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JPEN J Parenter Enteral Nutr 2008; 32; 667
DOI: 10.1177/0148607108325250

Journal of Parenteral and Enteral Nutrition
Volume 32 Number 6
November 2008 667-668

10.1177/0148607108325250
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The Best Is Yet to Come: The Future of Nutrition and Inflammation Research

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Financial disclosure: none declared.

The Intersociety Research Workshop (Chicago, IL, February 8-9, 2008) concluded on February 9, 2008, with a synthesis discussion led by John Milner. This session highlighted the physiological significance of inflammation as well as the burden of disease that may result with improperly controlled inflammation. Thus, attention focused on what is increasingly recognized as a complex balance between what is normal and what is abnormal. Throughout the meeting, evidence was presented about the considerable variability in response of biomarkers thought to reflect the inflammatory process. At least part of this variability appears to be influenced by genotype. It also appears that there is interplay with a host of dietary factors. For example, the ability of fish oil to decrease tumor necrosis factor (TNF)-α production appears to be influenced by inherent TNF-α production and by polymorphisms in the TNF-α and lymphotoxin α genes. It is also clear that one intervention or approach will not be beneficial in all circumstances. This concept is best illustrated by clinical application of anti-TNF, which offers benefits in the treatment of Crohn's disease and rheumatologic disorders, but is associated with increased mortality when administered to the critically ill. Thus, it is evident that genotype/phenotype can influence the susceptibility to both benefits and risks of targeted interventions.

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The 2008 Intersociety Research Workshop: Nutrition and Inflammation: Research Makes the Connection, was supported by grant number U13DK064190 from the National Institute of Diabetes and Digestive and Kidney Diseases. The content is solely the responsibility of the authors and does not necessarily represent the official view of the National Institute of Diabetes and Digestive and Kidney Diseases or the National Institutes of Health.

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A variety of research questions and potential opportunities were presented in the discussions that followed:

How do we measure inflammation? There are challenges discerning cell, tissue, and host specificity in response to intervention. How can we exploit new technologies to develop more reliable, sensitive, and predictive biomarkers for unraveling what constitutes normal and abnormal inflammation?

Static measures using cross-sectional data may have limited utility in understanding inflammation. Systems/computational biology may be helpful to better understand the complexity of inflammation.

There is a need for well-characterized/standardized models for studies of chronic and acute inflammation.

There is growing interest in investigation of the role of specific bioactive food components and dietary patterns in regulating normal and abnormal inflammation processes. What might be essential components of an effective anti-inflammatory diet? Does an anti-inflammatory diet need to be tailored to specific genotypes/phenotypes? Are there opportunities for integrated anti-inflammatory interventions with other strategies such as exercise?

How do nutrient inadequacies/imbalances contribute to inflammation; for example, vitamin D deficiency or limited intakes of selected phytochemicals? Are there threshold levels for pro- vs anti-inflammatory actions for specific essential and nonessential components? Are there upper level exposures which are detrimental to inflammatory control?

How does timing of anti-inflammatory interventions and adaptation processes such as autophagy influence the long-term response to intervention?

Growth is impaired in the setting of robust inflammation. Is there potential for anti-inflammatory interventions to facilitate growth of critically or chronically ill children?

Might there be opportunities for preemptive/preventive interventions that are personalized for individuals at high risk for adverse outcomes associated with inflammatory conditions? For example, there are gene polymorphisms that appear to predispose individuals to more

robust inflammatory response; might there be opportunity to target them for early intervention?

Priority must be given to develop strong competitive grant proposals that address nutrition and inflammation topics. It will be helpful to foster innovative collaborations that build on partnerships among academia, industry, and government. Many disciplines are independently exploring inflammation in the context of cachexia, including nutrition, oncology, and nephrology. Can collaborations be formed to address areas of common research interest? Would a roadmap initiative that focuses on inflammation assist in bringing together disverse groups to work on this important process?