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Metabolic health: A new frontier

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In the dynamic landscape of medical research and healthcare, the field of metabolic health is gaining prominence. The evolution of 'Journal of Insulin Resistance' to 'Journal of Metabolic Health' brings with it not only a collaboration with the Society of Metabolic Health Practitioners (SMHP) – an organisation working to improve metabolic health through evidence-based nutrition and lifestyle approaches – but also a broader focus on a growing area that is not just of paramount importance but serves as the cornerstone of overall well-being, Metabolic Health.

Metabolic health and chronic conditions

While the study of metabolism and its role in health and disease has been ongoing for many decades, the broader concept of metabolic health is an evolving area becoming increasingly recognised as a linchpin in the understanding and management of chronic conditions. Metabolic health primarily focuses on understanding how our bodies regulate energy, process nutrients and maintain homeostasis and is a concept that has profound implications for both our physical and mental well-being. With the increasing prevalence of chronic conditions such as obesity, type 2 diabetes (T2D), cancer, heart disease, among others, a more critical lens is being placed on the intricacies of metabolic health in both science and practice dimensions.

Obesity, a widespread health concern of our era, is profoundly intertwined with metabolic health. Fundamentally, it is a state of excess body fat accumulation, held by the traditional theory of a chronic imbalance between energy intake and expenditure. A more granular understanding indicates that its metabolic underpinnings are complex, multifactorial and intertwined, involving a variety of physiological, genetic and environmental factors. Its development and persistence are likely influenced by several key metabolic mechanisms including insulin resistance, leptin resistance, adipose tissue dysfunction, inflammation and gut microbiota composition, which are compounded by environmental and lifestyle factors.[1]

Type 2 diabetes is likely to be the biggest global epidemic in human history.[2] Considered a complex metabolic disorder, with both genetic and environmental influences, mechanistic evidence reveals insulin resistance and hyperinsulinaemia are hallmark metabolic mechanisms underpinning the condition. Management advancements, particularly around carbohydrate reduction, have made substantial inroads into targeting the route of the metabolic problem, that is, reducing hyperinsulinaemia.[3] Nomenclature such as 'diabetes reversal' and 'remission' is now being adopted to describe outcomes, and what has traditionally been known and referred to as a chronic progressive condition can and should be revisited.

Cancer is a multifaceted disease, which traditionally has been acknowledged as a genetic disease, primarily characterised by mutations and alterations in the DNA of cells. A growing body of research and interest has emerged in understanding cancer as a metabolic disease, which suggests that changes in cellular metabolism, particularly how cells generate and use energy, may play a crucial role in the development and progression of the disease.[4] One of the key features of cancer cells is their altered metabolism, known as the Warburg effect, and which facilitates a favouring of metabolic preference for glucose consumption, even in the presence of oxygen. Innovative metabolic manipulation of fuel utilisation from a gluco-centric to a keto-centric environmental context may hold promise for future developments.

The burgeoning mental health crisis is inextricably connected to metabolic health. Many neurological diseases, including Alzheimer's and Parkinson's disease, major depressive disorder, bipolar disorder, schizophrenia and epilepsy, are characterised by impaired brain glucose utilisation, insulin resistance, neurotransmitter imbalances, mitochondrial dysfunction, oxidative stress and inflammation.[5] Traditionally, nutrition has not been considered a metabolic therapy affecting the structure and function of the brain. However, recent dietary advances in altering fuel provision to the brain and in high-dose micronutrient supplementation[6] show promise in influencing biological

processes, including mitochondrial energy metabolism, inflammatory processes, oxidative stress, monoaminergic activity and progression of neurodegeneration. Such dietary strategies are now being considered metabolic therapies themselves. Specialist fields such as nutritional psychiatry and metabolic psychiatry are emerging and gaining recognition, thereby advancing the metabolic and mental health nexus.

The mitochondrial connection

The 'mitochondria as powerhouse' analogy is outdated; these tiny organelles are so much more than merely a home for energy production. They are the fundamental essence of all life and might very well hold the clues to a more comprehensive understanding of metabolic health and dysfunction. Mitochondria are living, dynamic, maternally inherited organelles that play multifaceted roles in biosynthesis and cellular signalling and energy transformation. They are essentially the master processor of the cell. Mitochondria have a unique ability to transform the cells' inputs and outputs and convert metabolic, biochemical and neuroendocrine signals into adaptation strategies. They detect and respond to cells' cues by reshaping their structure and function. They consolidate information via dynamic, network-based interactions and mechanisms and generate output signals that fine-tune the functions of other organelles and regulate physiology systemically. A deliberate focus on understanding the intricacies of the mitochondria is needed, as well-functioning mitochondria are essential for sustaining metabolic health.[7]

A steep learning curve

Metabolic health is at the forefront of medical research and holds the potential to redefine and reshape our approach to the prevention and management of a myriad of chronic conditions. Certain conditions like T2D have taken the lead with progress, making inroads into research, guideline change, and practice; other conditions, such as mental illness, are only beginning their journey of exploration. The scientific advancement of metabolic health is still in its infancy, and the path ahead is likely steep. We are on the cusp of a new era in the medical field, and we, at the *Journal of Metabolic Health*, hope to be part of the dissemination chain of this work helping shape the future of global healthcare.

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