NEOLIFE

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Omega-III Salmon Oil Plus

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NEOLIFE STUDIES

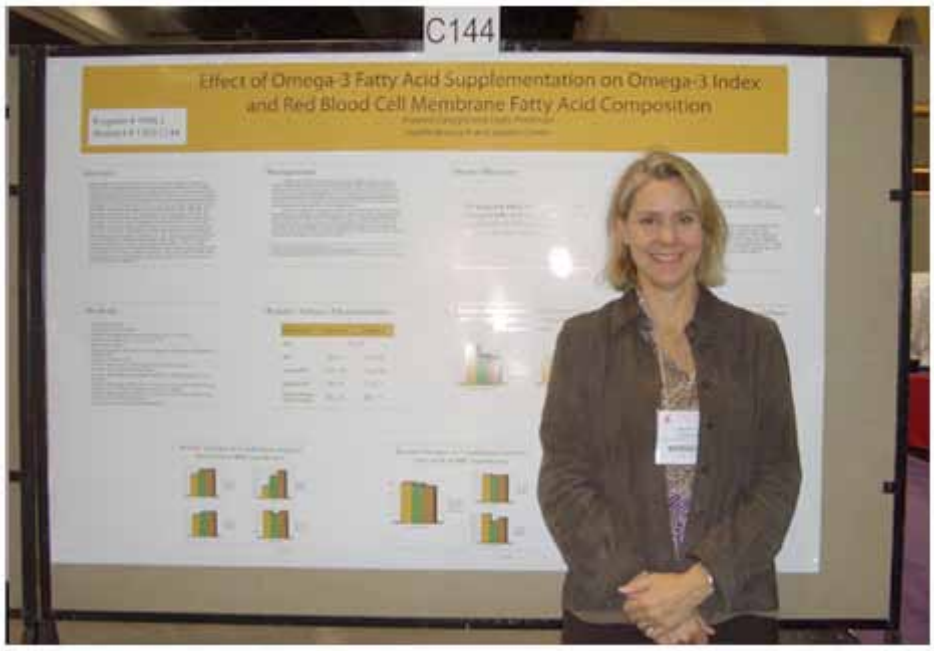
5-Lipoxygenase Metabolite 4-HDHA Is a Mediator of the Antiangiogenic Effect of ω-3 Polyunsaturated Fatty Acids

ANTI-ANGIOGENESIS
Przemyslaw Sapieha,1,2* Andreas Stahl,1,3* Jing Chen,1 Molly R. Seaward,1 Keirnan L. Willett,1 Nathan M. Krah,1 Roberta J. Dennison,1 Kip M. Connor,1† Christopher M. Aderman,1 Elvira Liclican,4 Arianna Carughi,5,6 Dalia Perelman,5,6 Yoshihide Kanaoka,7 John Paul SanGiovanni,8 Karsten Gronert,4 Lois E. H. Smith1‡

ABSTRACT
Lipid signaling is dysregulated in many diseases with vascular pathology, including cancer, diabetic retinopathy, retinopathy of prematurity, and age-related macular degeneration. We have previously demonstrated that diets enriched in ω-3 polyunsaturated fatty acids (PUFAs) effectively reduce pathological retinal neovascularization in a mouse model of oxygen-induced retinopathy, in part through metabolic products that suppress microglial- derived tumor necrosis factor–a. To better understand the protective effects of ω-3 PUFAs, we examined the relative importance of major lipid metabolic pathways and their products in contributing to this effect. ω-3 PUFA diets were fed to four lines of mice deficient in each key lipid-processing enzyme (cyclooxygenase 1 or 2, or lipoxygenase 5 or 12/15), retinopathy was induced by oxygen exposure; only loss of 5-lipoxygenase (5-LOX) abrogated the protection against retinopathy of dietary ω-3 PUFAs. This protective effect was due to 5-LOX oxida-tion of the ω-3 PUFA lipid docosahexaenoic acid to 4-hydroxy-docosahexaenoic acid (4-HDHA). 4-HDHA directly inhibited endothelial cell proliferation and sprouting angiogenesis via peroxisome proliferator–activated receptor γ (PPARγ), independent of 4-HDHA's anti-inflammatory effects. Our study suggests that ω-3 PUFAs may be profit-ably used as an alternative or supplement to current anti–vascular endothelial growth factor (VEGF) treatment for proliferative retinopathy and points to the therapeutic potential of ω-3 PUFAs and metabolites in other diseases of vasoproliferation. It also suggests that cyclooxygenase inhibitors such as aspirin and ibuprofen (but not lipoxygenase inhibitors such as zileuton) might be used without losing the beneficial effect of dietary ω-3 PUFA.

Source
Science Translational Medicine, Vol. 3, Issue 69, Pages 1-12: "5-Lipoxygenase Metabolite 4-HDHA Is a Mediator of the Antiangiogenic Effect of w-3 Polyunsaturated Fatty Acids." February 09, 2011

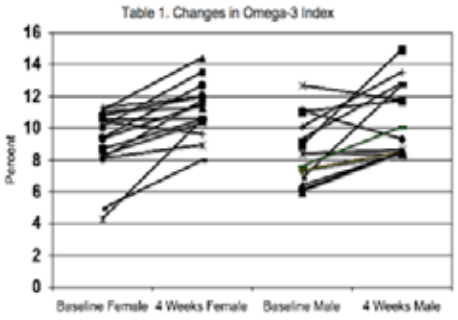
Effect of Omega-3 Fatty Acid Supplementation on Omega-3 Index and Red Blood Cell (RBC) Membrane Fatty Acid Composition



Omega III Salmon Oil Plus Published in FASEB online Journal April 2008

ABSTRACT
Omega-3 fatty acids (n-3 FA) have been shown from epidemiological studies and clinical trials to reduce the incidence of cardiovascular disease (CVD) in patients with the pre-existing CVD as well as in healthy individuals. In randomized secondary prevention trials fish or fish oil have been shown to reduce total and coronary heart disease (CHD) mortality at intakes of about 1 g/day. The Omega-3 Index (EPA + DHA expressed as % of total fatty acid) has been proposed as a physiologically relevant, modifiable, independent and graded risk factor for death from CHD. RBC membrane fatty acid composition correlates well with biomarkers of n-3 FA including serum EPA and DHA, whole blood EPA, DPA and DHA and fatty acid composition of cardiac tissue. The present dietary intervention study investigates the effect of a fish-oil based, n-3 FA supplement on Omega-3 Index and RBC fatty acid composition. Thirty healthy men and women consumed a supplement providing 1070 mg total n-3 FA (460 mg DHA, 480 mg EPA, and 80 mg other n-3 FA) daily for 4 wks. At the end of this period there was a significant 23% increase ($p<0.01$) in the Omega-3 Index (Fig.1). While there were no significant changes in % linoleic, gamma linoleic, and alpha linolenic acid; EPA, DPA and DHA

significantly (p<0.01) increased compared to baseline values (0.76% versus 1.4%; 2.30% versus 2.58% and 5.49% versus 6.60% respectively. There was a decrease (p<0.05) in arachidonic acid 19.58% versus 18.83%). This study shows that RBC membrane fatty acid composition and so Omega-3 Index can change in a short period of time with a fish-oil based supplement.



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Harris, WS, von Schacky C: The Omega-3 Index: A new risk factor for sudden cardiac death? Prev. Med. 2004, 39:212-220.

Harris et al. Omega-3 Fatty Acids in Cardiac Biopsies from Heart Transplant Patients: Correlation with Erythrocytes and Response to Supplementation. Circulation. 2004

http://www.gnldcontent.com/omega3/us/faseb.html

Reduced Cardiovascular Risk by Lowering Inflammatory Index

ABSTRACT

Carughi A. and Perelman D. Health

Research & Studies Center, Los Altos, CA.

Epidemiological and clinical studies have shown the cardio-protective effects of omega-3 (n-3) FA in patients with pre-existing cardiovascular disease and in healthy individuals. While mechanisms of action are not fully understood, n-3 FA are known to influence eicosanoid generating systems from membrane phospholipids and to lower proinflammatory circulating lipids. This study investigated the effects of low dose, marine sourced n-3 FA supplementation on selected markers of cardiovascular health and inflammation in healthy, normo-triglyceridemic volunteers. Thirty-one men and women took a supplement providing 1070 mg n-3 FA, comprising 480 mg docosahexaenoic acid (DHA), 460 mg eicosapentaenoic acid (EPA), 50 mg docosapentaenoic acid (DPA) and 80 mg other n-3 FA daily for 8 wks. At the end of the supplementation period, % EPA, DHA and DPA in red blood cell membranes (RBCm) were higher than baseline values (p<0.01). Although neither % linoleic acid nor γ linolenic acid in RBCm change, % arachidonic acid (AA) was significantly lower. There was a 38% increase (p<0.01) in the omega-3 index (%DHA + %EPA in RBCm; 6.1 ± 1.8 vs. 8.5 ± 1.8) and a 17% reduction (p<0.01) in serum triglycerides. Lp-PLA2 levels were slightly higher after supplementation (147 ± 43 vs. 157 ± 51 nm/mL) but were within the normal range. While IL-6 levels did not change, inflammatory index was significantly lower (%AA:%EPA in RBCm; 2.5 ± 1.8 vs. 0.8 ± 1.2). This study shows that low dose, marine sourced n-3 supplementation for just 8 weeks can have a positive effect on markers of cardiovascular health and inflammation.

Source

http://www.gnldcontent.com/omega3/us/ACN.html

Effect of Omega-3 Fatty Acid Supplementation on Cardiovascular Risk Factors and Inflammatory Markers

ABSTRACT

Diets rich in omega-3 fatty acids (n-3 FA) are associated with lower cardiovascular (CV) morbidity and mortality. Numerous mechanisms, including triglyceride-lowering and anti-inflammatory effects, have been proposed to explain the protective action of n-3 FA. We investigated the effect of marine-sourced n-3 FA supplementation on CVD risk factors and on markers of inflammation in healthy, normotriglyceridemic volunteers. Thirty-one men and women took a supplement providing 1070 mg total n-3 FA (480 mg docosahexaenoic acid, DHA; 460 mg eicosapentaenoic acid, EPA; 50 mg docosapentaenoic acid, DPA; and 80 mg other n-3 FA) daily for 8 wks. By 4 wks, values for % EPA, DPA, and DHA in red blood cell (RBC) membranes were significantly higher than at baseline, and kept increasing until the end of the study, when they were 56%, 16%, and 19% higher (p < 0.01, 0.05, and 0.01, respectively). While there were no changes in % linoleic acid or % -linolenic acid in RBC membranes, % arachidonic acid was 10% lower after supplementation (p < 0.05). At 8 wks serum triglyceride levels were 17% lower (p < 0.01), Omega-3 Index (% DHA + EPA in RBC) was 38% higher (p < 0.01), and the omega-6/omega-3 ratio was 30% lower (p < 0.05) than at baseline. Lp-PLA2 levels were slightly higher (147 ± 43 and 157 ± 51; p<0.05) but well within the normal range. While there were no significant changes in IL-6 and TNFa levels, Inflammatory Index was 68% lower (%AA: %EPA in RBC; p<0.01) after supplementation. This study shows that supplementation with relatively low levels of

marine-sourced omega-3 fatty acids can quickly improve cardiovascular risk factors and modify fatty acid RBC membrane composition consistent with a lower inflammatory state.

Source
http://www.gnldcontent.com/omega3/us/Linus.html%5D

Impact of Dietary Omega-3 and Omega-6 PUFA on DHA-derived Protective Autacoid Circuits

Gronert, Karsten and Leedom, Alexander from University of California, Berkeley, Vision Science Program, School of Optometry, Berkeley, CA

Carughi, Arianna and Perelman, Dalia from Health Research and Studies Center, Los Altos, CA

The Western diet contains 20-25 fold more omega-6 than omega-3 PUFA. Based on population studies and clinical trials omega-3 PUFA have been specifically recommended for the prevention of cardiovascular disease, and disorders with an inflammatory component such as retinopathies, rheumatoid arthritis and asthma. However, the mechanism for the beneficial effect of omega-3 PUFA is just beginning to unfold. DHA is a significant omega-3 PUFA in all human tissues and, more importantly, its levels are directly dependent on diet. The discovery of antiinflammatory DHA-derived mediators, protectin D1 (PD1) and 17S-resolvins, provides new insights into mechanisms for the anti-inflammatory effect of dietary omega-3 PUFA. We assessed the impact of short-term dietary omega-3 PUFA and omega-6 PUFA supplementation on lipid mediator profiles and outcome of acute and chronic inflammation in mice. Short-term dietary manipulation of omega-3/omega-6 PUFA dramatically altered formation of eicosanoids and DHA-derived mediators and extend of inflammatory injury and pathological neovascularization. Protective DHAderived mediators, 17-HDHA and PD1, were formed at significantly levels in mice, human corneas and serum from healthy human volunteers. More importantly, an 8- week clinical trial with 30 healthy volunteers demonstrated that fish oil supplements caused only a small significant change in tissue DHA, EPA and AA levels. However, lipidomic analyses of clotted blood from these volunteers demonstrated a striking and selective inhibition of leukocyte lipoxygenase activity. Our findings demonstrate that subtle changes in omega-3 PUFA tissue levels are sufficient to markedly alter the state of leukocyte activation and add to a rapidly evolving paradigm, namely that formation of DHA-derived signals constitutes a resident anti-inflammatory circuit that is amenable to dietary amplification.
Supported in part by grants from the National Eye Institute (EY016136 and P30EY003176)

Source
http://www.gnldcontent.com/omega3/US/Gronert.html

PEER REVIEWED STUDIES

Bone and Joint Health

Effect of glucosamine sulfate with or without omega-3 fatty acids in patients with osteoarthritis

ABSTRACT
INTRODUCTION:
A total of 177 patients with moderate-to-severe hip or knee osteoarthritis (OA) were tested over a period of 26 weeks in a two-center, two-armed, randomized, double-blind, comparison study. The aim was to see if a combination of glucosamine sulfate (1500 mg/day) and the omega-3 polyunsaturated fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (group A), showed equivalence (noninferiority) or superiority as opposed to glucosamine sulfate alone (group B).

METHODS:
The primary therapy evaluation was performed using the Western Ontario and McMaster Universities Arthrosis index (WOMAC) score. At the end of the study, a reduction in the pain score of > or =20% was required (primary target criterion) and the quantitative difference in the WOMAC subscores pain, stiffness, and function were analyzed (secondary target criteria).

RESULTS AND CONCLUSION:
When a minimal pain reduction of > or =20% was chosen, there was no statistically significant difference in the number of responders between the two groups (92.2% group A, 94.3% group B). A higher responder criterion (> or =80% reduction in the WOMAC pain score) was chosen. Therefore, the frequency of responders showed a therapeutic and statistical superiority for the combination product of glucosamine sulfate and the omega-3 polyunsaturated fatty acids in patients who complied with the study protocol (group A 44%, group B 32%; P=0.044). OA symptoms (morning stiffness, pain in hips and knees) were reduced at the end of the study: by 48.5%-55.6% in group A and by 41.7%-55.3% in group B. The reduction was greater in group A than in group B. There was a tendency toward superiority shown in the secondary target criteria and concurrent variables. In the global safety evaluation, both products have been demonstrated to be very safe in long-term treatment over 26 weeks. To our knowledge, this is the first clinical trial in which glucosamine was given in combination with omega-3 fatty acids to patients with OA.

Source
Gruenwald J, et al. Effect of glucosamine sulfate with or without omega-3 fatty acids in patients with osteoarthritis. Adv Ther. 2009 Sep;26(9):858-71.

Inflammatory cells during wound repair: the good, the bad and the ugly

ABSTRACT
Damage to any tissue triggers a cascade of events that leads to rapid repair of the wound - if the tissue is skin, then repair involves re-epithelialization, formation of granulation tissue and contraction of underlying wound connective tissues. This concerted effort by the wounded cell layers is accompanied by, and might also be partially regulated by, a robust inflammatory response, in which first neutrophils and then macrophages and mast cells emigrate from nearby tissues and from the circulation. Clearly, this inflammatory response is crucial for fighting infection and must have been selected for during the course of evolution so that tissue damage did not inevitably lead to death through septicemia. But, aside from this role, exactly what are the functions of the various leukocyte lineages that are recruited with overlapping time courses to the wound site, and might they do more harm than good? Recent knockout and knockdown studies suggest that depletion of one or more of the inflammatory cell lineages can even enhance healing, and we discuss new views on how regulation of the migration of inflammatory cells to sites of tissue damage might guide therapeutic strategies for modulating the inflammatory response.

Source
Martin P, et al. Inflammatory cells during wound repair: the good, the bad and the ugly. Trends Cell Biol. 2005 Nov;15(11):599-607.

CELLULAR HEALTH

Docosapentaenoic acid (22:5n-3): a review of its biological effects.

ABSTRACT
This article summarizes the current knowledge available on metabolism and the biological effects of n-3 docosapentaenoic acid (DPA). n-3 DPA has not been extensively studied because of the limited availability of the pure compound. n-3 DPA is an elongated metabolite of EPA and is an intermediary product between EPA and DHA. The literature on n-3 DPA is limited, however the available data suggests it has beneficial health effects. In vitro n-3 DPA is retro-converted back to EPA, however it does not appear to be readily metabolised to DHA. In vivo studies have shown limited conversion of n-3 DPA to DHA, mainly in liver, but in addition retro-conversion to EPA is evident in a number of tissues. n-3 DPA can be metabolised by lipoxygenase, in platelets, to form ll-hydroxy-7,9,13,16,19- and 14-hydroxy-7,10,12,16,19-DPA. It has also been reported that n-3 DPA is effective (more so than EPA and DHA) in inhibition of aggregation in platelets obtained from rabbit blood. In addition, there is evidence that n-3 DPA possesses 10-fold greater endothelial cell migration ability than EPA, which is important in wound-healing processes. An in vivo study has reported that n-3 DPA reduces the fatty acid synthase and malic enzyme activity levels in n-3 DPA-supplemented mice and these effects were stronger than the EPA-supplemented mice. Another recent in vivo study has reported that n-3 DPA may have a role in attenuating age-related decrease in spatial learning and long-term potentiation. However, more research remains to be done to further investigate the biological effects of this n-3 VLCPUFA.

Source
Kaur G, et al. Docosapentaenoic acid (22:5n-3): a review of its biological effects. Progressive Lipid Research. 2011 Jan; 50(1):28-34

CHILDREN'S HEALTH

Prenatal fatty acid status and child adiposity at age 3 y: results from a US pregnancy cohort

ABSTRACT
BACKGROUND:
Exposure to polyunsaturated fatty acids (PUFAs) in early life may influence adiposity development.

OBJECTIVE:
We examined the extent to which prenatal n-3 (omega-3) and n-6 (omega-6) PUFA concentrations were associated with childhood adiposity.

DESIGN:
In mother-child pairs in the Project Viva cohort, we assessed midpregnancy fatty acid intakes (n = 1120), maternal plasma PUFA concentrations (n = 227), and umbilical cord plasma PUFA concentrations (n = 302). We performed multivariable regression analyses to examine independent associations of n-3 PUFAs, including docosahexaenoic and eicosapentaenoic acids (DHA + EPA), n-6 PUFAs, and the ratio of n-6:n-3 PUFAs, with child adiposity at age 3 y measured by the sum of subscapular and triceps skinfold thicknesses (SS + TR) and risk of obesity (body mass index ≥95th percentile for age and sex).

RESULTS:
Mean (±SD) DHA + EPA intake was 0.15 ± 0.14 g DHA + EPA/d, maternal plasma concentration was 1.9 ± 0.6%, and umbilical plasma concentration was 4.6 ± 1.2%. In children, SS + TR was 16.7 ± 4.3 mm, and 9.4% of children were obese. In the adjusted analysis, there was an association between each SD increase in DHA + EPA and lower child SS + TR [-0.31 mm (95% CI: -0.58, -0.04 mm) for maternal diet and -0.91 mm (95% CI: -1.63, -0.20 mm) for cord plasma] and lower odds of obesity [odds ratio (95% CI): 0.68 (0.50, 0.92) for maternal diet and 0.09 (0.02, 0.52) for cord plasma]. Maternal plasma DHA + EPA concentration was not significantly associated with child adiposity. A higher ratio of cord plasma n-6:n-3 PUFAs was associated with higher SS + TR and odds of obesity.

CONCLUSION:
An enhanced maternal-fetal n-3 PUFA status was associated with lower childhood adiposity.

Source

Donahue SM, et al. Prenatal fatty acid status and child adiposity at age 3 y: results from a US pregnancy cohort. am J clin nutr. 2011 Feb 10. [Epub ahead of print]

Dietary PUFA for preterm and term infants: review of clinical studies

ABSTRACT

Human milk contains n-3 and n-6 LCPUFA (long chain polyunsaturated fatty acids), which are absent from many infant formulas. During neonatal life, there is a rapid accretion of AA (arachidonic acid) and DHA (docosahexaenoic acid) in infant brain, DHA in retina and of AA in the whole body. The DHA status of breast-fed infants is higher than that of formula-fed infants when formulas do not contain LCPUFA. Studies report that visual acuity of breast-fed infants is better than that of formula-fed infants, but other studies do not find a difference. Cognitive development of breast-fed infants is generally better, but many sociocultural confounding factors may also contribute to these differences. The effect of dietary LCPUFA on FA status, immune function, visual, cognitive, and motor functions has been evaluated in preterm and term infants. Plasma and RBC FA status of infants fed formulas supplemented with both n-3 and n-6 LCPUFA was closer to the status of breast-fed infants than to that of infants fed formulas containing no LCPUFA. Adding n-3 LCPUFA to preterm-infant formulas led to initial beneficial effects on visual acuity. Few data are available on cognitive function, but it seems that in preterm infants, feeding n-3 LCPUFA improved visual attention and cognitive development compared with infants receiving no LCPUFA. Term infants need an exogenous supply of AA and DHA to achieve similar accretion of fatty acid in plasma and RBC (red blood cell) in comparison to breast-fed infants. Fewer than half of all studies have found beneficial effects of LCPUFA on visual, mental, or psychomotor functions. Improved developmental scores at 18 mo of age have been reported for infants fed both AA and DHA. Growth, body weight, and anthropometrics of preterm and term infants fed formulas providing both n-3 and n-6 LCPUFA fatty acids is similar in most studies to that of infants fed formulas containing no LCPUFA. A larger double-blind multicenter randomized study has recently demonstrated improved growth and developmental scores in a long-term feeding study of preterm infants. Collectively, the body of literature suggests that LCPUFA is important to the growth and development of infants. Thus, for preterm infants we recommend LCPUFA intakes in the range provided by feeding of human milk typical of mothers in Western countries. This range can be achieved by a combination of AA and DHA, providing an AA to DHA ratio of approximately 1.5 and a DHA content of as much as 0.4%. Preterm infants may benefit from slightly higher levels of these fatty acids than term infants. In long-term studies, feeding more than 0.2% DHA and 0.3% AA improved the status of these fattyacids for many weeks after DHA; AA was no longer present in the formula, enabling a DHA and AA status more similar to that of infants fed human milk. The addition of LCPUFA in infant formulas for term infants, with appropriate regard for quantitative and qualitative qualities, is safe and will enable the formula-fed infant to achieve the same blood LCPUFA status as that of the breast-fed infant.

Source

Fleith M, Clandinin MT. Dietary PUFA for preterm and term infants: review of clinical studies. Crit Rev Food Sci Nutr. 2005;45(3):205-29

Prenatal docosahexaenoic acid supplementation and infant morbidity: randomized controlled trial

ABSTRACT

OBJECTIVE:

Long-chain polyunsaturated fatty acids such as docosahexaenoic acid (DHA) influence immune function and inflammation; however, the influence of maternal DHA supplementation on infant morbidity is unknown. We investigated the effects of prenatal DHA supplementation on infant morbidity.

METHODS:

In a double-blind randomized controlled trial conducted in Mexico, pregnant women received daily supplementation with 400 mg of DHA or placebo from 18 to 22 weeks' gestation through parturition. In infants aged 1, 3, and 6 months, caregivers reported the occurrence of common illness symptoms in the preceding 15 days.

RESULTS:

Data were available at 1, 3, and 6 months for 849, 834, and 834 infants, respectively. The occurrence of specific illness symptoms did not differ between groups; however, the occurrence of a combined measure of cold symptoms was lower in the DHA group at 1 month (OR: 0.76; 95% CI: 0.58–1.00). At 1 month, the DHA group experienced 26%, 15%, and 30% shorter duration of cough, phlegm, and wheezing, respectively, but 22% longer duration of rash (all $P \leq .01$). At 3 months, infants in the DHA group spent 14% less time ill ($P < .0001$). At 6 months, infants in the DHA group experienced 20%, 13%, 54%, 23%, and 25% shorter duration of fever, nasal secretion, difficulty breathing, rash, and "other illness," respectively, but 74% longer duration of vomiting (all $P < .05$).

CONCLUSIONS:

DHA supplementation during pregnancy decreased the occurrence of colds in children at 1 month and influenced illness symptom duration at 1, 3, and 6 months.

Source

Imhoff-Kunsch B, Stein AD, Martorell R et al. Prenatal docosahexaenoic acid supplementation and infant morbidity: randomized controlled trial. Pediatrics.2011; 128(3):505-12.

Long-term effects of prenatal omega-3 fatty acid intake on visual function in school-age children

ABSTRACT

OBJECTIVE:

To assess the long-term effect on visual development of omega-3 polyunsaturated fatty acid (n-3 PUFA) intake during gestation.

STUDY DESIGN:
Using visual evoked potentials (VEPs), the long-term effects on visual development were evaluated in 136 school-age Inuit children exposed to high levels of n-3 PUFAs during gestation. VEP protocols using color and motion stimuli were used to assess parvocellular and magnocellular responses. Concentrations of the two major n-3 PUFAs (docosahexaenoic acid [DHA] and eicosapentaenoic acid [EPA]) were measured in umbilical cord and child plasma phospholipids, reflecting prenatal and postnatal exposure, respectively.

RESULTS:
After adjustment for confounders, cord plasma DHA level was found to be associated with shorter latencies of the N1 and P1 components of the color VEPs. No effects were found for current n-3 PUFA body burden or motion-onset VEPs.

CONCLUSION:
This study demonstrates beneficial effects of DHA intake during gestation on visual system function at school age. DHA is particularly important for the early development and long-term function of the visual parvocellular pathway.

Source
Jacques C, et al. Long-term effects of prenatal omega-3 fatty acid intake on visual function in school-age children. J Pediatr. 2011 Jan;158(1):83-90, 90.e1. Epub 2010 Aug 25.

COGNITIVE HEALTH

Physicians and nurses use and recommend dietary supplements: report of a survey

ABSTRACT
BACKGROUND:
Numerous surveys show that dietary supplements are used by a large proportion of the general public, but there have been relatively few surveys on the prevalence of dietary supplement use among health professionals, including physicians and nurses. Even less information is available regarding the extent to which physicians and nurses recommend dietary supplements to their patients.

METHODS:
An online survey was administered in October 2007 to 900 physicians and 277 nurses by Ipsos Public Affairs for the Council for Responsible Nutrition (CRN), a trade association representing the dietary supplement industry. The health professionals were asked whether they used dietary supplements and their reasons for doing so, and whether they recommend dietary supplements to their patients.

RESULTS:
The "Life...supplemented" Healthcare Professionals Impact Study (HCP Impact Study) found that 72% of physicians and 89% of nurses in this sample used dietary supplements regularly, occasionally, or seasonally. Regular use of dietary supplements was reported by 51% of physicians and 59% of nurses. The most common reason given for using dietary supplementswas for overall health and wellness (40% of physicians and 48% of nurses), but more than two-thirds cited more than one reason for using the products. When asked whether they "ever recommend dietary supplements" to their patients, 79% of physicians and 82% of nurses said they did.

CONCLUSION:
Physicians and nurses are as likely as members of the general public to use dietary supplements, as shown by comparing the results of this survey with data from national health and nutrition surveys. Also, most physicians and nurses recommend supplements to their patients, whether or not the clinicians use dietary supplements themselves.

Source
Dickinson A, et al. Physicians and nurses use and recommend dietary supplements: report of a survey. Nutr J. 2009 Jul 1;8:29.

Docosapentaenoic acid (22:5n-3): a review of its biological effects

ABSTRACT
This article summarizes the current knowledge available on metabolism and the biological effects of n-3 docosapentaenoic acid (DPA). n-3 DPA has not been extensively studied because of the limited availability of the pure compound. n-3 DPA is an elongated metabolite of EPA and is an intermediary product between EPA and DHA. The literature on n-3 DPA is limited, however the available data suggests it has beneficial health effects. In vitro n-3 DPA is retro-converted back to EPA, however it does not appear to be readily metabolised to DHA. In vivo studies have shown limited conversion of n-3 DPA to DHA, mainly in liver, but in addition retro-conversion to EPA is evident in a number of tissues. n-3 DPA can be metabolised by lipoxygenase, in platelets, to form ll-hydroxy-7,9,13,16,19- and 14-hydroxy-7,10,12,16,19-DPA. It has also been reported that n-3 DPA is effective (more so than EPA and DHA) in inhibition of aggregation in platelets obtained from rabbit blood. In addition, there is evidence that n-3 DPA possesses 10-fold greater endothelial cell migration ability than EPA, which is important in wound-healing processes. An in vivo study has reported that n-3 DPA reduces the fatty acid synthase and malic enzyme activity levels in n-3 DPA-supplemented mice and these effects were stronger than the EPA-supplemented mice. Another recent in vivo study has reported that n-3 DPA may have a role in attenuating age-related decrease in spatial learning and long-term potentiation. However, more research remains to be done to further investigate the biological effects of this n-3 VLCPUFA.

Source
Kaur G, et al. Docosapentaenoic acid (22:5n-3): a review of its biological effects. Progressive Lipid Research. 2011 Jan; 50(1):28-34

Omega-3 supplementation lowers inflammation and anxiety in medical students: a randomized controlled trial

ABSTRACT
Observational studies have linked lower omega-3 (n-3) polyunsaturated fatty acids (PUFAs) and higher omega-6 (n-6) PUFAs with inflammation and depression, but randomized controlled trial (RCT) data have been mixed. To determine whether n-3 decreases proinflammatory cytokine production and depressive and anxiety symptoms in healthy young adults, this parallel group, placebo-controlled, double-blind 12-week RCT compared n-3 supplementation with placebo. The participants, 68 medical students, provided serial blood samples during lower-stress periods as well as on days before an exam. The students received either n-3 (2.5 g/d, 2085 mg eicosapentaenoic acid and 348 mg docosahexanoic acid) or placebo capsules that mirrored the proportions of fatty acids in the typical American diet. Compared to controls, those students who received n-3 showed a 14% decrease in lipopolysaccharide (LPS) stimulated interleukin 6 (IL-6) production and a 20% reduction in anxiety symptoms, without significant change in depressive symptoms. Individuals differ in absorption and metabolism of n-3 PUFA supplements, as well as in adherence; accordingly, planned secondary analyses that used the plasma n-6:n-3 ratio in place of treatment group showed that decreasing n-6:n-3 ratios led to lower anxiety and reductions in stimulated IL-6 and tumor necrosis factor alpha (TNF-α) production, as well as marginal differences in serum TNF-α. These data suggest that n-3 supplementation can reduce inflammation and anxiety even among healthy young adults. The reduction in anxiety symptoms associated with n-3 supplementation provides the first evidence that n-3 may have potential anxiolytic benefits for individuals without an anxiety disorder diagnosis.

Source
Kiecolt-Glaser JK et al. Omega-3 supplementation lowers inflammation and anxiety in medical students: a randomized controlled trial. Brain Behav Immun 25:1725-34, 2011.

Serum phospholipid docosahexaenoic acid is associated with cognitive functioning during middle adulthood

ABSTRACT
Existing evidence links greater dietary intake of fish and (n-3) PUFA to better early brain development and lowered risk of cognitive disorders in late life. The mechanisms for these associations remain unclear and may be related to specific (n-3) fatty acids and may concern cognitive function generally rather than only early brain development and age-related cognitive dysfunction. In this investigation, we tested potential associations between (n-3) fatty acids in serum phospholipids and major dimensions of cognitive functioning in mid-life adults. Participants were 280 community volunteers between 35 and 54 y of age, free of major neuropsychiatric disorders, and not taking fish oil supplements. Dietary biomarkers were alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenonic acid (DHA) in serum phospholipids measured using GC. Five major dimensions of cognitive functioning were assessed with a 75-min battery of neuropsychological tests. In covariate adjusted regression models, higher DHA (mol %) was related to better performance on tests of nonverbal reasoning and mental flexibility, working memory, and vocabulary (P <or= 0.05). These associations were generally linear. Associations between DHA and nonverbal reasoning and working memory persisted with additional adjustment for participant education and vocabulary scores (P <or= 0.05). Neither EPA nor ALA was notably related to any of the 5 tested dimensions of cognitive performance. Among the 3 key (n-3) PUFA, only DHA is associated with major aspects of cognitive performance in nonpatient adults <55 y old. These findings suggest that DHA is related to brain health throughout the lifespan and may have implications for clinical trials of neuropsychiatric disorders.

Source
Muldoon MF, et al. Serum phospholipid docosahexaenoic acid is associated with cognitive functioning during middle adulthood. J Nutr. 2010 Apr;140(4):848-53.

The effect of low-dose omega 3 fatty acids on the treatment of mild to moderate depression in the elderly: a double-blind, randomized, placebo-controlled study

ABSTRACT
Due to the rise in the social and economic costs of depression, new antidepressant medication with fewer side effects should be found. Several studies have shown that an association exists between ω-3 polyunsaturated fatty acids (ω-3 PUFAs) and depression. However, this association has not been clear enough in the elderly with mild to moderate depression. Sixty-six inhabitants of Kahrizak Charity Foundation participated in this double-blind, randomized, placebo-controlled study. Each participant was ≥ 65 years of age, had a Mini Mental State Exam of ≥ 22, and had scores ranging from 5 to 11 on the Geriatric Depression Scale-15 (GDS-15). During the 6 months, the drug group was treated daily with one gram of fish oil capsule containing 300 mg of both eicosapentaenoic acid and docosahexaenoic acid. No significant differences were noted between the groups in regard to level of education, use of antidepressant drugs, alcohol, tobacco use, history of chronic diseases, age, body mass index (BMI), high-sensitive C-reactive protein (hs-CRP), total cholesterol, and GDS-15 scores at baseline. After adjusting for cholesterol, BMI, and history of thyroid dysfunctions, a statistically significant difference was seen in GDS-15 scores between both groups. Furthermore, treatment with ω-3 PUFAs was clinically more effective in treating depression in comparison with the placebo. In this study, low-dose ω-3 PUFAs had some efficacy in the treatment of mild to moderate depression in elderly participants.

Source
Tajalizadekhoob Y, et al. The effect of low-dose omega 3 fatty acids on the treatment of mild to moderate depression in the

elderly: a double-blind, randomized, placebo-controlled study. eur Arch Psychiatry Clin Neurosci. 2011 Feb 12. [Epub ahead of print

Red blood cell omega 3 fatty acid levels and markers of accelerated brain aging

ABSTRACT

OBJECTIVE:

Higher dietary intake and circulating levels of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) have been related to a reduced risk for dementia, but the pathways underlying this association remain unclear. We examined the cross-sectional relation of red blood cell (RBC) fatty acid levels to subclinical imaging and cognitive markers of dementia risk in a middle-aged to elderly community-based cohort.

METHODS:

We related RBC DHA and EPA levels in dementia-free Framingham Study participants (n = 1575; 854 women, age 67 ± 9 years) to performance on cognitive tests and to volumetric brain MRI, with serial adjustments for age, sex, and education (model A, primary model), additionally for APOE ε4 and plasma homocysteine (model B), and also for physical activity and body mass index (model C), or for traditional vascular risk factors (model D).

RESULTS:

Participants with RBC DHA levels in the lowest quartile (Q1) when compared to others (Q2-4) had lower total brain and greater white matter hyperintensity volumes (for model A: β ± SE = -0.49 ± 0.19; p = 0.009, and 0.12 ± 0.06; p = 0.049, respectively) with persistence of the association with total brain volume in multivariable analyses. Participants with lower DHA and ω-3 index (RBC DHA+EPA) levels (Q1 vs. Q2-4) also had lower scores on tests of visual memory (β ± SE = -0.47 ± 0.18; p = 0.008), executive function (β ± SE = -0.07 ± 0.03; p = 0.004), and abstract thinking (β ± SE = -0.52 ± 0.18; p = 0.004) in model A, the results remaining significant in all models.

CONCLUSION:

Lower RBC DHA levels are associated with smaller brain volumes and a "vascular" pattern of cognitive impairment even in persons free of clinical dementia.

Source

Tan Zs, Harris WS, Beiser AS et. al. Red blood cell omega 3 fatty acid levels and markers of accelerated brain aging. Neurology 2012:78(9):658-64.

EYE HEALTH

Fatty acids and retinopathy

ABSTRACT

SUMMARY:

Dr. Emily Chew (MD) from the US National Institute of Health reviewed the mechanism by which omega-3 fatty acids protect from age-related eye disease (age-related macular degeneration, retinopathy and diabetic retinopathy). She concluded that taking an omega-3 supplement to prevent the disease or slow its rate of progression may prove a better course of action than the current, often painful therapies. As evidence for this, she cited an article in the February 09, 2011 edition of Science Translational Medicine (2) co-authored by SAB member Dr. Arianna Carughi, in which the human clinical evidence component was drawn in part from our 2009 clinical trial on Salmon Oil Plus.

Source

Chew EY, Fatty acids and retinopathy. new england Journal of Medicine, 2011; 364:1970

Dietary n-3 fatty acids and fish intake and incident Age-related Macular Degeneration in women. archives of ophthalmology

ABSTRACT

OBJECTIVE:

To examine whether intake of ω-3 fatty acids and fish affects incidence of age-related macular degeneration (AMD) in women.

DESIGN:

A detailed food-frequency questionnaire was administered at baseline among 39 876 female health professionals (mean [SD] age: 54.6 [7.0] years). A total of 38 022 women completed the questionnaire and were free of a diagnosis of AMD. The main outcome measure was incident AMD responsible for a reduction in best-corrected visual acuity to 20/30 or worse based on self-report confirmed by medical record review.

RESULTS:

A total of 235 cases of AMD, most characterized by some combination of drusen and retinal pigment epithelial changes, were confirmed during an average of 10 years of follow-up. Women in the highest tertile of intake for docosahexaenoic acid, compared with those in the lowest, had a multivariate-adjusted relative risk of AMD of 0.62 (95% confidence interval, 0.44-0.87). For eicosapentaenoic acid, women in the highest tertile of intake had a relative risk of 0.66 (95% confidence interval, 0.48-0.92). Consistent with the findings for docosahexaenoic acid and eicosapentaenoic acid, women who consumed 1 or more servings of fish per week, compared with those who consumed less than 1 serving per month, had a relative risk of AMD of 0.58 (95% confidence interval, 0.38-0.87).

CONCLUSION:

These prospective data from a large cohort of female health professionals without a diagnosis of AMD at baseline indicate that regular consumption of docosahexaenoic acid and eicosapentaenoic acid and fish was associated with a significantly decreased risk of incident AMD and may be of benefit in primary prevention of AMD.

Source

Christen WG, et al. Dietary n-3 fatty acids and fish intake and incident Age-related Macular Degeneration in women. archives of ophthalmology. 2011; 129(7): 921-929. doi:10/1001/archopaphthmol.2011.34

Inflammatory cells during wound repair: the good, the bad and the ugly

ABSTRACT
Damage to any tissue triggers a cascade of events that leads to rapid repair of the wound - if the tissue is skin, then repair involves re-epithelialization, formation of granulation tissue and contraction of underlying wound connective tissues. This concerted effort by the wounded cell layers is accompanied by, and might also be partially regulated by, a robust inflammatory response, in which first neutrophils and then macrophages and mast cells emigrate from nearby tissues and from the circulation. Clearly, this inflammatory response is crucial for fighting infection and must have been selected for during the course of evolution so that tissue damage did not inevitably lead to death through septicemia. But, aside from this role, exactly what are the functions of the various leukocyte lineages that are recruited with overlapping time courses to the wound site, and might they do more harm than good? Recent knockout and knockdown studies suggest that depletion of one or more of the inflammatory cell lineages can even enhance healing, and we discuss new views on how regulation of the migration of inflammatory cells to sites of tissue damage might guide therapeutic strategies for modulating the inflammatory response.

Source
Martin P, et al. Inflammatory cells during wound repair: the good, the bad and the ugly. Trends Cell Biol. 2005 Nov;15(11):599-607.

HEALTHY PREGNANCY

Omega-3 fatty acids and pregnancy

ABSTRACT
Omega-3 fatty acids are essential fatty acids that must be consumed in the diet. Adequate consumption of omega-3 fatty acids is vitally important during pregnancy as they are critical building blocks of fetal brain and retina. Omega-3 fatty acids may also play a role in determining the length of gestation and in preventing perinatal depression. The most biologically active forms of omega-3 fatty acids are docosahexaenoic acid and eicosapentaenoic acid, which are primarily derived from marine sources such as seafood and algae. Recent surveys, however, indicate that pregnant women in the United States and in other countries eat little fish and therefore do not consume enough omega-3 fatty acids, primarily due to concern about the adverse effects of mercury and other contaminants on the developing fetus. This review discusses the benefits of omega-3 fatty acid consumption during pregnancy and provides guidelines for obstetricians advising patients.

Source
Coletta JM et al. Omega-3 fatty acids and pregnancy. Rev Obstet Gynecol 3:163-71, 2010.

Omega-3 Acid supplementation during pregnancy

ABSTRACT
Omega-3 fatty acids are essential and can only be obtained from the diet. The requirements during pregnancy have not been established, but likely exceed that of a nonpregnant state. Omega-3 fatty acids are critical for fetal neurodevelopment and may be important for the timing of gestation and birth weight as well. Most pregnant women likely do not get enough omega-3 fatty acids because the major dietary source, seafood, is restricted to 2 servings a week. For pregnant women to obtain adequate omega-3 fatty acids, a variety of sources should be consumed: vegetable oils, 2 low-mercury fish servings a week, and supplements (fish oil or algae-based docosahexaenoic acid).

Source
Greenberg JA et al. Omega-3 Acid supplementation during pregnancy. Rev Obstet Gynecol 1:162–69, 2008.

The roles of long-chain polyunsaturated fatty acids in pregnancy, lactation and infancy: review of current knowledge and consensus recommendations

ABSTRACT
This paper reviews current knowledge on the role of the long-chain polyunsaturated fatty acids (LC-PUFA), docosahexaenoic acid (DHA, C22:6n-3) and arachidonic acid (AA, 20:4n-6), in maternal and term infant nutrition as well as infant development. Consensus recommendations and practice guidelines for health-care providers supported by the World Association of Perinatal Medicine, the Early Nutrition Academy, and the Child Health Foundation are provided. The fetus and neonate should receive LC-PUFA in amounts sufficient to support optimal visual and cognitive development. Moreover, the consumption of oils rich in n-3 LC-PUFA duringpregnancy reduces the risk for early premature birth. Pregnant and lactating women should aim to achieve an average daily intake of at least 200 mg DHA. For healthy term infants, we recommend and fully endorse breastfeeding, which supplies preformed LC-PUFA, as the preferred method of feeding. When breastfeeding is not possible, we recommend use of an infant formula providing DHA at levels between 0.2 and 0.5 weight percent of total fat, and with the minimum amount of AA equivalent to the contents of DHA. Dietary LC-PUFA supply should continue after the first six months of life, but currently there is not sufficient information for quantitative recommendations.

Source
Koletzko B, Lien E, Agostoni C, et al. World Association of Perinatal Medicine Dietary Guidelines Working Group: The roles of long-chain polyunsaturated fatty acids in pregnancy, lactation and infancy: review of current knowledge and consensus recommendat

Nutrition and Lifestyle for a Healthy Pregnancy Outcome

ABSTRACT
It is the position of the American Dietetic Association that women of child-bearing ages should maintain good nutritional status through a lifestyle that optimizes maternal health and reduces the risk of birth defects, suboptimal fetal growth and

development, and chronic health problems in their children. The key components of a health-promoting lifestyle during pregnancy include appropriate weight gain; appropriate physical activity; consumption of a variety of foods in accordance with the Dietary Guidelines for Americans 2005; appropriate and timely vitamin and mineral supplementation; avoidance of alcohol, tobacco, and other harmful substances; and safe food handling. Pregnant women with inappropriate weight gain, hyperemesis, poor dietary patterns, phenylketonuria, certain chronic health problems or a history of substance abuse should be referred to a registered dietitian for medical nutrition therapy. Prenatal weight gain within the Institute of Medicine recommended ranges has been associated with better pregnancy outcomes. Most pregnant women need 2,200 to 2,900 kcal a day, but prepregnancy body mass index, rate of weight gain, maternal age and appetite must be considered when tailoring this recommendation to the individual. The consumption of more food to meet energy needs, and the increased absorption and efficiency of nutrient utilization that occurs in pregnancy, are generally adequate to meet the needs for most nutrients. However, vitamin and mineral supplementation is appropriate for some nutrients and situations. This position paper also includes recommendations pertaining to use of alcohol, tobacco, caffeine and illicit drugs.

Source
Nutrition and Lifestyle for a Healthy Pregnancy Outcome. Position Paper of the American Dietetics Association. JADA 2008;108(3): 553-561.

HEART HEALTH

Impact of omega-3 polyunsaturated fatty acids on coronary plaque instability

ABSTRACT
OBJECTIVE:
To assess the impact of omega-3 polyunsaturated fatty acids (ω3 PUFAs) on coronary plaque instability.

METHODS:
Serum content of eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA), and docosahexaenoic acid (DHA) was measured in 336 of 368 consecutive patients suspected of having coronary artery disease who underwent coronary angiography. Conventional and integrated backscatter intravascular ultrasound (IB-IVUS) parameters were analyzed in 116 patients with 128 coronary plaques, using a 43-MHz (motorized pullback 0.5mm/s) intravascular catheter (View It, Terumo Co., Japan). Lipid-rich plaques were classified into two categories according to their components.

RESULTS:
Patients with acute coronary syndrome had significantly lower levels of ω3 PUFAs (especially of EPA and DPA) than those without it. IB-IVUS analyses showed that ω3 PUFAs correlated inversely with % lipid volume and positively with % fibrous volume. Patients with low EPA levels, low DPA levels, and low DHA levels had a significantly higher % lipid volume (p=0.048, p=0.008, and p=0.036, respectively) and a significantly lower % fibrous volume (p=0.035, p=0.008, and p=0.034, respectively) than those with high levels of these fatty acids. Even after adjustment for confounders, the presence of both low EPA and low DPA levels proved to be an independent predictor for lipid-rich plaques in any of the two categories.

CONCLUSIONS:
A lower serum content of ω3 PUFAs (especially of EPA and DPA) was significantly associated with lipid-rich plaques, suggesting the contribution to the incidence of acute coronary syndrome.

Source
Amano T, et al. Impact of omega-3 polyunsaturated fatty acids on coronary plaque instability. Atherosclerosis. 2011 Sep; 218(1):110-6.

Physicians and nurses use and recommend dietary supplements: report of a survey

ABSTRACT
BACKGROUND:
Numerous surveys show that dietary supplements are used by a large proportion of the general public, but there have been relatively few surveys on the prevalence of dietary supplement use among health professionals, including physicians and nurses. Even less information is available regarding the extent to which physicians and nurses recommend dietary supplements to their patients.

METHODS:
An online survey was administered in October 2007 to 900 physicians and 277 nurses by Ipsos Public Affairs for the Council for Responsible Nutrition (CRN), a trade association representing the dietary supplement industry. The health professionals were asked whether they used dietary supplements and their reasons for doing so, and whether they recommend dietary supplements to their patients.

RESULTS:
The "Life...supplemented" Healthcare Professionals Impact Study (HCP Impact Study) found that 72% of physicians and 89% of nurses in this sample used dietary supplements regularly, occasionally, or seasonally. Regular use of dietary supplements was reported by 51% of physicians and 59% of nurses. The most common reason given for using dietary supplementswas for overall health and wellness (40% of physicians and 48% of nurses), but more than two-thirds cited more than one reason for using the products. When asked whether they "ever recommend dietary supplements" to their patients, 79% of physicians and 82% of nurses said they did.

CONCLUSION:
Physicians and nurses are as likely as members of the general public to use dietary supplements, as shown by comparing the results of this survey with data from national health and nutrition surveys. Also, most physicians and nurses recommend supplements to their patients,

whether or not the clinicians use dietary supplements themselves.

Source
Dickinson A, et al. Physicians and nurses use and recommend dietary supplements: report of a survey. Nutr J. 2009 Jul 1;8:29.

Effect of consumption of tomato juice enriched with n-3 polyunsaturated fatty acids on the lipid profile, antioxidant biomarker status, and cardiovascular disease risk in healthy women

ABSTRACT
INTRODUCTION:
Epidemiologic evidence suggests that tomato-based products could reduce the risk of cardiovascular diseases. One of the main cardiovascular risk factors is low levels of high-density lipoprotein cholesterol (HDL-C). This study aimed to prospectively evaluate the effect of tomato consumption on HDL-C levels.

SUBJECT AND METHODS:
We conducted a randomized, single-blinded, controlled clinical trial. We screened 432 subjects with a complete lipid profile. Those individuals with low HDL-C (men <40 mg/dL and women <50 mg/dL) but normal triglyceride levels (<150 mg/dL) were included. Selected participants completed a 2-week run-in period on an isocaloric diet and then were randomized to receive 300 g of cucumber (control group) or two uncooked Roma tomatoes a day for 4 weeks.

RESULTS:
A total of 50 individuals (women = 41; 82%) with a mean age of 42 ± 15.5 years and a mean body mass index of 27.6 ± 5.0 kg/m2completed the study. A significant increase in HDL-C levels was observed in the tomato group (from 36.5 ± 7.5 mg/dL to 41.6 ± 6.9 mg/dL, P < 0.0001 versus the control group). After stratification by gender, the difference in HDL-C levels was only significant in women. The mean HDL-C increase was 5.0 ± 2.8 mg/dL (range 1–12 mg/dL). Twenty patients (40%) finished the study with levels >40 mg/dL. A linear regression model that adjusted for those parameters that impact HDL-C levels (age, gender, waist-to-hip ratio, body mass index, fasting triglyceride concentration, simple sugars, alcohol, physical activity, and omega-3 consumption) showed an independent association between tomato consumption and the increase in HDL-C (r2 = 0.69; P < 0.0001).

CONCLUSION:
Raw tomato consumption produced a favorable effect on HDL-C levels in overweight women.

Source
García-Alonso FJ, et al. Effect of consumption of tomato juice enriched with n-3 polyunsaturated fatty acids on the lipid profile, antioxidant biomarker status, and cardiovascular disease risk in healthy women. Eur J Nutr. 2012 Jun;51(4):415-24.

Docosapentaenoic acid (22:5n-3): a review of its biological effects

ABSTRACT
This article summarizes the current knowledge available on metabolism and the biological effects of n-3 docosapentaenoic acid (DPA). n-3 DPA has not been extensively studied because of the limited availability of the pure compound. n-3 DPA is an elongated metabolite of EPA and is an intermediary product between EPA and DHA. The literature on n-3 DPA is limited, however the available data suggests it has beneficial health effects. In vitro n-3 DPA is retro-converted back to EPA, however it does not appear to be readily metabolised to DHA. In vivo studies have shown limited conversion of n-3 DPA to DHA, mainly in liver, but in addition retro-conversion to EPA is evident in a number of tissues. n-3 DPA can be metabolised by lipoxygenase, in platelets, to form ll-hydroxy-7,9,13,16,19- and 14-hydroxy-7,10,12,16,19-DPA. It has also been reported that n-3 DPA is effective (more so than EPA and DHA) in inhibition of aggregation in platelets obtained from rabbit blood. In addition, there is evidence that n-3 DPA possesses 10-fold greater endothelial cell migration ability than EPA, which is important in wound-healing processes. An in vivo study has reported that n-3 DPA reduces the fatty acid synthase and malic enzyme activity levels in n-3 DPA-supplemented mice and these effects were stronger than the EPA-supplemented mice. Another recent in vivo study has reported that n-3 DPA may have a role in attenuating age-related decrease in spatial learning and long-term potentiation. However, more research remains to be done to further investigate the biological effects of this n-3 VLCPUFA.

Source
Kaur G, et al. Docosapentaenoic acid (22:5n-3): a review of its biological effects. Progressive Lipid Research. 2011 Jan; 50(1):28-34

Omega-3 polyunsaturated fatty acids and cardiovascular diseases

ABSTRACT
Omega-3 polyunsaturated fatty acid (omega-3 PUFA) therapy continues to show great promise in primary and, particularly in secondary prevention of cardiovascular (CV) diseases. The most compelling evidence for CV benefits of omega-3 PUFA comes from 4 controlled trials of nearly 40,000 participants randomized to receive eicosapentaenoic acid (EPA) with or withoutdocosahexaenoic acid (DHA) in studies of patients in primary prevention, after myocardial infarction, and most recently, with heart failure (HF). We discuss the evidence from retrospective epidemiologic studies and from large randomized controlled trials showing the benefits of omega-3 PUFA, specifically EPA and DHA, in primary and secondary CV prevention and provide insight into potential mechanisms of these observed benefits. The target EPA + DHA consumption should be at least 500 mg/day for individuals without underlying overt CV disease and at least 800 to 1,000 mg/day for individuals with known coronary heart disease and HF. Further studies are needed to determine optimal dosing and the relative ratio of DHA and EPA omega-3 PUFA that provides maximal cardioprotection in those at risk of CV disease as well in the treatment of

atherosclerotic, arrhythmic, and primary myocardial disorders.

Source
Lavie CJ, et al. Omega-3 polyunsaturated fatty acids and cardiovascular diseases. J Am Coll Cardiol. 2009 Aug 11;54(7):585-94.

Prevention of sudden cardiac death by n-3 polyunsaturated fatty acids

ABSTRACT
There were already several epidemiologic studies that showed eating fish frequently seemed to reduce deaths from coronary heart disease. There were also observational and clinical trials that more specifically showed that the reduction in cardiovascular deaths from eating fish was largely the result of the prevention of sudden cardiac death by n-3 polyunsaturated fatty acids in fish oil. This led me to perform a clinical trial in which all subjects had an implanted cardioverter-defibrillator and were at very high risk of sudden cardiac death. The results of this study and the mechanisms by which n-3 fish oil fatty acids prevent fatal cardiac arrhythmias will be the subject of this review.

Source
Leaf A. Prevention of sudden cardiac death by n-3 polyunsaturated fatty acids. J Cardiovasc Med 2007; 8 Suppl 1:S27-29.

Fatty fish, marine omega-3 fatty acids and incidence of heart failure

ABSTRACT
BACKGROUND:
Marine omega-3 fatty acids have beneficial effects on cardiovascular risk factors. Consumption of fatty fish and marine omega-3 has been associated with lower rates of cardiovascular diseases.

OBJECTIVE:
We examined the association of fatty fish and marine omega-3 with heart failure (HF) in a population of middle-age and older women.

METHODS:
Participants in the Swedish Mammography Cohort aged 48–83 years completed 96-item food-frequency questionnaires. Women without history of HF, myocardial infarction, or diabetes at baseline (n= 36 234) were followed from January 1, 1998 until December 31, 2006 for HF hospitalization or mortality through Swedish inpatient and cause-of-death registers; 651 women experienced HF events. Cox proportional hazards models accounting for age and other confounders were used to calculate incidence rate ratios (RR) and 95% confidence intervals (CI).

RESULTS:
Compared to women who did not eat fatty fish, RR were 0.86 (95% CI: 0.67, 1.10) for <1 serving/week, 0.80 (95% CI: 0.63, 1.01) for 1 serving/week, 0.70 (95% CI: 0.53, 0.94) for 2 servings/week, and 0.91 (95% CI: 0.59, 1.40) for ≥3 servings/week (Ptrend = 0.049). RR across quintiles of marine omega-3 fatty acids were 1 (reference), 0.85 (95% CI: 0.67, 1.07), 0.79 (95% CI: 0.61, 1.02), 0.83 (95% CI 0.65, 1.06), and 0.75 (95% CI: 0.58, 0.96) (Ptrend = 0.04).

CONCLUSION:
Moderate consumption of fatty fish (one to two servings per week) and marine omega-3 fatty acids were associated with a lower rate of first HF hospitalization or death in this population.

Source
Levitan EB, et al. Fatty fish, marine omega-3 fatty acids and incidence of heart failure. Eur J Clin Nutr. 2010 Jun;64(6):587-94. Epub 2010 Mar 24.

The omega-3 fatty acids EPA and DHA decrease plasma F(2)-isoprostanes: Results from two placebo-controlled interventions

ABSTRACT
Omega-3 (omega3) fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), protect against cardiovascular disease. Despite these benefits, concern remains that omega3 fatty acids may increase lipid peroxidation. It has previously been shown that urinary F(2)-isoprostanes (F(2)-IsoPs) were reduced following omega3 fatty acid supplementation in humans. It is now determined whether EPA or DHA supplementation affects plasma F(2)-IsoPs. In two 6-week placebo-controlled interventions, Study A: overweight, dyslipidaemic men; and Study B: treated-hypertensive Type 2 diabetic, patients were randomized to 4 g daily EPA, DHA. Post-intervention plasma F(2)-IsoPs were significantly reduced by EPA (24% in Study A, 19% in Study B) and by DHA (14% in Study A, 23% in Study B) relative to the olive oil group. The fall in plasma F(2)-IsoPs was not altered in analyses that corrected for changes in plasma arachidonic acid, which was reduced with EPA and DHA supplementation. Neither F(3)- nor F(4)-IsoPs were observed in plasma in both studies. These results show that in humans, EPA and DHA reduce in vivo oxidant stress as measured in human plasma and urine.

Source
Mas E, et al. The omega-3 fatty acids EPA and DHA decrease plasma F(2)-isoprostanes: Results from two placebo-controlled interventions. Free Radic Res. 2010 Jun 14. [Epub ahead of print]

Circulating long-chain omega-3 fatty acids in incidence of congestive heart failure in older adults

ABSTRACT
BACKGROUND:
Few previous studies have evaluated associations between long-chain ω-3 fatty acids and incidence of congestive heart failure (CHF), and those that have are typically based on diet questionnaires and yield conflicting results. Circulating fatty acidconcentrations provide objective biomarkers of exposure.

OBJECTIVE:
To determine whether plasma phospholipid concentrations of long-chain ω-3 fatty acids, including eicosapentaenoicacid (EPA), docosapentaenoic acid (DPA), and docosahexaenoic acid (DHA), were associated with incident CHF.

DESIGN:
Prospective cohort study. Setting: 4 U.S. communities.

PATIENTS:
2735 U.S. adults without prevalent heart disease who were enrolled in the Cardiovascular Health Study from 1992 to 2006.

MEASUREMENTS:
Plasma phospholipid fatty acid concentrations and other cardiovascular risk factors were measured in 1992 by using standardized methods. Relationships with incident CHF (555 cases during 26 490 person-years, adjudicated by using medical records) were assessed by using Cox proportional hazards models.

RESULTS:
After multivariate adjustment, plasma phospholipid EPA concentration was inversely associated with incident CHF; risk was approximately 50% lower in the highest versus the lowest quartile (hazard ratio [HR], 0.52 [95% CI, 0.38 to 0.72]; P for trend = 0.001). In similar analyses, trends toward lower risk were seen for DPA (HR, 0.76 [CI, 0.56 to 1.04]; P for trend = 0.057) and total long-chain ω-3 fatty acids (HR, 0.70 [CI, 0.49 to 0.99]; P for trend = 0.062) but not for DHA (HR, 0.84 [CI, 0.58 to 1.21]; P for trend = 0.38). In analyses censored to the middle of follow-up (7 years) to minimize exposure misclassification over time, multivariate-adjusted HRs were 0.48 for EPA (CI, 0.32 to 0.71; P for trend = 0.005), 0.61 for DPA (CI, 0.39 to 0.95; P for trend = 0.033), 0.64 for DHA (CI, 0.40 to 1.04; P for trend = 0.057), and 0.51 for total ω-3 fatty acids (CI, 0.32 to 0.80; P for trend = 0.003).

LIMITATIONS:
Temporal changes in fatty acid concentrations over time may have caused underestimation of associations. Unmeasured or imperfectly measured covariates may have caused residual confounding.

CONCLUSION:
Circulating individual and total ω-3 fatty acid concentrations are associated with lower incidence of CHF in older adults.

Source
Mozaffarian D, et al. Circulating long-chain omega-3 fatty acids in incidence of congestive heart failure in older adults. Annals of Internal Medicine, 2011 August 2; 155(3):160-70

Fish oil-derived fatty acids, docosahexaenoic acid and docosapentaenoic acid, and the risk of acute coronary events

ABSTRACT
BACKGROUND:
Previous findings concerning the serum levels of fish-derived (n-3) fatty acids and coronary heart disease are inconsistent. The purpose of this study was to investigate the association between the serum n-3 end-product fatty acidsdocosahexaenoic acid (DHA), docosapentaenoic acid (DPA), and eicosapentaenoic acid and the risk of acute coronary events in middle-aged men.

METHODS AND RESULTS:
We studied this association in the Kuopio Ischaemic Heart Disease Risk Factor Study, a prospective population study in Eastern Finland. Subjects were randomly selected and included 1871 men aged 42 to 60 years who had no clinical coronary heart disease at baseline examination. A total of 194 men had a fatal or nonfatal acute coronary event during follow-up. In a Cox proportional hazards' model adjusting for other risk factors, men in the highest fifth of the proportion of serum DHA+DPA in all fatty acids had a 44% reduced risk (P=0.014) of acute coronary events compared with men in the lowest fifth. Men in the highest fifth of DHA+DPA who had a low hair content of mercury (</=2.0 microgram/g) had a 67% reduced risk (P=0.016) of acute coronary events compared with men in the lowest fifth who had a high hair content of mercury (>2.0 microgram/g). There was no association between proportion of eicosapentaenoic acid and the risk of acute coronary events.

CONCLUSIONS:
Our data provide further confirmation for the concept that fish oil-derived fatty acids reduce the risk of acute coronary events. However, a high mercury content in fish could attenuate this protective effect.

Source
Rissanen T, et al. Fish oil-derived fatty acids, docosahexaenoic acid and docosapentaenoic acid, and the risk of acute coronary events. Circulation. 2000, Nov 28; 102(22): 2677-

IMMUNE HEALTH

Omega-3 supplementation lowers inflammation and anxiety in medical students: a randomized controlled trial

ABSTRACT
Observational studies have linked lower omega-3 (n-3) polyunsaturated fatty acids (PUFAs) and higher omega-6 (n-6) PUFAs with inflammation and depression, but randomized controlled trial (RCT) data have been mixed. To determine whether n-3 decreases proinflammatory cytokine production and depressive and anxiety symptoms in healthy young adults, this parallel group, placebo-controlled, double-blind 12-week RCT compared n-3 supplementation with placebo. The participants, 68 medical students, provided serial blood samples during lower-stress periods as well as on days before an exam. The students received either n-3 (2.5 g/d, 2085 mg eicosapentaenoic acid and 348 mg docosahexanoic acid) or placebo capsules that mirrored the proportions of fatty acids in the typical American diet. Compared to controls, those students who received n-3 showed a 14% decrease in lipopolysaccharide (LPS) stimulated interleukin 6 (IL-6) production and a 20% reduction in anxiety symptoms, without significant change in depressive symptoms. Individuals differ in absorption and metabolism of n-3 PUFA supplements, as well as in adherence; accordingly, planned secondary analyses that used the plasma n-6:n-3 ratio in place of treatment group showed that decreasing n-6:n-3 ratios led

to lower anxiety and reductions in stimulated IL-6 and tumor necrosis factor alpha (TNF-α) production, as well as marginal differences in serum TNF-α. These data suggest that n-3 supplementation can reduce inflammation and anxiety even among healthy young adults. The reduction in anxiety symptoms associated with n-3 supplementation provides the first evidence that n-3 may have potential anxiolytic benefits for individuals without an anxiety disorder diagnosis.

Source
Kiecolt-Glaser JK et al. Omega-3 supplementation lowers inflammation and anxiety in medical students: a randomized controlled trial. Brain Behav Immun 25:1725-34, 2011.

MEN'S HEALTH

Dietary fat and semen quality among men attending a fertility clinic

ABSTRACT

BACKGROUND:
The objective of this study was to examine the relation between dietary fats and semen quality parameters.

METHODS:
Data from 99 men with complete dietary and semen quality data were analyzed. Fatty acid levels in sperm and seminal plasma were measured using gas chromatography in a subgroup of men (n = 23). Linear regression was used to determine associations while adjusting for potential confounders.

RESULTS:
Men were primarily Caucasian (89%) with a mean (SD) age of 36.4 (5.3) years; 71% were overweight or obese; and 67% were never smokers. Higher total fat intake was negatively related to total sperm count and concentration. Men in the highest third of total fat intake had 43% (95% confidence interval (CI): 62–14%) lower total sperm count and 38% (95% CI: 58–10%) lower sperm concentration than men in the lowest third (Ptrend = 0.01). This association was driven by intake of saturated fats. Levels of saturated fatty acids in sperm were also negatively related to sperm concentration (r= –0.53), but saturated fat intake was unrelated to sperm levels (r = 0.09). Higher intake of omega-3 polyunsaturated fats was related to a more favorable sperm morphology. Men in the highest third of omega-3 fatty acids had 1.9% (0.4–3.5%) higher normal morphology than men in the lowest third (Ptrend = 0.02).

CONCLUSIONS:
In this preliminary cross-sectional study, high intake of saturated fats was negatively related to sperm concentration whereas higher intake of omega-3 fats was positively related to sperm morphology. Further, studies with larger samples are now required to confirm these findings.

Source
Attaman JA et al. Dietary fat and semen quality among men attending a fertility clinic. Hum Reprod 27:1466-74, 2012.

SKIN HEALTH

Oleic acid modulation of the immune response in wound healing: A new approach for skin repair

ABSTRACT
Injury triggers inflammatory responses and tissue repair. Several treatments are currently in use to accelerate healing; however, more efficient formulations are still needed for specific injuries. Since unsaturated fatty acids modulate immune responses, we aimed to evaluate their therapeutic effects on wound healing. Skin wounds were induced in BALB/c mice and treated for 5 days with n-3, n-9 fatty acids or vehicle (control). n-9 treated mice presented smaller wounds than control and n-3 at 120 h post-surgery (p.s.). Collagen III mRNA, TIMP1 and MMP9 were significantly elevated in n-9 group compared to n-3 or vehicle at 120 h p.s. Among the inflammatory mediators studied we found that IL-10, TNF-α and IL-17 were also higher in n-9 treated group compared to n-3 or vehicle at 120 h p.s. Interestingly, COX2 had decreased expression on wound tissue treated with n-9. Inflammatory infiltrate analysis revealed diminished frequency of CD4(+), CD8(+) and CD11b(+) cells in n-9 wounds at 24 and 120 h p.s., which was not related to cell death, since in vitro apoptosis experiments did not show any cell damage after fatty acids administration. These results suggested that unsaturated fatty acids, specifically n-9, modulate the inflammation in the wound and enhance reparative response in vivo. n-9 may be a useful tool in the treatment of cutaneous wounds.

Source
Cardoso CR, et al. Oleic acid modulation of the immune response in wound healing: A new approach for skin repair. Immunobiology. 2010 Jul 22. [Epub ahead of print]

Dietary nutrient intakes and skin-aging appearance among middle-aged American women

ABSTRACT
Background: Nutritional factors play a key role in normal dermatologic functioning. However, little is known about the effects of diet on skin-aging appearance.

OBJECTIVE:
We evaluated the associations between nutrient intakes and skin-aging appearance.

DESIGN:
Using data from the first National Health and Nutrition Examination Survey, we examined associations between nutrient intakes and skin aging in 4025 women (40–74 y). Nutrients were estimated from a 24-h recall. Clinical examinations of the skin were conducted by dermatologists. Skin-aging appearance was defined as having a wrinkled appearance, senile dryness, and skin atrophy.

RESULTS:
Higher vitamin C intakes were associated with

a lower likelihood of a wrinkled appearance [odds ratio (OR) 0.89; 95% CI: 0.82, 0.96] and senile dryness (OR: 0.93;95%CI: 0.87, 0.99). Higher linoleic acid intakes were associated with a lower likelihood of senile dryness (OR: 0.75; 95% CI: 0.64, 0.88) and skin atrophy (OR: 0.78; 95% CI 0.65, 0.95). A 17-g increase in fat and a 50-g increase in carbohydrate intakes increased the likelihood of a wrinkled appearance (OR: 1.28 and 1.36, respectively) and skin atrophy (OR: 1.37 and 1.33, respectively). These associations were independent of age, race, education, sunlight exposure, income, menopausal status, body mass index, supplement use, physical activity, and energy intake.

CONCLUSIONS:
Higher intakes of vitamin C and linoleic acid and lower intakes of fats and carbohydrates are associated with better skin-aging appearance. Promoting healthy dietary behaviors may have additional benefit for skin appearance in addition to other health outcomes in the population.

Source
Cosgrove MC et al. Dietary nutrient intakes and skin-aging appearance among middle-aged American women. Am J Clin Nutr 86:1225-31, 2007.

Skin aging and photoaging alter fatty acids composition, including 11,14,17-eicosatrienoic acid, in the epidermis of human skin

ABSTRACT
We investigated the alterations of major fatty acid components in epidermis by natural aging and photoaging processes, and by acute ultraviolet (UV) irradiation in human skin. Interestingly, we found that 11,14,17-eicosatrienoic acid (ETA), which is one of the omega-3 polyunsaturated acids, was significantly increased in photoaged human epidermis in vivo and also in the acutely UV-irradiated human skin in vivo, while it was significantly decreased in intrinsically aged human epidermis. The increased ETA content in the epidermis of photoaged human skin and acute UV-irradiated human skin is associated with enhanced expression of human elongase 1 and calcium-independent phophodiesterase A2. We demonstrated that ETA inhibited matrix metalloproteinase (MMP)-1 expression after UV-irradiation, and that inhibition of ETA synthesis using EPTC and NA-TCA, which are elongase inhibitors, increased MMP-1 expression. Therefore, our results suggest that the UV increases the ETA levels, which may have a photoprotective effect in the human skin.

Source
Kim EJ, et al. Skin aging and photoaging alter fatty acids composition, including 11,14,17-eicosatrienoic acid, in the epidermis of human skin. J Korean Med Sci. 2010 Jun;25(6):980-3. Epub 2010 May 24.

Omega-3 fatty acids effect on wound healing

ABSTRACT
Physiological events in the initial inflammatory stage of cutaneous wound healing influence subsequent stages. Proinflammatory cytokines coordinate molecular and cellular processes during the inflammatory stage. Polyunsaturated fatty acids (PUFA) alter proinflammatory cytokine production, but how this phenomenon specifically influences wound healing is not clearly understood. In the present study, effects of marine-derived omega-3 eicosapentaenoic and docosahexaenoic PUFA on proinflammatory cytokines in wound serum and time to complete healing in healthy, human skin were evaluated. We compared plasma fatty acid levels in two groups (N=30) at baseline and after 4 weeks of eicosapentaenoic/docosahexaenoic PUFA supplements (active) or placebo (control). Eight small blisters on participants' forearms were created. Proinflammatory cytokines interleukin-1beta (IL-1beta), IL-6, and tumor necrosis factor-alpha were quantified in blister fluid at 5 and 24 hours after creation. Wound area was calculated daily. Eicosapentaenoic and docosahexaenoic plasma fatty acid levels were significantly higher in the active group. Additionally, we found significantly higher IL-1beta levels in blister fluid in the active group and time to complete wound closure was somewhat longer. These results suggest that eicosapentaenoic and docosahexaenoic PUFA may increase proinflammatory cytokine production at wound sites and thus, depending on the clinical context, have noninvasive, therapeutic potential to affect cutaneous wound healing.

Source
McDaniel JC, et al. Omega-3 fatty acids effect on wound healing. Wound Repair Regen. 2008 May-Jun;16(3):337-45.

Randomized controlled trial of oral omega-3 PUFA in solar-simulated radiation-induced suppression of human cutaneous immune responses

ABSTRACT
Background: Skin cancer is a major public health concern, and the majority of cases are caused by solar ultraviolet radiation (UVR) exposure, which suppresses skin immunity. Omega-3 (n23) PUFAs protect against photoimmunosuppression and skin cancer in mice, but the impact in humans is unknown.

OBJECTIVES:
We hypothesized that EPA-rich n23 PUFA would abrogate photoimmunosuppression in humans. Therefore, a nutritional study was performed to assess the effect on UVR suppression of cutaneous cell-mediated immunity (CMI) reflected by nickel contact hypersensitivity (CHS).

DESIGN:
In a double-blind, randomized controlled study, 79 volunteers (nickel-allergic women, 22–60 y old, with phototype I or II) took 5 g n23 PUFA–containing lipid (70% EPA plus 10% DHA) or a control lipid daily for 3 mo. After supplementation, nickel was applied to 3 skin sites preexposed on 3 consecutive days to 1.9, 3.8, or 7.6 J/cm2 of solar-simulated radiation (SSR) and to 3 unexposed control sites. Nickel CHS responses were quantified after 72 h and the percentage of immunosuppression by SSR was calculated. Erythrocyte [red blood cell (RBC)] EPA was measured by using gas chromatography.

RESULTS:
SSR dose-related suppression of the nickel CHS response was observed in both groups. Photoimmunosuppression appeared less in the n23 PUFA group than in the control group (not statistically significant [mean difference (95% CI): 6.9% (22.1%, 15.9%)]). The difference was greatest at 3.8 J/cm2 SSR [mean difference:

11% (95% CI: 0.5%, 21.4%)]. Postsupplementation RBC EPA was 4-fold higher in the n23 PUFA group than in the control group (mean difference: 2.69% (95% CI: 2.23%, 3.14%), which confirmed the EPA bioavailability.

CONCLUSION:
Oral n—3 PUFAs appear to abrogate photoimmunosuppression in human skin, providing additional support for their chemopreventive role; verification of study findings is required. This trial was registered at clinicaltrials.gov as NCT01032343.

Source
Pilkington SM et al. Randomized controlled trial of oral omega-3 PUFA in solar-simulated radiation-induced suppression of human cutaneous immune responses. Am J Clin Nutr 97:646-52, 2013.

Discovering the link between nutrition and skin aging

ABSTRACT
Skin has been reported to reflect the general inner-health status and aging. Nutrition and its reflection on skin has always been an interesting topic for scientists and physicians throughout the centuries worldwide. Vitamins, carotenoids, tocopherols, flavonoids and a variety of plant extracts have been reported to possess potent anti-oxidant properties and have been widely used in the skin care industry either as topically applied agents or oral supplements in an attempt to prolong youthful skin appearance. This review will provide an overview of the current literature "linking" nutrition with skin aging.

Source
Schagen S et al. Discovering the link between nutrition and skin aging. Review. Dermato-Endocrinol 4:298-307, 2012.

SPORTS NUTRITION

The omega-3 fatty acids EPA and DHA decrease plasma F(2)-isoprostanes: Results from two placebo-controlled interventions

ABSTRACT
Omega-3 (omega3) fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), protect against cardiovascular disease. Despite these benefits, concern remains that omega3 fatty acids may increase lipid peroxidation. It has previously been shown that urinary F(2)-isoprostanes (F(2)-IsoPs) were reduced following omega3 fatty acid supplementation in humans. It is now determined whether EPA or DHA supplementation affects plasma F(2)-IsoPs. In two 6-week placebo-controlled interventions, Study A: overweight, dyslipidaemic men; and Study B: treated-hypertensive Type 2 diabetic, patients were randomized to 4 g daily EPA, DHA. Post-intervention plasma F(2)-IsoPs were significantly reduced by EPA (24% in Study A, 19% in Study B) and by DHA (14% in Study A, 23% in Study B) relative to the olive oil group. The fall in plasma F(2)-IsoPs was not altered in analyses that corrected for changes in plasma arachidonic acid, which was reduced with EPA and DHA supplementation. Neither F(3)- nor F(4)-IsoPs were observed in plasma in both studies. These results show that in humans, EPA and DHA reduce in vivo oxidant stress as measured in human plasma and urine.

Source
Mas E, et al. The omega-3 fatty acids EPA and DHA decrease plasma F(2)-isoprostanes: Results from two placebo-controlled interventions. Free Radic Res. 2010 Jun 14. [Epub ahead of print]

The effects of omega-3 supplementation on pulmonary function of young wrestlers during intensive training

ABSTRACT
The purpose of this study was to examine the effects of omega-3 supplementation on young wrestler's pulmonary function during intensive wrestling training. Forty healthy young male wrestlers participated in this study. The subjects were randomly divided into experimental (n=10), placebo (n=10), active control (n=10) and inactive control (n=10) groups. Participants in experimental, placebo and active control groups performed wrestling incremental training up to 95% of exercise MHR, three times a week, for 12 weeks. The inactive control group did not participate in any exercise training. Subjects in the experimental group were asked to consume omega-3 (1000 mg/day for 12 weeks), while those in placebo were refused any doses of omega-3. The pulmonary variables were measured at baseline and at the end of 12 weeks of training program. Results indicated that consuming omega-3 during 12 weeks training had a significantly positive effect on pulmonary variables such as FEV1, FVC, VC, MVV, FEF25-75, FIV1 (p=0.001), but no significant changes were observed in FEV1% (p=0.141) and FIV1% (p=0.117). The results of the present study suggest that consuming omega-3 during intensive wrestling training can improve pulmonary function of athletes during and in post-exercise.

Source
Tartibian B, et al. The effects of omega-3 supplementation on pulmonary function of young wrestlers during intensive training. J Sci Med Sport. 2010 Mar;13(2):281-6.

STRESS MANAGEMENT

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decreases proinflammatory cytokine production and depressive and anxiety symptoms in healthy young adults, this parallel group, placebo-controlled, double-blind 12-week RCT compared n-3 supplementation with placebo. The participants, 68 medical students, provided serial blood samples during lower-stress periods as well as on days before an exam. The students received either n-3 (2.5 g/d, 2085 mg eicosapentaenoic acid and 348 mg docosahexanoic acid) or placebo capsules that mirrored the proportions of fatty acids in the typical American diet. Compared to controls, those students who received n-3 showed a 14% decrease in lipopolysaccharide (LPS) stimulated interleukin 6 (IL-6) production and a 20% reduction in anxiety symptoms, without significant change in depressive symptoms. Individuals differ in absorption and metabolism of n-3 PUFA supplements, as well as in adherence; accordingly, planned secondary analyses that used the plasma n-6:n-3 ratio in place of treatment group showed that decreasing n-6:n-3 ratios led to lower anxiety and reductions in stimulated IL-6 and tumor necrosis factor alpha (TNF-α) production, as well as marginal differences in serum TNF-α. These data suggest that n-3 supplementation can reduce inflammation and anxiety even among healthy young adults. The reduction in anxiety symptoms associated with n-3 supplementation provides the first evidence that n-3 may have potential anxiolytic benefits for individuals without an anxiety disorder diagnosis.

Source
Kiecolt-Glaser JK et al. Omega-3 supplementation lowers inflammation and anxiety in medical students: a randomized controlled trial. Brain Behav Immun 25:1725-34, 2011.

WEIGHT MANAGEMENT

Dietary omega 3 fatty acid supplementation increases the rate of muscle protein synthesis in older adults: a randomized controlled trial

ABSTRACT
Background: Loss of muscle mass with aging is a major public health concern. Omega-3 (n–3) fatty acids stimulate protein anabolism in animals and might therefore be useful for the treatment of sarcopenia. However, the effect of omega-3 fatty acids on human protein metabolism is unknown.

OBJECTIVE:
The objective of this study was to evaluate the effect of omega-3 fatty acid supplementation on the rate of muscle protein synthesis in older adults.

DESIGN:
Sixteen healthy, older adults were randomly assigned to receive either omega-3 fatty acids or corn oil for 8 wk. The rate of muscle protein synthesis and the phosphorylation of key elements of the anabolic signaling pathway were evaluated before and after supplementation during basal, postabsorptive conditions and during a hyperaminoacidemic-hyperinsulinemic clamp.

RESULTS:
Corn oil supplementation had no effect on the muscle protein synthesis rate and the extent of anabolic signaling element phosphorylation in muscle. Omega-3 fatty acid supplementation had no effect on the basal rate of muscle protein synthesis (mean 6 SEM: 0.051 6 0.005%/h compared with 0.053 6 0.008%/h before and after supplementation, respectively; P = 0.80) but augmented the hyperaminoacidemia-hyperinsulinemia–induced increase in the rate of muscle protein synthesis (from 0.009 6 0.005%/h above basal values to 0.031 6 0.003%/h above basal values; P , 0.01), which was accompanied by greater increases in muscle mTORSer2448 (P = 0.08) and p70s6kThr389 (P , 0.01) phosphorylation.

CONCLUSION:
Omega-3 fatty acids stimulate muscle protein synthesis in older adults and may be useful for the prevention and treatment of sarcopenia.

Source
Smith GI, Atherton P, Reeds DN et al. Dietary omega 3 fatty acid supplementation increases the rate of muscle protein synthesis in older adults: a randomized controlled trial. Am J Clin Nutr 2011;93:402-12.