Despite the public dogma that fats of animal origin, particularly from ruminants, cause human disease (primarily cardiovascular and cancer), the topic has been far from axiomatic within the scientific community. The general hypothesis is more than 70 yr old and, importantly, there are actual studies demonstrating a link between animal fat intake and a specific disease. These reports receive considerable attention from the mainstream media. However, these associations (mostly epidemiological) are based upon differences in relative risk and not absolute risk. If some environmental factor causes disease frequency to increase from 1/100 to 2/100, media report the relative risk difference as being a 100% increase, without providing context of actual disorder incidence. In reality, the absolute risk difference is 1 percentage unit. Appreciating how these 2 simple arithmetic calculations markedly influence data interpretation is key to putting the aforementioned trials into sensible perspective. When evaluated on an absolute risk the increased chance of acquiring a disease in the abovementioned studies is typically below 2 percentage units (a statistical difference most people would presumably consider biologically insignificant). Further, there are a much larger number of scientific articles that do not support the causal relationship between animal fat and human disease. Noteworthy is the fact that these also include some very large and randomly controlled long-term intervention trials. Interestingly, these scientific publications rarely receive media exposure. Since Gary Taubes first eloquently exposed the controversy in 2001 (Science 291:2536–2545), the number of papers disagreeing with the animal fat-human disease dogma has markedly increased. Thus, most scientific evidence does not corroborate the hypothesis that animal fat causes human disease, and in the epidemiological experiments that do, rational people would contextualize if results were presented as absolute risks instead of relative risks. In summary, the perceived link between animal fat intake and health disorders was always tenuous, but it is becoming increasingly ambiguous and this is especially true with regards to ruminant-derived products.

Key Words: dairy fat, disease

347 Dietary fats: The saturated vs. unsaturated controversy. G. D. Lawrence*, Long Island University, Brooklyn, NY.

The low fat, low saturated fat mantra has been chanted so loudly and so often that many people believe it must have solid scientific support (it does not). There will be a brief description of the historical development of the saturated fat-cholesterol hypothesis that begat the low fat doctrine in popular diet and nutrition circles and presentation of the scientific evidence that shows the inaccuracies and false assumptions of those hypotheses. Numerous studies in recent years have shown that saturated fatty acids, palmitic acid in particular, can increase levels of several inflammatory markers in vitro, although these studies have not shown exacerbation of inflammatory diseases in vivo. There will be some discussion of the role of saturated vs omega-3 and omega-6 polyunsaturated fatty acids in inflammatory syndromes, metabolic disorders and cardiovascular disease. The effect of high sugar diets on all of these metabolic consequences will also be discussed in the context of human health.

Key Words: inflammation, saturated fat, polyunsaturated fatty acid

348 Scientific evidence and gaps: A systematic review of dietary cholesterol and cardiovascular disease. G. Raman*, Tufts Medical Center, Boston, MA.

Established in the 1960s, the dietary guidelines recommended no more than 300 mg/day of cholesterol for healthy populations in the US. The objective of this presentation is to identify scientific evidence and gaps using a systematic review to examine the effects of dietary cholesterol on cardiovascular risk in healthy adults. A systematic review is a form of research that provides a summary of studies on a specific clinical question, using explicit methods to search, critically appraise, and synthesize the literature systematically. It is particularly useful in bringing together several separately conducted studies and synthesizing their results. Following a systematic review, meta-analyses can be conducted in which data from individual studies are pooled quantitatively and reanalyzed using established statistical methods. Systematic reviews and meta-analyses are considered to provide the most robust evidence for evaluating scientific questions related to human health. Of the 40 eligible studies, 19 prospective observational cohorts with 361,923 subjects found no association between dietary cholesterol intake and chronic heart disease or cerebrovascular stroke. In 21 clinical trial articles with 632 subjects, as compared with control, intervention doses of 500 to 900 mg/day of dietary cholesterol interventions increased serum lipids including, total cholesterol, low-density lipoprotein (LDL) cholesterol, and high-density lipoprotein (HDL) cholesterol. Our systematic review identified that there is a lack of long-term data (observational or trials) in healthy adults to support a recommendation of lower intake of dietary cholesterol of no more than 300 mg/day of cholesterol. Additional clinical trials are needed to examine the role of dietary intake of cholesterol between 300 and 500 mg/day on clinical outcomes. These data are based on the Original Publication: Berger S, Raman G*, Vishwanathan R, Jacques PF, Johnson EJ. Dietary cholesterol and cardiovascular disease: A systematic review and meta-analysis. Am. J. Clin. Nutr. 2015;102:276–294.

Key Words: dietary cholesterol, cardiovascular disease, serum cholesterol

349 Nutritional significance of milk fat membrane composition and structure. R. Jimenez-Flores*, The Ohio State University, Columbus, OH.

The milk fat globule membrane (MFGM) is avidly studied by many groups of scientists around the world and is yielding very important new information. Its structure, complex and heterogeneous, doesn’t fit into the norms of physical and chemical studies. The structure of the MFGM is not static, it changes constantly with its surroundings and, in particular, it changes with each different step in processing. From the simple process of cooling milk to the drastic homogenization and UHT treatments, the fate of the MFGM and its components is poorly understood in terms of its influence on digestion and nutrient delivery. The MFGM was initially described in the 1970s and 1980s as the membrane that surrounds fat globules in milk, preventing coalescence and rancidity of lipids. However, in the last 2 decades, its biologically active properties have been explored in greater detail and in different models. In fact, research has ascribed to MFGM anticancer and anti-hypercholesterolemic activities, antimicrobial and antiviral properties such as inhibition of the ulcer-forming bacterium Helicobacter pylori and rotavirus, and suppression of diseases such as multiple sclerosis. In
addition, in clinical studies, complementation of infant food with MFGM and micronutrients has led to new products with great potential for the health and wellness of consumer, especially babies. We propose that the composition and structure of the MFGM in milk plays a central role in the digestion of fat both the rate and extent of digestion. The structural studies presented here are based on the phospholipid characterization, on protein analysis, bacterial binding and microscopy observations on native and processed MFGM. Bacterial interactions have been studied by a combination of gradient centrifugation procedures, fluorescent tagging and binding, and confocal microscopy. In addition, some of the changes to the MFGM proteins during milk processing have been followed by proteomic techniques, particle size distribution and surface charge. We present also an important part of the milk lipids, the ectosomes and exosomes, that recently have been linked with functions in nutrition and health. Results of these studies have proven useful in finding relevant information from this complex system.

**Key Words:** milk fat globule membrane (MFGM), nutrition, fat digestion