

Index

A

- Acamprosate
 - historical perspective, 3
 - mechanism of action, 3
- Acetylcholine (ACh). *See also* Choline acetyltransferase; Nicotinic acetylcholine receptor
 - pools, 271
 - therapeutic targeting in nicotine addiction
 - acetylcholinesterase inhibitors, 273
 - dietary supplements, 272–273
- N*-Acetylcysteine (NAC), cocaine addiction management, 6
- ACh. *See* Acetylcholine
- Adolescence. *See* Nicotine
- 2-AG. *See* 2-Arachidonylglycerol
- Alcohol dependence
 - central amygdala studies
 - disinhibition model of output, 302–303
 - γ -aminobutyric acid
 - acute alcohol effects, 297–298
 - chronic alcohol effects, 298–299
 - GABAergic system overview, 297
 - glutamatergic transmission
 - acute alcohol effects, 299
 - chronic alcohol effects, 300
 - overview, 299
 - neuropeptides
 - corticotrophin-releasing factor, 300–301
 - neuropeptide Y, 302
 - nociceptin, 301–302
 - overview, 300
 - prospects for study, 303
 - escalation of use in animals, 11
 - N*-methyl-D-aspartate receptor, ethanol effects
 - acute effects
 - GluN1, 282
 - GluN2, 282–283
 - overview, 282
 - posttranslational effectors, 283
 - basolateral amygdala, 288
 - bed nucleus of the stria terminalis receptors, 286–288
 - central amygdala, 288
 - chronic effects, 284
 - plasticity effects, 284–285
 - prospects for study, 288–289
- opioid receptor modulation
 - μ -opioid receptor
 - A118G polymorphism studies, 310–313
 - overview, 309–310
 - naltrexone studies, 310, 313–315
- AMPA receptor
 - nicotine studies
 - dependence role, 252–253
 - reinforcing effects, 253
 - reward-enhancing effects, 258
 - nucleus accumbens and cocaine effects
 - chronic administration studies, 122–123
 - overview, 121–122
 - prospects for study, 129–130
 - receptor trafficking and cocaine-induced plasticity, 123–124
 - reinstatement of drug seeking
 - GluA1 subunit-containing receptors, 124–127
 - GluA2 subunit-containing receptors, 127–129
 - opiate effects on AMPA/NMDA receptor ratio, 158
 - opiate memory mechanisms
 - ascending dopamine pathways, 176–177
 - basolateral amygdala outputs, 175–176
 - conditioned reinforcement, 171
 - conditioned reward and aversion, 170–171
 - extinction and reinstatement, 171, 173
 - hippocampus, 176
 - overview, 172
 - prefrontal-accumbens pathways, 174–175
 - prospects for study, 177
 - systems perspective, 173–174
 - psychostimulant-induced neuroadaptation, 82–84
 - relapse neurobiology, 50–51
 - ventral tegmental area, cocaine-evoked
 - synaptic plasticity of excitatory transmission
 - AMPA receptor/NMDA receptor ratio, 112–116
 - excitatory postsynaptic potentials, 114–115
- Amygdala. *See also* Basolateral amygdala; Central nucleus of the amygdala
 - reward circuitry, 72–75
- Anandamide
 - dopamine signaling regulation during cue-motivated behavior, 327–328
 - opioid withdrawal role, 207

Index

Animal models, addiction. *See also specific drugs*
drug preference for nondrug rewards, 14–15
DSM-IV criteria appearance, 10
escalation of drug use, 10–11
extinction resistance, 12–13
historical perspective, 2
motivation for drug, 13–14
neurocognitive deficits, 11–12
prospects for study, 17
punishment resistance, 15–16
Anterior cingulate, mesocorticolimbic dopamine pathway, 45

Anxiety
bed nucleus of the stria terminalis mediation, 285–286
nicotine effects, 216

Appetite
nicotine effects, 217–218
nicotinic acetylcholine receptor modulation, 217–218

2-Arachidonoylglycerol (2-AG)
dopamine signaling regulation during cue-motivated behavior, 327–328
opioid withdrawal role, 207

Aripirazole, indications, 6

Attention, nicotine effects, 215–217

B

Basolateral amygdala (BLA). *See also Amygdala*
drug-associated learning, 45
N-methyl-D-aspartate receptor response to alcohol, 288
opiate memory and glutamate receptors, 175–176
optogenetics, 64–65, 67
relapse neurobiology, 49–51

BDNF. *See Brain-derived neurotrophic factor*

Bed nucleus of the stria terminalis (BNST)
connectivity, 285
mesocorticolimbic dopamine pathway, 45
N-methyl-D-aspartate receptor response to alcohol, 286–288
relapse neurobiology, 52
stress and anxiety mediation, 285–286

BLA. *See Basolateral amygdala*

BNST. *See Bed nucleus of the stria terminalis*

Brain-derived neurotrophic factor (BDNF)
cocaine addiction
epigenetic regulation, 144–146
role, 143–144
CREB regulation, 105
opiate effects in ventral tegmental area, 158–159, 191–192

Buprenorphine
naloxone combination. *See Suboxone*

opioid choice effects, 203–204
Bupropion, nicotine addiction management, 5, 275

C

Calcium/calmodulin protein kinase II (CaMKII),
AMPA receptor modulation in nucleus accumbens, 126–127

CaMKII. *See Calcium/calmodulin protein kinase II*

Cannabinoids
cannabinoid receptors in central nervous system, 334–335

Δ^9 -tetrahydrocannabinol
hippocampus synaptic transmission, acute effects

excitatory synaptic transmission, 335–336
inhibitory synaptic transmission, 336

lasting synaptic effects after acute exposure, 338–339

non-cannabinoid receptor acute effects in brain, 337–338

overview of effects, 333–334

prospects for study, 343

synaptic effects after long-term exposure

cerebellum, 340
dorsal striatum, 341–342
hippocampus, 340–341
nucleus accumbens, 339

dopamine release
stimulation by cannabinoids
pharmacological mechanisms, 322–323
phasic events, 321–322
tonic levels, 321
tonic versus phasic, 320–321
withdrawal effects, 323–324

endocannabinoid system
dopamine release effects, 324
overview, 324
signaling disruption effects
cue-evoked dopamine release, 326–327
drug-induced dopamine release, 324–326

Cdk5. *See Cyclin-dependent kinase-5*

CeA. *See Central nucleus of the amygdala*

Central nucleus of the amygdala (CeA). *See also Amygdala*

alcohol dependence studies
disinhibition model of output, 302–303
 γ -aminobutyric acid
acute alcohol effects, 297–298
chronic alcohol effects, 298–299
GABAergic system overview, 297
glutamatergic transmission
acute alcohol effects, 299
chronic alcohol effects, 300
overview, 299

- neuropeptides
 - corticotrophin-releasing factor, 300–301
 - neuropeptide Y, 302
 - nociceptin, 301–302
 - overview, 300
 - prospects for study, 303
 - N*-methyl-D-aspartate receptor response
 - to alcohol, 288
 - negative emotional circuitry, 296–297
 - relapse neurobiology, 52
 - Cerebellum, THC effects on synaptic transmission, 340
 - Channelrhodopsin-2. *See* Optogenetics
 - ChAT. *See* Choline acetyltransferase
 - Choline acetyltransferase (ChAT)
 - acetylcholine synthesis, 270
 - polymorphisms
 - rodents, 272
 - smokers, 272
 - Chromatin modification. *See* Epigenetics
 - Clonidine, opioid choice effects, 206–207
 - Cocaine addiction
 - animal studies
 - escalation of drug use, 11, 16
 - motivation for drug, 13–14
 - epigenetics. *See* Epigenetics
 - multi-symptomatic model, 25, 29
 - nucleus accumbens AMPA receptor
 - transmission effects
 - chronic administration studies, 122–123
 - overview, 121–122
 - prospects for study, 129–130
 - receptor trafficking and cocaine-induced plasticity, 123–124
 - reinstatement of drug seeking
 - GluA1 subunit-containing receptors, 124–127
 - GluA2 subunit-containing receptors, 127–129
 - structural plasticity changes. *See* Structural plasticity
 - vaccine therapy, 6
 - ventral tegmental area, cocaine-evoked synaptic plasticity of excitatory transmission
 - AMPA receptor excitatory postsynaptic potentials, 114–115
 - AMPA receptor/NMDA receptor ratio, 112–116
 - induction mechanism and mesolimbic dopamine, 112–114
 - NMDA receptor excitatory postsynaptic potentials, 115–116
 - synaptic function consequences, 115–116
 - vulnerability
 - animal models
 - diagnosis, 29, 31–33
 - multi-symptomatic model of addiction, 29
 - novelty responses, 34–37
 - overview, 28–29
 - rat responders, 29
 - validation, 32, 34
 - contributing factors
 - complex interactions, 27–28
 - drug type, 26
 - overview, 25–26
 - personality traits, 26
 - prospects for study, 37
 - Cognition
 - adolescent nicotine exposure and performance
 - impact in later life, 228–231
 - neurocognitive deficits in animal addiction, 11–12
 - Conditioned place preference (CPP)
 - alcoholism, 302
 - cocaine seeking, 127, 143
 - nicotine addiction, 258, 263
 - opioid addiction, 149, 170–173, 175, 177
 - vulnerability to addiction, 35
 - Corticotrophin-releasing factor (CRF)
 - alcohol effects in bed nucleus of the stria terminalis, 286
 - AMPA receptor/NMDA receptor ratio
 - modulation, 113–114
 - central amygdala alcohol dependence studies, 300–301
 - opioid withdrawal role, 207
 - relapse neurobiology, 52
 - CPP. *See* Conditioned place preference
 - CREB. *See* Cyclic AMP response element-binding protein
 - CRE. *See* Corticotrophin-releasing factor
 - Cyclic AMP response element-binding protein (CREB)
 - activation
 - behavioral consequences, 101–103
 - cellular and molecular consequences, 99–101
 - epigenetic regulation, 138
 - nucleus accumbens drug reward circuitry, 103–104
 - opiate effects in locus coeruleus, 161, 164
 - psychostimulant-induced structural plasticity, 85, 87
 - transcriptional activation mechanism
 - extracellular signals and stimuli, 99
 - intracellular signals, 98–99
 - overview, 96–97
 - treatment implications, 104–105
 - Cyclin-dependent kinase-5 (Cdk5), psychostimulant-induced structural plasticity, 87–88
- D**
- Δ^9 -Tetrahydrocannabinol. *See* Cannabinoids
 - Dendritic morphology. *See also* Structural plasticity
 - orbitofrontal cortex and psychostimulant effects, 49
 - psychostimulant-induced changes, 72
 - stress and environment effects, 81
 - techniques for study, 80
 - Depression, nicotine effects, 216

Index

- Disulfiram, alcohol addiction management, 4
DNA methylation. *See* Epigenetics
Dopamine
 cannabinoids and release
 stimulation by cannabinoids
 pharmacological mechanisms, 322–323
 phasic events, 321–322
 tonic levels, 321
 tonic versus phasic, 320–321
 withdrawal effects, 323–324
 endocannabinoid system
 dopamine release effects, 324
 overview, 324
 signaling disruption effects
 cue-evoked dopamine release, 326–327
 drug-induced dopamine release, 324–326
 nicotine and signaling
 modulation by nicotine, 239–241
 withdrawal adaptations, 241–243
Dopamine receptor
 antagonist therapy overview, 5–6
 classification, 5
 relapse neurobiology, 50
Dorsal striatum, THC effects on synaptic transmission, 341–342
Drug classification, drugs of abuse, 45
Dynorphin
 behavioral consequences of induction, 102–103
 nucleus accumbens drug reward circuitry, 103–104
 opioid withdrawal role, 207
- E**
Ecstasy, structural plasticity effects, 81
Epigenetics
 chromatin structural changes and gene transcription, 136
 cocaine addiction
 brain-derived neurotrophic factor epigenetic regulation, 144–146
 genome-wide studies of chromatin regulation
 microRNAs, 141–143
 overview, 141
 DNA methylation, psychostimulant-induced changes
 behavioral responses, 140
 gene transcription, 140
 histone acetylation, psychostimulant-induced changes
 behavioral responses, 137–138
 gene transcription, 136–137
 histone methylation, psychostimulant-induced changes
 behavioral responses, 139–140
 gene transcription, 138–139
 prospects for addiction studies, 146
- Ethanol. *See* Alcohol dependence
Extinction, resistance in animal addiction, 12–13
- F**
FAAH. *See* Fatty acid amide hydrolase
Fatty acid amide hydrolase (FAAH), inhibitor development, 207–208
Fos, psychostimulant-induced structural plasticity, 85
- G**
GABA. *See* γ -Aminobutyric acid
GABA_A receptor
 cannabinoid modulation of dopamine release, 323
 ventral tegmental area receptors and opiate motivation
 brain-derived neurotrophic factor in switching, 191–192
 inhibitory and excitatory properties, 187–188
 integrated model of motivation, 192–193
 motivational switching mechanism, 190–191
 overview, 187
 signaling switch mechanisms, 188–189
GABA_B receptor, nicotine dependence role, 261–264
 γ -Aminobutyric acid (GABA)
 central amygdala alcohol dependence studies
 acute alcohol effects, 297–298
 chronic alcohol effects, 298–299
 GABAergic system overview, 297
 nicotine dependence studies
 conditioned behavioral responses, 262–264
 overview, 260–261
 prospects for study, 264
 reinforcing effects, 261–262
 reward-enhancing effects, 262
 seeking behavior, 264
 withdrawal, 264
 receptors. *See* GABA_A receptor; GABA_B receptor
Glutamate receptors. *See specific receptors*
- H**
Habenula
 anatomy, 213
 nicotine withdrawal role, 243–245
 nicotinic acetylcholine receptors in mesolimbic system and nicotine reinforcement, 213–215
Halorhodopsin. *See* Optogenetics
Hippocampus
 drug-associated learning, 45
 opiate memory and glutamate receptors, 176
 reward circuitry, 72–75
 THC effects on synaptic transmission
 acute effects
 excitatory synaptic transmission, 335–336

inhibitory synaptic transmission, 336
long-term exposure, 340–341
Histone modification. *See* Epigenetics

I

Incentive sensitization theory, addiction, 44
Interpeduncular nucleus (IPN)
 nicotine withdrawal role, 243–245
 nicotinic acetylcholine receptors in mesolimbic system and nicotine reinforcement, 213–215
IPN. *See* Interpeduncular nucleus

L

LC. *See* Locus coeruleus
Locus coeruleus (LC)
 anatomy, 161
 opiate effects
 cellular plasticity changes, 161–163
 structural plasticity changes, 163
Long-term depression (LTD)
 nicotine effects in adolescents, 226
 opiate effects, 156
 psychostimulant-induced neuroadaptation, 82–84
 THC effects, 338
Long-term potentiation (LTP)
 opiate effects, 155–156
 psychostimulant-induced neuroadaptation, 82–84
 THC effects, 338
LTD. *See* Long-term depression
LTP. *See* Long-term potentiation

M

MAGL. *See* Monoacylglycerol lipase
Marijuana. *See* Cannabinoids
MDMA. *See* Ecstasy
MEF2. *See* Monocyte enhancing factor-2
Mesopontine rostromedial tegmental nucleus (rMTg)
 dopamine system, 238–239
 relapse neurobiology, 52
Metabotropic glutamate receptor (mGlu)
 nicotine studies
 dependence role, 252
 mGluR2 and adolescent prefrontal cortex response to nicotine, 227
 reinforcing studies, 254–255
 reward-enhancing effects, 258
 seeking behavior, 259
 withdrawal, 259–260
 opiate memory mechanisms and mGluR2/3
 ascending dopamine pathways, 176–177
 basolateral amygdala outputs, 175–176
 conditioned reinforcement, 171

 conditioned reward and aversion, 170–171
 extinction and reinstatement, 171, 173
 hippocampus, 176
 overview, 172
 prefrontal-accumbens pathways, 174–175
 prospects for study, 177
 systems perspective, 173–174

Methadone

 compliance, 3
 historical perspective, 2–3

N-Methyl-D-aspartate receptor (NMDAR)

 alcohol effects in central amygdala, 299–300
 CREB modulation, 100

ethanol effects

acute effects

 GluN1, 282
 GluN2, 282–283
 overview, 282

posttranslational effectors, 283

 basolateral amygdala, 288

 bed nucleus of the stria terminalis receptors, 286–288

 central amygdala, 288

 chronic effects, 284

 plasticity effects, 284–285

 prospects for study, 288–289

nicotine studies

 conditioned rewarding effects, 258–259

 dependence role, 252–253

 reinforcing effects, 253–254, 256

opiate studies

 AMPA/NMDA receptor ratio, 158

opiate memory mechanisms

 ascending dopamine pathways, 176–177
 basolateral amygdala outputs, 175–176
 conditioned reinforcement, 171

 conditioned reward and aversion, 170–171

 extinction and reinstatement, 171, 173

 hippocampus, 176

 overview, 172

 prefrontal-nucleus accumbens pathways, 174–175

 prospects for study, 177

 systems perspective, 173–174

relapse neurobiology, 51

 ventral tegmental area, cocaine-evoked synaptic plasticity of excitatory transmission

 AMPA receptor/NMDA receptor ratio, 112–116

 NMDA receptor excitatory postsynaptic potentials, 115–116

 synaptic function consequences, 115–116

mGlu. *See* Metabotropic glutamate receptor

MicroRNA, cocaine addiction studies of epigenetic regulation, 141–143

Mitogen- and stress-activated protein kinase-1 (MSK1), epigenetic regulation, 139

Index

- Monoacylglycerol lipase (MAGL), inhibitor development, 207–208
- Monocyte enhancing factor-2 (MEF2), psychostimulant-induced structural plasticity, 87–88
- MSK1. *See* Mitogen- and stress-activated protein kinase-1
- Multi-symptomatic model of addiction, 25, 29
- N**
- NAC. *See* N-Acetylcysteine
- NAcc. *See* Nucleus accumbens
- nAChR. *See* Nicotinic acetylcholine receptor
- Naloxone, buprenorphine combination. *See* Suboxone
- Naltrexone
 - alcohol addiction management, 3–4
 - alcoholism studies, 310, 313–315
 - formulations, 4
- Neuropeptide Y (NPY), central amygdala alcohol dependence studies, 302
- NF- κ B. *See* Nuclear factor- κ B
- Nicotine
 - γ -aminobutyric acid in dependence
 - conditioned behavioral responses, 262–264
 - overview, 260–261
 - prospects for study, 264
 - reinforcing effects, 261–262
 - reward-enhancing effects, 262
 - seeking behavior, 264
 - withdrawal, 264
 - choline acetyltransferase polymorphisms
 - in smokers, 272
 - dependence phases, 252
 - dopamine signaling
 - modulation by nicotine, 239–241
 - withdrawal adaptations, 241–243
 - glutamate receptors in dependence
 - conditioned rewarding effects, 258–259
 - overview, 252–253
 - reinforcing effects, 253–256
 - reward-enhancing effects, 256–257
 - seeking behavior, 259
 - withdrawal, 259–260
 - neurochemistry, 270
 - pharmacogenetic cessation treatment of smoking, 274–275
 - pharmacotherapy of addiction. *See specific drugs*
 - prefrontal cortex function effects in adolescents
 - cognitive performance impact in later life, 228–231
 - immediate effects, 225–226
 - long-term consequences, 228–229
 - mGluR2 expression, 227
 - nicotinic acetylcholine receptor expression, 225–228
 - prospects for study, 231
 - vulnerability versus adult brain, 224–225
 - smoking effects on depression, appetite, and attention, 215–218
 - smoking mortality, 269
 - structural plasticity effects, 81
 - withdrawal and habenula-interpeduncular pathway, 213–215, 243–245
- Nicotine replacement therapy, historical perspective, 4–5
- Nicotinic acetylcholine receptor (nAChR)
 - adolescent prefrontal cortex response to nicotine, 225–228
 - aversion and nicotine withdrawal role in habenula-interpeduncular pathway, 213–215, 243–245
 - food intake regulation, 217–218
 - polymorphisms
 - rodents, 274
 - smokers, 273–274
 - prospects for addiction studies, 218
 - subtypes in mesolimbic system and nicotine reinforcement, 211–213, 270
- NMDAR. *See* N-Methyl-D-aspartate receptor
- Nociceptin, central amygdala alcohol dependence studies, 301–302
- NPY. *See* Neuropeptide Y
- Nuclear factor- κ B (NF- κ B), psychostimulant-induced structural plasticity, 87
- Nucleus accumbens (NAcc)
 - acute reinforcement, 45–46
 - AMPA receptor transmission effects of cocaine
 - chronic administration studies, 122–123
 - overview, 121–122
 - prospects for study, 129–130
 - receptor trafficking and cocaine-induced plasticity, 123–124
 - reinstatement of drug seeking
 - GluA1 subunit-containing receptors, 124–127
 - GluA2 subunit-containing receptors, 127–129
- CREB activation
 - behavioral consequences, 101–103
 - cellular and molecular consequences, 99–101
 - drug reward circuitry, 103–104
- dynorphin
 - behavioral consequences of induction, 102–103
 - drug reward role, 103–104
- lesion studies, 47
- mesocorticolimbic dopamine pathway, 45
- opiate memory and glutamate receptors, 174–175
- optogenetics, 66–67
- relapse neurobiology, 49–50, 52
- reward circuitry, 72–75, 95–96
- structural plasticity, 75–81
- THC effects on synaptic transmission, 339

O

- Obstruction Box, 16
- OFC. *See* Orbitofrontal cortex
- Opioid addiction
 - glutamate receptors in memory mechanisms
 - ascending dopamine pathways, 176–177
 - basolateral amygdala outputs, 175–176
 - conditioned reinforcement, 171
 - conditioned reward and aversion, 170–171
 - extinction and reinstatement, 171, 173
 - hippocampus, 176
 - overview, 172
 - prefrontal-accumbens pathways, 174–175
 - prospects for study, 177
 - systems perspective, 173–174
 - locus coeruleus
 - anatomy, 161
 - cellular plasticity changes, 161–163
 - structural plasticity changes, 163
 - medications
 - development
 - experimental strategies, 199–202
 - historical perspective, 2–3
 - opioid choice effects
 - buprenorphine, 203–204
 - implications for drug development, 205–206
 - non- μ opioid medications, 206–207
 - opioid agonists, 205
 - opioid antagonists, 202–203
 - prospects for study, 207–208
 - types, 202–203
 - memory mosaic, 169–170
 - motivation, reward, and reinforcement, 183–184
 - physical dependence, 153–154
 - structural plasticity, 81
 - ventral tegmental area
 - acute changes
 - neuronal activity, 154–155
 - synaptic plasticity, 155–156
 - anatomy, 154–155, 185–186
 - chronic changes
 - structural and cellular plasticity, 158–161
 - synaptic plasticity, 156–158
 - dopamine-dependent reinforcement, 184
 - motivation and GABA_A receptors
 - brain-derived neurotrophic factor in switching, 191–192
 - inhibitory and excitatory properties, 187–188
 - integrated model of motivation, 192–193
 - motivational switching mechanism, 190–191
 - overview, 187
 - signaling switch mechanisms, 188–189
 - nondeprived/deprived hypothesis, 184

- Opioid receptors
 - alcoholism and μ -opioid receptor
 - A118G polymorphism studies, 310–313
 - naltrexone studies, 310, 313–315
 - overview, 309–310
 - κ -opioid receptor, CREB modulation, 101–103
- Optogenetics
 - brain slice studies, 65–66
 - lasers, 65
 - opsin modulation of neural circuits, 64–65
 - overview, 63–64
 - prospects, 67
 - strategies in vivo, 66–67
- Orbitofrontal cortex (OFC)
 - mesocorticolimbic dopamine pathway, 45
 - psychostimulants and dendritic morphology, 49
 - relapse neurobiology, 50, 52

P

- Pedunculopontine tegmental nucleus (PPTg),
 - relapse neurobiology, 52
- PFC. *See* Prefrontal cortex
- Phencyclidine, structural plasticity effects, 81
- PKA. *See* Protein kinase A
- PKC. *See* Protein kinase C
- Plasticity. *See* Structural plasticity; *specific brain areas*
- POMC. *See* Proopiomelanocortin
- Postsynaptic density (PSD), psychostimulant-induced neuroadaptation, 82–84
- PPTg. *See* Pedunculopontine tegmental nucleus
- Prefrontal cortex (PFC)
 - cocaine addiction studies, 48
 - drug-seeking behavior role, 48
 - mesocorticolimbic dopamine pathway, 45
 - nicotine effects in adolescents
 - cognitive performance impact in later life, 228–231
 - immediate effects, 225–226
 - long-term consequences, 228–229
 - mGluR2 expression, 227
 - nicotinic acetylcholine receptor expression, 225–228
 - prospects for study, 231
 - vulnerability versus adult brain, 224–225
 - opiate memory and glutamate receptors, 174–175
 - optogenetics, 67
 - psychostimulants and dendritic morphology, 49
 - relapse neurobiology, 49–52
 - reward circuitry, 72–75
 - structural plasticity, 75–76
- Proopiomelanocortin (POMC), nicotine effects on neurons, 217–218
- Protein kinase A (PKA), AMPA receptor phosphorylation in nucleus accumbens, 125–126

Index

Protein kinase C (PKC), AMPA receptor phosphorylation in nucleus accumbens, 127–128
PSD. *See* Postsynaptic density
Punishment, resistance in animal addiction, 15–16

Q

Quinine adulteration model, 15

R

Relapse, neurobiology, 49–53
Rho, psychostimulant-induced structural plasticity, 88–89
rMTg. *See* Mesopontine rostromedial tegmental nucleus

S

Shock, punishment resistance in animal addiction, 16
Smoking. *See* Nicotine
Stages, addiction, 44–45
Striatum. *See* Dorsal striatum
Structural plasticity. *See also* Dendritic morphology
ecstasy effects, 81
nicotine effects, 81
nucleus accumbens, 75–79, 81
opiate effects, 81
phencyclidine effects, 81
prefrontal cortex, 75–76
prospects for study, 89
psychostimulant mechanisms
cyclic AMP response element-binding protein, 85, 87
cyclin-dependent kinase-5, 87–88
Fos, 85
monocyte enhancing factor-2, 87–88
nuclear factor- κ B, 87
overview, 84–86
Rho, 88–89
sex differences, 82
techniques for study, 80
Suboxone, rationale for development, 3

T

Tegmental pedunclopontine nucleus (TOPP), 184–185
THC. *See* Cannabinoids
TOPP. *See* Tegmental pedunclopontine nucleus

V

Varenicline, nicotine addiction management, 5, 269
Ventral tegmental area (VTA)
acute reinforcement, 46

cocaine-evoked synaptic plasticity of excitatory transmission
AMPA receptor
AMPA receptor/NMDA receptor ratio, 112–116
excitatory postsynaptic potentials, 114–115
induction mechanism and mesolimbic dopamine, 112–114
NMDA receptor excitatory postsynaptic potentials, 115–116
synaptic function consequences, 115–116
mesocorticolimbic dopamine pathway, 45, 238–239
nicotinic acetylcholine receptors, 211–213
opiate effects
acute changes
neuronal activity, 154–155
synaptic plasticity, 155–156
anatomy, 154–155, 185–186
chronic change
structural and cellular plasticity, 158–161
synaptic plasticity, 156–158
dopamine-dependent reinforcement, 184
GABA_A receptors in motivation
brain-derived neurotrophic factor in switching, 191–192
inhibitory and excitatory properties, 187–188
integrated model of motivation, 192–193
motivational switching mechanism, 190–191
overview, 187
signaling switch mechanisms, 188–189
optogenetics, 65–67
relapse neurobiology, 52
reward circuitry, 72–75
VTA. *See* Ventral tegmental area
Vulnerability, addiction
animal models
diagnosis, 29, 31–33
multi-symptomatic model of addiction, 29
novelty responses, 34–37
overview, 28–29
rat responders, 29
validation, 32, 34
contributing factors
behavioral consequences, 118
complex interactions, 27–28
drug type, 26
overview, 25–26
personality traits, 26
prospects for study, 118
reversal of drug-evoked plasticity, 116–118
prospects for study, 37