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# Biochimica et Biophysica Acta

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## Foreword

### Special issue: Reciprocal interactions between diet, metabolism, and the nervous system

Scientifically, we have come a long way in our understanding that what we ingest promotes both short-term and long-term changes in our metabolism and modulates our overall health, but of course the mechanistic basis for these observations has proved to be increasingly elusive. Indeed, with each scientific advance in this area what continues to emerge is that biology is infinitely more complex than we can ever imagine. This is particularly true when one considers the growing body of work that suggests that diet and/or metabolic disturbances (metabolic syndrome, pre-diabetes, diabetes, and obesity) may significantly impact our nervous system in ways that were not even considered in years past. For example, our dietary choices and metabolic profile appear to play a critical role in regulating overall brain performance, modulating the presence of brain pathology, regulating the autonomic nervous system, and modulating our susceptibility to a variety of neurodegenerative conditions. The collection of articles in this special issue is intended to bring readers up to speed on the latest with regard to some of the important aspects by which diet, metabolism, and the nervous system intersect in both physiological and pathological settings.

This collection contains articles that describe the impact the diabetic, as well as pre-diabetic (including metabolic syndrome) state, has upon the nervous system. Most of the existing literature has focused on understanding the consequences of diabetes, including the effects of diabetes on the nervous system. Clearly these efforts are highly relevant and important contributions, but there is some concern that many of these previous studies do not provide the most significant or mechanistic insight. Studying the effects of diabetes on the nervous system is by definition a study of the ability of late-stage disease (irreversible diabetic state) to alter the function and neurochemistry in the nervous system. To develop a mechanistic insight and to identify the factors that initiate and promote early disturbances in the nervous system, studies must be conducted in humans and rodents in the pre-diabetic state. Such studies are crucial to understanding what specific factors or thresholds in diet and metabolism must be achieved to promote biologically significant changes in the nervous system. Additionally, such studies will assist in identifying the specific factors that promote or inhibit these same aforementioned changes in the nervous system. Because of this, the current collection of reports therefore contains not only articles on the diabetic state, but also includes a number of articles and discussions on the pre-diabetic state and effects of metabolic syndrome upon the nervous system.

An exciting area of investigation includes the studies that highlight the ability of the autonomic nervous system not only to be affected by diet and changes in metabolism, but to actually play a crucial role in regulating both metabolism and food consumption. Studies have also now identified that circulating factors with known and established roles

in regulating metabolism (adipokines, insulin, etc.) appear to have some additional roles in regulating central nervous system function. Such studies highlight the strong potential for as yet to be defined reciprocal interplay between diet, metabolism, and the nervous system. A focus of this collection has been to highlight what is known about this emerging area of research, due to the huge biological and clinical implications this line of research has for the future.

In closing, this is a unique collection of work from authors with a diverse set of scientific expertise who have come together to generate a body of work that advances our understanding of neuroscience and diseases of the nervous system. Specifically, this collection provides insight into the ability of consumption of a high-fat diet, pre-diabetes, metabolic syndrome, and diabetes to promote deleterious changes in the nervous system. The collection has tremendous implications for clinical research and it is hoped will stimulate much needed work in this area of neuroscience.

I thank each of the contributors to this collection, because without their diverse perspectives and efforts this collection would not be possible. Together we hope that this collection increases interest in this area of neuroscience and that these efforts stimulate future publications and scientific advances that increase our understanding of diet, metabolism, and the nervous system.



**Jeffrey N. Keller** is Professor, Associate Executive Director of Basic Research, Hibernia National Bank/Edward G. Schlieder Chair, and Director of the newly established Institute for Dementia Research and Prevention at the Pennington Biomedical Research Center, LSU System, Baton Rouge Louisiana. Dr Keller received his Ph.D. in molecular and cellular biology at the University of Kentucky in 1999. Since that time Dr Keller's efforts have been focused on studying aging, oxidative stress, proteasome biology, and Alzheimer's disease. The work of Dr Keller in the last 2 years has been focused on understanding the ability of a high-fat diet to modulate brain function and brain pathology during aging. In particular, he is interested in the ability of these high-fat diets to

accelerate brain aging and promote the development of age-related neurodegenerative diseases. These efforts are a part of a multi-group effort at the Center headed by Dr Keller. In addition to these research efforts, Dr Keller serves on the editorial boards of nine journals, is a reviewer for multiple NIH grant review study sections, and is a member of multiple government task forces focused on health and dementia.

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