

Preface

Curcumin, a hydrophobic polyphenol, is the yellow pigment in the Indian spice turmeric (curry powder). It is derived from the rhizome of the herb *Curcuma longa*, which belongs to the family Zingiberaceae. Curcumin is sensitive to degradation by visible and ultraviolet light, as well as high pH and oxygen. It has a half-life of around 8 hours in the human blood. Curcumin possesses antioxidant, antiinflammatory, antimicrobial, anticarcinogenic, antihypertensive, antihyperlipidemic, antidiabetic, antipsoriasis, antithrombotic, antihepatotoxic, and neuroprotective properties. Curcumin has been used extensively in Ayurvedic medicine (Indian system of medicine) and Chinese traditional medicine for centuries as an antiinflammatory, antinociceptive, and antishock agent to relieve pain and inflammation not only in the skin and muscles but also in the treatment of numerous pathological conditions, including rheumatism, digestive and inflammatory disorders, intermittent fevers, urinary discharges, and leukoderma as part of traditional medicine. Curcumin acts not only by inhibiting oxidative stress and neuroinflammation, reversing the amyloid pathology, but also by modulating synaptic plasticity and inducing neurogenesis in the hippocampus of transgenic mouse model of Alzheimer disease (AD), a neurodegenerative disorder, which is characterized by the deposition of senile plaques and neurofibrillary tangles, the loss of neurons, and synapses, along with memory impairment and cognitive deficit. Direct injections of curcumin into the brains of the mice with AD not only delay further development of plaque but also reduce the levels of senile plaque. Curcumin not only retards A β -mediated oxidative stress but also inhibits the activation of NF- κ B and prevents A β -induced cell death in a human neuroblastoma cell line supporting the view that regular consumption of curcumin from childhood to adulthood may reduce the risk of developing AD, and thus, curcumin can be used as a potential therapeutic agent for the treatment of AD.

Information on the treatment potentials of curcumin for AD is scattered throughout the literature in the form of original papers, reviews, and few edited books, which are focused on the effect of curcumin on anticarcinogenic activities of curcumin in visceral tissues. At present there are no books on the effects of curcumin on the brain and potential use of curcumin for the treatment of AD. The overarching

objective of this monograph is to provide readers with a comprehensive and cutting-edge information on the effects of curcumin on the brain in a manner that is not only useful to students and teachers but also to researchers, nutritionists, and physicians. This monograph has ten chapters. The first chapter describes information on neurochemical changes in AD. Chapter 2 provides information on potential animal models of AD and their importance in investigating the pathogenesis of AD. Chapter 3 deals with metabolism, bioavailability, and biochemical effects of curcumin in visceral organs and the brain. Chapter 4 focuses on cutting-edge information on the effects of curcumin on transcription factors and enzyme activities in visceral organs and the brain. Chapter 5 describes the effect of curcumin on growth factors and their receptors, ion channels, and transporters in the visceral organs and the brain. Chapter 6 narrates the effect of curcumin on oxidative stress in animal models of AD and in AD patients. Chapter 7 describes the cutting-edge information on the effect of curcumin on neuroinflammation in animal models of AD and in AD patients. Chapter 8 provides readers with information on the therapeutic importance of curcumin in neurological disorders other than AD. Chapter 9 deals with cutting-edge information on treatment of AD with phytochemicals other than curcumin. Finally, Chap. 10 deals with perspective and direction for future research on the potential use of curcumin for the treatment of human AD.

My presentation and demonstrated ability to present complicated information on signal transduction processes associated with effects of curcumin on the brain will make this book particularly accessible to neuroscience graduate students, teachers, and fellow researchers. It can be used as a supplemental text for neuroscience, nutrition, and neurochemistry courses. Clinicians, neuroscientists, neurologists, neurochemists, and nutritionists will find this book useful for understanding the molecular aspects of the potential use of curcumin for AD treatment. To the best of my knowledge, this monograph will be the first to provide a comprehensive description of signal transduction processes associated with beneficial effects of curcumin in the brain.

The choices of topics presented in this monograph are personal. They are not only based on my interest on the effects of curcumin on the brain but also in areas where major progress has been made. The key objective of this monograph is to critically evaluate the effect of curcumin on metabolic processes in the brain. Each chapter of this monograph contains an extensive list of references, which are arranged alphabetically to works that are cited in the text. I have tried to ensure uniformity and mode of presentation as well as a logical progression of subjects from one topic to another and have provided an extensive bibliography. For the sake of simplicity and uniformity, a large number of figures with chemical structures of curcumin and its analogs along with line diagrams of colored signal transduction pathways are also included. I hope that my attempt to integrate and consolidate the knowledge on the effect of curcumin in the brain will initiate more studies on molecular mechanisms associated with beneficial effects of curcumin on human health in general and the brain in particular. This knowledge will be useful for the optimal health of young, boomer, and pre-boomer American generations.

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