Communicating Health Messages about N-3FA

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Abstract. Dietary advice to the public about fat consumption has consistently emphasized the reduction of total fat, saturated fat and cholesterol. Against a background of conflicting and changing messages about how much and what type of fat to consume, updated messages have emerged that emphasize the fatty acid profile of the fat, e.g. Dietary Guidelines for Americans, 2000. General scientific agreement supports the recommendation to increase omega-3 fatty acid (n-3FA) consumption and reduce omega-6 (n-6FA) intake. Specific quantitative recommendations for n-3FA intake, however, vary widely among countries and expert groups and have not yet been included among the National Academy’s Recommended Dietary Allowances. Unresolved questions remain about safe limits for infants, patients with certain health risks and interactions between n-6FA and n-3FA. Complexities about different fatty acid classes and n-3FA in particular further complicate communications efforts to provide concise and accurate guidance for public health. Food sources of n-3FA are limited and new ways of incorporating these fatty acids into foods need to be developed. Biotechnology and food technology are likely to be important in enhancing n-3FA intake for all segments of the population. Communications challenges presented by emerging and conflicting science about different classes of fatty acids and the health benefits of n-3FA are discussed in detail.

Keywords: health messages, n-3 fatty acids, communications, dietary fat

BACKGROUND

For the past two decades or more, dietary recommendations regarding fat intake have consistently focused on reducing consumption of total fat, saturated fat and cholesterol as a means of lowering blood low-density lipoprotein (LDL) and cholesterol levels and avoiding excess calorie intake (Dietary Guidelines Advisory Committee 1985-1995, National Research Council, 1989, National Cholesterol Education Program 1993). Fat has principally been viewed as the major culprit in overweight and the development of heart disease and other chronic diseases. In spite of increasing awareness of the complex contribution to health of individual fatty acids and fatty acid classes, general advice to the public has emphasized restriction of certain classes of fatty acid – saturates and trans fatty acids – and limitation of calories from fat to no more than 30% total energy. The health-promoting attributes of fats have largely been overlooked. Recognition of the complex and sometimes contradictory effects of individual fatty acids in the reduction of disease risk has made it exceedingly difficult to craft health messages for the public without enhancing the confusion about dietary fat that already exists (Food and Agriculture Organization, 1994). As new knowledge accrues, guidance on dietary fat is likely to become more complex. The most recent edition of the Dietary Guidelines for Americans released in May 2000, reflects these issues (Dietary Guidelines Advisory Committee, 2000). Better understanding of the complexities of fatty acid metabolism creates new opportunities to develop health messages that are targeted to specific audiences, focused on health promotion, compatible with disease prevention and are attuned to consumer behavior. Health messages to the public encouraging consumption of n-3FA and tempering n-6FA intake present unique challenges and opportunities.

Scope of Health Effects of n-3FA

It is now clear that the n-3 long chain fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) have direct and indirect effects on the heart that are protective against heart disease. They consistently lower triacylglycerol levels in normal and hyperlipidemic subjects, reduce platelet aggregation, usually reduce cholesterol levels, modestly increase LDL and high density lipoprotein (HDL) levels, modulate endothelial activation, and reduce cardiac arrhythmias (Connor 2000, von Schacky 2000). In addition, they have been shown to reduce blood pressure, risk of sudden death, mortality from coronary heart disease in subjects with a previous myocardial infarction, modulate endothelial activation and improve vasodilation and blood rheology (Burr et al. 1989, Nettleton 1995, Albert et al. 1998, De Caterina et al. 2000, von Schacky 2000). In addition to their effects in protecting against heart disease, n-3FA act as immunomodulators, reducing the immune and inflammatory responses in immune-based diseases such as arthritis, psoriasis and asthma and in autoimmune disorders such as lupus and nephropathy (Connor 2000, James et al. 2000, Kremer 2000). N-3FA may also be beneficial in multiple sclerosis, certain cancers, peroxisomal disorders and in enhancing resistance to infection (Nettleton 1995, Ip 1997, Gogos et al. 1998, Harbige 1998, Martinez et al. 2000). A recent frontier where n-3FA appear beneficial is certain neuropsychiatric illnesses such as bipolar disorder, schizophrenia and depression (National Institutes of Health 1998, Stoll et al. 1999).
Benefits of n-3FA in infant nutrition

N-3FA are considered essential nutrients for fetal and infant development (Innis 1991, Uauy and Hoffman 2000), although absolute requirements have not been defined (Gibson and Makrides 2000). DHA is the required fatty acid, though infants can synthesize DHA from alpha-linolenic acid (ALA) and EPA. Recommended levels of n-3FA for infant formulae vary among countries and controversy exists about the supplementation of formulae with EPA and DHA (Scott et al. 1998). All agree that at a minimum ALA is appropriate. Interactions with n-6FA, particularly arachidonic acid, are an important consideration if fatty acid imbalances are to be avoided. Infant nutrition may be enhanced if effective ways to boost the consumption of n-3FA by pregnant and nursing women can be found. Recognition of the desirability of such an approach is a first step.

COMMUNICATIONS ISSUES

While the public has been reminded to limit fat intake to combat heart disease, diverse targets have been suggested. The Dietary Guidelines for Americans, the American Heart Association and others have recommended total energy intakes that comprise no more than 30% calories from fat, with saturated fat not exceeding 10% calories. Very low fat diets with no more than 15% calories from fat have been promoted as an antidote to heart disease and a way to reduce weight (Ornish et al. 1990). The most recent edition of the Dietary Guidelines describes a diet limited to 30% calories from fat as “moderate.” This subtle shift in language recognizes that people have difficulty adhering to diets with less fat and that the benefits of consuming less fat have been questioned. The public, however, has heard conflicting messages in translating numbers to foods. Examples of these mixed messages are shown in Table 1. There may not be any good or bad foods, but some say there are good and bad fats and that some foods are unhealthy any time (Center for Science in the Public Interest 2000). Vegetable fats may be preferable to animal fats, but what about tropical vegetable oils and margarine? If saturated fatty acids are the dietary villains in raising blood cholesterol levels, does that mean everything else is okay?

The history of health messages about butter, margarine and spreads is illustrative of both changing science and consumer confusion (Katan 2000). Originally, margarine was promoted as superior to butter because of its lower saturated fatty acid content. Differences among margarines were minimized in the belief that the net effect would be lower saturated fatty acid intake. With the realization that some margarines, particularly stick types, may contain tropical oils rich in saturated fatty acids and partially hydrogenated oils rich in trans fatty acids, and might actually be less healthful than butter, margarine became suspect (Mensink and Katan 1990, Lichtenstein et al. 1999). As concern about the health advantages of margarines changed, emphasis shifted to soft margarines over stick versions, but inevitably the popular press returned to the comparison with butter. Recent product developments include margarines free of trans fatty acids and specialty soft margarines enhanced with phytosterols to control blood cholesterol levels. Focus solely on soft margarine still leaves open the question for consumers of which functionally desirable (solid) fats are nutritionally suitable for baking. Add the plethora of brand and composition differences among products and consumers still have reason to be confused.

Similar evolution is occurring among vegetable oils except that the emphasis has shifted from encouraging consumption of high linoleic acid polyunsaturated oils to those with predominantly monounsaturated fatty acids. Simple identity may be obscured with the development of vegetable oils having markedly different fatty acid profiles from the original product, e.g. high oleic acid soy and sunflower oils. Product labels alert the consumer to these changes, but consumers can no longer rely on the food source or shorthand nomenclature such as “vegetable” to indicate the predominant fatty acid classes. Diversity of fatty acid profile from the same plant source, e.g. soy, canola and sunflower, arguably a consumer benefit from biotechnology, changes the way consumer education messages must be crafted and demands that nutritionists, physicians and health educators stay abreast of such important changes in the food supply. This oversimplistic example illustrates the difficulty faced by those developing simple, food-based messages for the general public. Whether relatively simple dietary messages about fat can ever be effective or meaningful will need to be evaluated.

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Table 1. Mixed messages about dietary fat.

- Eat a low fat diet – 30% calories from fat
- Very low fat diets may reverse coronary heart disease
- Choose a diet moderate in fat
- No good foods/bad foods
- Good fats and bad fats
- Vegetable fats are better than animal fats
- Avoid tropical oils and shortening
- Saturated fatty acids are the villains in heart disease
- Trans fatty acids are worse than saturates
- Margarine is better than butter
- Some margarines are no better than butter
- Some margarines help lower blood cholesterol
- Some vegetable oils are healthier than others
- Both fatty fish and lean fish are good for you

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SCIENTIFIC ISSUES

Both scientists and consumers confront new and changing information. Nutritionists have responded to new data and emerging understanding about fatty acid metabolism by modifying dietary advice to the public, paying greater attention to the interactions and complexities of dietary fatty acids and putting greater effort into quantifying minimal and safe levels of intake. Thus, the most recent Dietary Guidelines for Americans, emphasize moderate fat intake and consumption of monounsaturated fatty acids, with acknowledgment of the diverse effects among polyunsaturated fatty acids. While many scientists admit that n-6FA intakes may be excessive, not all would advocate reducing their consumption. Official mention in dietary advice to the public of the value of fish oils and n-3FA has been long in arriving (Holman 1998). It may be said that nutrition scientists generally agree about the desirability of a low intake of saturated and trans fatty acids, the relatively benign effect of monounsaturates (Feldman 1999), and the potential for excess n-6FA intake to be detrimental. There is also general agreement about the essentiality of n-3FA for infant development, the cardio-protective effects of n-3FA and the desirability of increasing n-3FA intake by the general population (Simopoulos et al. 1999). By how much intake should increase is unsettled and ways to effect such change present challenges. For people with certain diseases, questions of dose, therapeutic effects and duration of treatment are unresolved. Consumption of n-3FA may have contradictory effects. The benefit of n-3FA among Type 2 diabetics whose risk of heart disease may be reduced perhaps at some cost to their glucose control is an example. Further, the inherent complexities about n-3FA themselves makes resolution of these questions particularly difficult. To what extent can ALA substitute for EPA and DHA? To what extent does high intake of n-6FA compromise the benefit of n-3FA consumption?

A summary of the different recommendations for n-3FA intake is shown in Table 2 (Simopoulos et al. 1999, Kris-Etherton 2000). These recommendations reflect not only differences in units – ratios, grams, percent total energy – but in quantity. Figures shown for the U.S. have not been adopted officially. Differences in recommendations between the U.K. and Sweden, 1.5% and 4.0% energy respectively, show how widely national recommendations can vary.

Finally, it is useful to note that the emergence of new nutrition knowledge can have the paradoxical effect of refining dietary guidelines and discouraging the incorporation of new information into health messages until more precise information becomes available. It is in announcing and interpreting new findings for the public that the news media excel and public interest thus generated makes it compelling that health messages from scientists stay current.

Table 2. Recommended intakes of n-3 fatty acids *.

<table>
<thead>
<tr>
<th>Source</th>
<th>Ratio</th>
<th>ALA</th>
<th>EPA+DHA</th>
<th>Total n-6:n-3</th>
<th>n-3FA g/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO</td>
<td>5-10:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>5:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>2:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masters</td>
<td>2.3:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMA (UK)</td>
<td>-</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BNF</td>
<td>2.4</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NATO</td>
<td>-</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>2.2</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
<td>1.2-1.6</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
<td></td>
<td></td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>WHO</td>
<td></td>
<td></td>
<td></td>
<td>2.8</td>
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FUTURE COMMUNICATIONS

As awareness of the health benefits of n-3FA increases, the need to quantify and refine dietary fat messages will become more urgent. The need to diversify food sources of n-3FA will become pressing. EPA and DHA are most concentrated in fatty fish: salmon, tuna, rainbow trout, sardines, mackerel, Atlantic bluefish, herring and anchovies, while ALA is found mainly in canola, soy and flaxseed oils. Other avenues for furnishing n-3FA include fish oil supplements, purified fatty acids, algal sources and functional foods with micro-encapsulated n-3FA (Lovegrove et al. 1997, Newton 1998, Kris-Etherton 2000). Genetically engineered seed oils with enhanced n-3FA or their precursors may also be promising (Ursin 2000). Poultry and eggs have become important sources in the U.S. diet because fish meal is fed to chickens and substantial amounts of chicken are consumed (Huang et al. 1990, Raper and Exler 1991). Awareness of diverse food sources of n-3FA will need to increase.

Acknowledgement of the differences in effectiveness between plant and animal sources of n-3FA may be important. In order to encourage interest in and adoption of dietary fat guidance, it is desirable to explain the benefits beyond changes in blood cholesterol levels. For the greater public health, it will likely become even more important to emphasize preventive health strategies rather than therapeutic approaches. Communication about n-3FA can also capitalize on the public’s strong interest in
diet and health, organic and natural foods and innovative products that encourage modification of dietary habits. The success of the food industry in developing low fat foods shows that food manufacturers are responsive to consumer trends. Applications from genomics and biotechnology are promising for developing more healthful foods with enhanced n-3FA content.

Effective communications strategies take into account specific audiences, the need to tailor the message to the audience, and simplicity. Updated health information about fat, however, is complex, competes in an environment laden with conflicting messages and reaches audiences already mystified by food fats, oils and margarines. Moreover, the effects of dietary change occur over the long term and may not be sensed by the individual. Against this daunting background is the enduring popularity of food and the pleasure of eating, the power and potential of n-3FA themselves, people’s interest in their own health and popular fascination with promising science. Surely a wager on the side of n-3FA is a winning bet.

REFERENCES


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