Drug Delivery in Central Nervous System Diseases - Technologies, Markets and Companies

Description: The delivery of drugs to central nervous system (CNS) is a challenge in the treatment of neurological disorders. Drugs may be administered directly into the CNS or administered systematically (e.g., by intravenous injection) for targeted action in the CNS. The major challenge to CNS drug delivery is the blood-brain barrier (BBB), which limits the access of drugs to the brain substance.

Advances in understanding of the cell biology of the BBB have opened new avenues and possibilities for improved drug delivery to the CNS. Several carrier or transport systems, enzymes, and receptors that control the penetration of molecules have been identified in the BBB endothelium. Receptor-mediated transcytosis can transport peptides and proteins across the BBB. Methods are available to assess the BBB permeability of drugs at the discovery stage to avoid development of drugs that fail to reach their target site of action in the CNS.

Various strategies that have been used for manipulating the blood-brain barrier for drug delivery to the brain include osmotic and chemical opening of the blood-brain barrier as well as the use of transport/carrier systems. Other strategies for drug delivery to the brain involve bypassing the BBB. Various pharmacological agents have been used to open the BBB and direct invasive methods can introduce therapeutic agents into the brain substance. It is important to consider not only the net delivery of the agent to the CNS, but also the ability of the agent to access the relevant target site within the CNS. Various routes of administration as well as conjugations of drugs, e.g., with liposomes and nanoparticles, are considered. Some routes of direct administration to the brain are non-invasive such as transnasal route whereas others involve entry into the CNS by devices and needles such as in case of intrathecal and intracerebroventricular delivery. Systemic therapy by oral and parenteral routes is considered along with sustained and controlled release to optimize the CNS action of drugs. Among the three main approaches to drug delivery to the CNS - systemic administration, injection into CSF pathways, and direct injection into the brain - the greatest developments is anticipated to occur in the area of targeted delivery by systemic administration.

Many of the new developments in the treatment of neurological disorders will be biological therapies and these will require innovative methods for delivery. Cell, gene and antisense therapies are not only innovative treatments for CNS disorders but also involve sophisticated delivery methods. RNA interference (RNAi) as a form of antisense therapy is also described.

The role of drug delivery is depicted in the background of various therapies for neurological diseases including drugs in development and the role of special delivery preparations. Pain is included as it is considered to be a neurological disorder. A special chapter is devoted to drug delivery for brain tumors. Cell and gene therapies will play an important role in the treatment of neurological disorders in the future.

The method of delivery of a drug to the CNS has an impact on the drug’s commercial potential. The market for CNS drug delivery technologies is directly linked to the CNS drug market. Values are calculated for the total CNS market and the share of drug delivery technologies. Starting with the market values for the year 2016, projections are made to the years 2021 and 2026. The markets values are tabulated according to therapeutic areas, technologies and geographical areas. Unmet needs for further development in CNS drug delivery technologies are identified according to the important methods of delivery of therapeutic substances to the CNS. Finally suggestions are made for strategies to expand CNS delivery markets. Besides development of new products, these include application of innovative methods of delivery to older drugs to improve their action and extend their patent life.

Profiles of 76 companies involved in drug delivery for CNS disorders are presented along with their technologies, products and 99 collaborations. These include pharmaceutical companies that develop CNS drugs and biotechnology companies that provide technologies for drug delivery. A number of cell and gene therapy companies with products in development for CNS disorders are included. References contains over 420 publications that are cited in the report. The report is supplemented with 53 tables and 13 figures.

The report includes information on the following areas:
- Basics of drug delivery to the CNS
- Blood-brain barrier
- Methods of drug delivery to the CNS
- Delivery of cell, gene and antisense therapies to the CNS
- Drug delivery in the treatment of CNS disorders
- Drug delivery for brain tumors
- Markets for drug delivery in CNS disorders
- Companies

Contents:

0. Executive Summary

1. Basics of Drug Delivery to the Central Nervous System
   Introduction
   Historical evolution of drug delivery for CNS disorders
   Neuroanatomical and neurophysiological basis of drug delivery
   The cerebrospinal fluid
   The lymphatic drainage system of the brain
   The extracellular space in the brain
   Neurotransmitters
   Extracellular vesicles as drug delivery vehicles
   Neuropharmacology relevant to drug delivery
   Introduction to neuropharmacology
   Pharmacokinetics
   Absorption and distribution of drugs
   Drug metabolism and elimination
   Pharmacodynamics
   Receptors
   Sites of drug action in the CNS
   Receptors coupled to guanine nucleotide binding proteins
   Acetylcholine receptor channels
   Dopamine receptors
   GABA receptor channels
   Glutamate receptor channels
   Non-competitive NMDA antagonists
   Serotonin receptors
   G-protein coupled receptors
   In vivo study of drug action in the CNS in human patients
   Electroencephalography
   Brain imaging
   Chronopharmacology as applied to the CNS
   Role of drug delivery in personalized therapy of CNS disorders

2. Blood Brain Barrier
   Introduction
   Features of the blood-brain barrier relevant to CNS drug delivery
   The neurovascular unit
   Functions of the BBB
   BBB as an anatomical as well as physiological barrier
   BBB as a biochemical barrier
   Role of shear stress on development of BBB
   Genomics of BBB
   Proteomics of BBB
   Other neural barriers
   Blood-cerebrospinal fluid barrier
   Blood nerve barrier
   Blood-retinal barrier
   Blood-labyrinth barrier
   Passage of substances across the blood-brain barrier
   Transporters localized in the BBB
   Adenosine carrier
   Amino acid transporters
   Efflux transport systems
Glucose transporter
Ionic transporter
BBB-specific enzymes
Receptor-mediated transcytosis
Lysophosphatidic acid-mediated increase in BBB permeability
Folate transport system
Transferrin receptor
Molecular biology of the BBB
Transport of peptides and proteins across the BBB
Passage of leptin across the BBB
Passage of cytokines across the BBB
Passage of hormones across the BBB
Passage of enzymes across the BBB
Passage of omega-3 fatty acids across the BBB
Drugs that cross the BBB by binding to plasma proteins
Current concepts of the permeability of the BBB
Factors that increase the permeability of the BBB
BBB disruption as an adverse effect of pharmaceuticals
BBB disruption as adverse effect of vaccines for CNS disorders
CNS disorders and BBB
Autoimmune disorders
Brain tumors
Primary brain tumors
Cerebral metastases
Central nervous system injuries
Cerebrovascular disease
Cerebral ischemia
Intracerebral hemorrhage
Epilepsy
Infections
Mitochondrial encephalopathies
Multiple sclerosis
Neurodegenerative disorders
BBB in Alzheimer disease
BBB in Parkinson disease
BBB in amyotrophic lateral sclerosis
West Nile virus infection
Testing permeability of the BBB
In vitro models of BBB
In vivo study of BBB
Brain imaging
In silico prediction of BBB
Relevance of the BBB penetration to pharmacological action
BBB penetration and CNS drug screening
BBB models for testing drug delivery
CERENSE
SM
In vivo brain distribution of P-glycoprotein
Transthyretin monomer as a marker of blood-CSF barrier disruption
Evaluation of BBB permeability by brain imaging
Biomarkers of disruption of blood-brain barrier
Future directions for research on the BBB
Use of neural stem cells to construct the blood brain barrier
Strategies to cross the BBB

3. Methods of Drug Delivery to the CNS
Introduction
Routes of drug delivery to the brain
Drug deliverys to the brain via the nasal route
Devices for nasal administration of drugs for CNS
Nasal mucosal patch to facilitate drug delivery across the BBB
Passage of viruses to the brain via the nasal route
Potential and limitations of nasal drug delivery to the brain
Drugs that can be delivered to the brain via the nasal route
- Erythropoietin
- Esketamine
- Hypocretin
- IFN beta-1b
- Lysosomal enzymes
- Midazolam
- Neurotrophic factors
- Thyrotropin-releasing hormone
- Neuroprotective drugs for stroke

Transdermal drug delivery for neurological disorders
Drug delivery to the brain via inner ear
Drug delivery for disorders of the spinal cord
Intrathecal drug delivery
Anatomical & physiological aspects of intrathecal drug delivery
Advantages of intrathecal drug delivery
Drugs that can be delivered by intrathecal route
Pharmacokinetics of intrathecal drug delivery
Retrograde delivery to the brain via the epidural venous system
Devices for drug delivery to the CNS
Catheters for drug delivery to the CNS
Reservoirs and pumps for drug delivery to the CNS
Invasive neurosurgical approaches

Intracranial drug delivery to the brain
Direct injection into the CNS substance or CNS lesions
Targeted delivery of biologicals to the spinal cord by microinjection
Intraventricular injection of drugs
Strategies for drug delivery to the CNS across the BBB
Increasing the permeability (opening) of the BBB
Osmotic opening of the BBB
Focal disruption of BBB by ultrasound
Chemical opening of the BBB
Cerebral vasodilatation to open the BBB
Modulation of vascular permeability by laser irradiation
Neurostimulation for opening BBB
Use of nitric oxide donors to open the BBB
Manipulation of the sphingosine 1-phosphate receptor system
Pharmacological strategies to facilitate transport across the BBB

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Inhibition of P-glycoprotein to enhance drug delivery across the BBB
LipoBridge® technology
Modification of the drug to enhance its lipid solubility
Monoclonal antibody fusion proteins
Neuroimmunophilins
Peptide-mediated transport across the BBB
Prodrug bioconversion strategies and their CNS selectivity
Transport of small molecules across the BBB
Transport across the BBB by short chain oligoglycerolipids
Transvascular delivery across the BBB
Trojan horse approach
Role of the transferrin-receptor system in CNS drug delivery
Use of receptor-mediated transcytosis to cross the BBB
Cell-based drug delivery to the CNS
Activated T lymphocytes
Microglial cells
Neural stem cells
Drug delivery to the CNS by using novel formulations
Crystalline formulations
Liposomes
Monoclonal antibodies
Microspheres
Microbeads
Brain-targeted chemical delivery systems
Nanotechnology-based drug delivery to CNS
Nanoparticles for drug delivery across the BBB
NanoDel? technology for crossing the BBB
Masking BBB-limiting characteristics by nanotechnology
Nanovesicles for transport across BBB
Peptide-nanoparticle conjugates for crossing the BBB
Penetration of BBB by nanoparticles coated with polysorbate 80
Transcytosis of transferrin-containing nanoparticles across the BBB
Nanotechnology-based devices and implants for CNS
Biochip implants for drug delivery to the CNS
Controlled-release microchip
Retinal implant chip
Convection-enhanced delivery to the CNS
Systemic administration of drugs for CNS effects
Sustained and controlled release drug delivery to the CNS
Fast dissolving oral selegiline
Choice of the route of systemic delivery for effect on the CNS disorders
Methods of delivery of biopharmaceuticals to the CNS
Delivery of biopharmaceuticals across the BBB
Methods of delivery of peptides for CNS disorders
Alteration of properties of the BBB for delivery of peptides
Challenges for delivery of peptides across the BBB
CNS delivery of peptides via conjugation to biological carriers
Delivery of conopeptides to the brain
Direct delivery of neuropeptides into the brain
Molecular manipulations of peptides to facilitate transport into CNS
Transport to spinal cord motor neurons after peripheral injection
Transnasal administration of neuropeptides
Delivery of neurotrophic factors to the nervous system
Systemic administration of NTFs
Delivery systems to facilitate crossing of the BBB by NTFs
Direct application of NTFs to the CNS
Intracerebroventricular injection
Intrathecal administration
Implants for delivery of neurotrophic factors
Use of neurotrophic factor mimics
Use of microspheres for delivery of neurotrophic factors
Use of nanobiotechnology for delivery of neurotrophic factors
Use of microorganisms for therapeutic entry into the brain
Bacteriophages as CNS therapeutics
Intracellular drug delivery in the brain
Local factors in the brain affecting drug action
Methods for testing drug delivery to the CNS
Animal models for testing drug delivery
Screening for drug-P-gp interaction at BBB

4. Delivery of Cell, Gene and Antisense Therapies to the CNS
Introduction
Cell therapy of neurological disorders
Methods for delivering cell therapies in CNS disorders
Cerebrospinal fluid-stem cell interactions for therapy of CNS disorders
Engineered stem cells for drug delivery to the brain
Encapsulated cells
Intrathecal delivery of stem cells
Intraparenchymal delivery of stem cells to the spinal cord
Intravascular administration
Neural stem cells as therapeutic delivery vehicles
Gene therapy techniques for the nervous system

Introduction
Methods of gene transfer to the nervous system
AAV vector mediated gene therapy for neurogenetic disorders
Ideal vector for gene therapy of neurological disorders
Promoters of gene transfer
Routes of delivery of genes to the nervous system
Direct injection into CNS
Introduction of the genes into cerebral circulation
Introduction of genes into cerebrospinal fluid
Intravenous administration of vectors
Delivery of gene therapy to the peripheral nervous system
Cell-mediated gene therapy of neurological disorders
Neuronal cells
Neural stem cells and progenitor cells
Astrocytes
Cerebral endothelial cells
Implantation of genetically modified encapsulated cells into the brain
Genetically modified bone marrow cells
Nanoparticles as nonviral vectors for CNS gene therapy
Applications of gene therapy for neurological disorders
Companies involved in cell/gene therapy of neurological disorders
Antisense therapy of CNS disorders
Delivery of antisense oligonucleotides to the CNS
Delivery of oligonucleotides across the BBB
Cellular delivery systems for oligonucleotides
High-flow microinfusion into the brain parenchyma
Systemic administration of peptide nucleic acids
Introduction of antisense compounds into the CSF Pathways
Intrathecal administration of antisense compounds
Intracerebroventricular administration of antisense oligonucleotides
Nanoparticle-based delivery of antisense therapy to the CNS
Methods of delivery of ribozymes
Delivery aspects of RNAi therapy of CNS disorders
Delivery of siRNA to the CNS
Future drug delivery strategies applicable to the CNS

5. Drug Delivery for Treatment of Neurological Disorders
Introduction
Targeted drug delivery for neurological disorders
Parkinson's disease
Drug delivery systems for Parkinson's disease
Methods of delivery of levodopa in PD
Duodenal levodopa infusion
Sublingual apomorphine
Transdermal drug delivery for PD
Transdermal dopamine agonists for PD
Transdermal administration of other drugs for PD
Intracerebral administration of GDNF
Cell therapy for PD
Human dopaminergic neurons for PD
Graft survival-enhancing drugs
Xenografting porcine fetal neurons
Encapsulated cells for PD
Stem cells for PD
Engineered stem cells for drug delivery to the brain in PD
Human retinal pigment epithelium cells for PD
Delivery of cells for PD
Gene therapy for Parkinson disease
Rationale
Techniques of gene therapy for PD
Prospects of gene therapy for PD
Companies developing gene therapy for PD
RNAi therapy of Parkinson's disease
Alzheimer disease
Drug delivery for Alzheimer disease
Blood-brain partitioning of an AMPA receptor modulator
Clearing amyloid through the BBB
Delivery of the passive antibody directly to the brain
Delivery of thyrotropin-releasing hormone analogs by molecular packaging
Nanoparticle-based drug delivery for Alzheimer's disease
Perispinal etanercept
Slow release implant of an AChE inhibitor
Intranasal insulin in Alzheimer disease
Transdermal drug delivery in Alzheimer's disease
Trojan-horse approach to prevent build-up of Aβ aggregates
Cell and gene therapy for Alzheimer disease
NGF gene therapy
Neprilysin gene therapy
RNAi therapy of Alzheimer's disease
Huntington's disease
Treatment of HD
Gene therapy of HD
Encapsulated genetically engineered cellular implants
Viral vector mediated administration of neurotrophic factors
RNAi therapeutics for the treatment of HD
Amyotrophic lateral sclerosis
Treatment of ALS
Drug delivery in ALS
Delivery of stem cell therapy for ALS
Gene and antisense therapy of ALS
Neurotrophic factor gene therapies of ALS
Antisense therapy of ALS
RNAi therapy of amyotrophic lateral sclerosis
Cerebrovascular disease
Treatment of stroke
Drug delivery in stroke
Intraarterial administration of tissue plasminogen activator in stroke
Drug delivery for prevention of restenosis of carotid arteries
In-stent restenosis
Targeted local anti-restenotic drug delivery
Catheter-based drug delivery for restenosis
Stents for prevention of restenosis
Drug-eluting stents
Antisense approach to prevent restenosis
Drug-eluting stents for the treatment of intracranial atherosclerosis
Tissues transplants for stroke
Transplant of encapsulated tissue secreting neurotrophic factors
Methods for delivery of neurotrophic factors in stroke
Cell therapy for stroke
Stem cell transplant into the brain
Immortalized cell grafts for stroke
Intravenous infusion of marrow stromal cells
Intravenous infusion of umbilical cord blood stem cells
Future of cell therapy for stroke
Gene therapy of cerebrovascular diseases
Gene transfer to cerebral blood vessels
NOS gene therapy for restenosis
Gene therapy for cerebral ischemia
Gene therapy of strokes with a genetic component
Drug delivery to intracranial aneurysms
Drug delivery for vasospasm following subarachnoid hemorrhage
Intrathecal tissue plasminogen activator
Gene therapy for vasospasm
Drug delivery in multiple sclerosis
An electronic device for self injection of interferon beta-1a
Marrow stromal cells for SCI
Intravenous injection of stem cells for spinal cord repair
Combinatorial approach for regeneration in SCI
Cell therapy of syringomyelia
Gene therapy of spinal cord injury
Drug delivery in CNS infections
Drug delivery in neuroAIDS
Drug delivery for miscellaneous neurological disorders
Drug delivery for CNS involvement in Hunter syndrome
Antisense therapy for spinal muscular atrophy
Antisense gene splicing for SMA
Intrathecal antisense delivery
Genetically modified stem cells for metachromatic leukodystrophy
Relief of spasticity by intrathecal baclofen
Drug delivery for retinal disorders
Age-related macular degeneration
Squalamine
Combretastatin A4P for myopic macular degeneration
Gene therapy for AMD
Anti-VEGF approach to AMD
Delivery of pegaptanib for treatment of AMD
Stem cell therapy for retinitis pigmentosa
Proliferative retinopathies
Drug delivery for inner ear disorders
Delivery of stem cells for hearing loss
Auditory hair cell replacement by gene therapy
Future prospects of drug delivery to the inner ear
Drug delivery in psychiatric disorders
Delivery of antidepressants
Transdermal delivery of antidepressants
Nasal delivery of antidepressants
Delivery methods and formulations of antipsychotics
Long-acting injectable antipsychotics
Transdermal haloperidol
Transdermal risperidone for treatment of schizophrenia
Transdermal blonanserin for treatment of schizophrenia
Transnasal oxytocin for schizophrenia
Transdermal lithium for bipolar disorder

6. Drug delivery for brain tumors
Introduction
Methods for evaluation of anticancer drug penetration into brain tumor
Innovative methods of drug delivery for glioblastoma multiforme
Delivery of anticancer drugs across the blood-brain barrier
Anticancer agents with increased penetration of BBB
BBB disruption
Nanoparticle-based targeted delivery of chemotherapy across the BBB
Tyrosine kinase inhibitor increases topotecan penetration into CNS
Bypassing the BBB by alternative methods of drug delivery
Intranasal perillyl alcohol
Intraarterial chemotherapy
Enhancing tumor permeability to chemotherapy
PDE5 inhibitors for increasing BTB permeability
Local delivery of therapeutic agents into the brain
Biodegradable microspheres containing 5-FU
Carmustine biodegradable polymer implants
Fibrin glue implants containing anticancer drugs.
Interstitial delivery of dexamethasone for reduction of peritumor edema
Magnetically controlled microspheres
Convection-enhanced delivery
CED for receptor-directed cytotoxin therapy
CED of topotecan
CED of a modified diphtheria toxin conjugated to transferrin
CED of nanoliposomal CPT-11
CED for delivery 1
I-chTNT-1/B MAb
Anticancer drug formulations for targeted delivery to brain tumors
Intravenous delivery of anticancer agents bearing transferrin
Liposomes for drug delivery to brain tumors
MAbs targeted to brain tumors
Targeted delivery of drug-peptide conjugates to GBM
Multiple targeted drugs for brain tumors
Nanoparticles for targeted drug delivery in glioblastoma multiforme
Targeted antiangiogenic/apoptotic/cytotoxic therapies
Introduction of the chemotherapeutic agent into the CSF pathways
Intraventricular chemotherapy for meningeal cancer
Intrathecal chemotherapy
Photodynamic therapy for chemosensitization of brain tumors
Nanoparticles for photodynamic therapy of brain tumors
Innovative delivery of radiotherapy to brain tumors
GliaSite Radiation Therapy System
Boron neutron capture therapy for brain tumors
Cell therapy for glioblastoma multiforme
Chimeric antigen receptor T cells
Mesenchymal stem cells to deliver treatment for gliomas
Gene therapy for glioblastoma multiforme.
Antiangiogenic gene therapy
Anticancer drug delivery by genetically engineered MSCs
Intravenous gene delivery with nanoparticles into brain tumors
Ligand-directed delivery of dsRNA molecules targeted to EGFR
Neural stem cells for drug/gene delivery to brain tumors
Peptides targeted to glial tumor cells
RNAi gene therapy of brain cancer
Single-chain antibody-targeted adenoviral vectors
Targeting normal brain cells with an AAV vector encoding interferon-?
Treatment of medulloblastoma by suppressing genes in Shh pathway
Virus-mediated oncolytic therapy of brain cancer
HIV-mediated Oncolysis
Autophagy by conditionally replicating adenoviruses
Reovirus-mediated Oncolysis
Measles virus-mediated oncolysis
Oncolytic virus targeted to brain tumor stem cells
Oncolyis with vesicular stomatitis virus
Future prospects of viral-mediated oncolysis
Vaccination for glioblastoma multiforme

7. Markets for Drug Delivery in CNS Disorders
Introduction
Methods of calculation of CNS drug delivery markets
Markets for CNS drug delivery technologies
Drug delivery share in selected CNS markets
CNS share of drug delivery technologies
Geographical distribution of CNS drug delivery markets
Impact of improved drug delivery on CNS drug markets
Neurodegenerative disorders
Alzheimer disease
Parkinson disease
Huntington disease
Amyotrophic lateral sclerosis
Epilepsy
Migraine and other headaches
Stroke
Central nervous system trauma
Multiple sclerosis
Brain tumors
Limitations of the current drug delivery technologies for CNS
Unmet needs in CNS drug delivery technologies
Future strategies for expanding CNS drug delivery markets
Education of neurologists
Demonstration of the advantages of the newer methods of delivery
Rescue of old products by novel drug delivery methods
Facilitation of the approval process of new drugs

8. Companies
Introduction
Profiles of companies
Collaborations

9. References

Tables
Table 1-1: Landmarks in the development of drug delivery to the CNS
Table 2-1: Proteins expressed at the neurovascular unit
Table 2-2: Transporters that control penetration of molecules across the BBB
Table 2-3: Enzymes that control the penetration of molecules across the BBB
Table 2-4: Factors that increase the permeability of the BBB
Table 2-5: Diseases with associated disturbances of BBB
Table 3-1: Various methods of drug delivery to the central nervous system
Table 3-2: Drugs available for intrathecal administration
Table 3-3: Investigational drugs administered by intrathecal route
Table 3-4: Strategies for drug delivery to the CNS across the BBB
Table 3-5: Specific inhibitors of P-glycoprotein in clinical development
Table 3-6: Molecules attached to Trojan horses injected intravenously for CNS effect
Table 3-7: Examples of controlled and sustained release drug delivery for CNS disorders
Table 3-8: Novel methods of delivery of drugs for CNS disorders
Table 3-9: Indications for the clinical applications of NTFs in neurologic disorders
Table 3-10: Methods for delivery of neurotrophic factors to the CNS
Table 4-1: Methods for delivering cell therapies in CNS disorders
Table 4-2: Classification of methods of gene therapy
Table 4-3: Potential indications for gene therapy of neurologic disorders
Table 4-4: Companies developing cell/gene therapies for CNS disorders
Table 4-5: Methods of antisense delivery as applied to the CNS
Table 4-6: Classification of pharmacotherapy for Alzheimer disease
Table 4-7: Novel drug delivery methods for Alzheimer disease therapies
Table 4-8: Classification of neuroprotective agents for amyotrophic lateral sclerosis
Table 4-9: Methods of delivery of therapies in development for ALS
Table 4-10: Classification of treatments for stroke
Table 4-11: Treatments of stroke involving innovative drug delivery methods
Table 4-12: Drug delivery for prevention of carotid artery restenosis after angioplasty
Table 4-13: Gene transfer in animal models of carotid artery restenosis
Table 4-14: Neuroprotective gene transfer strategies in models of cerebral ischemia
Table 4-15: Gene Therapy for reducing cerebral infarction in animal stroke models
Table 4-16: Pharmacological agents for treatment of cerebral vasospasm
Table 4-17: Gene therapy strategies for vasospasm
Table 4-18: A classification of drug delivery methods used in management of pain
Table 4-19: Spinal administration of drugs for pain
Table 4-20: Investigational drugs for pain administered by intrathecal route
Table 4-21: Current management of migraine
Table 4-22: Novel drug delivery methods for migraine
Table 4-23: Innovative methods of drug delivery for glioblastoma multiforme
Table 4-24: Strategies for gene therapy of malignant brain tumors
Table 4-25: Share of drug delivery technologies in selected CNS markets: 2016-2026
Table 7-2: CNS market share of drug delivery technologies 2016-2026
Table 7-3: Value of CNS drug delivery in the major world markets from 2016-2026
Table 7-4: Limitations of the current drug delivery technologies for CNS
Table 8-1: Alkermes pipeline
Table 8-2: Collaborations of companies in CNS drug delivery

Figures
Figure 1-1: Interaction of neurotransmitters with receptors
Figure 2-1: The neurovascular unit
Figure 2-2: Various forms of passage of substances across the blood brain barrier
Figure 2-3: Role of BBB models for drug delivery in preclinical CNS drug development
Figure 3-1: Routes of drug delivery to the brain
Figure 3-2: Penetration of CSF into spinal cord
Figure 3-3: Disposition of opioids after intrathecal administration
Figure 3-4: Use of receptor-mediated transcytosis to cross the BBB
Figure 3-5: Nanotechnology-based strategies for delivery of BDNF to the CNS
Figure 5-1: Oral versus transdermal administration of a drug in Parkinson's disease
Figure 5-2: Effect of tyrosine hydroxylase gene delivery on dopamine levels
Figure 6-1: A concept of targeted drug delivery to GBM across the BBB
Figure 7-1: Unmet needs in the CNS drug delivery technologies

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