
Preface

The book on “Translational Research in Environmental and Occupational Stress” introduces the various aspects of translational research which resulted from bench to bedside and bedside to bench for the benefit of the society at large. This book includes the tangible and non-tangible products which have been developed after rigorous research in the field of Environmental and Occupational Stress. It serves as a guide as well as a reference book for practicing clinicians, scientists, and research scholars.

Translating Physiological Knowledge to Health Application: This chapter introduces the problems encountered by soldiers operating in extreme operational environments such as high altitude, cold and desert. This chapter describes how the physiological responses during high altitude acclimatization were formulated as the staging of acclimatization schedule at high altitude. Likewise, physiological effects of heat stress resulted in formulation of an ergogenic drink. The extreme cold conditions led to the development of anti-frostbite cream. The translational research led to the development of products/technologies/processes which helped in providing health solutions.

Grassroots Solutions to Overcome Abiotic and Biotic Environmental Stress in Agriculture: This chapter gives an insight into the myriad problems in agricultural farming due to environmental stress and their counter measures. The authors give an account of the grassroot solutions and innovations by the farmers to overcome abiotic and biotic stress. Moreover, they also highlight various efforts of the farmers to conserve germplasm and improve the quality of their produce.

Stress Research: Varied Paradigms: In this chapter, the authors describe different existing perspectives for the thorough understanding of the concept of stress from multiple viewpoints. Further, they focus on discussing different research paradigms. Beginning with the early physiological notions of 1920, the authors analyze genetic, biological, psychosocial, developmental, and interactional paradigms.

Therapeutic Potential of Intermittent Hypoxia: Lessons from Respiratory Motor Plasticity: In this chapter, the authors consider distinctions between the intermittent hypoxia (IH) protocols giving rise to pathology versus beneficial effects and then consider the mechanisms and implications of respiratory and non-respiratory motor plasticity elicited by modest protocols of IH. Specifically, the goals of this chapter are to: (1) differentiate between

the experimental IH protocols giving rise to beneficial versus pathologic effects in multiple body systems; (2) review the impact of modest IH protocols on respiratory and non-respiratory motor function; (3) review recent advances in our understanding of mechanisms giving rise to that IH-induced motor plasticity; and (4) consider the clinical implications of IH-induced motor plasticity.

High-Altitude Research and Its Practical Clinical Application: In this chapter, the authors highlight their experiences and discoveries that change the way disease is treated in hypoxic environment of high altitude. This chapter describes life under chronic hypoxia which is as normal as sea level and diseases at high altitude, particularly in the cardio-respiratory areas which behave differently because the organism adapts to chronic hypoxia, even deviating from the normal and optimal status of good health.

Nanomaterials in Healthcare: In this chapter, authors present a summary of different nanomaterial based technologies in healthcare with emphasis on therapeutics, medical devices and diagnostics.

Nanotoxicity and Cellular Stress Response: Physical and Chemical Properties and Their Link to Translational Research: This chapter is an elaborate account on nanomaterial toxicity wherein the author emphasizes on the various physicochemical properties of nanomaterial such as size, shape, chemical composition and surface chemistry which is required to understand their interaction with the biological system.

HIF-1 and EGLN1 Under Hypobaric Hypoxia: Regulation of Master Regulator Paradigm: This chapter highlights the adaptation and acclimatization to high altitude which are driven by the alterations in the O₂-sensing pathway. The authors describe the role of HIF-1 and EGLN1, the central regulatory molecules of O₂-sensing pathway which will help in our understanding of the pathophysiological mechanisms.

Electrochemical Biosensors for Hypoxia Markers: In this chapter, the authors describe the development of a biosensor which measures the biologically important hypoxia biomarkers as it provides valuable information regarding the personnel at high altitude. This is a perfect example of translational research which led to the development of a cost effective and portable electrochemical biosensor for the measurement of various hypoxia biomarkers in volume miniaturized samples using screen printed electrodes.

Determining Nutritional Requirements of Indian Soldiers: An Outcome of Translational Research: This chapter stresses upon the adequate nutritional requirement for maintaining highest level of physical fitness under different climatic conditions and operational situations. The planning of ration for combat operations is a challenging task, as balance between nutrient requirement for optimum health and palatability needs to be ensured. Translational research has played a great role in formulating dietary recommendations and ration scales for Armed Forces and at the same time, various ready to eat products became the innovative products of military nutrition research.

Improvements in Adjuvants for New-Generation Vaccines: This chapter highlights the development of new herbal adjuvants, which will lead to the generation of both Th1 and Th2 immune response to mitigate the diseases caused by bacteria or viruses.

Rapid Acclimatization Strategies for High-Altitude Induction: This chapter describes the possible ways to prevent high altitude induced diseases. Authors claim that acclimatization to high altitude is the best strategy to prevent high altitude induced diseases, but it can be achieved by hypoxia preconditioning by the use of interventions like hypoxia mimetism, viz, cobalt chloride (CoCl_2) and sphingosine-1-phosphate (S1P) and nanocurcumin. They also discuss an alternative approach to induce acclimatization and reduce incidence of acute mountain sickness by the use of intermittent hypoxia exposure.

Noise, the Silent Killer: This chapter highlights noise induced hearing loss and its effective counter measure by carbogen breathing. This chapter describes the development of remedial measures for conserving hearing and effectively counteracting the adverse interactions of noise on the efficiency and performance of people working in noisy environments.

Yoga for Preventive, Curative, and Promotive Health and Performance: In this chapter, the authors describe about Yoga, which is an ancient Indian system of philosophy, culture, tradition and a way of maintaining better life, established in India thousands of years ago. The authors also highlight that regular yogic practices endow perfect physical and mental health to its practitioner which improves aerobic capacity, anaerobic capacity, joint flexibility and muscle strength. Authors claim that Yoga is not only a discipline to be practiced by spiritual aspirants but also has got relevance to the spirit of military activities.

Technology Translation from Heat Physiology Research: The authors describe the effect of high ambient temperature exposure on human body and its effects. Authors also highlight the translational aspects of their study, which resulted in the formulation of replenishment drink DIP-SIP and development of a Man Mounted Air Conditioning System.

Improved Habitability Under Extreme Environments at High Attitude: This chapter deals with improving habitability under extreme environmental conditions. This chapter highlights the solar shelter ‘Sourja’ for cold conditions, space heating device (Bukhari) and oxygen enriched shelters at high and extreme altitudes to combat hypoxia and solar snow melter.

Inhaled Nitric Oxide Therapy for Treatment of High-Altitude Pulmonary Edema: This chapter describes about the inhaled nitric oxide therapy for treatment of high altitude pulmonary edema. This chapter also highlighted the development of tailor made NO delivery system for patients of high altitude pulmonary edema.

High-Altitude Medicine: The Path from Genomic Insight to Clinical Applications: This chapter describes the role of genomics in high altitude induced diseases. Authors highlight that the ultimate goal would lie in making genomic information readily accessible for more informed and better management of high altitude environmental stress.

Hypoxia in Acute Chemical Emergencies: Toxicity, Mechanism, and Treatment: In this chapter, the authors discuss the toxicity, molecular mechanism(s) of action and treatment modalities of chemical asphyxiants. It also addresses the possible implication of organophosphorus compounds in

producing chemical hypoxia. This information will be useful for medical management of hypoxia-related chemical emergencies.

Hypertension at High Altitude: This chapter describes the cause for sustained elevation of blood pressure during exposure to high altitude and the factors associated with inter-individual variation. Overall, this chapter reviews available literature on systemic blood pressure responses to high altitude.

Herbs for Mitigating High Altitude Maladies: This chapter highlights the translation of traditional ethnopharmacological wisdom into a process and product with a scientific rationale and development of products for mitigating high altitude maladies. Herbs have wide range of therapeutic effects and through systematic scientific investigations using various animal models and clinical trials, research at DIPAS has translated this knowledge into products for protection against high altitude maladies.

Lessons from a 20-Year Investigation of Intermittent Hypoxia: Principles and Practices: In this chapter, the author presents an elaborate description about intermittent hypoxia. An in depth account on the key mechanisms involved and the effect of intermittent hypoxia on the cardio-respiratory system, immune system, reactive oxygen and nitrogen species signalling, hypoxia inducible factor signalling and epigenetics is given. The author also talks about the clinical applications of intermittent hypoxia treatment being practiced in treating various disease states.

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