

APPENDIX D
SAES-422
Format for Multistate Research Activity
Accomplishments Report

Note: This report is submitted each year of an activity's duration and is due 60 calendar days following the annual meeting. The SAES-422 is submitted electronically by AAs into NIMSS. Annual Reports for MRF projects are available to CRIS and CSREES through NIMSS.

Project/Activity Number: NC1199

Project/Activity Title: N-3 polyunsaturated fatty acids and human health and disease

Period Covered: April 30, 2013 – April 30, 2014

Date of This Report: June 1, 2014

Annual Meeting Date(s): April 26, 2014

Participants: Concetta DiRusso (Nebraska), Chair; Liz Droke (South Dakota), Chair-Elect; Rob Chapkin (Texas); Debra Palmer (New Jersey); Naima Moustaid-Moussa (Texas); Jennifer Fenton (Michigan); Shane Broughton (Wyoming); Kimberly Myers (North Carolina); Mary Harris (Colorado); Robert Ward (Utah)

Diedre Chester – USDA/AFRI

Guests: Monique Lemieux (student of Naima Moustaid-Moussa); Meriam Overtami (student of Naima Moustaid-Moussa); Deepika Bangia (student of Debra Palmer); Laura Davidson (associate of Rob Chapkin).

Brief summary of minutes of annual meeting:

The NC1199 Multistate group held its annual meeting at the San Diego Convention Center on April 26, 2014. Members present and guests are listed above. The meeting opened with a discussion of recent business and plans for the 2014 annual meeting to be held in April-May 2015.

Deidre Chester, National Program Leader for NIFA programs Childhood Obesity and Function and Efficacy of Nutrients gave us a brief update on changes occurring within the NIFA grant programs. Following Dr. Chester, each member present at the meeting, gave an update on their research project(s) as listed below.

Shane Broughton - N-3 Polyunsaturated Fatty Acids in Ovulation and Vitamin D Metabolism

Rob Chapkin - Divergent mechanisms by which the n-3 PUFA armamentarium reduces chronic disease risk.

Concetta DiRusso- Dietary highly unsaturated fatty acids favor beneficial bacterial growth in the GI track

Liz Droke - Chia-seeds and inflammation: getting started

Jennifer Fenton - Fenton lab n-3 research overview

Mary Harris - Maternal Omega-3 DHA effects on infant growth and cognitive development

Naima Moustaid-Moussa - Anti-inflammatory effects of omega 3 fatty acids in obesity-associated insulin resistance

Kimberly Myers - N-3 intake in southern obese women.

Robert Ward - Effect of dietary fat composition on the development and severity of metabolic inflammation

Debra Palmer – update on the Omega 3 website

Wrap up and planning for 2015, possibly at EB2015, Boston, MA, on March 27, 2015

Since this meeting took place the day prior to the opening of Experimental Biology 2014 meetings that included among others the annual meeting of the American Society for Nutrition, American Society for Biochemistry and Molecular biology and the American Physiological Association, a schedule of all presentations and posters by members of the committee within EB2014 was prepared and distributed so that members could attend and receive further updated information relevant to the committee's activities and accomplishments (see Appendix D.i).

Accomplishments:

Objective 1: To determine the effects of n-3 fatty acids on health-related outcomes in both human and rodent models.

Colorado: Two studies make up the Colorado Station NC1199 project. The first is a human clinical trial (Omega Smart Baby Project) supplementing pregnant and breastfeeding mothers with omega (n)-3 DHA to evaluate the effect on infant body fat and on breast milk n-3 DHA levels and levels of obesity promoting and protective hormones in breast milk. The second project will look at the effect of n-3 DHA on the inflammatory response to the Western diet (high fat, high sugar) or to a low fat diet. Both studies are interested in evaluating the requirement for preformed n- 3 DHA or "fish oil fatty acid" in the diet, although technically it can be made by the body from a plant based n-3, linolenic acid (ALA). Conversion of ALA to n- 3 DHA is believed to low in humans, but there is accumulating evidence that common gene mutations (known as "fads2 SNPs") have significant effects on the synthesis of n-3 DHA from ALA and therefore upon human requirements for dietary n-3 DHA and also on the ability to transport n-3 DHA to breast milk and tissues.

Nebraska: In collaboration with Colorado, Nebraska has been evaluating plasma samples from the Omega Smart Baby Project to assess endocrine and hormonal biomarkers including insulin, leptin, lipocalin 2 to assess correlation between levels of these proteins and plasma fatty acids

including especially DHA.

Wyoming: Previous studies indicate that women with Polycystic Ovarian Syndrome (PCOS) have compromised vitamin D status. Our data confirmed this finding and indicate that when polycystic women ingest a diet high in the long-chain n-3 HUFA, vitamin D status may be further compromised to a degree that is only marginally recoverable with vitamin D₃ supplementation. Thus, n-3 HUFA ingestion may be beneficial and problematic for reproduction and in those with compromised reproductive capacity.

Objective 2: To define the mechanisms mediating the health promoting effects of n-3 fatty acids.

Nebraska: Studies at the Nebraska Station have demonstrated that the regulatory and metabolic impact of dietary long chain polyunsaturated fatty acids, AA, EPA and DHA, differ from that of the 18 carbon polyunsaturated fatty acids, linoleic and linolenic acids. The questions we are addressing: include (1) what is the contribution of dietary fat to the development and progression of cardiovascular disease, metabolic syndrome, nonalcoholic fatty liver disease (NAFLD) and nonalcoholic steatohepatitis (NASH); (2) what is the influence of dietary fat on the metabolic and genetic relationships among NAFLD/NASH, hepatic cholesterol and bile acid transport, and lipoprotein levels; (3) how do dietary polyunsaturated fatty acids and long chain polyunsaturated fatty acids differentially regulate these processes; and (4) what biomarkers of liver found in blood correlate with dietary fatty acid composition to report on these metabolic processes. The studies planned for this funding period build on previous studies from our lab, which demonstrated the regulatory and metabolic impact of dietary long chain polyunsaturated fatty acids, AA, EPA and DHA, differ from that of the 18 carbon polyunsaturated fatty acids, LA and LN. From these studies we determined the metabolic profile of blood lipids and transcription profile of liver is more similar when mice are fed diets containing saturated fat or polyunsaturated fats than when mice are fed diets enriched in the long chain polyunsaturated fatty acids.

Texas: Arachidonic acid (20:4 Δ 5,8,11,14, AA)-derived prostaglandin E₂ (PGE₂) promotes colon cancer development. In contrast, chemoprotective n-3 polyunsaturated fatty acids (PUFA) supplant AA, thereby decreasing PGE₂ biosynthesis in colonocytes, with eicosapentaenoic acid (20:5 Δ 5,8,11,14,17, EPA) in particular being metabolized to a novel 3-series E-prostaglandin (PGE₃), a putative anti-tumorigenic-cyclooxygenase metabolite. Since transformation of adult stem cells is an extremely important route towards initiating intestinal cancer, we utilized the Lgr5-EGFP-IRES-creERT2 knock-in mouse model to isolate and culture colonic organoids, in order to document ex vivo responses to exogenous 2 and 3-series prostaglandins. Colonic crypts were isolated from transgenic mice and cultured in a Matrigel based 3-D platform. Organoids were treated with exogenous PGE₂, PGE₃ or DMSO (vehicle control) for 5 days and the number of viable organoids was recorded daily. Subsequently, samples were processed for immunohistochemistry, flow cytometry and real time PCR analyses. PGE₂ promoted optimal organoid growth and induced significantly higher levels of cell proliferation (P < 0.05) compared to PGE₃ and control. In contrast, the Lgr5-GFP positive stem cell number was uniquely elevated by > 2-fold in PGE₂ treated cultures compared to PGE₃ and control. This coincided with the up-regulation of stem cell related Sox9, Axin2, and Cd44 mRNAs. Our results demonstrate

that relative to AA-derived PGE2 , a known promoter of colon tumorigenesis, EPA-derived PGE3 has diminished ability to support colonic stem cell expansion in mouse colonic organoids.

West Virginia: Our contributions to this multi-state project are to perform n-3 fatty acids feeding studies using non-diseased and diseased rat models. Different sources of n-3 fatty acids will be fed and the fatty acid composition of various tissues determined. Eicosanoids derived from n-3 and n-6 fatty acid regulate normal tissue physiology, but an imbalance of n-6 to n-3 fatty acids play a role in the pathophysiology of various diseases. Yet, few studies have examined the role n-3 fatty acids in optimizing renal and pulmonary health. The safety of n-3 fatty acid supplementation will also be evaluated since higher tissue unsaturation may increase tissue susceptibility to lipid peroxidation resulting in tissue damage. Therefore, the study objectives are to determine whether increased tissue n-3 polyunsaturated (PUFA) deposition alters genes involved in the regulation of inflammation, eicosanoid metabolism, and lipid peroxidation in renal and lung tissue. The expected outputs will assist in identifying the n-3 fatty acid sources that results in the highest tissue deposition, reduces inflammation without increasing lipid oxidation in order to promote kidney and lung health and to prevent disease.

Wyoming: In rodent studies it has been found that significant increased n-3 PUFA ingestion can enhance ovulation up to 1.4-fold. Thus, n-3 HUFA ingestion may be beneficial and problematic for reproduction and in those with compromised reproductive capacity. In this regard we are examining two different parameters in an ongoing rodent study. While ovulation is enhanced it is unknown if this increases viable offspring production. The potential for n-3 PUFA to lead to an effect on fetal imprinting and enhanced litter size is being examined in a crossover study by providing dams with n-3 PUFA through pregnancy followed by maintenance or a cross to a control diet to examine potential effects on ovulation. In conjunction with this study, the impact of chronic n-3 PUFA ingestion on vitamin D retention and biosynthesis is being examined in the rodent model. It has been found that in PCOS, marginal increases in sex hormone binding globulin and reductions in estrogen may alter the free estrogen index and ameliorate to some degree reproductive infertility and lead to possible reductions in estrogen dependent cancer risks.

Objective 3: To evaluate the effect of an eXtension site on meeting the public's informational needs regarding n-3 fatty acids

The eXtension website [<http://www.extension.org/omega-3>] is a joint project of members of NC1199 led by Dr. Debra M. Palmer (NJ). Committee members completed the content pages for the website and now participate in promoting the site and in keeping materials up to date. Content includes:

- Pregnancy and Breastfeeding
- Heart Disease and High Triglycerides
- Health Benefits of Consuming DHA and EPA
- Omega-3 Food Sources
- Recipe for Foods High in Omega-3s
- Omega-3 Supplements
- Seafood Food Safety and Other Concerns About Consuming Seafood to Increase Omega-3s
- More Scientific Information About Omega-3s

- Newly Released Cookbook

Outputs:

Publications (NC1199 Members in bold and underlined):

Meyers, K.B. and Meggs, W.J. *The inflammation Cookbook*. 2013. Abbott Press, 286 Pages. ISBN: 1458209512

Gurzell EA, Teague H, **Harris M**, Clinthorne J, **Shaikh SR**, and **Fenton JI**. 2013. DHA-enriched fish oil targets B cell lipid microdomain and enhances ex vivo and in vivo B cell function. *J Leukoc Biol*. 93(4):463-70.

Fenton JI, Hord NG, Ghosh S, Gurzell EA. 2013 Immunomodulation by dietary long chain omega-3 fatty acids and the potential for adverse health outcomes. *Prostaglandins Leukot Essent Fatty Acids*. 89(6):379-90.

Fenton JI and McCaskey SJ. 2013 Curcumin and docosahexaenoic acid block insulin-induced colon carcinoma cell proliferation via MEK dependent mechanism. *PLEFA*. 88(3):219-26.

LeMieux M, Al-Jawadi A, Wang S, **Moustaid-Moussa N**. 2013. Metabolic profiling in nutrition and metabolic disorders. *Adv Nutr*. 4(5):548-50.

Dodson MV1, Boudina S, Albrecht E, Bucci L, Culver MF, Wei S, Bergen WG, Amaral AJ, **Moustaid-Moussa N**, Poulos S, Hausman GJ. 2013. A long journey to effective obesity treatments: is there light at the end of the tunnel? *Exp Biol Med* 238(5):491-501.

Siriwardhana N1, Kalupahana NS, Cekanova M, LeMieux M, Greer B, **Moustaid-Moussa N**. 2013. Modulation of adipose tissue inflammation by bioactive food compounds. *J Nutr Biochem*. 24(4):613-23.

Fletcher SJ1, Kalupahana NS, Soltani-Bejnood M, Kim JH, Saxton AM, Wasserman DH, De Taeye B, Voy BH, Quignard-Boulangue A, **Moustaid-Moussa N**. 2013. Transgenic mice overexpressing Renin exhibit glucose intolerance and diet-genotype interactions. *Front Endocrinol (Lausanne)*, 3:166.

Siriwardhana N1, Kalupahana NS, Fletcher S, Xin W, **Claycombe KJ**, Quignard-Boulangue A, Zhao L, Saxton AM, **Moustaid-Moussa N**. 2012. n-3 and n-6 polyunsaturated fatty acids differentially regulate adipose angiotensinogen and other inflammatory adipokines in part via NF-κB-dependent mechanisms. *J Nutr. Biochem*. 23(12):1661-7.

Siriwardhana N1, Kalupahana NS, **Moustaid-Moussa N**. 2012 Health benefits of n-3 polyunsaturated fatty acids: eicosapentaenoic acid and docosahexaenoic acid. *Adv Food Nutr Res*. 65:211-22.

Melton EM, Cerny RL, **DiRusso CC**, Black PN. 2013. Overexpression of human fatty acid transport protein 2/very long chain acyl-CoA synthetase 1 (FATP2/Acsvl1) reveals distinct patterns of trafficking of exogenous fatty acids. *Biochem. Biophys. Res. Commun*.

Teague H, Fhaner CJ, **Harris M**, Duriancik DM, Reid GE, **Shaikh SR**. 2013. n-3 PUFAs enhance the frequency of murine B-cell subsets and restore the impairment of antibody production to a T-independent antigen in obesity. *J Lipid Res*. 54(11):3130-8.

Rockett BD, Melton M, **Harris M**, Bridges LC, **Shaikh SR**. 2013. Fish oil disrupts MHC class II lateral organization on the B-cell side of the immunological synapse independent of B-T cell adhesion. *J Nutr Biochem*. 24(11):1810-6.

Teague H, Rockett BD, **Harris M**, Brown DA, **Shaikh SR**. 2013. Dendritic cell activation, phagocytosis and CD69 expression on cognate T cells are suppressed by n-3 long-chain polyunsaturated fatty acids. *Immunology*. 139(3):386-94

Mulligan CM, Le CH, deMooy AB, Nelson CB, **Chicco AJ**. 2014. Inhibition of delta-6 desaturase reverses cardiolipin remodeling and prevents contractile dysfunction in the aged mouse heart without altering mitochondrial respiratory function. *J Gerontol A Biol Sci Med Sci*. 69(7):799-809.

Le CH, Mulligan CM, Routh MA, Bouma GJ, Frye MA, Jeckel KM, Sparagna GC, Lynch JM, Moore RL, McCune SA, Bristow M, Zarini S, Murphy RC, **Chicco AJ**. 2014. Delta-6-desaturase links polyunsaturated fatty acid metabolism with phospholipid remodeling and disease progression in heart failure. *Circ Heart Fail*. 7(1):172-83.

Jeckel KM, Veeramachaneni DN, **Chicco AJ**, Chapman PL, Mulligan CM, Hegarty JR, Pagliassotti MJ, Ferguson LA, Bouma GJ, Frye MA. 2012. Docosahexaenoic acid supplementation does not improve Western diet-induced cardiomyopathy in rats. *PLoS One*. 7(12):e51994.

Mulligan CM, Sparagna GC, Le CH, De Mooy AB, Routh MA, Holmes MG, Hickson-Bick DL, Zarini S, Murphy RC, Xu FY, Hatch GM, McCune SA, Moore RL, **Chicco AJ**. 2012. Dietary linoleate preserves cardiolipin and attenuates mitochondrial dysfunction in the failing rat heart. *Cardiovasc Res*. 94(3):460-8.

Nakamura MT, Yudell BE, Loor JJ. 2014. Regulation of energy metabolism by long-chain fatty acids. *Prog Lipid Res*. 53:124-44.

Monteiro J, Askarian F, **Nakamura MT**, Moghadasian MH, Ma DW. 2013. Oils rich in α -linolenic acid independently protect against characteristics of fatty liver disease in the $\Delta 6$ -desaturase null mouse. *Can J Physiol Pharmacol*. 91(6):469-79.

Monteiro J, Li FJ, MacLennan M, Rabalski A, Moghadasian MH, **Nakamura MT**, Ma DW. 2012. Menhaden oil, but not safflower or soybean oil, aids in restoring the polyunsaturated fatty acid profile in the novel delta-6-desaturase null mouse. *Lipids Health Dis*. 11:60

Vannice, G. and H. Rasmussen. 2014. Position of the Academy of Nutrition and Dietetics: Dietary Fatty Acids for Healthy Adults. *J. Acad. Nutr. Diet*. 114(1):136153.

E. Droke, Reviewers representing the Research Dietetic Practice Group. The process of publishing position statements requires authors and reviewers, all of who are acknowledged in the published paper.

Presentations (NC1199 Members in bold and underlined):

Harris, M.A. Annual Breastfeeding Conference, St. Luke's Presbyterian Hospital, (August 6, 2013, Denver, CO)

Harris, M.A. Society for Maternal Fetal Medicine (Feb 6, 2104, New Orleans, LA)

Harris MA, Baker S, McGirr K and Davalos D. "The Omega Smart baby Project: Effect of DHA on Infant Development." Abstract accepted for presentation at the Experimental biology meeting Apr28, 1 2014.

Muller, C., Walter, J., Peterson, D. and **DiRusso, C.C.** Dietary fatty acid composition coordinately modulates systemic metabolic profiles in mice with shifts in the population dynamics of gut microbiota. *Molecular and Cellular Biology of Lipids Gordon Conference*, Waterville Valley, NH, July 2013.

Additional presentations at EB2014 listed in Appendix D.i.

Impacts:

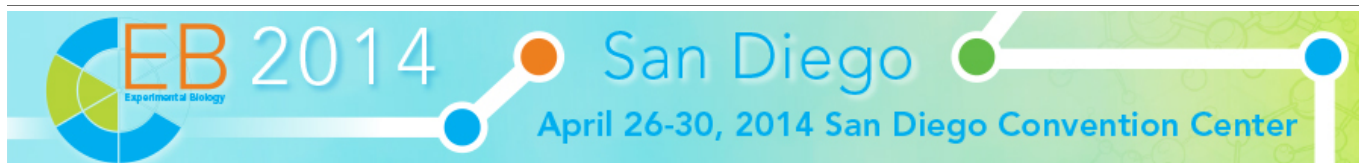
Activities: Individually and jointly committee members conduct unique research projects to further the mission and objectives of NC1199. In addition to the annual meeting held in April, a teleconference was held on Oct 9, 2013 hosted by the chair, DiRusso (NE). One outcome was the nomination of member Adam Chicco for an Early Career Award given by ISSFAL. Several collaborative interactions between committee members have been established to further the objectives of NC1199. These include, for example, Harris and DiRusso on the Omega Smart Baby Project; Chicco and Nakamura employing the *fads* desaturase knockout mice; Donohue, Chicco and Broughton on development and utilization of rodent diets differing in fatty acid compositions. The entire committee has contributed to the development and maintenance of the Omega 3 eXtension website led by Palmer (NJ). These collaborative interactions are viewed as essential drivers of the committee's productivity. Thus individually and collectively, NC1199 members have educated the professional health and nutrition communities and the general public on the specific requirements and benefits of dietary omega 3 polyunsaturated fatty acids for individuals of both sexes and at different ages; generated useful tools to disseminate information about dietary omega 3; and conducted novel research to understand components and mechanisms by which dietary fatty acids impact growth, development, and health outcomes.

Milestones: In terms of collaborative projects, particularly the Omega 3 website, the committee has made substantial impacts into understanding and promoting the health benefits of Omega 3 fatty acids, particularly DHA, as evidenced by the large number of professional, peer reviewed publications and presentations listed above under Outcomes. The Omega 3 website is completed and now is being maintained and update by group members, a future goal is to devise a mechanism to ensure the website information maintains accuracy and remains relevant in the long-term.

Indicators: Achievement outcomes for NC1199 may be monitored as peer-reviewed professional publications, presentations and electronic interactions at the website maintained by the committee. Several committee members have applied for funding jointly to support their basic research on omega 3 fatty acids.

Authorization: *Submission by an AES or CES director or administrative advisor through NIMSS constitutes signature authority for this information.*

*Limited to three pages or less exclusive of publications, details may be appended.



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Session Start Time Presentation Time Location (Click on times for Session info)	Pres # & Type	Poster Board #	Authors & Institutions	Abstract Title Session # & Title (Click on title for Presentation info)
Sat 4/26 10:30 AM 10:45 AM - 11:00 AM San Diego Convention Center, Room 29C	40.2 Minisymposium		Tao Xu ¹ Korry Hintze, Michael Lefevre, Robert E. Ward Nutrition, Dietetics and Food Sciences, Utah State University, Logan, UT	Effect of modifying the n-3 and n-6 content of the Total Western Diet on the acute inflammatory response to lipopolysaccharide in C57BL mice 40. Medical Nutrition: Nutrition and Inflammation
Sun 4/27 7:30 AM 12:45 PM - 1:45 PM San Diego Convention Center, Exhibit Halls A-D	628.13 Poster	C134	Albert Lihong Zhou ¹ Heidi Wengreen, Robert E. Ward Nutrition, Dietetics & Food Sciences, Utah State University, Logan, UT	Correlation between erythrocyte pentadecanoic acid, dairy intakes, and cognitive function in participants of the Cache County Study on Memory, Health and Aging 628. Nutrition Epidemiology: Nutrition and Chronic Disease Epidemiology
Sun 4/27 7:30 AM 12:45 PM - 1:45 PM San Diego Convention Center, Exhibit Halls A-D	638.1 Poster	C236	David M. Duriancik ¹ , Ingeborg Langohr ² , Elizabeth M. Gardner ¹ , Jenifer I. Fenton ¹ ¹ Food Science & Human Nutrition, Michigan State University, East Lansing, MI, ² Pathobiological Sciences, Louisiana State University, Baton Rouge, LA	Dietary fish oil increases neutrophil development and recruitment to the colon in colitis-prone mice 638. Nutrition Immunology: Nutritional Immunology
Sun 4/27 7:30 AM 1:45 PM - 2:45 PM San Diego Convention Center, Exhibit Halls A-D	637.16 Poster	C233	Robert E. Ward ¹ , Korry Hintze ¹ , Michael Lefevre ¹ , Abby Benninghoff ² , Minghao Li ¹ , Giovanni Rompato ³ ¹ Nutrition, Dietetics and Food Sciences, Utah State University, Logan, UT, ² Animal, Dairy and Veterinary Sciences, Utah State University, Logan, UT, ³ Center for Integrated Biosystems, Utah State University, Logan, UT	Effects of green tea on the cecal metagenome of mice fed either the AIN-93 or Total Western Diet 637. Medical Nutrition: Nutrition and the Microbiome
Sun 4/27 7:30 AM 1:45 PM - 2:45 PM	643.8 Poster	C305	Charles A. Pickens ¹ , Sarah S. Comstock ¹ , William S. Harris ² , Jenifer I. Fenton ¹ ¹ Food Science and Human Nutrition, Michigan State University, East Lansing,	Obesity is associated with increased dihomo-λ-linolenic and with decreased nervonic and n-3

	San Diego Convention Center, Exhibit Halls A-D		MI,2OmegaQuant Analytics, Sioux Falls, SD	fatty acids in plasma phospholipids 643 Energy and Macronutrient Metabolism: Metabolic Phenotyping, Metabolomics and Biomarkers
	Sun 4/27 8:00 AM - 12:00 AM San Diego Convention Center, Ballroom 20 D	Symposium	Naima Moustaid-Moussa Texas Tech University	Chair 114.Nutri-metabolomics
	Sun 4/27 8:00 AM - 8:45 AM - 9:00 AM San Diego Convention Center, Room 29D	123.4 Minisymposium	Abby Benninghoff ^{1,2} , Stephany Monsanto ¹ , Deanna Larson ¹ , Korry Hintze ^{2,3} , Robert Ward ^{2,3} , Michael Lefevre ^{2,3} ¹ Animal, Dairy and Veterinary Sciences, Utah State University, Logan, UT, ² USTAR Applied Nutrition Research, Utah State University, Logan, UT, ³ Nutrition, Dietetics and Food Sciences, Utah State University, Logan, UT	The micronutrient profile of the typical American diet enhances colorectal carcinogenesis in mice 123.Diet and Cancer: Animal Studies
	Sun 4/27 3:00 PM - 12:00 AM - 12:00 AM San Diego Convention Center, Room 29D	Minisymposium	Jenifer Fenton 1	Chair 136.Diet and Cancer: Clinical and Human Studies
	Sun 4/27 3:00 PM - 4:30 PM - 4:45 PM San Diego Convention Center, Room 29D	136.7 Minisymposium	Sarah S. Comstock ¹ , Diana Xu ¹ , Kari Hortos ² , Bruce Kovan ^{2,3} , Sarah McCaskey ² , Dorothy R. Pathak ⁴ , Jenifer I. Fenton ¹ ¹ Food Science and Human Nutrition, Michigan State University, East Lansing, MI, ² College of Osteopathic Medicine, Michigan State University, East Lansing, MI, ³ Tri-County Gastroenterology, Township of Clinton, MI, ⁴ Department of Epidemiology and Biostatistics, Michigan State University, East Lansing, MI	Serum C-peptide is positively associated with the presence of colorectal adenomas 136.Diet and Cancer: Clinical and Human Studies
	Mon 4/28 7:30 AM - 12:45 PM - 1:45 PM San Diego Convention Center, Exhibit Halls A-D	819.1 Poster	C224 Eunjoo Kim ^{1,2,3} , Laurie A. Davidson ^{1,3} , Bhimanagouda S. Patil ⁴ , Guddadarangavvanahally K. Jayaprakasha ⁴ , Evelyn S. Callaway ^{1,3} , Nancy D. Turner ^{1,3,4} , Robert S. Chapkin ^{1,3,4} ¹ Program in Integrative Nutrition & Complex Diseases, Texas A&M, College Station, TX, ² Cellular and Molecular Medicine, Texas A&M, College Station, TX, ³ Departments of Nutrition and Food Science, Texas A&M, College Station, TX, ⁴ Vegetable Crop Improvement Center, Texas A&M, College Station, TX	Effects of chemoprotective diets on crypt adult stem cells & the cells of origin of colon cancer 819.Nutrient-Gene Interactions: Nutrition and (Stem) Cell Differentiation
	 Mon 4/28 7:30 AM - 1:45 PM - 2:45 PM San Diego Convention Center, Exhibit Halls A-D	816.6 Poster	C203 Sara Kellen ¹ , Michael Lefevre ^{1,2} , Robert Ward ^{1,2} , Abby Benninghoff ^{2,3,4} , Korry Hintze ^{1,2} ¹ Nutrition, Dietetics and Food Science, Utah State University, Logan, UT, ² Applied Nutrition Research, Utah Science Technology and Research Initiative (USTAR), Utah State University, Logan, UT, ³ Animal, Dairy and Veterinary Sciences, Utah State University, Logan, UT, ⁴ School of Veterinary Medicine, Utah State University, Logan, UT	Formulation of the Total Western Diet 2, a whole food-based rodent diet that emulates average American micro- and macronutrient intakes for colorectal cancer and gut microflora studies 816.Animal Research Models in Intestinal Physiology and Digestive Function

Mon 4/28 3:00 PM 3:00 PM - 3:15 PM San Diego Convention Center, Room 30C	269.1 Minisymposium		Mary Harris ¹ , Miller Stacy ¹ , Susan Baker ¹ , Kathryn McGirr ¹ , Deana Davalos ² ¹ Food Science and Human Nutrition, Colorado State University, Fort Collins, CO, ² Psychology, Colorado State University, Fort Collins, CO	The omega smart baby project: effect of maternal DHA on infant development 269. Energy and Macronutrient Metabolism: Dietary Factors Affecting Lipid Metabolism
Tue 4/29 7:30 AM 12:15 PM - 1:45 PM San Diego Convention Center, Exhibit Halls A-D	975.1 Poster	D203	Tim Y. Hou ¹ , Rola Barhoumi ² , Gonzalo M. Rivera ³ , David M. McMurray ⁴ , Robert S. Chapkin ^{1,4} ¹ Biochemistry & Biophysics, Texas A&M University, College Station, TX, ² Veterinary Integrative Biosciences, Texas A&M University, College Station, TX, ³ Veterinary Pathobiology, Texas A&M University, College Station, TX, ⁴ Microbial Pathogenesis & Immunology, Texas A&M University Health Science Center, College Station, TX	Lipophilic natural compounds (n-3 polyunsaturated fatty acids) modulate plasma membrane organization in mouse CD4⁺ T cells 975.Mode of Action of Bioactive Natural Products
Tue 4/29 7:30 AM 12:45 PM - 1:45 PM San Diego Convention Center, Exhibit Halls A-D	1037.5 Poster	C260	Mandanna Pahlavani ¹ , Nishan S. Kalupahana ² , Monique LeMieux ¹ , Arwa Aljawadi ¹ , Shane Scoggin ¹ , Kate Claycombe ³ , Naima Moustaid-Moussa ¹ ¹ Nutritional Sciences, Texas Tech University, Lubbock, TX, ² Physiology, University of Peradeniya, Peradeniya, Sri Lanka, ³ USDA-ARS GFHNR, Grand Forks, ND	Eicosapentaenoic acid regulates brown adipose tissue gene expression and metabolism in high fat fed mice 1037.Nutrient-Gene Interactions: Nutrient-Gene Interactions in Obesity and Inflammation
Tue 4/29 7:30 AM 1:15 PM - 2:45 PM San Diego Convention Center, Exhibit Halls A-D	1001.1 Poster	D303	Iryna Voloshyna ¹ , Michael J. Littlefield ¹ , Isaac Teboul ¹ , Amy M. Archer ² , Thomas Palaia ¹ , Louis Ragolia ¹ , Harris R. Perlman ² , Allison B. Reiss ¹ ¹ Medicine, Winthrop University Hospital, Mineola, NY, ² Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL	Cholesterol homeostasis in mouse bone marrow-derived macrophages from RA- and SLE-like murine models: a possible mechanism for atherogenesis 1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM 1:15 PM - 2:45 PM San Diego Convention Center, Exhibit Halls A-D	1001.10 Poster	D312	David L. Ebenezer ¹ , Yutong Zhao ² , Steven J. Ackerman ¹ , Viswanathan Natarajan ^{1,2,3} ¹ Biochemistry and Molecular Genetics, University of Illinois at Chicago, Chicago, IL, ² Pharmacology, University of Illinois at Chicago, Chicago, IL, ³ Medicine, University of Illinois at Chicago, Chicago, IL	Epigenetic regulation of LPS-induced lung injury by sphingosine-1-phosphate lyase 1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM 1:15 PM - 2:45 PM San Diego Convention Center, Exhibit Halls A-D	1001.2 Poster	D304	Alexandra Leamy ¹ , Robert A. Egnatchik ¹ , Masakazu Shiotaz ² , David Jacobson ² , Jamey D. Young ¹ ¹ Chemical and Biomolecular Engineering, Vanderbilt University, Nashville, TN, ² Department of Molecular Physiology and Biophysics, Vanderbilt University, Nashville, TN	Palmitate-induced alterations in phospholipid composition promote ER stress and cellular dysfunction in hepatic lipotoxicity 1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM 1:15 PM - 2:45 PM San Diego Convention Center, Exhibit Halls A-D	1001.3 Poster	D305	Michael Hinton ¹ , Runping Liu ^{1,2} , Xiaoxuan Zhang ^{1,2} , Xiang Wang ^{1,2} , William M. Pandak ³ , Phillip B. Hylemon ^{1,3} , Huiping Zhou ^{1,3} ¹ Microbiology and Immunology, Virginia Commonwealth University, Richmond, VA, ² China Pharmaceutical University, Nanjing, China, ³ McGuire Veterans Affairs Medical Center, Richmond, VA	Alcohol potentiates HIV protease inhibitor-induced ER stress and hepatic lipotoxicity 1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM 1:15 PM - 2:45 PM	1001.4 Poster	D306	Jessica M. Chekal ¹ , Mary Harris ² , Concetta C. DiRusso ¹	Impact of DHA status on serum markers of obesity and

San Diego Convention Center, Exhibit Halls A-D			1Biochemistry, University of Nebraska - Lincoln, Lincoln, NE,2Colorado State University, Fort Collins, CO	inflammation in pregnant women
Tue 4/29 7:30 AM - 1:15 PM - 2:45 PM	1001.5 Poster	D307	Ariane Neumann ¹ , Graham Brogden ¹ , Susanne Brodesser ² , Hassan Y. Naim ¹ , Maren von Köckritz-Blickwede ¹	Cholesterol-depletion in human blood-derived neutrophils by methyl-β-cyclodextrin leads to the formation of neutrophil extracellular traps
San Diego Convention Center, Exhibit Halls A-D			1Department of Physiological Chemistry, University of Veterinary Medicine Hannover, Hannover, Germany,2Cluster of Excellence Cellular Stress Responses in Aging-Associated Diseases (CECAD), University of Cologne, Cologne, Germany	1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM - 1:15 PM - 2:45 PM	1001.6 Poster	D308	Kimberly Paul ¹ , Ciara McKnight ² , Sunayan Ray ¹	The host is a harsh mistress: role of fatty acid synthesis in trypanosome survival
San Diego Convention Center, Exhibit Halls A-D			1Genetics & Biochemistry, Clemson University, Clemson, SC,2Biological Sciences, Clemson University, Clemson, SC	1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM - 1:15 PM - 2:45 PM	1001.7 Poster	D309	Jassim M. Al-Hassan , Sosamma O. George, Mohammad Afzal	Steroids contents of wound healing preparations from the skin of the Arabian Gulf catfish (<i>Arius bilineatus</i>, Val.)
San Diego Convention Center, Exhibit Halls A-D			Biological Sciences, Kuwait University, Kuwait, Kuwait	1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM - 1:15 PM - 2:45 PM	1001.8 Poster	D310	Raffael D Villalobos ¹ , Daniel Villalobos ² , Miguel Murguía-Romero ³ , Raffael Jiménez-Flores ⁴ , René Méndez-Cruz ⁴ , Santiago Sigris-Flores ⁴ , Gabriel Medranos, Rafael Villalobos-Molina ³	The hypertriglyceridemic waist, waist-to-height ratios and cardiometabolic risk in university students
San Diego Convention Center, Exhibit Halls A-D			1Carrera de Biotecnología, Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico City, Mexico,2Carrera de Biología, Universidad Nacional Autónoma de México, Tlalnepantla, Mexico,3Unidad de Biomedicina, Universidad Nacional Autónoma de México, Tlalnepantla, Mexico,4Carrera de Medicina, Universidad Nacional Autónoma de México, Tlalnepantla, Mexico,5Carrera de Nutrición, Universidad Autónoma de Ciudad Juárez, Ciudad Juárez, Mexico	1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM - 1:15 PM - 2:45 PM	1001.9 Poster	D311	Teruo Miyazawa , Shunji Kato, Kento Sawane, Taiki Miyazawa, Kiyotaka Nakagawa	LC-MS/MS determination of phosphatidylcholine hydroperoxide and its truncated products in human blood plasma
San Diego Convention Center, Exhibit Halls A-D			FBC Lab, Tohoku University, Sendai, Japan	1001.Lipids in Inflammation and Stress
Tue 4/29 7:30 AM - 1:45 PM - 2:45 PM	1017.6 Poster	C33	Alena Clark ¹ , Susan Baker ² , Kathryn McGirr ² , Mary Harris ² , Deana Davalos ³	Breastfeeding support increases breastfeeding duration among middle- to high-income women
San Diego Convention Center, Exhibit Halls A-D			1Nutrition and Dietetics Program, University of Northern Colorado, Greeley, CO,2Food Science and Human Nutrition, Colorado State University, Fort Collins, CO,3Psychology, Colorado State University, Fort Collins, CO	1017.Lactation: Effects of Lactation/Breastfeeding on the Recipient Infant and/or Lactating Mother
Tue 4/29 7:30 AM - 1:45 PM - 2:45 PM	1037.2 Poster	C257	Arwa Aljawadi ¹ , Monique Lemieux ¹ , Nishan Kalupahana ² , Kate J. Claycombe ³ , Naima	Eicosapentaenoic acid regulation of muscle lipid metabolism in vivo

San Diego Convention Center, Exhibit Halls A-D			Moustaid-Moussa ¹ ¹ Nutritional Sciences, Texas Tech University, Lubbock, TX, ² Physiology, University of Peradeniya, Peradeniya, Sri Lanka, ³ GFHNRC, USDA, Grand Forks, ND	and in vitro 1037.Nutrient-Gene Interactions: Nutrient-Gene Interactions in Obesity and Inflammation
Tue 4/29 10:30 AM - 11:00 AM 11:00 AM - 11:15 AM San Diego Convention Center, Room 30B	382.3 Minisymposium		M. Jeannie Allen ^{1,2} , Yang-Yi Fan ^{1,2} , Jennifer M. Monk ^{1,2} , Tim Y. Hou ^{1,3} , Rola Barhoumi ⁴ , David N. McMurray ^{1,5} , Robert S. Chapkin ^{1,2,5} ¹ Program in Integrative Nutrition and Complex Diseases, Texas A&M University, College Station, TX, ² Nutrition and Food Science, Texas A&M University, College Station, TX, ³ Biochemistry and Biophysics, Texas A&M University, College Station, TX, ⁴ Image Analysis Library, Texas A&M University, College Station, TX, ⁵ Microbial Pathogenesis and Immunology, Texas A&M University Health Science Center, College Station, TX	n-3 Polyunsaturated fatty acids reduce Th17 polarization by decreasing responsiveness to interleukin-6 382.Nutritional Immunology: Nutrition Immunology
Tue 4/29 10:30 AM - 11:15 AM 11:15 AM - 11:30 AM San Diego Convention Center, Room 30B	382.4 Minisymposium		Sarah S. Comstock ¹ , Jennifer M. Auchtung ² , Eric A. Gurzell ¹ , Ingeborg M. Langohr ³ , Robert A. Britton ² , Jenifer I. Fenton ¹ ¹ Food Science and Human Nutrition, Michigan State University, East Lansing, MI, ² Microbiology and Molecular Genetics, Michigan State University, East Lansing, MI, ³ Pathobiological Sciences, Louisiana State University, Baton Rouge, LA	Dietary n-3 fatty acids differentially modulate cecal bacterial populations and intestinal inflammation in colitis-prone mice 382.Nutritional Immunology: Nutrition Immunology
Tue 4/29 10:30 AM - 12:15 PM 12:15 PM - 12:30 PM San Diego Convention Center, Room 30A	383.8 Minisymposium		Monique J. LeMieux ¹ , Nishan S. Nishan S Kalupahana ² , Arwa Aljawadi ¹ , Mandana Pahlavani ¹ , Kate J. Claycombe ³ , Naima Moustaid-Moussa ¹ ¹ Nutritional Sciences, Texas Tech University, Lubbock, TX, ² Physiology, University of Peradeniya, Peradeniya, Sri Lanka, ³ USDA-ARS GFHNRC, Grand Forks, ND	Eicosapentaenoic acid reduces high-fat diet-induced insulin resistance by altering adipose tissue glycolytic and inflammatory function 383.Nutrient-Gene Interactions: Nutrient-Gene Interactions in Obesity and Inflammation
Wed 4/30 12:00 AM - 10:00 AM 10:00 AM - 11:00 AM San Diego Convention Center, Sails Pavilion	LB345 Late Breaking Poster Session	LB345	N.N. Wijayatunga, V.G. Sam, C.D. Blackledge, N. Siriwardhana, M.L. Mancini, G.J. Mancini, M. LeMieux and N. Moustaid-Moussa. Texas Tech University and University of Tennessee Medical Center.	Differential regulation of adipokine levels after Bariatric surgery 5506.Disease Prevention, Progression and Treatment
Wed 4/30 7:30 AM - 12:30 PM 12:30 PM - 2:15 PM	LB727 Late Breaking Poster Session	LB727	N.N. Wijayatunga, P.R. Perera, K.P. Wanigasuriya, A. Wijesiri, N. Moustaid-Moussa and H. Peiris. Texas Tech University and Faculty of Medical Sciences, University of Sri Jayewardenepura.	Serum cystatin C in early prediction of risk of chronic kidney disease progression in type 2 diabetes 19504.Renal Physiology

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