.03	0.03	0.03	0.02	0.00	0.00
3 wheat products without oil	9.78	8.95	15.78	1.11	0.83	1.02	1.44	0.08	3.44
4 wheat products with oil or sugar	2.41	2.10	2.98	2.11	1.88	2.16	2.53	0.22	0.66
5 starch roots and tubers	0.93	0.65	1.61	0.11	0.00	0.00	0.00	0.00	6.87
6 other grains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7 legume products	0.78	0.77	1.26	0.04	0.04	0.04	0.04	0.00	2.14
8 soybean products	1.86	5.35	0.40	3.08	1.62	2.46	5.81	0.00	0.68
9 soybean oil for cooking	11.04	0.02	0.00	32.98	17.07	26.41	62.58	0.07	0.00
10 peanut oil for cooking	0.03	0.00	0.00	0.09	0.08	0.10	0.11	0.00	0.00
11 other vegetable oil for cooking	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12 lard for cooking	0.39	0.00	0.00	1.15	1.19	1.27	1.05	0.19	0.00
13 butter	0.14	0.00	0.00	0.42	0.92	0.33	0.04	0.37	0.00
14 other saturated fat for cooking	0.28	0.00	0.00	0.82	1.00	0.62	1.05	0.09	0.00
15 nuts and seeds products	1.26	1.87	0.44	2.54	2.19	2.45	3.29	0.00	3.20
16 pork products	10.96	13.44	0.10	26.03	34.33	33.44	10.36	17.46	0.02
17 beef products	1.05	3.92	0.00	1.33	2.18	1.75	0.70	5.02	0.00
18 chicken products	0. 76	3.64	0.00	0.63	1.02	0.74	0. 28	3.66	0.00
19 other poultry	0.08	0.27	0.00	0.11	0.15	0.13	0.07	0.30	0.00
20 organ meats	0.21	0.55	0.00	0.38	0.50	0.47	0.21	2.19	0.00
21 sea fish	1.99	9.62	0. 16	1.34	1.40	0.76	0.17	7.10	0.00
22 fresh water fish	0.62	2.84	0.07	0.46	0. 46	0.25	0.08	2.66	0.00
23 shellfish	0.79	4.06	0.21	0.27	0.34	0.14	0.02	5.17	0.00
24 milk products	4.40	6.27	3.12	5.64	11.76	4.91	0.01	6.11	0.00
25 egg products	2.16	4.51	0.08	4.18	5.56	5.24	1.11	43.34	0.00
26 sugar(sugar and drinks)	1.72	0.01	3.36	0.05	0.05	0.05	0.05	0.00	0.00
27 fruits	3.73	2.23	7.10	0.74	0.00	0.00	0.00	0.00	32.24
28 pale vegetables	1.66	3.78	2.76	0.54	0.00	0.00	0.00	0.00	24.69
29 dark vegetables	0.58	2.11	0.68	0.23	0.00	0.00	0.00	0.00	11.88
30 tea	0.09	0.24	0.12	0.03	0.00	0.00	0.00	0.00	1.36
31 coffee	0.03	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
32 alcohol	0.38	0.09	0.20	0.00	0.00	0.00	0.00	0.00	0.00
33 other mixed dishes	5.52	4.58	4.67	7.24	8.00	7.95	5.14	3.83	3.33
34 cake, cookies, deserts	5.66	3.36	7.24	4.21	5.46	5.41	1.80	2.13	1.47
35 seaweed	0.08	0.19	0.14	0.01	0.00	0.00	0.00	0.00	0.00
36 others including seasoning	0.15	0.11	0.07	0.30	0.16	0.24	0.55	0.00	0.03

Table 3. Lipids and apolipoproteins levels (means±standard deviation) in the two populations by sex.

	Males (Mean±SD)		Females (Mean±SD)	
	Taipei	Framingham	Taipei	Framingham
TC (mmol/l)	5.00±0.82	5.40±0.96[a]	4.79±0.82	5.23±0.95
TG (mmol/l)	1.29±0.66	1.43±0.91	0.89±0.45	0.99±0.62
LSL-C (mmol/l)	3.10±0.77	3.58±0.91[a]	2.73±0.74	3.23±0.93[a]
HDL-C (mmol/l)	1.30±0.41	1.17±0.28[a]	1.65±0.38	1.55±0.36[a]
Apo A-1 (g/l)	1.40±0.31	1.36±0.31	1.64±0.33	1.59±0.32
Apo B (g/l)	1.05±0.30	1.12±0.32[b]	0.89±0.29	0.89±0.26

**P*-values were obtained after log transformation. a: P=0.01; b: P=0.05.

Table 4. BMI adjusted means and standard errors of lipid and apolipoprotein in the two populations by sex.

	Males (Mean±SD)		Females (Mean±SD)	
	Taipei	Framingham	Taipei	Framingham
TC (mmol/l)	5.10±0.05	5.38±0.05[a]	4.99±0.05	5.25±0.05[a]
TG* (mmol/l)	1.39±0.03	1.28±0.05	0.96±0.03	0.09±0.05
LSL-C (mmol/l)	1.24±0.03	1.19±0.03	1.55±0.03	1.55±0.03
HDL-C (mmol/l)	3.18±0.05	3.57±0.05[a]	2.95±0.05	3.26±0.05[a]
Apo A-1 (g/l)	1.37±0.02	1.37±0.02	1.59±0.02	1.60±0.02
Apo B (g/l)	1.09±0.02	1.11±0.02	0.97±0.02	0.91±0.02[b]

**P*-values were obtained after log transformation. a: P=0.01; b: P=0.05.

Framingham males (P=0.02), but similar apo A–1 concentrations. Taipei females and Framingham females had similar apo A–1 and apo B mean concentrations.

Table 4 shows the BMI adjusted means and standard errors of TC, TG, LDL–C, HDL–C apo A–1, and apo B levels in the two populations by sex. After adjusting for BMI, in both males and females, only least square means of TC and LDL–C were significantly different (P<0.01) in Taipei and Framingham subjects.

Discussion

We report the distributions and the mean values of blood lipoproteins and dietary intakes from healthy middle–aged Chinese and American populations. Our data showed that Taipei subjects with lower TC, lower LDL–C, and higher HDL–C levels had a more favorable lipid profile than Framingham subjects. The differences in apo A–1 and apo B levels were not as striking compared to the differences in lipoprotein cholesterol levels between the two populations. These observations were confirmed when assessing the data using cumulative frequency plots. Differences between Taipei subjects and Framingham subjects were more substantial for TC and LDL–C than apo A–1 and apo B levels. Since differences on the basis of gender were observed for TG, HDL–C, apo A–1 and apo B concentrations, it appears that gender differences attributable to sex hormones have a more profound effect than differences due to genetic predisposition or dietary practices.

Rice, wheat, soybean, and pork products are major food sources for total energy intake in Taipei subjects. The dietary pattern of Chinese in the Taiwan area was also described by Pan and co–workers[19] using 152 food groups. They documented that rice, pork, and soybean oil contributed 59.8% of total energy[19]. The major sources of fat in the diet of Chinese in Taiwan were soybean oil and pork products[20]. In contrast, the major sources of fat in the American diet were reported to be meat, poultry, fish and dairy products[21]. Our results from 24–hour recalls agree with the results of the Dietary Survey in Taiwan Area in 1986–88, which reported 14.7% of total energy from protein, 35.6% of total energy from fat with a P/S ratio of 1.35[22]. The relatively high fat diet consumed in Taiwan had a high P/S ratio, in contrast with the high fat diet consumed in USA that had a low P/S ratio diet.

The type of fatty acids consumed has considerable effects on lipoprotein and apolipoprotein concentrations. From human and animal kinetic studies, many researchers suggested that one mechanism causing elevated LDL–C concentrations is that saturated fatty acid suppresses receptor-mediated clearance of LDL thereby impairing LDL removal from circulation[23–25]. A high saturated fat diet has been reported to increase HDL–C and apo A–1 concentrations by Shepherd et al.[26]. In non–human primates, consumption of a high saturated fat diet resulted in increased hepatic messenger ribonucleic acid (mRNA) for apo A–1 compared with a diet high in polyunsaturated fat[27]. In addition, a diet with low P/S ratio increased hepatic apo A–1 levels in African green monkeys[28], suggesting that a diet with a low P/S ratio may increase apo A–1 production from the liver. Animal work has shown that the lecithin:cholesterol acyltransferase (LCAT) activity[29], and cholesteryl ester transfer protein (CETP) concentration[30] and its mRNA levels were increased after the consumption of a diet high in saturated fat and cholesterol[31]. These findings may account for increased HDL–C concentrations observed in the Framingham subjects consuming the higher levels of saturated fat.

Lower LDL–C and apo B levels tended to be associated with higher polyunsaturated fat intake in Taipei subjects than in Framingham subjects. Besides the effects of replacing saturated fat in the diet, the mechanism proposed to explain how polunsaturated fat affects on lipids relates to increased fecal excretion of bile acids, neutral steroids and endogenous cholesterol by polyunsaturated fat[32–34]. Spritz & Mishkel proposed that substituting unsaturated fat for saturated fat resulted in lipid–lowering due to the larger space occupied within lipoprotein particle which results in fewer cholesterol esters in the core of lipoprotein particles[35].

The controversial issue of decreased HDL–C levels associated with the consumption of diets high in polyunsaturated fat intake has been raised. It has suggested that polyunsaturated fat is not to be preferred for replacing saturated fat in dietary modification. However, the factors affecting HDL–C levels includes total fat intake, energy balance, physical fitness and alcohol intake. Results from metabolic unit studies with very high P/S diet showed HDL–C level does decrease[36,37] in some studies concomitantly with a decrease in LDL–C levels. However, diets with P/S under 1.5 showed no change in HDL–C levels[38–40] in other studies. Our data provides an example of an Eastern population with a high total fat and polyunsaturated fat intake that does not have lower HDL–C levels in comparison with a Western population sample.

In summary, results from comparing dietary intakes, and TC, TG, LDL–C, HDL–C, apo A–1 and apo B concentrations in Taipei and Framingham middle–aged subjects showed that Taipei subjects had lower total fat intakes (35%) with a P/S ratio of 1.4 and appeared to have a less atherogenic lipid profile than Framingham subjects who have higher fat intakes (40%) with a P/S ratio of 0.5. After adjusting for BMI, TC and LDL–C levels remained significantly different, for both sexes between populations, probably due to differences in saturated fat and polyunsaturated intake. The nutrient-lipoprotein associations between the two populations suggest the biochemical responses from individual nutrients are probably also influenced by the overall dietary pattern and dietary composition in addition to the quantity of the nutrient.

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Cross-cultural comparisons between Taipei Chinese and Framingham Americans: dietary intakes, blood lipids and apolipoproteins

Li-Ching Lyu, Barbara M. Posner, Ming-Jer Shieh, Alice H. Lichtenstein, L. Adrienne Cupples, Johanna T. Dwyer, Peter W.F. Wilson and Ernst J. Schaefer

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台北華人和 Framingham 美國人的飲食、血脂和脫輔基脂蛋白的比較

摘要

作者評估了健康、中年台北華人和 Framingham 美國人的飲食（24 小時回憶）、總膽固醇（TC）、甘油三酯（TG）、低密度脂蛋白（LDL-C）、高密度脂蛋白（HDL-C）、脫輔基脂蛋白（APO）A_1 及脫輔基脂蛋白 B 水平，研究對象是在 Framingham 心臟研究項目下，按性別、年齡、經絕期配對的。台北對象飲食中，蛋白質佔總能量 16%、碳水化合物佔 48%、脂類佔 35%和酒佔 1%，而 Framingham 對象分別爲 17%、40%、39% 及 4%。台北對象的飽和、單不飽和、與多不飽和脂肪酸估計佔總能量 9%、13% 和 13%，而 Framingham 對象分別爲 16%、15% 和 8%。台北與 Framingham對象的血脂水平差異相當顯著，但脫輔基脂蛋白水平的差異並非如此明顯。TG、HDL-C、APO A_1 和 APO B 的性別差異較國藉差異更大。台北男女對象的 TC、LDL-C 水平明顯低於 Framingham，而 HDL-C 水平則明顯高於 Framingham 對象。對體重指數（BMI）調整以後，在兩個人群中不同性別的 TC 和 LDL-C 水平仍有明顯差異，這也許是飽和脂肪進食不同所致。該研究証明了台北市工作者飲食中多不飽和脂肪酸較高，而飽和脂肪酸較低，因而較 Framingham 美國人具有利的脂類水平。