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Evidence Report/Technology Assessment
Number 91

Health Effects of Omega-3 Fatty Acids on Asthma

Prepared for:
Agency for Healthcare Research and Quality
U.S. Department of Health and Human Services
540 Gaither Road
Rockville, MD 20850
www.ahrq.gov

Contract No. 290-02-0021

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AHRQ Publication No. 04-E013-2
March 2004

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Suggested Citation:
Schachter H, Reisman J, Tran K, Dales B, Kourad K, Barnes D, Sampson M, Morrison A, Gaboury I, and Blackman J. Health Effects of Omega-3 Fatty Acids on Asthma. Evidence Report/Technology Assessment No. 91 (Prepared by University of Ottawa Evidence-based Practice Center under Contract No. 290-02-0021). AHRQ Publication No. 04-E013-2. Rockville, MD: Agency for Healthcare Research and Quality. March 2004.

Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Evidence-based Practice Centers (EPCs), sponsors the development of evidence reports and technology assessments to assist public- and private-sector organizations in their efforts to improve the quality of health care in the United States. This report was requested and funded by the Office of Dietary Supplements, National Institutes of Health. The reports and assessments provide organizations with comprehensive, science-based information on common, costly medical conditions and new health care technologies. The EPCs systematically review the relevant scientific literature on topics assigned to them by AHRQ and conduct additional analyses when appropriate prior to developing their reports and assessments.

To bring the broadest range of experts into the development of evidence reports and health technology assessments, AHRQ encourages the EPCs to form partnerships and enter into collaborations with other medical and research organizations. The EPCs work with these partner organizations to ensure that the evidence reports and technology assessments they produce will become building blocks for health care quality improvement projects throughout the Nation. The reports undergo peer review prior to their release.

AHRQ expects that the EPC evidence reports and technology assessments will inform individual health plans, providers, and purchasers as well as the health care system as a whole by providing important information to help improve health care quality.

We welcome written comments on this evidence report. They may be sent to: Director, Center for Outcomes and Evidence, Agency for Healthcare Research and Quality, 540 Gaither Road, Rockville, MD 20850.

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The authors of this report are responsible for its content. Statements in the report should not be construed as endorsement by the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services of a particular drug, device, test, treatment, or other clinical service.

Acknowledgments

The authors would like to thank numerous individuals for their support of the present project: our collaborators at Southern California/RAND (SC-RAND) and Tufts-New England Medical Center (Tufts-NEMC) EPCs; Isabella Steffensen and Christine Murray for their ability to convey with words, tables and figures what it is we did and found; Vasil Mamaladze, Uwe Siebert, Marie Sirdevan, and Malgorzata Winiszewska for their expert and timely translation of articles; Jonathan Arm for taking the time to clarify the relationship of two, included reports on research in which he played a key role; Lillian Thompson for her words of wisdom regarding flaxseed; Herb Woolf for responding with substance to our request of industry for evidence; Peter O'Blenis for assuring that our software would adapt and grow as quickly as the project requirements shifted and expanded; Tammy Clifford for her thoughts on research design; Gabriela Lewin and Adrienne Showler for their ideas concerning the organization of the data; Nick Barrowman for his grounding on statistical matters; Isabelle French for coordinating our review team particularly in our interactions with our Technical Expert Panel, the Federal Partners, and AHRQ; Rosaly Correa-de-Araujo and Jacqueline Besteman who, as our Task Order Officers, provided the AHRQ structure affording our work; and, Anne Thurn of the Office of Dietary Supplements for her direction on behalf of the Federal Partners. Sections of Chapter 1 were developed in collaboration with Tufts-NEMC EPC, and, with contributions from SC-RAND EPC.

Structured Abstract

Context. Considerable interest in the possible value of omega-3 fatty acid supplementation in asthma was sparked by Horrobin's hypothesis that the low incidence of asthma in Eskimos stems from their consumption of large quantities of oily fish, rich in omega-3 fatty acids. Additional impetus for research came from observations that omega-3 fatty acids' possible protective, or even therapeutic, effect might be afforded by their impact on mediators of inflammation thought to be related to the pathogenesis of asthma.

Objectives. The purpose of this study was to conduct a systematic review of the scientific-medical literature to identify, appraise, and synthesize the evidence for the health effects of omega-3 fatty acids in asthma. Questions addressed the: efficacy of omega-3 fatty acids to improve respiratory outcomes; impact of covariates (e.g., omega-3 fatty acid source, type, and dose) on efficacy; influence of omega-3 fatty acids on mediators of inflammation thought to be related to the pathogenesis of asthma; value of omega-3 fatty acids as primary prevention as well as secondary prevention; and, safety profile in asthma populations, or subpopulations, and those at risk. The results may be used to inform a research agenda as well as to assist clinicians in advising patients who may wish to take this supplementation to treat or prevent asthma.

Data Sources. A comprehensive search for citations was conducted using six databases (Medline, Premedline, Embase, Cochrane Central Register of Controlled Trials, CAB Health, and, Dissertation Abstracts). Searches were not restricted by language of publication, publication type, or study design except with the MeSH term "dietary fats," which was limited by study design to increase its specificity. Search elements included: scientific terms, with acronyms, as well as generic and trade names relating to the exposure and its sources (e.g., eicosapentaenoic acid; EPA; omega-3 fatty acids; MaxEPA®; fish oil); and, relevant population terms (e.g., asthma; inflammation). Additional published or unpublished literature was sought through manual searches of reference lists of included studies and key review articles, and from the files of content experts.

Study Selection. Studies were considered relevant if they described human populations of any age, involved any type of study design, and investigated the use of any foods or extracts known to contain omega-3 fatty acids as a treatment, primary or secondary prevention. Populations in treatment or secondary prevention studies had to have received a diagnosis of asthma, whereas those in primary prevention studies could be either at elevated risk for asthma or healthy (i.e., without asthma). A treatment study could assess a respiratory outcome, mediators of inflammation, or safety. A primary prevention study needed, at the very least, to estimate asthma prevalence or incidence. A secondary prevention study required a longterm assessment of respiratory function. Two levels of screening for relevance, and two reviewers per level, were employed. Disagreements were resolved by forced consensus and, if necessary, third party intervention.

Data Extraction. All data were abstracted by one reviewer, then checked by another one. Data pertained to the characteristics of the report, study, population, intervention/exposure and comparator(s), cointerventions, withdrawals and dropouts, and outcomes (including safety).

Study quality (internal validity) and study applicability (external validity) were each rated independently by two assessors, with disagreements resolved by forced consensus and, if necessary, third party intervention.

Data Synthesis. Question-specific qualitative syntheses of the evidence were derived. Problems and limitations of available studies made it inappropriate to conduct meta-analysis of randomized controlled trial (RCT) evidence for any question: e.g., missing data, flawed designs, non-comparable study parameters. In interpreting results, greater emphasis was placed on RCT evidence given its status as the gold standard by which an intervention/exposure's efficacy or effectiveness is investigated. Forced expiratory volume in one second (FEV_1) was selected as the primary outcome given its status as a gold standard index of pulmonary function. Thirty-one reports, describing 26 unique studies, were deemed relevant for the systematic review, with five studies each described by two reports.

Conclusions. Aside from an acceptable safety profile, it is impossible to definitively conclude anything with respect to the value of using omega-3 fatty acid supplementation in asthma for adults or children either in or beyond North America. The lack of sufficiently consistent evidence, as well as a paucity of evidence from well-designed, well-conducted and adequately powered studies suggests that no definitive conclusion can yet be drawn regarding the efficacy of omega-3 fatty acid supplementation as a treatment. The influence on efficacy of key intervention, population or cointervention factors (e.g., sources, types or doses of omega-3 fatty acid content) cannot yet be determined. The picture of the impact of the exposure on mediators of inflammation thought to be related to the pathogenesis of asthma is largely unclear. There are too few studies from which to conclude anything definitive with respect to primary prevention. Some data suggest that dietary fish consumption, including oily fish, may serve a protective role for children, yet this association was neither observed for adolescent (positive association) or adult populations (no association). Final follow-up data when children reach five years of age in a large randomized controlled trial should provide a clearer picture of the value of omega-3 fatty acids as early primary prevention. No safety profile relating to omega-3 fatty acid intake was reported for primary prevention studies, and little probability of harm beyond occasional mild discomfort was observed in treatment studies. The questions of secondary prevention and of safety related to omega-3 fatty acid use in subpopulations of asthmatics could not be addressed due to a lack of studies. Overall, the present collection of evidence likely does not constitute the best test of the overarching hypothesis that omega-3 fatty acid supplementation alone can foster asthma-related benefits. Future research investigating North American samples is likely needed to establish or refute the value of omega-3 fatty acids to treat or prevent asthma in North American adults and children.

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http://www.ahrq.goc/clinic/epcindex.htm