

Preface

Psychoneuroimmunology (PNI) is an emerging area that has developed rapidly during the last 40 years. As a multidisciplinary field, PNI may provide the scientific basis for mind-body relationships toward the development of personalized medicine. This book provides a comprehensive overview of the cutting-edge discoveries and the systems approaches in the area.

This book has several features that readers may find helpful. The first part of the book focuses on the PNI theories based on systems biology methodologies. The recognition of systemic biomarkers and networks may provide insights into the complex multidirectional interactions among various systems. The integrative biopsychosocial model is becoming the central theme for understanding health and diseases. For example, as the stress-inflammation connections are critical among different diseases, the elucidation of the complex associations may contribute to the findings of personalized and systems-based therapeutic targets.

The second part of this book focuses on the translation of PNI approaches into clinical practice. One of the major challenges in current bioscience is the translation of basic scientific discoveries into better clinical outcomes. This book is written in response to this challenge by highlighting the translational implications of PNI with the application of integrative interventions including meditation, nutritional supplements, and other mind-body strategies.

Specifically, PNI and systems biology studies support the establishment of integrative biopsychosocial models and multidimensional frameworks to connect the dynamical patterns of genetics, behaviors, environment, physiology, and pathology within various timeframes. On the basis of systemic PNI profiles, patient subgroups can be identified for personalized interventions toward the human-centered systems and dynamical medicine (see Chap. 1).

Novel models based on PNI and systems biology may provide the insights into the basic mechanisms at different levels of the human complex adaptive system (CAS). The understanding of the stress-inflammation networks would enable better therapeutic outcomes for various diseases including multiple sclerosis, cancer, and cardiovascular diseases (see Chap. 2).

In addition, the rhythmic patterns in the hypothalamic-pituitary-adrenocortical (HPA) axis have profound impacts on health and diseases. The molecular feedback and feedforward loops are essential in the neuroendocrine-immune networks. The dynamical systems approach may be appropriate to analyze the resilience and robustness of the HPA-leptin axis (see Chap. 3).

The cytokine networks may have impacts on the HPA axis in neuropsychiatric dysfunctions such as anxiety, depression, fatigue, cognitive problems, schizophrenia, and sleep disorders. Dynamical studies of the inflammatory biomarkers and pathways need to become a high priority in systemic PNI profiling (see Chap. 4).

Inflammation is considered a biological pathway that may connect sleep problems with the higher risks of disorders including depression and pain. Improving sleep quality and duration may be effective mind-body interventions (see Chap. 5).

The identification of systems-based biomarkers of depression is crucial for the translation of the discoveries in PNI into better clinical interventions. The depression-associated inflammatory networks and HPA axis-mediated interactions often have overlaps with physical disorders including rheumatoid arthritis, cardiovascular diseases, obesity, and cancer (see Chap. 6).

In schizophrenia, the complex interactions among the immune, endocrine, and nervous systems may be the essential mechanisms. The functions of the HPA-gonadal (HPAG) axis have been correlated to schizophrenia. The elucidation of these pathways is critical as the common inflammatory networks may be involved in both depression and schizophrenia (see Chap. 7).

Inflammatory biomarkers have an essential role in the psychological stress and behavioral symptoms of those with obesity. The elucidation of the cellular networks may contribute to the development of effective interventions for obesity and associated metabolic diseases including diabetes and cardiovascular diseases (see Chap. 8).

The bidirectional interactions between the nervous and immune systems have the major roles in inflammation, providing the connections among psychosocial stress, aging, and chronic diseases. The inflammatory, synaptic, and neurotrophic pathways have been related to the aging process and associated neurodegenerative diseases (see Chap. 9).

The PNI principles can be applied to understand the mechanisms in the comorbid disorders including cardiovascular diseases and psychiatric problems. The research in systems biology and PNI would help with the discovery of systems-based biomarkers including the inflammatory pathways for the diagnosis and treatment of cardiovascular diseases (see Chap. 10).

The individual variations and risk factors that may affect the psycho-neurological symptoms in cancer patients include perceived stress, cognitive deficits, malfunctions in the HPA axis, and inflammation. Such mechanisms indicate a framework for personalized medicine for different diseases sharing the common pathways in the inflammatory microenvironment (see Chap. 11).

Many evidences have addressed the stress-caused alterations in immune imbalance in chronic skin disorders including atopic dermatitis, psoriasis, and malignant melanoma. Various inflammatory pathways have been identified in fibrotic disorders

including localized scleroderma, pediatric and adult lichen sclerosus, and eosinophilic fasciitis (see Chap. 12).

The integrative PNI framework may help interpret the underlying mechanisms of mind-body medicine. Taking more adaptive ways and more effective coping strategies when facing life challenges may help improve the behaviors, psychophysiological responses, and overall health (see Chap. 13).

By covering topics from important concepts to recent development, from theoretical frameworks to clinical practice, this book intends to assist the understanding of PNI and mind-body methods toward the development of systems and dynamical medicine. It tries to present a state-of-the-art and holistic view for the translation of PNI into better preventive and personalized medical practice.

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