

**Emerging Frontiers in Brain Research**  
**-Crossroads of metabolic regulation, stress response and disease-**  
**The 11<sup>th</sup> Meeting of Hirosaki International Forum of Medical Science**  
**Communication Center of Hirosaki University School of Medicine**  
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## PREFACE

In developed countries, over 20% of the total population is over the age of 60. As such, the treatment and prevention of neurodegenerative diseases, such as Alzheimer's and Parkinson's diseases, are important issues to be overcome in the 21st century. However, efficient therapeutic strategies to prevent, retard and treat these diseases remain to be explored.

Aerobic energy metabolism utilizes glucose and oxygen to satisfy all the energy needs of the adult brain. Despite the small size of the brain (2% of body weight), it is the largest consumer of total body oxygen (20%) and glucose (25%), utilizing 15% of the total cardiac output. Because of this high demand for energy, neurons are highly susceptible to a temporal lack of oxygen and glucose. Moreover, aerobic energy metabolism inevitably generates reactive oxygen species as byproducts that cause oxidative stress. In addition, normal brain activity transiently increases the local blood flow to specific areas of the brain to satisfy the energy demand. The brain possesses highly organized stress response mechanisms to cope with years of altering metabolic demand with age.

This volume is a compendium of reports from the 11th Meeting of the Hirosaki International Forum of Medical Science. The theme of the meeting was "Emerging Frontiers in Brain Research", with the subtitle of "Crossroads of metabolic regulation, stress response and disease". This symposium aimed to translate the mechanisms of metabolic regulation and stress response into an understanding of the various brain diseases, including neurodegenerative diseases such as Parkinson's and Alzheimer's diseases, brain injury and stroke, as well as to enhance the understanding of normal brain activity. Distinguished guests from around the world were invited to the conference, which successfully provided opportunities to exchange knowledge of recent developments in these fields.

We hope that this compendium of manuscripts provides a current source of information on the metabolic regulation, stress response and diseases of the brain. We would like to thank the authors for their contributions to this publication and for their efforts in advancing knowledge of their fields.

Finally, we would like to especially thank the Alumni Association of Hirosaki University Graduate School of Medicine, the Aomori Association for Promotion of Medical Science for continuous financial support and the Hirosaki University Press for support of this volume.

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## Chairman's Address

The 11th meeting of the Hirosaki International Forum of Medical Science was held on March 27-28, 2009, with the theme of “Emerging Frontiers in Brain Research —Crossroads of metabolic regulation, stress response and disease”. Indeed the meeting turned out to be an occasion in which we soaked ourselves in genuine scientific discussion. We also enjoyed the friendship with the distinguished guest speakers from abroad and all over Japan. Science united us even with people we saw each other for the first time in the meeting.

This volume reminds us of that wonderful occasion and the importance of exchanging recent scientific notions. I believe it would also provide the insight in the recent advance in scientific studies on the brain. I also hope this volume would help promote the research, particularly on brain science, by further stimulating highly motivated young scientists here in Hirosaki. I herewith thank all the contributors to the meeting and to this volume. Also the cooperation of the Hirosaki University Press is greatly acknowledged.

Kei Satoh

Chairman, The 11th Meeting of Hirosaki International Forum of Medical Science  
Dean, Hirosaki University Graduate School of Medicine