Special Report

Desirable intakes of polyunsaturated fatty acids in Indonesian adults

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A Indonesian Advisory Group on Fatty Acid Nutrition and Health was established in 2004 to consider the increasing incidence of nutritionally-related cardiovascular disease in Indonesia. Emerging international recommendations often focused on dietary fat and may not have been relevant to the national situation. Traditional dietary patterns were apparently protective against ischaemic heart disease often with fat derived dominantly from a particular source like coconut, soy, peanut or fish. These fats were used in ways which promoted the use of potentially cardioprotecive foods like legumes, vegetables, fruits and aquatic food. Optimal intakes of polyunsaturated fatty acids in Indonesia are likely to reflect both absolute intakes and the relationships between n–3 and n–6 fatty acids of longer chain lengths. This leaves some issues for active and continuing review, like the intakes of trans fatty acids, and the regulatory and food labelling implications. Some studies underway and others which need implementation will enable the Advisory Group to prepare a second report with more basis in Indonesian evidence. In the meantime, the Advisory Group has recommended that the AHA (American Heart Association) and ISSFAL (International Society for the Study of Fatty Acids and Lipids) recommendations obtain until the end of 2007.

Key Words: Omega–3 fatty acids, chronic disease, dietary patterns, Okinawan Round Table on Nutrition and CVD, coconut, fish, tofu, tempeh

INTRODUCTION

For more than 10 years, cardiovascular disease (CVD) has been the major leading cause of death in Indonesia. Available data from National Household Surveys indicate increasing trend for the contribution of CVD to total death. Sequential National Household Surveys undertaken in 1980, 1986, 1992 and 2001 demonstrated the increasing trend of the proportion of death due to non-communicable diseases (NCDs), ie from 25.41% in 1980 to 48.53% in 2001. The proportion of death due to cardiovascular disease in 2001 was almost treble the figure in 1986 (9.1% in 1986 vs. 26.3% in 2001). The proportion of death due to other vascular disease like stroke has doubled for the last 15 years (9.1% in 1986 vs 26.3% in 2001).[1-3]

For decades, nutrition scientists have explored extensively the links between nutrition and health and diseases. Nutritional adequacy was understood as nutrients adequacy, aiming to prevent nutritional deficiencies. Advancements in nutritional sciences have led to the notion that nutrient adequacy is crucial for health and disease prevention and treatment. Nowadays, the nutritional approach to the prevention of CVD should not only look at the excess of (saturated) fat and cholesterol intake alone, but should, inter alia, also consider vitamin B-6, folic acid and vitamin B-12 deficiencies, insofar as hyper-homocysteinemia is concerned.[4] A life cycle approach has also led to a new paradigm that not only overweight and obesity contribute to the development of CVD, but intra-uterine growth restriction (IUGR), stunting and underweight in early life should also be taken into consideration as risks of CVD in later life.[5] The Asia Pacific Clinical Nutrition Society prepared a comprehensive and regionally sensitive report on Nutrition and Cardiovascular Disease in 2001, known as “the Okinawa Roundtable” which encouraged a broad view of those for factors which of only encouraged, but protected against CVD in the region , including basic food commodities (eg grains, legumes, seeds, green vegetables, fish), food products (eg soy-based) and beverages like tea.[6-8]

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Coronary heart disease (CHD) has many well-documented risk factors, and they can be classified as modifiable and non-modifiable risks. Most modifiable risk factors of CHD, such as central obesity, hypertension, dyslipidemia, and diabetes mellitus are, to a certain degree, related to nutrition. Amongst other nutritional factors, there is substantial evidence that omega–3 (n–3) polyunsaturated fatty acids (PUFA) from fish and fish oils are protective against CHD.

Available evidence on the protective roles of n–3 PUFAs against CHD is mainly from developed countries. Developing countries like Indonesia should develop their own response to this issue, with regard to the following considerations: the increasing incidence of CHD and its risks; the availability of abundant marine resources (known as natural source of n–3 PUFAs) but with their potential environmental risks; the need for more comprehensive studies of the relations of n–3 PUFAs and CHD, and at the same time perform comprehensive review and re-analysis of available studies.

Through the initiative of the Indonesian Heart Foundation, an Advisory Group on Fatty Acids was formed in September 2004. This advisory group comprises individual experts in fatty acids and acts as a peer-review body with responsibilities to review and reanalyze available data on fatty acids, to foster fatty acid research, and to make recommendations for the intake of polyunsaturated fatty acids in Indonesian adults, as far as their relevance to CHD is concerned.

The Advisory Group convened in September and October 2004 to discuss advances in essential fatty acid science and CHD, and take note of available studies on the fatty acid consumption of Indonesian adults, and, finally, make recommendations for intake of polyunsaturated fatty acids in Indonesian adults. This report represents a collective view of the Advisory Group and is made available for promulgation to stakeholders, academics, non-governmental organizations and related institutions, and nutrition (food and beverage) industries.

The Protective roles of n–3 polyunsaturated fatty acids against coronary heart disease

The protective roles of n–3 PUFAs from fish and fish oils against CHD have been well documented. n–3 [α-linolenic acid (LNA)] and n–6 [linoleic acid (LA)] PUFAs are classified as essential fatty acids because human beings and other mammals cannot synthesize them, and, therefore, they have to be obtained from foods. LNA is highly available in the chloroplast of green vegetables, and LA can be found in natural plant seeds.[9,10]

These 2 essential fatty acids (with an 18 carbon chain length) undergo metabolism, resulting in the production of fatty acids derivatives with longer carbon chains (the elongation process) ie 20 and 22. As far as their biological roles are concerned, the major metabolic derivative of LA is arachidonic acid (AA), and those of LNA are eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (Figure 1). EPA and DHA are largely found in fish, especially oily species like mackerel, lake trout, herring, sardines, albacore tune, and salmon; AA is mainly found in phospholipids of grain-fed animal.[11-13]

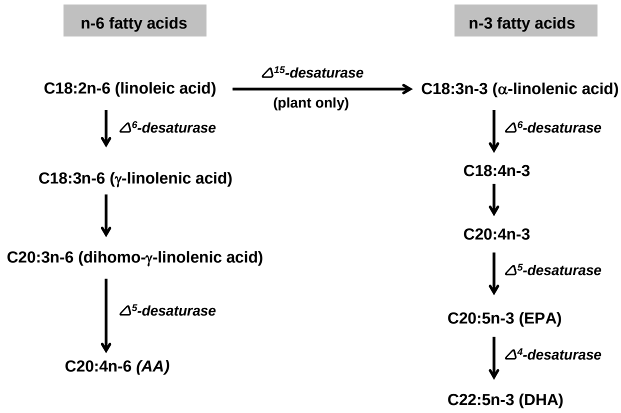

Figure 1. Metabolism of essential fatty acids. (Source: reference 9)

There is competition between n–3 and n–6 fatty acids as substrates for the desaturase enzyme. Therefore, the n–3:n–6 fatty acids ratio is often used to indicate the consumption pattern of essential fatty acids and relate it to cardiovascular disease in particular ethnic groups. The optimal n–3:n–6 fatty acid ratio should confer low death rates from cardiovascular disease (Table 1) and in general[9] Consumption of n–3 fatty acids from fish or fish oils leads to the replacement of AA by EPA and DHA in cell membranes, particularly those related to platelet aggregation, thrombosis and inflammation.[12]

AA and EPA undergo further metabolism, resulting in the production of eicosanoids. This process occurs with the assistance of cyclooxygenase (especially in platelets and endothelial cells) and lipoxygenase (especially in neutrophils) enzymes (Figure 2). Again, AA and EPA compete for the cyclooxygenase and lipoxygenase enzymes for conversion into eicosanoids. Those derived from AA are pro-aggregatory, vasoconstrictor and pro-inflammatory; while those derived from EPA are anti-aggregation, vasodilator and anti-inflammatory. Hence, optimal consumption of EPA from fish or fish oils leads to the production of eicosanoids favorable to cardiovascular health.

The cardio-protective roles of marine n–3 fatty acids have been the subject of increasing investigation over the last 25 years. Sequential update reviews have been published in various nutrition and medical literatures.[12-14] Until now, published articles mostly describe the benefits

Table 1. Ethnic differences in fatty acid concentrations in thrombocyte phospholipids and percentage of all deaths from cardiovascular disease

	Europe and United States	Japan	Greenland Eskimos
		%	
Arachidonic acid (C20:4n-6)	26	21	8.3
Eicosapentaenoic acid (C20:5n-3)	0.5	1.6	8.0
n-6:n-3 ratio	50	12	1
Mortality from cardiovascular disease	45	12	7

Source: reference 12.

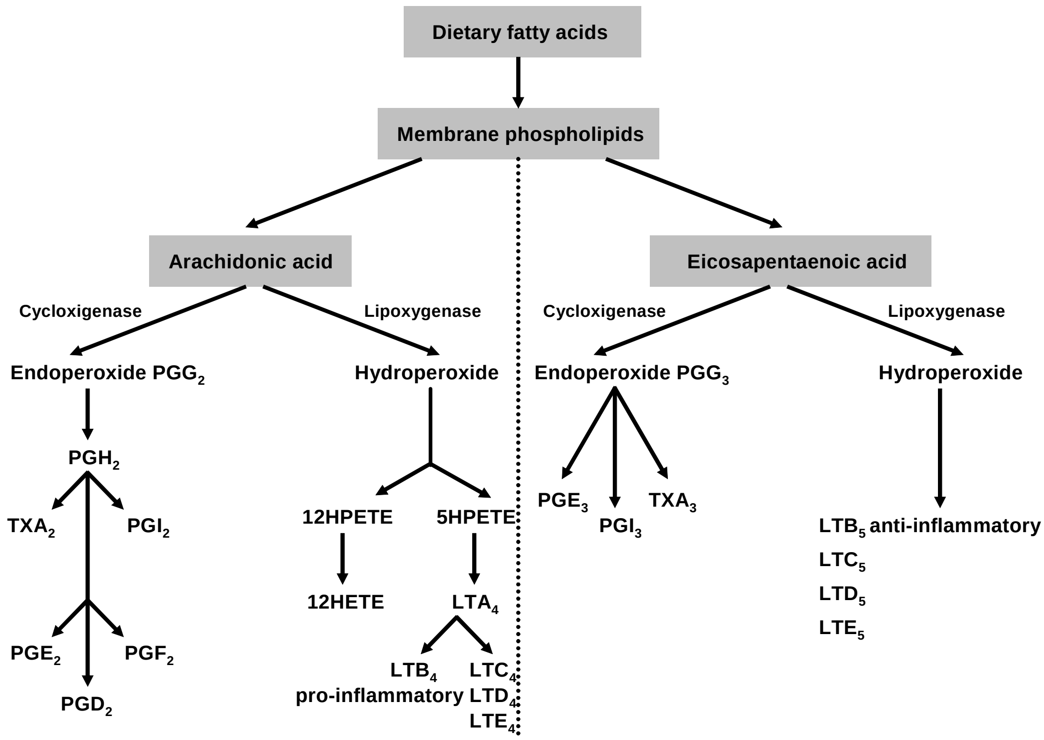

Figure 2. Synthesis of eicosanoids from arachidonic acid and eicosapentaenoic acid (Source: 10 with slight modification)

Table 2. Effect of marine derived n–3 fatty acids on death from CHD in secondary prevention of myocardial infarction

Study	Design	Intervention	Intervention events (%)	Control events (%)	Absolute risk reduction (%)	Relative risk reduction (%)	No needed to treat	Comments
Diet and Re-infarction Trial (DART)[15]	Randomized, controlled, 2-year follow-up, 2033 men after MI	Fish meal twice weekly or fish oil capsules if unable to tolerate fish (1.5 g/d)	7.7*	11.4	3.7	32.5	27	Before routine use of secondary prevention treatment such as aspirin, -blockers, statins
Indian Experiment of Infarct Survival[16]	Randomized, double-blind placebo, controlled, 1-year follow-up, 360 patients after MI	Fish oil (EPA+DHA 1.8 g/d) or mustard seed oil (ALA 2.9 g/d)	11.4*	22.0	10.6	48.2	10	Small size, high mortality, may not be applicable to Western populations
GISSI-Prevenzione Trial, Italy[17]	Randomized, controlled, 3.5-year follow-up, 11324 patients after MI	Fish oil (EPA+DHA 0.85 g/d)	4.8**	6.8	2.0	29.7	50	Not blinded, no placebo
Nilsen *et al*[18]	Randomized, double-blind placebo, controlled, 1.5-year follow-up, 300 patients after MI	Fish oil (EPA+DHA 3.5 g/d)	5.3	5.3	-	-	-	Small size, reasonable intake of fish among general population

*p < 0.01 between control and intervention groups; **p = 0.024 between control and intervention groups. MI= myocardial infarction; EPA= eicosapentaenoic acid, DHA= docosahexaenoic acid. Source: reference 14.

of n–3 fatty acids from fish and fish oils on secondary prevention of CHD. Assessments on the effects of fish and fish oils on risk of CHD in primary prevention still remain a challenge for scientists working in the area of nutrition and CHD risks.

In their review, Din *et al*[14] have highlighted 4 major randomized-controlled trials[15-18] on the effect of marine derived n–3 fatty acids on death from CHD in secondary prevention of myocardial infarction (Table 2).

To summarize, available evidence demonstrates the ability of n–3 PUFAs to:

1. Reduce risk for arrhythmias
2. Reduce triglyceride concentrations
3. Reduce risk for thrombosis
4. Reduce blood pressure
5. Reduce inflammatory process
6. Reduce atherosclerosis process
7. Improve endothelial function

Intake of polyunsaturated fatty acids in Indonesian adults

Despite much data on food and nutrient intakes of Indonesian adults, analyses on the intake of polyunsaturated fatty acids are scarce. There are several reasons for this: most available studies are not designd to investigate the intake of PUFAs and its relations with health and CHD in particular; the current Indonesian Food Composition Tables contain only fat as a macronutrient, and do not include information about the types of dietary fat; and validation studies of dietary fat and fatty acids intakes are not available.

The present report reviews several studies of dietary fat and PUFAs intakes and their relations with CHD and its risks in Indonesian adults. One study describes dietary fat and PUFAs intake patterns and their relations with lipid profiles in 4 Indonesian ethnic groups, presented as a doctorate thesis.[19] Another study on dietary fat intakes was reported by Lipoeto *et al*.[20] This study used a case-control design in Minangkabau people with CHD, and was presented at the 17th International Congress of Nutrition held in Vienna, Austria in 2001.

These 2 studies reported similarities in the contribution

Table 3. Daily dietary fats and fatty acids intake of Minangkabau, Sundanese, Javanese and Buginese ethnics living in Indonesia[19]

Macronutrient	Minangkabau (n= 480)	Sundanese (n= 373)	Javanese (n= 302)	Buginese (n=275)
Energy (kcal/day)	1557 (1530 – 1583)	1740 (1705 – 1775)	1249 (1212 – 1287)	1153 (1115 – 1191)
Carbohydrates				
• g/day	219 (214 – 224)	230 (225 – 235)	164.9 (160 – 170)	156.1 (151 – 161)
• % energy	56.2 (55.4 – 56.9)	53.3 (52.6 – 54.0)	53.4 (52.3 – 54.4)	54.7 (53.7 – 55.8)
Protein				
• g/day	54.2 (52.7 – 55.8)	64.1 (62.2 – 65.9)	40.1 (38.5 – 41.6)	48.7 (46.4 – 50.9)
• % energy	13.9 (13.6 – 14.2)	14.7 (14.4 – 15.0)	12.9 (12.5 – 13.2)	16.8 (16.3 – 17.3)
Fat				
• g/day	52.0 (50.4 – 53.6)	64.6 (62.5 – 66.7)	50.6 (48.2 – 53.0)	38.6 (36.5 – 40.6)
• % energy	30.2 (29.4 – 30.9)	33.0 (32.3 – 33.7)	35.8 (34.8 – 36.8)	29.5 (28.6 – 30.5)
Saturated fats				
• g/day	35.3 (34.2 – 36.3)	39.2 (37.7 – 40.7)	33.4 (31.6 – 35.3)	25.8 (24.4 – 27.3)
• % energy	20.7 (20.1 – 21.3)	20.0 (10.5 – 20.6)	23.5 (22.7 – 24.4)	19.8 (19.0 – 20.6)
Monounsaturated fat				
• g/day	8.5 (8.0 – 9.1)	12.0 (11.5 – 12.6)	7.6 (7.2 – 8.0)	5.8 (5.4 – 6.2)
• % energy	4.8 (4.6 – 5.0)	6.1 (5.9 – 6.3)	5.4 (5.1 – 5.6)	4.4 (4.1 – 4.6)
Polyunsaturated fats				
• g/day	4.7 (4.4 – 4.9)	8.8 (8.4 – 9.2)	6.1 (5.8 – 6.4)	3.7 (3.5 – 4.1)
• % energy	2.6 (2.6 – 3.0)	4.6 (4.4 – 4.7)	4.4 (4.2 – 4.6)	2.8 (2.7 – 3.0)
Cholesterol (mg/day)	165 (151 – 180)	221 (202 – 240)	138 (118 – 158)	159 (141 – 178)
P:S ratio	0.15 (0.14 – 0.16)	0.25 (0.24 – 0.27)	0.22 (0.20 – 0.24)	0.17 (0.15 – 0.18)

P:S ratio= Polyunsaturated : Saturated fatty acids ratio

Table 4. Daily dietary fats and fatty acids intake of 108 CHD patients and 220 healthy age- and sex-matched controls.

Daily nutrient intake	CHD patients	Healthy controls
Fat (% energy)	32.8 ± 5.6	31.6 ± 5.0*
Saturated fat (% energy)	20.9 ± 4.6	20.9 ± 4.5
• Lauric acid (C12:0)	9.8 ± 2.5	9.9 ± 2.4
• Myristic acids (C14:0)	3.9 ± 0.9	4.0 ± 0.9
• Palmitic acids (C16:0)	3.9 ± 0.9	3.8 ± 0.8
Monounsaturated fat (% energy)	6.7 ± 1.9	6.6 ± 1.4
Polyunsaturated fat (% energy)	4.1 ± 1.6	4.1 ± 1.3
• n–3	0.9 ± 0.3	0.8 ± 0.3
• n–6	3.1 ± 1.5	3.2 ± 1.2
• Arachidonic acid (C20:4)	0.08 ± 0.03	0.06 ± 0.02**
P:S ratio	0.20 ± 0.05	0.20 ± 0.05
Cholesterol (mg)	302 ± 211	183 ± 103**

Mean ± SD. Significant difference: *, $p < 0.05$, **, $p < 0.0001$. P:S ratio= Polyunsaturated : Saturated fatty acids ratio. Source: reference 20.

of dietary fats to daily energy intake, ie approximately 30% in apparently healthy and CHD subjects (Tables 3 and 4). This intake was dominated by saturated fatty acids (more than 20%), leading to a lower P:S ratio than that recommended by the American Heart Association and National Cholesterol Education Program – ATP III.

Lipoeto *et al*.[20] have undertaken a more comprehensive analysis of fatty acid intakes, and were able to demonstrate a difference in AA intake between CHD patients and healthy controls. ALA and LA intake values of CHD patients and healthy controls were higher than the healthy intake of ALA and adequate intake of LA recommended by ISSFAL.[21]

Another case-control study was conducted by Supari, and the data were reported by Satoto *et al* in Widyakarya Nasional Pangan dan Gizi VI in 1998.[22,23] The study compared plasma fatty acid concentrations of CHD patients and healthy controls. Data on intake of fatty acids was not available. The study confirmed previous ethnic comparative studies wich have demonstrated higher plasma n–6:n–3 fatty acid ratios in CHD patients than their healthy counterparts (Table 5).

Issfal's recommendations for intake of polyunsaturated fatty acids in healthy adults and statement on ω-3 polyunsaturated fatty acids and heart disease

A report on 'Recommendations for Intake of Polyunsaturated Fatty Acids in Healthy Adults' was prepared by the ISSFAL sub-committee on June 8, 2004, and was approved at the ISSFAL Board Meeting held on June 28 at Brighton, UK.[21] The report contains the following specific recommendations about the intake of PUFAs:

1. An adequate intake of LA: 2 energy% (Review of 9 reports studies in adults and infants, with different degrees of limitation in the dietary source of n-3 fatty acids and intakes)
2. A healthy intake of ALA: 0.7 energy% (Review of 10 studies undertaken in 1968 – 2003, consisting of 4 prospective studies, 2 cross-sectional studies, 1 case-control study, 1 primary prevention study and 2 secondary prevention studies. Additional reviews were made on actual dietary intakes from Australia, France, Japan, USA, and Norway)
3. For cardiovascular health, a minimum intake of EPA and DHA combined: 500 mg/day (Review of 6 US epidemiologic studies on EPA + DHA intakes, with an additional review of Scandinavian data).

For patients with documented CHD, intakes of 800 - 1000 mg of EPA and DHA (combined) per day appears to be a prudent approach for secondary prevention.[24] This may be obtained from the consumption of oily fish or from omega–3 fatty acid capsules, although the decision to use the latter should be made in consultation with a physician.[25]

Table 5. Plasma fatty acids concentrations in CHD patients and healthy controls

Plasma fatty acid	CHD patients	Healthy controls
Essential fatty acids	0.96 ± 0.09	6.35 ± 4.00
n–6	47.1 ± 3.6	64.2 ± 5.8
n–6:n–3 ratio	46.1 ± 6.1	31.2 ± 2.2
Palmitic acid	39.8 ± 5.6	48.8 ± 4.8
Linoleic acid	35.1 ± 5.0	56.5 ± 8.8

Source: reference 22, quoted in 23.

n–3 polyunsaturated fatty acids and Indonesian food habits and practices

A food-based approach to describe the relations between nutrition and CHD is more appropriate than a nutrient approach when ethno-ecological considerations are taken into account, aiming to achieve healthy and sustainable food habits and practices. There is accumulating evidence in the nutrition literature about the interplay between foods (and or food components) and CHD. A notable example is soy foods, which are widely consumed by Asian populations, particularly Indonesians. Soy foods consumption is known to be related to the low incidence and prevalence of certain chronic diseases like breast (in women) and prostate (in men) cancers, and of osteoporosis. Soy foods consumption also lowers serum total cholesterol and LDL-cholesterol concentrations. Similarly, fish is abundant across the Indonesian archipelago and widely consumed by Indonesians.[26] Hence, Indonesia can take into consideration the consumption of these and

Table 6. Methylmercury levels in selected commercial fish species

Species	Methylmercury concentration (ppm)	
	Mean	Range
Tilefish	1.45	0.65 – 3.73
Swordfish	1.00	0.65 – 3.73
King mackerel	1.00	0.10 – 1.67
Shark	0.96	0.05 – 4.54
Tuna (fresh and frozen)	0.32	ND – 1.3
Pollack	0.20	ND – 0.78
Tuna (canned)	0.17	ND – 0.75
Catfish	0.07	ND – 0.31
Salmon (canned and fresh)	ND	ND – 0.18
Shrimp	ND	ND

ND denotes not detectable. The mean for salmon is presented as not detectable because most of the samples did not have a detectable value and therefore the true mean is below the level of detection. Source: reference 28.

other cardio-protective foods, and could presume this to be a potential nutritional approach to CHD prevention, at both primary and secondary levels.

On the other hand, the dimensions of food and nutrition in health and disease are complex. A particular cuisine does not only represent nutrients and foods, but also includes socio-cultural, belief and traditional practices. Implementation of research findings on nutrients and foods in CHD in daily practice can only be sustainable if they can be translated into the cuisine of a particular society.

One of the dominant cooking methods in Indonesian food culture is frying, and this may compromise the cardio-protective effect of foods. It has been reported that fried fish (for example from fast food stalls or frozen products) contains minimal amounts of n–3 fatty acids.[11] Furthermore, coconut and palm oil represent the major cooking oils in Indonesian culture. The poorer Indonesian communities also use ‘minyak curah’ for cooking and frying. A case study in Jakarta demonstrated that frying contributed to a high intake of saturated fatty acids, and, therefore, counterbalanced a presumably favorable saturated - polyunsaturated fatty acid ratio.[27] Further studies are still required to address the interactions between these oils and fried fish on the cardio-protective role of n–3 fatty acids from fish.

Another issue to be considered is environmental risk, although very limited data on the levels of contaminants in Indonesian foods are available. US data show that some types of fish may contain significant levels of contaminants like methylmercury, polychlorinated biphenyls (PCBs) and dioxins.[28] Recent epidemiologic findings on the association between methylmercury exposure and CHD are still contradictory,[29,30] indicating the need to further explore this issue. Nevertheless, there are many species of fish that are low in methylmercury (Table 6).[28] It is therefore advisable to consume a variety of fish to minimize any possible adverse effects.

Advisory group’s proposal on desirable intake of polyunsaturated fatty acids in Indonesian adults

Knowing the well-documented benefits of n–3 fatty acids from fish and fish oils for the secondary prevention of CHD, and realizing the limitations in defining the optimal intake of n–3 fatty acids, and the availability of Indonesian data, the Advisory Group agreed to adopt, for the time being, the ISSFAL’s recommendations for intake of polyunsaturated fatty acids in healthy adults. The term *‘desirable intake’* is preferred to *‘recommended intake’* because the latter term has to be endorsed in the Widya Karya Pangan dan Gizi. The following proposal is agreed:

1. An adequate intake of LA: 2 energy%
2. A healthy intake of ALA: 0.7 energy%
3. For cardiovascular health, a minimum intake of EPA and DHA combined: 500 mg/day
4. For patients with documented CHD: 800 – 1000 mg of EPA and DHA (combined) per day. This may be obtained from the consumption of oily fish or from omega-3 fatty acid capsules, although the decision to use the latter should be made in consultation with a physician.

These recommendations will be in practice for 3 years, 2005 -2007, and are subject to be reviewed whenever additional findings and data on n-3 fatty acids and their relations to cardiovascular health and CHD in Indonesian adults are available.

The Advisory Group recommends that all healthy adults eat fish (particularly fatty fish) at least two times a week. Fish is a good source of protein and is low in saturated fat. Fish, especially oily species like mackerel, lake trout, herring, sardines, albacore tuna, and salmon, provide significant amounts of the two kinds of omega–3 fatty acids shown to be cardioprotective, EPA and DHA (Tables 7 and 8). The Advisory Group also recommends

Table 7. Content of n–3 fatty acids of selected fish and seafood

	EPA + DHA content (g) per 100 g serving of fish (edible portion)	Amount of fish (in g) required to provide 1 g EPA + DHA
Tuna (fresh)	0.28 – 1.51	66 – 357
Atlantic salmon	1.28 – 2.15	42.5 – 70.9
Mackerel	0.4 – 1.85	54 – 250
Atlantic herring	2.01	50
Rainbow trout	1.15	87
Sardines	1.15 – 2	50 – 87
Halibut	0.47 – 1.18	85 – 213
Tuna (canned)	0.31	323
Cod	0.28	357
Haddock	0.24	417
Catfish	0.18	556
Flounder	0.49	204
Oyster	0.44	227
Shrimp	0.32	313
Scallop	0.2	500
Cod liver oil capsule	0.19	5

EPA= eicosapentaenoic acid, DHA= docosahexaenoic acid. There are variations in n–3 fatty acids content of the listed fish and seafood. Species, season, diet, packaging and cooking methods contribute to the variation of n–3 fatty acids content. Source: references 14 and 25.

Table 8. Content of n–3 and n–6 fatty acids of selected fish and seafood commonly consumed by Indonesian people

Type of fish	Total n–3 fatty acids (g) per 100 g wet weight	Total n–6 fatty acids (g) per 100 g wet weight	n–3/n–6 ratio
Tembang	1.2	0.3	4.0
Sirkuning	0.2	0.2	1.0
Belanak	0.4	0.3	1.3
Teri	1.4	0.3	4.7
Tenggiri	1.1	0.7	1.6
Sardin	1.2	0.6	2.0
Kakap	0.6	0.3	2.0
Cucut	1.9	0.5	3.8

Note: No information is available on the content of EPA and DHA. Source: references 26.

eating plant derived omega–3 fatty acids. Tofu and other forms of soybeans, which exist in Indonesian culture, contain ALA.

FUTURE ACTIVITIES

This report is a milestone of the Advisory Group for the future of fatty acid nutrition and health in Indonesia. Several studies of fatty acids are underway, and their findings will ultimately allow revision of the current report. While the adoption of ISSFAL and AHA recommendations will apply for 3 years (2005 -2007), the Advisory Group, with its related competent institutions, will undertake the following activities:

1. Compile a database of available quality Indonesian studies of food consumption.,with special regard to those related to CHD and its risks
2. Review and re-analyze consumption data using ‘relevant’ food composition tables with values for n-3 and n-6 fatty acids
3. Put the present recommendation to Widya Karya Nasional Pangan dan Gizi
4. Prepare the second report on ‘Desirable Intakes of Polyunsaturated Fatty Acids in Indonesian Adults’.

AUTHOR DISCLOSURES

Asikin Hanafiah, Darwin Karyadi, Widjaja Lukito, Muhilal and Fadilah Supari, no conflicts of interest.

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Special Report

Desirable intakes of polyunsaturated fatty acids in Indonesian adults

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印尼成人多元不飽和脂肪酸期望攝取量

一個印尼脂肪酸營養和健康顧問團在 2004 年成立，關切印尼日漸增加的營養相關心血管疾病發生率。新興的國際建議多將焦點放在膳食脂肪，未必能符合國內的狀況。傳統飲食型態對於缺血性心臟病有明顯保護者，其脂肪多來自特定來源，像椰子、黃豆、花生或魚。使用這些脂肪的同時，也吃了其他潛在保護心血管的食物，像豆科植物、蔬菜、水果和水生食物。在印尼，最適的多元不飽和脂肪酸攝取很可能同時反映了絕對攝取量，及 n–3 和 n–6 長鏈脂肪酸間的關係。這些議題留待持續與積極的評估，例如反式脂肪酸的攝取，及其對管理及食品標示的意涵。一些進行中和其他需要進行的研究，將使顧問團能依據印尼的證據準備第二次報告。同時，顧問團也建議建議 AHA（美國心臟協會）和 ISSFAL（脂肪酸及脂肪國際學術協會）保留到 2007 年底。

關鍵字：omega–3 脂肪酸、慢性疾病、飲食型態、琉球營養與心血管疾病圓桌會議、椰子、魚、黃豆、豆腐、天貝。