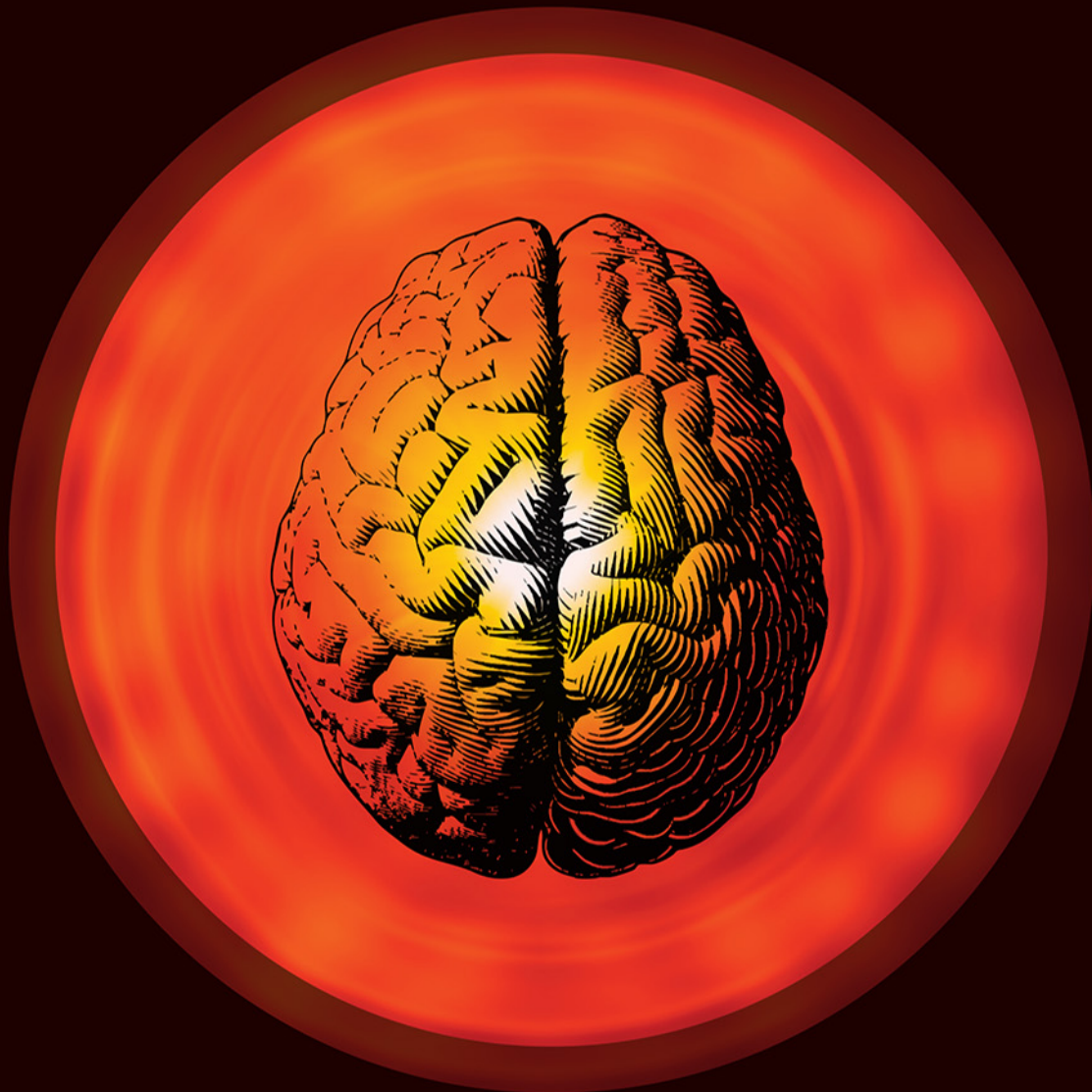


Photobiomodulation in the Brain

Low-Level Laser (Light)
Therapy in Neurology and Neuroscience



Edited by
Michael R. Hamblin and Ying-Ying Huang



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Michael R. Hamblin

Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, MA, United States
Department of Dermatology, Harvard Medical School, Boston, MA, United States

Ying-Ying Huang

Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, MA, United States
Department of Dermatology, Harvard Medical School, Boston, MA, United States



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Dedication

**To the love of my life, my beautiful wife, Angela
Michael R. Hamblin**

**To Sophie and Ryan, you have always been great sources
of inspiration, joy, and pride
Ying-Ying Huang**

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Contents

List of Contributors
Preface

xix
xxv

Part I

Basic considerations and in vitro 1

1. Photobiomodulation therapy and the brain: an innovative tool for therapy and discovery 3

Praveen R. Arany

1.1 Introduction 3

1.1.1 Beyond the structure-function architecture of the human brain 3

1.1.2 A bottom-up approach to brain neurosciences 4

1.1.3 Modulating the “brain black box” with light 5

References 6

2. Theoretical neuroscience 9

Marcelo Victor Pires de Sousa, Marucia Chacur, Daniel Oliveira Martins and Carlo Rondinoni

2.1 Molecular and cellular neuroscience 9

2.1.1 History of neuroscience discovery over the decades 9

2.1.2 Molecular techniques in neuroscience research 10

2.2 Translational research in neuroscience 11

2.3 Approaches to simulations and computational neuroscience 11

2.3.1 Neural function simulation 12

2.4 Cognition and behavior 13

2.5 Neural treatment simulation 16

References 17

3. Photobiomodulation of cultured primary neurons: role of cytochrome c oxidase 21

Margaret Wong-Riley and Huan Ling Liang

3.1 Introduction 21

3.2 Cytochrome c oxidase: a biological mediator of photobiomodulation 21

3.3 Effect of photobiomodulation on primary neurons exposed to tetrodotoxin 22

3.4 Equilibrium constants of azide and cyanide with cytochrome c oxidase 23

3.5 Effects of photobiomodulation at different wavelengths 24

3.6 Optimal regimen of photobiomodulation via light-emitting diode for cultured neurons exposed to cyanide 26

3.7 Photobiomodulation pretreatment has added benefits for neurons exposed to cyanide 28

3.8 Therapeutic effect of photobiomodulation on primary neurons exposed to MPP⁺ or rotenone 29

3.9 Pretreatment with photobiomodulation is beneficial for neurons exposed to MPP⁺ or rotenone 31

3.10 Conclusions 32

Acknowledgments 32

References 32

4. Photobiomodulation on cultured cortical neurons 35

Ying-Ying Huang and Michael R. Hamblin

4.1 Introduction 35

4.2 Dose response in cultured cortical neurons 36

4.3 Oxidative stress in cultured cortical neurons 38

4.4 Excitotoxicity in cultured cortical neurons	41	6.2.3 Absorption	72
Conclusion	45	6.2.4 Penetration	74
References	46	6.2.5 Speckling	75
5. Safety and penetration of light into the brain	49	6.3 Infrared light—on a journey to the brain	76
<i>Erica B. Wang, Ramanjot Kaur, Manuel Fierro, Evan Austin, Linda Ramball Jones and Jared Jagdeo</i>		6.3.1 Penetration of skin	76
5.1 Introduction	49	6.3.2 Penetration of skull	78
5.2 Safety	49	6.3.3 Penetration of heterogeneous tissues	79
5.2.1 Animal studies	49	6.3.4 A hairy problem	82
5.2.2 Clinical studies	51	6.3.5 Effectively treating the brain	83
5.2.3 NeuroThera Effectiveness and Safety Trial clinical trials	51	6.4 Alternative hypotheses to direct near-infrared light energy effects	83
5.3 Light penetration into the brain	51	6.5 Conclusion	85
5.4 Mechanism of action	52	Acknowledgments	86
5.5 Penetration depth	53	References	86
5.6 Optical properties of tissue	54	7. Light sources and dosimetry for the brain and whole body	89
5.6.1 Light–tissue interactions	54	<i>James D. Carroll</i>	
5.6.2 Melanin	54	7.1 Dose	89
5.6.3 Water	55	7.2 Irradiation parameters: wavelength (nm)	89
5.6.4 Hemoglobin	55	7.3 Penetration	90
5.6.5 Optical window	56	7.4 Power Watts (W)	90
5.7 Cerebrospinal fluid	57	7.5 Beam spot size (cm ²)	91
5.7.1 Gray and white brain matter	57	7.6 Irradiance (W/cm ²)	91
5.8 Wavelength	57	7.7 Pulses	91
5.8.1 Animal studies	58	7.8 Coherence	92
5.8.2 Human studies	58	7.9 Time, energy, and fluence	92
5.9 Skull anatomy	59	7.10 Fluence (energy density) (J/cm ²)	93
5.9.1 Animal studies	59	7.11 Irradiation time (seconds)	93
5.9.2 Human studies	59	7.12 Number of treatments and treatment intervals (hours, days, or weeks)	93
5.9.3 Monte Carlo modeling	59	7.13 Devices	94
5.10 Irradiance	62	References	94
5.11 Coherence	62	8. Mechanisms of photobiomodulation in the brain	97
5.12 Pulsing	62	<i>Michael R. Hamblin</i>	
5.13 Tissue storage and processing	63	8.1 Introduction	97
5.14 Conclusion	63	8.2 Molecular mechanisms of photobiomodulation	97
References	64	8.2.1 Mitochondria and cytochrome c oxidase	97
Further reading	66	8.2.2 Opsins, flavins, and cryptochromes	99
6. Near-infrared photonic energy penetration—principles and practice	67	8.2.3 Light-gated ion channels	99
<i>Theodore A. Henderson and Larry D. Morries</i>		8.2.4 Water as a chromophore	100
6.1 Introduction	67	8.3 Mechanisms of photobiomodulation applied to the brain	100
6.1.1 Understanding near-infrared light	67	8.3.1 Metabolism	101
6.2 Light interactions with tissue	70	8.3.2 Blood flow	101
6.2.1 Reflection and refraction	70	8.3.3 Neuroprotection	101
6.2.2 Scattering	71		

8.3.4	Oxidative stress	102	11.3	Alternative photobiomodulation treatment modalities	140
8.3.5	Antiinflammatory effects	102	11.3.1	Intracranial photobiomodulation	140
8.3.6	Neurogenesis	103	11.3.2	Intranasal photobiomodulation	141
8.3.7	Synaptogenesis	104	11.4	Introducing “remote photobiomodulation”	141
8.3.8	Stem cells	104	11.5	Discovering the indirect effects of photobiomodulation	142
8.3.9	Preconditioning	105	11.6	The effects of photobiomodulation on stem cells	144
8.3.10	Systemic effects	105	11.7	Remote photobiomodulation as a neuroprotective intervention	145
8.3.11	Laser acupuncture	105	11.7.1	Parkinson’s disease	145
8.4	Conclusion	106	11.7.2	Alzheimer’s disease	146
	References	106	11.7.3	Retinopathy	146
Part II			11.8	The precedent: remote ischemic conditioning	147
Studies in animal models			11.9	Peripheral tissue targets for remote photobiomodulation-induced neuroprotection	148
9.	Transcranial photobiomodulation for stroke in animal models	113	11.10	Mechanisms underlying remote photobiomodulation-induced protection	148
	<i>Luis De Taboada and Michael R. Hamblin</i>		11.10.1	Circulating cellular mediators	148
9.1	Introduction	113	11.10.2	Circulating molecular mediators	149
9.2	Animal models of stroke	115	11.10.3	Modulation of the microbiome	149
9.2.1	Middle cerebral artery occlusion	115	11.10.4	Neurogenic signaling	149
9.2.2	Rabbit small clot embolic stroke model	116	11.11	Conclusion	150
9.2.3	Photothrombotic stroke models	116		References	150
9.3	Photobiomodulation for ischemic stroke in MCAO models	117	12.	Photobiomodulation for traumatic brain injury in mouse models	155
9.4	Photobiomodulation for ischemic stroke using the RSCM model	118		<i>Michael R. Hamblin</i>	
9.5	Photobiomodulation for ischemic stroke in photothrombotic model	119	12.1	Introduction	155
9.6	Conclusion	121	12.2	Studies from other laboratories	155
	References	121	12.3	Studies from the Hamblin laboratory	156
10.	Photobiomodulation in photothrombotic stroke	125	12.3.1	Closed-head traumatic brain injury study	156
	<i>Lorelei Tucker, Luodan Yang, Yong Li and Quanguang Zhang</i>		12.3.2	Pulsed versus continuous wave photobiomodulation for traumatic brain injury	156
	References	136	12.3.3	Treatment repetition study	157
11.	Remote photobiomodulation as a neuroprotective intervention—harnessing the indirect effects of photobiomodulation	139	12.3.4	Photobiomodulation increases neurogenesis and neuroprogenitor cells in traumatic brain injury mice	159
	<i>Luke Gordon, Boaz Kim, Claudia Petrucco, Ji Yeon Kim, Patrick Benson, Jonathan Stone and Daniel M. Johnstone</i>		12.3.5	Photobiomodulation increases BDNF and synaptogenesis in traumatic brain injury mice	161
11.1	Transcranial photobiomodulation	139	12.3.6	The solution to the problem of 14 daily photobiomodulation treatments	163
11.2	Limitations of transcranial photobiomodulation	140			

12.4 Conclusion	165	14.3 Photobiomodulation therapy	194
References	166	14.3.1 Introduction to photobiomodulation therapy	194
13. Photobiomodulation and mitochondria for traumatic brain injury in mouse models	169	14.3.2 Mechanisms of photobiomodulation therapy	194
<i>Mei X. Wu and Michael R. Hamblin</i>		14.3.3 Translational photobiomodulation studies in depression animal models	197
13.1 Introduction	169	14.4 Conclusions and future outlook	199
13.2 IEX-1 in traumatic brain injury	169	References	199
13.3 IEX-1 KO mice fail to fully recover from mild traumatic brain injury	170	15. Transcranial photobiomodulation treats Alzheimer's disease in amyloid-β protein precursor transgenic mice	207
13.4 Histological alteration in IEX-1 KO mice after mild traumatic brain injury	171	<i>Luis De Taboada and Michael R. Hamblin</i>	
13.5 Inflammatory responses after mild traumatic brain injury	173	15.1 Introduction	207
13.6 Transcranial photobiomodulation for traumatic brain injury in IEX-1 Knockout Mice	173	15.2 Study design	208
13.7 Combination of photobiomodulation and metabolic modulation	177	15.3 Transcranial photobiomodulation improves cognitive performance as measured by Morris Water Maze	208
13.8 Photobiomodulation assists neurons to survive hypoxia in vitro	178	15.4 Transcranial photobiomodulation lowers the amyloid load in brain and reduces levels of A β peptides in brain, cerebrospinal fluid, and plasma	209
13.9 Photobiomodulation suppresses apoptosis induced by hypoxia	178	15.5 Transcranial photobiomodulation reduces inflammation in the brain	209
13.10 Hypoxia accelerates, but photobiomodulation protects against secondary brain injury	178	15.6 Transcranial photobiomodulation improves mitochondrial function in the brain	210
13.11 Mitochondrial functions are additively improved by the combination of photobiomodulation with lactate or pyruvate	182	15.7 Discussion	210
13.12 Photobiomodulation and lactate or pyruvate together fully protect the hippocampal tissue and its function	183	15.8 Conclusion	211
13.13 Conclusion	185	References	211
References	185	16. Low-level laser therapy to the bone marrow: a new therapeutic approach to neurodegenerative diseases	213
14. Photobiomodulation for depression in animal models	189	<i>Amir Oron and Uri Oron</i>	
<i>Farzad Salehpour, Javad Mahmoudi, Saeed Sadigh-Eteghad and Paolo Cassano</i>		Acknowledgment	216
14.1 Introduction	189	References	216
14.2 Major depressive disorder	189	17. The experimental evidence for photobiomodulation-induced cellular and behavioral changes in animal models of Parkinson's disease: a template for translation to patients	219
14.2.1 The extent of the problem	189	<i>Nabil El Massri and John Mitrofanis</i>	
14.2.2 Pathophysiology of major depressive disorder	189	17.1 Introduction	219
14.2.3 Animal models of depression and photobiomodulation studies	192		
14.2.4 Behavioral tests used in depression and photobiomodulation studies	193		

17.2 Parkinson's disease and animal models	219	20.2.1 The contribution of ammonia	255
17.3 Photobiomodulation	221	20.2.2 The contribution of oxidative/ nitrosative stress	258
17.4 Neuroprotection	223	20.3 Photobiomodulation for hepatic encephalopathy	259
17.5 Gliosis	225	Acknowledgment	260
17.6 Growth factors	226	References	260
17.7 Functional activity	226	Further reading	263
17.8 Behavior	226		
17.9 Translation to patients	227		
17.10 Conclusion	228		
References	228		
Further reading	231		
18. Effects of near-infrared low-level laser stimulation on neuronal excitability	233	21. Photobiomodulation in animal models of retinal injury and disease	265
<i>Ljubica M. Konstantinović and Saša R. Filipović</i>		<i>Janis T. Eells</i>	
18.1 Introductory remarks	233	21.1 Introduction	265
18.2 Neuronal excitability—experimental results	234	21.2 Methanol intoxication	267
18.2.1 Effects on peripheral nerves	234	21.3 Bright light-induced retinal damage	267
18.2.2 Effects on brain	234	21.4 Diabetic retinopathy	269
18.3 Proposed mechanisms	236	21.5 Retinitis pigmentosa	269
18.4 Future directions	239	21.6 Aging and age-related macular degeneration	269
Acknowledgment	239	21.7 Retinopathy of prematurity	270
References	239	21.8 Optic nerve injury	270
		21.9 Glaucoma	271
		21.10 Conclusion and future directions	271
		Acknowledgment	271
		References	271
		Further reading	273
19. Photobiomodulation for multiple sclerosis in animal models	241	22. Transcranial photobiomodulation therapy for pain: animal models, dosimetry, mechanisms, perspectives	275
<i>M.A. Tolentino and J.A. Lyons</i>		<i>Marcelo Victor Pires de Sousa, Nathali Cordeiro Pinto and Elisabeth Mateus Yoshimura</i>	
19.1 Introduction	241	22.1 Introduction	275
19.2 Experimental autoimmune encephalomyelitis and multiple sclerosis	241	22.2 Pain—a major problem for human health	276
19.3 Photobiomodulation therapy for the treatment of experimental autoimmune encephalomyelitis/ multiple sclerosis	244	22.3 Transcranial photobiomodulation therapy—a multidisciplinary solution for pain	277
19.4 Conclusion and future directions	249	22.4 Photoneuromodulation: dosimetry, mechanisms, and therapeutics in translational research	277
References	249	22.4.1 Dosimetry	277
		22.4.2 Mechanisms	279
		22.4.3 Therapeutic effects	281
		22.4.4 Irradiation of nervous system: peripheral versus central	281
20. Hepatic encephalopathy and photobiomodulation: experimental models and clinical features	253		
<i>Natalia Arias, Juan Díaz González, Alberto Martín Pernía and Jorge L. Arias</i>			
20.1 Introduction	253		
20.2 What is hepatic encephalopathy?	255		

22.5	Photoneuromodulation of glutamate receptors, prostatic acid phosphatase and adenosine triphosphate	283
22.5.1	Behavioral evaluation of pain	283
22.5.2	Neurochemical and neurobiological evidences of analgesic effect	283
22.6	Future directions of transcranial photobiomodulation therapy for pain	284
22.7	Conclusion	285
	References	285

24.3	Developmental aspects	301
24.4	Physiological components	301
24.5	Psychological manifestations	302
24.6	Sociological implications	302
24.7	Causation	302
24.8	Treatment approaches	303
24.9	Most common treatments recommended	303
24.10	Results	304
24.11	Discussion	304
24.12	Future clinical trials for the treatment of traumatic brain injury	305
24.13	Conclusion	305
	References	306

Part III

Clinical studies 287

23. The challenge of effectively translating transcranial near-infrared laser therapy to treat acute ischemic stroke 289

Paul A. Lapchak

23.1	Introduction	289
23.2	NeuroThera effectiveness and safety trial (NEST): from transcranial laser therapy efficacy to NEST futility	289
23.2.1	NeuroThera effectiveness and safety trial-1	290
23.2.2	NeuroThera effectiveness and safety trial-2	291
23.2.3	NeuroThera effectiveness and safety trial-3	292
23.3	Translational stroke research in the embolic stroke rabbit model	293
23.3.1	Preclinical efficacy	293
23.4	What went wrong in NeuroThera effectiveness and safety trials?	294
23.5	Conclusions and commentary: should transcranial laser therapy be further considered as an approach to treat stroke?	294
	References	295

24. Effects of photobiomodulation on traumatic brain injury: proposed clinical assessment 299

Sherry Fox and Victoria Campbell

24.1	Introduction	299
24.2	Definition and statistics—traumatic brain injury	300

25. Transcranial, red/near-infrared light-emitting diode therapy for chronic traumatic brain injury and poststroke aphasia: clinical studies 309

Margaret A. Naeser, Paula I. Martin, Michael D. Ho, Maxine H. Krengel, Yelena Bogdanova, Jeffrey A. Knight, Andrea Fedoruk, Michael R. Hamblin and Bang-Bon Koo

25.1	Traumatic brain injury	309
25.1.1	Introduction to traumatic brain injury	309
25.1.2	Sports-related traumatic brain injury	309
25.1.3	Traumatic brain injury in soldiers and veterans	309
25.1.4	Diffuse axonal injury and white matter abnormalities on magnetic resonance imaging scans	310
25.1.5	Development of neurodegenerative disease posttraumatic brain injury	310
25.1.6	Functional brain imaging in traumatic brain injury	310
25.1.7	Resting-state, functional-connectivity magnetic resonance imaging in traumatic brain injury	310
25.1.8	Cognitive dysfunction in traumatic brain injury	311
25.1.9	Sleep disturbances in traumatic brain injury	311
25.1.10	Pharmacologic treatments for traumatic brain injury	311
25.1.11	Cognitive rehabilitation therapies for traumatic brain injury	312

25.2 Photobiomodulation for chronic traumatic brain injury	312	25.4.7 Weak connections between cortical nodes within intrinsic neural networks	320
25.2.1 Transcranial light-emitting diode treatment performed at home, to improve cognition in chronic, mild traumatic brain injury—case reports	312	25.4.8 Mechanisms and cellular effects, post-red/near-infrared transcranial light-emitting diode	320
25.2.2 Transcranial light-emitting diode treatment to improve cognition in chronic, mild traumatic brain injury—open protocol, group study	313	25.5 Photobiomodulation to improve language in chronic aphasia, due to left hemisphere stroke	321
25.2.3 Results	313	25.5.1 Stroke-aphasia	321
25.3 Ongoing current studies on photobiomodulation for traumatic brain injury	314	25.5.2 Importance of specific light-emitting diode placement areas on the scalp to treat aphasia, in chronic stroke	322
25.3.1 Transcranial light-emitting diode treatment to improve cognition and sleep in mild traumatic brain injury	314	25.5.3 Bilateral transcranial light-emitting diode treatment method	322
25.3.2 Intranasal (only) light-emitting diode treatment to improve cognition and sleep	316	25.5.4 Left hemisphere only, transcranial light-emitting diode treatment method	322
25.4 Discussion, photobiomodulation for traumatic brain injury	317	25.5.5 Results	323
25.4.1 Executive function, and relationship to resting-state, functional-connectivity magnetic resonance imaging networks (default mode network and salience network)	317	25.5.6 Photobiomodulation to treat primary progressive aphasia, a neurodegenerative disease	323
25.4.2 Specific transcranial light-emitting diode placements may affect specific parts of the salience network and default mode network in traumatic brain injury cases	318	25.6 Photobiomodulation for possible chronic traumatic encephalopathy	324
25.4.3 Verbal learning and memory, and relationship to resting-state, functional-connectivity magnetic resonance imaging (central executive network)	318	25.7 Conclusion	326
25.4.4 Specific transcranial light-emitting diode placements may affect specific parts of the central executive network in traumatic brain injury cases	319	References	326
25.4.5 Depression	319	26. Photobiomodulation as a potential therapeutic strategy for improving cognitive and functional outcomes in traumatic brain injury	333
25.4.6 Posttraumatic stress disorder relationship to intrinsic networks, default mode network and salience network	319	<i>Thomas J. Covey, David W. Shucard, Melissa Meynadasy, Thomas Mang and Praveen R. Arany</i>	
		26.1 Introduction	333
		26.2 Neuropathology of traumatic brain injury	335
		26.3 Putative targets of photobiomodulation therapy in traumatic brain injury	336
		26.4 Treatment parameters and biological targets of photobiomodulation in animal models of traumatic brain injury	336
		26.5 Effects of photobiomodulation on cognitive performance in animal models of traumatic brain injury	343
		26.6 Enhancement of cognitive performance in healthy individuals with photobiomodulation treatment	345

26.7	Effects of photobiomodulation therapy on cognitive outcomes in traumatic brain injury patients	351	28.3	Treatment of traumatic brain injury with near-infrared light therapy	386
26.8	Summary and future directions	354	28.3.1	Overview	386
26.9	Conclusion	356	28.3.2	Review of the literature	387
References		357	28.4	Conclusion	394
			Acknowledgment		395
			References		395
27.	Advanced neuroimaging methods for assessment of low-level light therapy	363	29.	Photobiomodulation: a novel approach to treating Alzheimer's disease	401
	<i>Suk-tak Chan, Maria Gabriela Longo, Eva-Maria Ratai and Rajiv Gupta</i>			<i>Lew Lim, Genane Loheswaran, Reza Zomorodi, Anita Saltmarche and Linda Chao</i>	
27.1	Introduction	363	29.1	Introduction	401
27.2	Known mechanisms of light therapy	363	29.2	Pharmacotherapies for Alzheimer's disease	401
27.3	Preclinical evidence for light therapy	364	29.3	Pathophysiology of Alzheimer's disease	402
27.4	Clinical evidence of light therapy efficacy	364	29.3.1	Amyloid cascade hypothesis	402
27.5	Evidence for transcranial delivery of light	365	29.3.2	Neurofibrillary tangles	402
27.6	Neuroimaging methods	365	29.3.3	Other protein targets	402
27.6.1	Computed tomography	365	29.4	The odds against a monotherapy	402
27.6.2	Magnetic resonance imaging	365	29.5	Mitochondrial cascade hypothesis of Alzheimer's disease	403
27.7	Structural imaging	367	29.6	Photobiomodulation and mitochondrial function	403
27.8	Diffusion imaging	368	29.7	Photobiomodulation in animal models of Alzheimer's disease	404
27.9	Perfusion imaging	369	29.8	Human clinical studies of photobiomodulation on dementia and Alzheimer's	404
27.10	Resting state functional connectivity imaging	370	29.8.1	Saltmarche et al. (2017)	405
27.11	Functional imaging using hypercapnic challenges	370	29.8.2	Zomorodi et al. (2017)	405
27.12	Magnetic resonance spectroscopy	371	29.8.3	Ongoing study—Chao (2018)	406
Funding		371	29.8.4	Discussion on the clinical studies	409
References		371	29.9	Key parameters	410
			29.9.1	The default mode network	411
			29.9.2	Pulse rate of 40 Hz	412
28.	Treatment of traumatic brain injury with near-infrared light	377	29.10	Proving light penetration through electroencephalography measures	412
	<i>Larry D. Morries and Theodore A. Henderson</i>		29.11	Electroencephalography as a tool for developing Alzheimer's disease therapies	412
28.1	Background	377	29.12	Pulsed photobiomodulation as a potential treatment modality	413
28.1.1	Definition	377	29.13	The future of photobiomodulation as a treatment for Alzheimer's disease	413
28.1.2	Incidence	378	References		413
28.1.3	Vulnerable populations	378			
28.1.4	Symptoms	379			
28.2	Diagnostic workup	379			
28.2.1	Neurological and physical evaluation	379			
28.2.2	Balance testing	381			
28.2.3	Dysautonomia	382			
28.2.4	Cervicogenic headaches	382			
28.2.5	Questionnaires and cognitive testing	382			
28.2.6	Neuroimaging	384			

30. Electroencephalography as the diagnostic adjunct to transcranial photobiomodulation	419	31.3 Photobiomodulation for normal older adults: a potential intervention for the aging brain	440
<i>Reza Zomorrodi, Genane Loheswaran and Lew Lim</i>		Acknowledgment	440
30.1 Introduction	419	Conflict of interest	441
30.2 Electroencephalography	419	References	441
30.3 Brain waves	420	Further reading	446
30.3.1 Delta oscillations	420	32. Noninvasive neurotherapeutic treatment of neurodegeneration: integrating photobiomodulation and neurofeedback training	447
30.3.2 Theta oscillations	420	<i>Marvin H. Berman, Trent Nichols, Jason Huang and Damir Nizamutdinov</i>	
30.3.3 Alpha oscillations	420	32.1 Photobiomodulation and neurotherapy introduction	447
30.3.4 Beta oscillations	421	32.2 Pathophysiology of neurodegeneration	448
30.3.5 Gamma oscillations	421	32.3 Photobiomodulation therapy	450
30.4 Photobiomodulation as a new noninvasive brain stimulation method	421	32.4 Near infrared photobiomodulation decreases synaptic vulnerability to A β	451
30.5 The causal link between photobiomodulation and neural oscillations	422	32.5 Early human clinical trials	452
30.5.1 Maintaining homeostasis	422	32.6 Digit span measures	454
30.5.2 Calcium signaling	422	32.7 Neuropsychological testing results	454
30.6 Evidence for transcranial photobiomodulation influences on brain oscillations	423	32.8 Treatment of neurodegeneration with directed energy	458
30.7 The potential use of electroencephalography with photobiomodulation for brain disorders	424	32.9 Near infrared spectroscopy assessment of Alzheimer's	458
30.8 Discussion and conclusion	424	32.10 Conclusion	459
References	424	References	460
31. Can photobiomodulation enhance brain function in older adults?	427	Further reading	462
<i>Agnes S. Chan, Michael K. Yeung and Tsz L. Lee</i>		33. Transcranial photobiomodulation therapy: observations from four movement disorder patients	463
31.1 Frontal lobe deterioration and normal human aging	427	<i>Catherine Hamilton, David Hamilton, Frank Nicklason and John Mitrofanis</i>	
31.1.1 Structural and functional deteriorations of the frontal lobe in normal human aging	427	33.1 Introduction	463
31.1.2 Cognitive declines in frontal lobe functioning in normal human aging	430	33.2 Case descriptions	463
31.1.3 Conventional interventions for improving frontal lobe functioning in normal older adults	434	33.2.1 Progressive supranuclear palsy: Patient FH	463
31.2 Photobiomodulation and neuroenhancement	435	33.2.2 Parkinson's disease: Patient BS	466
31.2.1 Mechanisms of action of photobiomodulation	435	33.2.3 Parkinson's disease: Patient PN	467
31.2.2 Photobiomodulation for enhancing brain functions in humans	435	33.2.4 Parkinson's disease: Patient MH	468
		33.3 Discussion	469
		33.4 Conclusion	472
		Acknowledgment	472
		References	472

34. Cerebral blood flow in the elderly: impact of photobiomodulation	473	36.3 Acupuncture and the brain	492
<i>Afonso Shiguemi Inoue Salgado, Francisco José Cidral-Filho, Daniel Fernandes Martins, Ivo I. Kerppers and Rodolfo Borges Parreira</i>		36.3.1 Functional magnetic resonance imaging	492
34.1 Introduction	473	36.4 Laser acupuncture and the brain	493
34.2 Brain hemodynamics in the elderly	473	36.4.1 Animal studies	493
34.3 Effect of photobiomodulation of the brain in the elderly	475	36.4.2 Laser acupuncture and functional magnetic resonance imaging	494
References	475	36.4.3 The frequency question	494
Further reading	477	36.4.4 Laser acupuncture and depression	494
		36.4.5 Laser acupuncture and cerebral blood flow	495
		36.4.6 Laser acupuncture and brain oscillations	496
		36.4.7 Laser acupuncture for stroke and neurorehabilitation	496
		36.4.8 The wavelength question	496
35. Transcranial photobiomodulation for major depressive and anxiety disorders and for posttraumatic stress disorder	479	36.5 Conclusion	497
<i>Marco Antonio Caldieraro and Paolo Cassano</i>		References	497
35.1 The potential of transcranial photobiomodulation for the anxious and depressed	479	37. Signature wounds of war: a case study	503
35.2 Transcranial photobiomodulation for major depressive disorder	480	<i>George Louis Lindenfeld and George Rozelle</i>	
35.3 Transcranial photobiomodulation for anxiety disorders and for posttraumatic stress disorder	481	37.1 Introduction	503
35.4 Safety and tolerability of transcranial photobiomodulation	484	37.2 RESET Therapy	506
35.5 Dosing transcranial photobiomodulation for mood and anxiety disorders	484	37.3 Case study	508
35.6 Conclusion	485	References	514
References	485	38. Transcatheter intracerebral photobiomodulation in degenerative brain disorders: clinical studies (Part 1)	515
36. Action at a distance: laser acupuncture and the brain	489	<i>Ivan V. Maksimovich</i>	
<i>Nicholas Alexander Wise</i>		38.1 Introduction	515
36.1 Background	489	38.2 Materials and methods	517
36.1.1 Acupuncture and meridian theory	489	38.2.1 Patient selection criteria	517
36.1.2 Physical properties of meridians and acupoints	489	38.2.2 Patient examination plan	517
36.1.3 Microsystems	490	38.2.3 Treatment methods	519
36.1.4 Acupuncture methods	490	38.3 Results	520
36.2 Laser acupuncture	491	38.3.1 Test group	520
36.2.1 Potential mechanisms of laser acupuncture	491	38.3.2 Control group	524
36.2.2 The deqi question	491	38.4 Discussion	525
		38.5 Conclusion	526
		38.6 Conflict of interest	526
		38.7 Funding	526
		References	526

39. Transcatheter intracerebral photobiomodulation in ischemic brain disorders: clinical studies (Part 2)	529		
<i>Ivan V. Maksimovich</i>			
39.1 Introduction	529		
39.2 Materials and methods	531		
39.2.1 Patient selection criteria	531		
39.2.2 Patient screening plan	531		
39.2.3 Analysis of patients	531		
39.2.4 Selection of patients	532		
39.2.5 Methods of treating patients	533		
39.2.6 Evaluation of results	535		
39.3 Results	535		
39.3.1 Test group 1—Patients with intracerebral atherosclerosis and chronic cerebrovascular insufficiency	535		
39.3.2 Test group 2—patients with intracerebral atherosclerosis and previous ischemic stroke	536		
39.3.3 Control group 1—patients with intracerebral atherosclerosis and chronic cerebrovascular insufficiency	538		
39.3.4 Control Group 2—patients with intracerebral atherosclerosis and previous ischemic stroke	539		
39.3.5 Clinical results in the long-term period	539		
39.4 Discussion	540		
39.5 Conclusion	541		
Conflict of interest	542		
Funding	542		
References	542		
40. Russian low level laser therapy techniques for brain disorders	545		
<i>Sergey V. Moskvina and Andrey V. Kochetkov</i>			
40.1 Introduction	545		
40.2 Protocol requirements of low level laser therapy procedures in Russia, low level laser therapy techniques	545		
40.3 Intravenous laser blood illumination	547		
40.4 Noninvasive laser blood illumination	549		
40.5 The analysis of the literature on the use of low level laser therapy in patients with various cerebrovascular disorders	551		
40.6 Indications	565		
40.7 Contradictions	566		
References	569		
41. Laser treatment of central nervous system injuries: an update and prospects	573		
<i>L. Longo</i>			
41.1 Introduction	573		
41.2 Clinical experience	574		
41.3 Mechanisms of action	582		
41.4 Appendix—Motor control and the Grimaldi maneuver	584		
References	586		
42. Photobiomodulation treatment for brain disorders: posttraumatic stress disorder (PTSD) and dementia	589		
<i>Randy Lamartiniere, Rhett Bergeron, Ronald Aung-Din, Matthew Bennett, William Stephan and Louis Banas</i>			
42.1 Introduction (clinical team)	589		
42.2 Original concussion case	590		
42.3 Posttraumatic stress disorder evaluation	591		
42.4 Case studies for posttraumatic stress disorder	593		
42.4.1 Case studies for dementia	595		
42.5 Conclusion and future directions	597		
References	597		
43. What we don't know and what the future holds	599		
<i>Michael R. Hamblin</i>			
43.1 Questions, or what we don't know	599		
43.2 What are the best diseases and conditions to be treated?	599		
43.3 How important is light penetration to the brain?	600		
43.4 What about systemic effects?	600		
43.5 What is the best way to deliver light?	601		
43.6 How important is pulsing?	601		
43.6.1 Pulse parameters and light sources	601		
43.6.2 Types of pulsed light sources	602		
43.6.3 Why could pulsing be important in photobiomodulation?	602		

43.6.4	Effect of pulsing photobiomodulation for the brain	603	43.10.1	Transcranial magnetic brain stimulation	605
43.7	How important is the location on the head?	604	43.10.2	Transcranial direct current stimulation	607
43.8	How important is the biphasic dose response?	604	43.10.3	Low intensity pulsed ultrasound	608
43.9	What about cognitive enhancement and preconditioning?	605	43.11	Could an invasive approach be considered?	608
43.10	How does photobiomodulation compare with other noninvasive brain stimulation techniques?	605	43.12	What does the future hold?	609
			References		609
			Index		615

List of Contributors

Praveen R. Arany Department of Oral Biology and Biomedical Engineering, School of Dental Medicine, University at Buffalo, Buffalo, NY, United States

Jorge L. Arias INEUROPA (Instituto de Neurociencias del Principado de Asturias), Oviedo, Spain; Laboratory of Neuroscience, Department of Psychology, University of Oviedo, Asturias, Spain

Natalia Arias Department of Basic and Clinical Neuroscience, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, United Kingdom; INEUROPA (Instituto de Neurociencias del Principado de Asturias), Oviedo, Spain

Ronald Aung-Din Sarasota, FL, United States

Evan Austin Department of Dermatology, University of California at Davis, Sacramento, CA, United States; Dermatology Service, Sacramento VA Medical Center, Mather, CA, United States

Louis Banas Laser Innovations, Amherst, New York, United States

Matthew Bennett Patterson, CA, United States

Patrick Benson Bosch Institute, University of Sydney, Sydney, NSW, Australia; Discipline of Physiology, University of Sydney, Sydney, NSW, Australia

Rhett Bergeron Real Health Medical, Roswell, GA, United States

Marvin H. Berman Quietmind Foundation, Elkins Park, PA, United States

Yelena Bogdanova VA Boston Healthcare System, Boston, MA, United States; Department of Psychiatry, Boston University School of Medicine, Boston, MA, United States

Marco Antonio Caldieraro Universidade Federal do Rio Grande do Sul, Department of Psychiatry and Forensic Medicine, Porto Alegre, RS, Brazil; Hospital de Clínicas de Porto Alegre, Department of Psychiatry, Porto Alegre, RS, Brazil

Victoria Campbell RaVive Health, Inc., Operation Stand Tall Against TBI – A Non-Profit Organization, Calhan, CO, United States, National Association of Social Workers, Washington, D.C., United States, American Psychological Association, Washington, D.C., United States, Campbell Method for Treating TBI

James D. Carroll Thor Photomedicine Ltd., Chesham, United Kingdom

Paolo Cassano Depression Clinical and Research Program, Department of Psychiatry, Massachusetts General Hospital, Boston, MA, United States; Center for Anxiety and Traumatic Stress Disorders, Department of Psychiatry, Massachusetts General Hospital, Boston, MA, United States; Department of Psychiatry, Harvard Medical School, Boston, MA, United States

Marucia Chacur Laboratory of Functional Neuroanatomy of Pain, Department of Anatomy—ICB, University of São Paulo, São Paulo, Brazil

Agnes S. Chan Department of Psychology, The Chinese University of Hong Kong, Hong Kong, China; Chanwuyi Research Center for Neuropsychological Well-Being, The Chinese University of Hong Kong, Hong Kong, China

Suk-tak Chan Harvard Medical School, Massachusetts General Hospital, Boston, MA, United States; Department of Radiology, Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, MA, United States

Linda Chao Departments of Radiology & Biomedical Imaging and Psychiatry, University of California, San Francisco, CA, United States

Francisco José Cidral-Filho Experimental Neuroscience Laboratory (LaNEx), University of Southern Santa Catarina, Palhocça, Santa Catarina, Brazil; Postgraduate Program in Health Sciences, University of Southern Santa Catarina, Santa Catarina, Brazil

Thomas J. Covey Division of Cognitive and Behavioral Neurosciences, Department of Neurology, Jacobs School of Medicine and Biomedical Sciences, University at Buffalo, Buffalo, NY, United States

Luis De Taboada Chief Technology Officer, LiteCure LLC, New Castle, DE, United States

Janis T. Eells Department of Biomedical Sciences, University of Wisconsin-Milwaukee, Milwaukee, WI, United States

Nabil El Massri Department of Anatomy, University of Sydney, Sydney, NSW, Australia

Andrea Fedoruk VA Boston Healthcare System, Boston, MA, United States

Manuel Fierro Department of Dermatology, University of California at Davis, Sacramento, CA, United States; Dermatology Service, Sacramento VA Medical Center, Mather, CA, United States

Saša R. Filipović Institute for Medical Research, University of Belgrade, Belgrade, Serbia

Sherry Fox BioCare Systems, Inc., Parker, CO, United States, Colorado BioScience Association, Denver, CO, United States, National Association of Laser Therapy, Baltimore, MD, United States, LumiWave NIR Therapy Device, Operation Stand Tall Against TBI – A Non-Profit Organization, Calhan, CO, United States

Juan Díaz González Área de Tecnología Electrónica de la Universidad de Oviedo, Gijon, Spain; Grupo de Electrónica para la Innovación Industrial, Gijon, Spain

Luke Gordon Bosch Institute, University of Sydney, Sydney, NSW, Australia; Discipline of Physiology, University of Sydney, Sydney, NSW, Australia

Rajiv Gupta Harvard Medical School, Massachusetts General Hospital, Boston, MA, United States; Department of Radiology, Neuroradiology Division, Massachusetts General Hospital, Boston, MA, United States

Michael R. Hamblin Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, MA, United States; Department of Dermatology, Harvard Medical School, Boston, MA, United States; Harvard-MIT Division of Health Sciences and Technology, Cambridge, MA, United States

Catherine Hamilton Department of Anatomy, University of Sydney, Sydney, NSW, Australia

David Hamilton Department of Anatomy, University of Sydney, Sydney, NSW, Australia

Theodore A. Henderson Neuro-Laser Foundation, Centennial, CO, United States; The Synaptic Space, Centennial, CO, United States

Michael D. Ho VA Boston Healthcare System, Boston, MA, United States

Jason Huang Department of Neurosurgery, Baylor Scott & White Health, Dallas, TX, United States

Ying-Ying Huang Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, MA, United States; Department of Dermatology, Harvard Medical School, Boston, MA, United States

Jared Jagdeo Department of Dermatology, University of California at Davis, Sacramento, CA, United States; Dermatology Service, Sacramento VA Medical Center, Mather, CA, United States; Department of Dermatology, State University of New York, Downstate Medical Center, Brooklyn, NY, United States

Daniel M. Johnstone Bosch Institute, University of Sydney, Sydney, NSW, Australia; Discipline of Physiology, University of Sydney, Sydney, NSW, Australia

Linda Ramball Jones Department of Physics and Astronomy, College of Charleston, Charleston, SC, United States

Ramanjot Kaur Department of Dermatology, University of California at Davis, Sacramento, CA, United States

Ivo I. Kerppers Laboratory of Neuroanatomy and Neurophysiology, University of Centro-Oeste, Guarapuava, Brazil

Boaz Kim Bosch Institute, University of Sydney, Sydney, NSW, Australia; Discipline of Physiology, University of Sydney, Sydney, NSW, Australia

- Ji Yeon Kim** Bosch Institute, University of Sydney, Sydney, NSW, Australia; Discipline of Physiology, University of Sydney, Sydney, NSW, Australia; School of Medicine, University of Queensland Centre for Clinical Research, Brisbane, QLD, Australia
- Jeffrey A. Knight** VA Boston Healthcare System, Boston, MA, United States; Department of Psychiatry, Boston University School of Medicine, Boston, MA, United States; National Center for PTSD—Behavioral Sciences Division, VA Boston Healthcare System, Boston, MA, United States
- Andrey V. Kochetkov** Federal State-Funded Educational Institution of Continuing Professional Education “Institute of Advanced Training of FMBA of Russia”, Moscow, Russia
- Ljubica M. Konstantinović** Department of Rehabilitation, Faculty of Medicine, University of Belgrade, Belgrade, Serbia; Clinic for Rehabilitation “Dr Miroslav Zotović”, Belgrade, Serbia
- Bang-Bon Koo** Bio-imaging Informatics Lab, Department of Anatomy and Neurobiology, Boston University School of Medicine, Boston, MA, United States
- Maxine H. Kregel** VA Boston Healthcare System, Boston, MA, United States; Department of Neurology, Boston University School of Medicine, Boston, MA, United States
- Randy Lamartiniere** Photo medicine Clinic, Baton Rouge, LA, United States
- Paul A. Lapchak** Neurocore LLC, Pomona, CA, United States
- Tsz L. Lee** Department of Psychology, The Chinese University of Hong Kong, Hong Kong, China
- Yong Li** Department of Neuroscience and Regenerative Medicine, Medical College of Georgia, Augusta University, Augusta, GA, United States
- Huan Ling Liang** Department of Cell Biology, Neurobiology and Anatomy, Medical College of Wisconsin, Milwaukee, WI, United States
- Lew Lim** Vielight Inc., Toronto, ON, Canada
- George Louis Lindenfeld** RESET Therapy Professional Training Institute LLC, Sarasota, FL, United States; RESET Therapy Professional Training Institute LLC, Hendersonville, NC, United States
- Genane Loheswaran** Vielight Inc., Toronto, ON, Canada
- L. Longo** Institute for Laser Medicine, International Academy for Laser Medicine and Surgery, Florence, Italy
- Maria Gabriela Longo** Department of Radiology, Neuroradiology Division, Massachusetts General Hospital, Boston, MA, United States
- J.A. Lyons** College of Health Sciences, University of Wisconsin-Milwaukee, Milwaukee, WI, United States
- Javad Mahmoudi** Neurosciences Research Center, Tabriz University of Medical Sciences, Tabriz, Iran
- Ivan V. Maksimovich** Clinic of Cardiovascular Diseases Named after Most Holy John Tobolsky, Moscow, Russia
- Thomas Mang** Department of Oral and Maxillofacial Surgery, School of Dental Medicine, University at Buffalo, Buffalo, NY, United States
- Paula I. Martin** VA Boston Healthcare System, Boston, MA, United States; Department of Neurology, Boston University School of Medicine, Boston, MA, United States
- Daniel Fernandes Martins** Experimental Neuroscience Laboratory (LaNEx), University of Southern Santa Catarina, Palhoça, Santa Catarina, Brazil; Postgraduate Program in Health Sciences, University of Southern Santa Catarina, Santa Catarina, Brazil
- Daniel Oliveira Martins** Laboratory of Functional Neuroanatomy of Pain, Department of Anatomy—ICB, University of São Paulo, São Paulo, Brazil
- Melissa Meynadasy** Division of Cognitive and Behavioral Neurosciences, Department of Neurology, Jacobs School of Medicine and Biomedical Sciences, University at Buffalo, Buffalo, NY, United States
- John Mitrofanis** Department of Anatomy, University of Sydney, Sydney, NSW, Australia
- Larry D. Morries** Neuro-Laser Foundation, Centennial, CO, United States

Sergey V. Moskvín The Federal State-Financed Institution “O.K. Skobelkin State Scientific Center of Laser Medicine under the Federal Medical Biological Agency” of Russia, Moscow, Russia

Margaret A. Naeser VA Boston Healthcare System, Boston, MA, United States; Department of Neurology, Boston University School of Medicine, Boston, MA, United States

Trent Nichols Quietmind Foundation, Elkins Park, PA, United States

Frank Nicklason Department of Anatomy, University of Sydney, Sydney, NSW, Australia; Geriatric Medicine, Royal Hobart Hospital, Hobart, TAS, Australia

Damir Nizamutdinov Department of Neurosurgery, Baylor Scott & White Health, Dallas, TX, United States

Amir Oron Department of Orthopedic Surgery, Kaplan Medical Center, Rehovot, Israel

Uri Oron Department of Zoology, George S. Wise Faculty of Life Sciences and Sagol School of Neuroscience, Tel Aviv University, Tel Aviv, Israel

Rodolfo Borges Parreira Salgado Institute of Integrative Health, Londrina, Brazil; Residency Program in Integrative Physical Therapy at UNIFIL University, Londrina, Brazil

Alberto Martín Pernía Área de Tecnología Electrónica de la Universidad de Oviedo, Gijón, Spain; Grupo de Electrónica para la Innovación Industrial, Gijón, Spain

Claudia Petrucco Bosch Institute, University of Sydney, Sydney, NSW, Australia; Discipline of Physiology, University of Sydney, Sydney, NSW, Australia

Nathali Cordeiro Pinto Physiotherapy, Bright Photomedicine Ltd., São Paulo, Brazil

Marcelo Victor Pires de Sousa Bright Photomedicine Ltd., São Paulo, Brazil

Eva-Maria Ratai Harvard Medical School, Massachusetts General Hospital, Boston, MA, United States; Department of Radiology, Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, MA, United States; Department of Radiology, Neuroradiology Division, Massachusetts General Hospital, Boston, MA, United States

Carlo Rondinoni Institute of Radiology (INRAD), Universidade de São Paulo, São Paulo, Brazil

George Rozelle MindSpa Integrative Wellness Center, Sarasota, FL, United States

Saeed Sadigh-Eteghad Neurosciences Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

Farzad Salehpour Neurosciences Research Center, Tabriz University of Medical Sciences, Tabriz, Iran; ProNeuroLIGHT LLC, Phoenix, AZ, United States

Afonso Shiguemi Inoue Salgado Salgado Institute of Integrative Health, Londrina, Brazil; Residency Program in Integrative Physical Therapy at UNIFIL University, Londrina, Brazil

Anita Saltmarche Saltmarche Health & Associates Inc., Orangeville, ON, Canada

David W. Shucard Division of Cognitive and Behavioral Neurosciences, Department of Neurology, Jacobs School of Medicine and Biomedical Sciences, University at Buffalo, Buffalo, NY, United States

William Stephan Buffalo, New York, United States

Jonathan Stone Bosch Institute, University of Sydney, Sydney, NSW, Australia; Discipline of Physiology, University of Sydney, Sydney, NSW, Australia

Luis De Taboada Chief Technology Officer, LiteCure LLC, New Castle, DE, United States

M.A. Tolentino College of Health Sciences, University of Wisconsin-Milwaukee, Milwaukee, WI, United States

Lorelei Tucker Department of Neuroscience and Regenerative Medicine, Medical College of Georgia, Augusta University, Augusta, GA, United States

Erica B. Wang Department of Dermatology, University of California at Davis, Sacramento, CA, United States; Dermatology Service, Sacramento VA Medical Center, Mather, CA, United States

Nicholas Alexander Wise Department of Physical Medicine and Rehabilitation, UNC Chapel Hill School of Medicine, Chapel Hill, NC, United States

Margaret Wong-Riley Department of Cell Biology, Neurobiology and Anatomy, Medical College of Wisconsin, Milwaukee, WI, United States

Mei X. Wu Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, MA, United States; Department of Dermatology, Harvard Medical School, Boston, MA, United States; Harvard-MIT Division of Health Sciences and Technology, Cambridge, MA, United States

Luodan Yang Department of Neuroscience and Regenerative Medicine, Medical College of Georgia, Augusta University, Augusta, GA, United States

Michael K. Yeung Department of Psychology, The Chinese University of Hong Kong, Hong Kong, China; Department of Neurology and Neurosurgery, Montreal Neurological Institute, McGill University, Montreal, QC, Canada

Elisabeth Mateus Yoshimura Institute of Physics, Laboratory of Radiation Dosimetry and Medical Physics, University of São Paulo, São Paulo, Brazil

Quanguang Zhang Department of Neuroscience and Regenerative Medicine, Medical College of Georgia, Augusta University, Augusta, GA, United States

Reza Zomorodi Temerty Centre for Therapeutic Brain Intervention, Centre for Addiction and Mental Health, Toronto, ON, Canada

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Preface

Photobiomodulation (PBM) also known as low-level laser (or light) therapy has been known for over 50 years (since 1967), but it is only relatively recently that it has begun to make the transition into the mainstream. PBM describes the use of red or near-infrared light at levels that do not produce undue heating of the tissue to produce beneficial effects on the human body. The introduction of light-emitting diodes (LEDs) has made this approach more accessible than the previously used laser sources, as LEDs are safer, cheaper, and can easily be used at home. Another factor that has led to PBM becoming more widely accepted is the growing understanding of the mechanisms of action at a molecular and cellular level. The lack of a clear mechanism of action was a deterrent to many biomedical scientists who maintained a healthy level of skepticism.

Among the wide range of tissues, organs, diseases, and conditions that can be beneficially affected by PBM, the subject of this book is the brain. The brain is probably the single human organ that engenders the most concern, interest, and expenditure in the 21st century. Brain disorders that cause widespread morbidity, mortality, and loss of quality of life can be divided into four broad categories. Traumatic brain disorders include stroke, traumatic brain injury (TBI), global ischemia, and perinatal difficulties. Neurodegenerative diseases include Alzheimer's disease, Parkinson's disease, and a range of dementias. Psychiatric disorders include major depression, anxiety, addiction, and insomnia, among many others. Finally there are neurodevelopmental disorders (autism and ADHD) and the possibility of cognitive enhancement in healthy individuals. Many of these brain disorders are specifically addressed in the present volume.

The book is divided into three parts. The first part covers some basic considerations, dosimetry, and devices, and discusses the mechanisms of action at a cellular level and on the brain as a whole organ. The second part includes contributions from researchers who have carried out studies on a variety of animal models in their investigations of brain disorders, stroke, TBI, and Alzheimer's and Parkinson's diseases, to name a few. The third part concentrates on human studies, including controlled clinical trials, pilot trials, case series, and clinical experience. Disorders treated include TBI, stroke, Alzheimer's and Parkinson's diseases, depression, and others.

The book is expected to play a role in stimulating the further increase and acceptance of PBM for brain disorders, which has really started to take off in recent years. It will also act as a resource for researchers and physicians wishing to get a broad overview of the field and who are contemplating entering it themselves. The number of individuals considering obtaining a home-use PBM device is also steadily increasing and this book will act as an authoritative source of unbiased, well-researched, information, which is all the more necessary in the Internet age.