CONTENTS

Contributors xv
Preface xix

1. Models of Depression 1
   Catharine H. Duman
   I. Introduction 2
   II. General Considerations in Modeling Depression 2
   III. Stress and Models of Depression 4
   IV. Models 6
   V. Concluding Remarks 15
   References 15

2. Astrocytes in the Amygdala 23
   Ryan T. Johnson, S. Marc Breedlove, and Cynthia L. Jordan
   I. The Amygdala 24
   II. Glia 25
   III. Amygdala Glia and Disease 26
   IV. Amygdala Glia and Hormones 33
   V. Conclusions 37
   Acknowledgments 38
   References 38

3. Limbic Effects of High-Frequency Stimulation of the Subthalamic Nucleus 47
   Yasin Temel
   I. Introduction 48
   II. Discussion 56
   III. Conclusion 57
   Acknowledgments 58
   References 58
4. Hippocampal Mossy Fiber Synaptic Transmission and Its Modulation
Katsunori Kobayashi

I. Introduction 65
II. Conclusion 77
References 78

5. Xenobiotics in the Limbic System—Affecting Brain’s Network Function
Ralf P. Meyer, Georgios Pantazis, Nina Killer, Carolin Bürck, Ricarda Schwab, Monika Brandt, Rolf Knoth, and Marcel Gehlhaus

I. Introduction 88
II. Xenobiotic Uptake and the Limbic System 89
III. The Main Players 91
IV. Molecular Circuits in the Limbic System 93
V. Downstream Effects from the Blood–Brain Barrier to the Limbic System 95
VI. Conclusions and Future Directions 101
Acknowledgments 102
References 102

6. Brain Plasticity after Ischemic Episode
Galyna G. Skibo and Alexander G. Nikonenko

I. Mechanisms of Brain Ischemic Injury 107
II. Mechanisms of Adult Brain Plasticity 114
III. Postischemic Brain Plasticity 116
References 121

7. Hypothalamic Inflammation and Obesity
Eliana P. Araújo, Márcio A. Torsoni, and Lício A. Velloso

I. Introduction 129
II. Hypothalamic Control of Feeding and Energy Expenditure 130
III. Nutrient-Induced Dysfunction of the Hypothalamus 136
IV. Hypothalamic Resistance to Anorexigenic Signals 137
V. Concluding Remarks 139
Acknowledgments 139
References 139
8. The Role of Functional Postsynaptic NMDA Receptors in the Central Nucleus of the Amygdala in Opioid Dependence 145
Michael J. Glass
I. Introduction 146
II. Opioids and Dependence 147
III. Glutamate Systems and Opioid Dependence 148
IV. The Central Nucleus and Dependence 149
V. The Synaptic Relationship Between NMDA and μ-Opioid Receptors in the CeA 152
VI. Deletion of Postsynaptic NR1 in Central Amygdala Neurons Attenuates Opioid Withdrawal-Induced Place Aversion 154
VII. Does the CeA Selectively Participate in the Conditioned Aversive Properties of Opioid Withdrawal? 155
VIII. Conclusion 158
References 160

9. Hippocampal Kainate Receptors 167
Erik B. Bloss and Richard G. Hunter
I. Introduction 168
II. Structure of Kainate Receptors 169
III. Anatomical Localization of KARs in the Hippocampal Formation 171
IV. Electrophysiological Functions of KARs in Hippocampal Synapses 175
V. KARs in Disease 177
VI. Conclusion 179
References 180

10. Role of Neurotrophic Factors in Behavioral Processes: Implications for the Treatment of Psychiatric and Neurodegenerative Disorders 185
Marie-Christine Pardon
I. Introduction 186
II. Cognition-Enhancing Effects of Neurotrophins 187
III. Neurotrophins Mediate Aggressive and Defensive Behavior 189
IV. Involvement of Neurotrophins in Anxiety-Like Behavior 190
V. Role of Neurotrophins in Rewarding and Addictive Behavior 191
VI. Neurotrophins Facilitate Adaptation to Stress 192
VII. Neurotrophins: A Therapeutic Target for the Treatment of Brain Disorders? 194
References 194
11. Postnatal Development of Hypothalamic Leptin Receptors

Elizabeth C. Cottrell, Julian G. Mercer, and Susan E. Ozanne

I. Introduction
II. The Leptin System
III. Developmental Roles of Leptin
IV. Developmental Programming: Role of Altered Neonatal Leptin Signaling
V. Conclusions and Future Directions
Acknowledgments
References

12. Regulation of Hippocampal Synaptic Plasticity by Estrogen and Progesterone

Michael R. Foy, Michel Baudry, Garnik K. Akopian, and Richard F. Thompson

I. Introduction
II. Estrogen and Hippocampus
III. Estrogen, NMDA, and AMPA Receptor Regulation
IV. Estrogen and Hippocampal LTP
V. Estrogen and Hippocampal LTD
VI. Progesterone and Hippocampus
VII. Progesterone and Progesterone Receptors
VIII. Progesterone and Hippocampal LTP and LTD
IX. Conclusions
Acknowledgments
References

13. Hormones and Sexual Reward

Raúl G. Paredes

I. Introduction
II. Reward
III. Conditioned Place Preference
IV. Hormones and CPP
V. Reward and Sexual Behavior
VI. Conclusion
Acknowledgments
References
14. Sex Steroids and Acetylcholine Release in the Hippocampus

Dai Mitsushima

I. Role of Acetylcholine in the Hippocampus
II. ACh Release in the Hippocampus Is Sex-Specific
III. Neural Control of Septohippocampal Cholinergic Neurons
IV. Circulating Sex Steroids Activate ACh Release
V. Activational Effect Is Sex-Specific
VI. Sexual Differentiation Fates the Sex-Specific Activational Effect
VII. Interaction with Environmental Conditions
VIII. Interaction with Spontaneous Behaviors
IX. Activational Effects and Alzheimer's Disease
X. Conclusions

Acknowledgments
References

15. Estradiol and GABAergic Transmission in the Hippocampus

Tomasz Wójtowicz and Jerzy W. Mozrzymas

I. Introduction
II. Estradiol and GABA\(_{\text{A}}\)R Function
III. Estradiol and GABAergic Transmission During Development
IV. Estradiol and GABAergic Transmission in Mature Animals
V. Mechanisms of Estradiol Action
VI. Conclusions and Future Directions

Acknowledgments
References

16. Transcriptional Regulation of Hypothalamic Corticotropin-Releasing Factor Gene

Kazunori Kageyama and Toshihiro Suda

I. Introduction
II. Regulatory Elements on Hypothalamic CRF Gene
III. Conclusion

Acknowledgments
References

17. Estrogen in the Limbic System

Gert J. ter Horst

I. Estrogen Synthesis and Actions
II. Estrogen Receptors
III. Anatomy of the Limbic System
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV. Distribution of Estrogen Receptors in the Limbic System</td>
<td>323</td>
</tr>
<tr>
<td>V. Estrogen and ER/β Expression</td>
<td>323</td>
</tr>
<tr>
<td>VI. Affective Disorders and Gender</td>
<td>324</td>
</tr>
<tr>
<td>VII. Estrogen in Hippocampus and Amygdala</td>
<td>325</td>
</tr>
<tr>
<td>VIII. Cyclic Estrogen Administration and Stress</td>
<td>326</td>
</tr>
<tr>
<td>IX. Estrogen, Stress, and Neuroplasticity</td>
<td>328</td>
</tr>
<tr>
<td>X. Recovery After Chronic Stress; Effect of Estrogen and Antidepressants</td>
<td>329</td>
</tr>
<tr>
<td>XI. Conclusion</td>
<td>331</td>
</tr>
<tr>
<td>References</td>
<td>333</td>
</tr>
</tbody>
</table>

18. Corticotropin-Releasing Hormone and Arginine Vasopressin in Depression: Focus on the Human Postmortem Hypothalamus | 339  |

Ai-Min Bao and Dick F. Swaab

   I. Introduction                                                      | 340  |
   II. The HPA-Axis as the Final Common Pathway in Depression           | 342  |
   III. The AVP Hypothesis of Depression                               | 348  |
   IV. Depression in Alzheimer's Disease                               | 356  |
   V. Conclusions                                                      | 357  |
   Acknowledgments                                                     | 358  |
   References                                                          | 359  |

19. Postnatal Ontogeny of the Glucocorticoid Receptor in the Hippocampus | 367  |

Anastasia Galeeva, Markku Pelto-Huikko, Svetlana Pivina, and Natalia Ordyan

   I. Introduction                                                      | 368  |
   II. Postnatal Development of the HPA Axis and the Stress-Hyporesponsive Period | 369  |
   III. Postnatal Expression of Corticosteroid Receptors in the Rat Hippocampus | 373  |
   IV. Effect of Prenatal Stress on the Expression of the GR in the Hippocampus During Postnatal Development | 379  |
   References                                                          | 382  |

20. Mineralocorticoid and Glucocorticoid Receptors in Hippocampus: Their Impact on Neurons Survival and Behavioral Impairment After Neonatal Brain Injury | 391  |

Justyna Rogalska

   I. Introduction                                                      | 392  |
   II. Corticosteroid Receptors Properties                              | 394  |
Contents

III. MR and GR Under Development of the Hippocampus 396
IV. Detrimental Effects of Hippocampal Glucocorticoid Receptor Activation 396
V. Neuroprotective Role of MR Overexpression in Damaged Hippocampus 401
VI. The Effect of Temperature on Hypoxia/Ischemia-Induced Changes in MR and GR Expression 405
VII. The Long-Term Consequences of Alterations in MR and GR Receptors After Neonatal Brain Injury 407
VIII. Conclusion 411
References 412

21. Glucocorticoids and Lithium in Adult Hippocampal Neurogenesis 421
Shuken Boku, Shin Nakagawa, and Tsukasa Koyama

I. Introduction 422
II. Differential Steps of Adult Hippocampal Neurogenesis 422
III. Stress and Glucocorticoids Actions on Adult Hippocampal Neurogenesis 424
IV. Lithium Action on Adult Hippocampal Neurogenesis 425
V. Concluding Remarks 426
Acknowledgments 428
References 428

Index 433