BioPortfolio has been marketing business and market research reports from selected publishers for over fifteen years. BioPortfolio offers a personal service to our customers with dedicated research managers who will work with you to source the best report for your needs. Based in the UK, BioPortfolio is well positioned to coordinate our customers' orders sourced from over 50 global report publishers.

We are pleased to present details of this report to assist your buying decision and administrative process. You will find easy-to-use How To Buy information on the last page of this document.

We look forward to being of service to you.

If you have bulk and/or recurring requirements, please get in touch - we can liaise with publishers to obtain sample pages and negotiate discounts on your behalf.

Phone: +44 (0)7887 945155 or Email: pdb@bioportfolio.co.uk
Pain Therapeutics - Drugs, Markets and Companies

Summary

This report describes the latest concepts of pathomechanisms of pain as a basis for management and development of new pharmacotherapies for pain. Major segments of the pain market are arthritis, neuropathic pain and cancer pain. Because pain is a subjective sensation, it is difficult to evaluate objectively in clinical trials. Various tools for pain measurement are described, including brain imaging.

Most of the currently used analgesic drugs fall into the categories of opioids and nonsteroidal antiinflammatory drugs such as COX-2 inhibitors. Non-opioid analgesics include ketamine, a N-methyl-D-aspartate receptor antagonist. Adjuvant analgesics include antidepressants and antiepileptic drugs used for the treatment of neuropathic pain. Management of pain is multidisciplinary and includes both pharmacological and non-pharmacological methods such as acupuncture, transcutaneous electrical nerve stimulation and surgery. Various pain syndromes require different approaches in management, for example, the main category of drugs for migraine are triptans such as sumatriptan.

Drug delivery is an important consideration in pain treatment. Controlled release preparations provide a steady delivery of analgesics. Well-known non-injection methods such as transdermal, pulmonary and intranasal application have been used. Topical analgesics and local anesthetics are also available. Devices such as implanted pumps are used for delivery of drugs such as opioids intrathecally (introduction into spinal subarachnoid space by lumbar puncture) in patients with cancer pain.

The wide variety of drugs in development includes opioid receptor ligands, bradykinin antagonists, mPGES-1 inhibitors, glutamate receptor antagonists, substance P and neurokinin receptor antagonists, norepinephrine transporter inhibitors, P2X2 neuron receptor antagonists and nitric oxide-based analgesics. A number of cannabinoids are also in development for pain. Fish-derived tetrodotoxin was initially focused on indication of opiate addiction withdrawal but is found to have an analgesic action as well. Cone shells contain therapeutically useful peptides including the conotoxins, and one such peptide, ziconotide, has been approved. Various cell and gene therapies are also being developed for the management of pain.

Advances in molecular and biological techniques are markedly advancing our understanding of pain. Understanding the pathophysiology of pain is an important factor in discovery of rational therapies for pain. Advances in pharmacogenomics and pharmacogenetics are enabling the development of personalized approaches to the management of pain.

Over 500 companies have been identified to be involved in developing or marketing pain therapeutics and 174 of these are profiled in the report along with 151 collaborations. These are a mix of pharmaceutical companies and biotechnology companies.

The worldwide analgesic markets were analyzed for the year 2015 and projected to 2025. Calculations are based on the epidemiology of various painful conditions and the development of analgesic drugs and devices. Unfulfilled needs for analgesics are identified and strategies are outlined to develop markets for analgesic drugs. The report is supplemented with 72 tables, 22 figures, and 600 selected references to the literature.

Additional Details

Publisher: Jain PharmaBiotech
Reference:

https://www.biopertfolio.co.uk/product/117633
dbt@biopertfolio.co.uk to order
Jain PharmaBiotech was formed by Prof. Dr. K.K.Jain in 1996 for basic as well as clinical research and to provide consulting services for the biopharmaceutical industries.
Table Of Contents for Pain Therapeutics - Drugs, Markets and Companies [Report Updated: 08-09-2017]

- Table of contents
  - Basic aspects of pain
  - Assessment of pain
  - Pharmacology of pain
  - Management of pain
  - Drug delivery for pain
  - Drug development for pain
  - Pain markets
  - Future of pain therapeutics
  - Companies involved in pain therapeutics

- 0. Executive Summary
- 1. Basic Aspects of Pain
- 2. Assessment of Pain and Analgesics
- 3. Selection of animal species as models for pain
- 4. Medical examination
- 5. Collection and analysis of data on pain patients
- 6. Evaluation of pain
- 7. Pain measurement tools
- 8. Early phase clinical trials of analgesics in humans
- 9. In vivo pain processing
- 10. Brain imaging in pain
- 11. Pain programs
- 12. Use of opioids for chronic non-cancer pain
- 13. Modulation of pain by pictures associated with social contacts
- 14. Management of pain in neonates and children
- 15. Quantitative sensory testing
- 16. Microneurographic recordings
- 17. Psychological assessment of pain
- 18. Future of pain therapeutics
- 19. Drug markets
- 20. Future of pain therapies
- 21. Future of pain therapeutics
- 22. Glossary of terms relevant to pain
- 23. Classification and description of neuropathic pain
- 24. Refractory neuropathic pain
- 25. Classification of neuropathic pain according to levels
- 26. Cancer pain
- 27. Bone pain in cancer
- 28. Complex regional pain syndrome
- 29. Mechanisms of pain
- 30. Pathways of nociceptors in pain transmission
- 31. Gate control and neuromatrix theories of pain
- 32. Pain mediators
- 33. Modulation of pain by emotions
- 34. Role of the sympathetic nervous system in pain
- 35. Visceral pain
- 36. Pathomechanism of visceral pain
- 37. Neuropeptide modulation for visceral pain
- 38. Drugs for chronic pain
- 40. Role of nociceptors in pain transmission
- 41. Acid-sensing ion channels
- 42. Calcium channels
- 43. Potassium ion channels
- 44. Genetic basis of neuropathic pain
- 45. Gene expression changes in neuropathic pain
- 46. Gial activation and neuropathic pain
- 47. Pain as a channelopathy
- 48. Acute versus chronic pain
- 49. Descending facilitatory modulation of pain
- 50. Development of chronic pain following severe accidental injury
- 51. Transcriptional repressor DREAM
- 52. Opioid receptors
- 53. AMPA receptors in chronic pain
- 54. Serotonin
- 55. Endocannabinoids
- 56. Prostaglandins
- 57. Cytokines as mediators of neuropathic pain
- 58. Nerve growth factor and pain
- 59. Biomarkers of visceral pain
- 60. Nociceptors in pain transmission
- 61. The sympathetic nervous system
- 62. The brain
- 63. Animal models of peripheral neuropathy
- 64. Acid-sensing ion channels
- 65. Calcium channels
- 66. Potassium ion channels
- 67. Genetic basis of neuropathic pain
- 68. Gene expression changes in neuropathic pain
- 69. Gial activation and neuropathic pain
- 70. Neuropeptide modulation for visceral pain
- 71. Assessment of pain in neonates and children
- 72. Quantitative sensory testing
- 73. Microneurographic recordings
- 74. Psychological assessment of pain
- 75. Future of pain therapeutics
- 76. Drug markets
- 77. Future of pain therapies
- 78. Future of pain therapeutics
Adverse effects of acetaminophen 316

Hyponatremia as an adverse effect of tramadol 316

Regulatory issues 317

Opioids 317

DEA and use of opioids for pain relief in terminal care 317

Cannabinoids 317

FDA and COX-2 inhibitors 317

Legal issues of COX-2 inhibitors 318

Regulatory aspects of opioid safety and abuse 318

Opioid misuse and regulatory agencies 319

Misuse of fentanyl 319

Regulation of extended release and long-acting opioids 320

Pain relief as a legal right 322

Pain and the WHO 322

Pain Markets 324

Introduction 324

Epidemiological basis of pain markets 324

Cancer 325

Neuropathic pain 325

Trigeminal neuralgia 325

Arthritis 325

Backache 325

Migraine 326

Multiple sclerosis 326

Irritable bowel syndrome 326

Chronic pelvic pain 326

Chronic pain due to traumatic brain injury 326

Postsurgical pain 326

Economics of pain 327

Pain as a driver of healthcare costs 327

Disability and financial loss through pain 328

Pain markets based on painful conditions 328

The cancer pain market 328

The arthritis pain market 329

Postsurgical pain market 329

The backache market 329

The headache market 330

Neuropathic pain market 330

Fibromyalgia market 331

Pain markets based on drugs 331

Opioids 331

Nonsteroidal antiinflammatory drugs 332

Transdermal pain therapeutics 332

Anesthesia 332

Antiepileptic drugs as analgesics 332

Other drugs 333

Hospital vs retail opioid market 333

Devices for pain 333

Pain markets according to geographical areas 333

Cost effectiveness of various approaches 334

Unfulfilled R&D needs in pain therapy 335

Pain markets based on painful conditions 335

Unfulfilled needs in drug development for chronic pain 336

Strategies for developing pain markets 336

Finding alternatives to intrathecal administration for chronic pain 336

Development of other applications of analgesic drugs 336

Partnership of patients, pharmacists and companies 337

Factors that may influence future pain markets 337

Drivers of pain markets 337

Public surveys as indicators of impact of pain on people 338

Effect of regulatory reviews on markets for pain products 338

Novel versus older therapies for pain 339

Future of Pain Therapeutics 340

Introduction 340

Advances in the understanding of pain 340

Pathogenesis of chronic pain 340

Role of glia in neuropathic pain 340

Molecular and neurobiological techniques 341

Improved understanding of cancer pain 342

Advances in drug discovery and development for pain 342

Novel targets for drug discovery for pain 342

PTH2 receptor 342

Modulators of endogenous cannabinoids 343

Application of new technologies to pain therapeutics 344

Technologies for the manufacture of analgesics 345

Future trends and needs in pain management 345

Pain management in future healthcare systems 346

Systems biology approach to pain 346

Personalized management of pain 347

Genetic factors in response to pain 348

Genetic mutations with loss of pain 348

Genetic mutations and painful conditions 349

Mechanism-specific management of pain 349

Pharmacogenomics and pharmacogenetics of pain 349

Personalized management of pain with commonly used analgesics 350

Pharmacogenomics and pharmacogenetics of opioids 350

Pharmacogenomics of NSAIDs 351

Preoperative testing to tailor postoperative analgesic requirements 351

Role of conditioned pain modulation in personalized management of pain 352

Signature of pain on brain imaging 352

Strategies for improving pain management 352

Research on pain in Europe 353

Companies Involved in Pain Therapeutics 356

Introduction 356

Profiles of companies 356

Collaborations 537

References 542
List Of Tables in Pain Therapeutics - Drugs, Markets and Companies [Report Updated: 08-09-2017]

Table 1-1: Landmarks in the history of pain therapeutics .... 21
Table 1-2: Classification of pain........ 23
Table 1-3: Classification of neuropathic pain ...... 25
Table 1-4: Classification of chronic cancer pain according to cause...... 27
Table 1-5: Percentage of patients with pain according to the type of cancer ........ 28
Table 1-6: Key molecular elements of pain in the peripheral nervous system ...... 51
Table 1-7: Key molecular elements of pain in the central nervous system .......... 52
Table 2-1: IASP guidelines for the use of animals in pain studies .......... 65
Table 2-2: Chronic pain as a manifestation of other diseases............. 66
Table 2-3: Recommendations for assessing patient satisfaction with pain management ....... 72
Table 3-1: Classification of some currently used pain medications according to mechanism.. 78
Table 3-2: Drugs used for the treatment of pain . 78
Table 3-3: Selective COX-2 inhibitors in clinical use for pain 80
Table 3-4: Antiepileptic drugs with analgesic effect ............ 95
Table 4-1: Non-pharmacological approaches to management of pain. 107
Table 4-2: Companies involved in neuromodulation therapy for pain . 113
Table 4-3: Reasons for the inadequate management of acute pain.... 117
Table 4-4: Causes of chronic backache ............ 134
Table 4-5: Management of chronic pelvic pain .. 137
Table 4-6: Management of pain in cancer ....... 138
Table 4-7: Definitions of tolerance, physiological dependence, withdrawal and addiction .... 144
Table 4-8: A simplified classification of headache ............ 144
Table 4-9: Various methods for the management of migraine............ 148
Table 4-10: Management of neuropathic pain based on mechanism and diagnosis ........ 156
Table 4-11: Management of central neuropathic pain ........ 159
Table 4-12: Current management of peripheral diabetic neuropathy . 163
Table 4-13: Treatment strategies for postherpetic neuralgia............. 164
Table 4-14: Management of complex regional pain syndrome........ 167
Table 4-15: Methods of treating phantom limb pain .......... 169
Table 4-16: Treatment of chronic unexplained pain due to central sensitization . 175
Table 4-17: Anti-itching therapies.... 176
Table 4-18: Suggested improvements in the management of pain .... 189
Table 5-1: A classification of drug delivery methods used in management of pain ............. 192
Table 5-2: Selected marketed non-injection drug delivery systems for pain....... 197
Table 5-3: Approved drugs for spinal administration for pain .......... 215
Table 5-4: Off-label intrathecal use of drugs for for pain ... 216
Table 5-5: Experimental studies of intrathecal administration of drugs for analgesia .... 216
Table 5-6: Intrathecal drugs for pain in clinical trials ....... 216
Table 5-7: Comparison of pharmacokinetics of lipophilic with hydrophilic opioids ............ 218
Table 5-8: Delivery systems for pain (other than intrathecal) in clinical development ....... 224
Table 6-1: Classification of drugs in development for pain. 226
Table 6-2: Preclinical studies on cannabinoid (CB2) receptor agonists as analgesics ........ 231
Table 6-3: Cannabinoid receptor agonists in clinical development as analgesics . 232
Table 6-4: NO-related therapies for pain.......... 250
Table 6-5: Major opioids receptors and their ligands......... 253
Table 6-6: Strategies to counteract pain at various levels at periphery and in the CNS ..... 259
Table 6-7: Types of TRPV1 antagonists............. 261
Table 6-8: TRPV1 antagonists in clinical trials ... 261
Table 6-9: Biological therapies for pain.......... 263
Table 6-10: Experimental gene therapy approaches for relief of pain. 269
Table 6-11: Selected preclinical approaches to pain therapy............... 278
Table 6-12: Selected preclinical drugs for neuropathic pain .............. 279
Table 6-13: Selected clinical trials of miscellaneous drugs for pain .... 285
Table 6-14: Selected clinical trials of drugs for postsurgical pain ...... 289
Table 6-15: COX-2 inhibitors in clinical development ........ 291
Table 6-16: Disease modifying drugs for arthritis in clinical trials ...... 291
Table 6-17: Clinical trials of drugs for neuropathic pain .... 292
Table 6-18: Selected drugs in clinical development for migraine ...... 302
Table 6-19: Therapeutic targets for treating visceral pain . 306
Table 7-1: Companies with products to deter abuse of opioids........ 311
Table 7-2: Diagnostic criteria for an opioid-use disorder ... 313
Table 8-1: Market values for various painful conditions 2015-2025 ... 328
Table 8-2: Changes in market shares of drugs for neuropathic pain 2015-2025 . 330
Table 8-3: Markets for pain according to therapies 2015-2025 .......... 331
Table 8-4: Distribution of value of pain therapeutics in major markets 2015-2025 .......... 334
Table 8-5: Distribution of value of opioids in major pain markets 2015-2025.... 334
Table 8-6: Distribution of value of NSAIDs in major pain markets 2015-2025.... 334
Table 8-7: Strategies for developing pain markets .......... 336
Table 9-1: P450 isoforms in the metabolism of drugs used in the management of pain...... 350
Table 10-1: Top companies in pain therapeutics .............. 356
Table 10-2: Product pipeline of Adolor Corporation......... 363
Table 10-3: Selected collaborations in the area of pain management. 537
List Of Figures, Charts and Diagrams in Pain Therapeutics - Drugs, Markets and Companies [Report Updated: 08-09-2017]

Figure 1-1: Afferent pain pathways .... 30
Figure 1-2: Evolution of the gate control theory.. 32
Figure 1-3: The body self-neurometric 32
Figure 1-4: Various ligands and receptors on the peripheral terminals of nociceptive nerve fibers ........ 51
Figure 1-5: Prostaglandin biosynthesis pathway.. 55
Figure 2-1: Biopsychosocial factors that interact and modulate the experience of pain........ 67
Figure 2-2: Pain intensity scales .......... 68
Figure 3-1: Pathway of metabolism of codein ..... 87
Figure 4-1: The WHO step ladder for pain ........ 140
Figure 4-2: An algorithm for the acute management of migraine ...... 149
Figure 4-3: Neuroimmune activation events leading to sensitization of CNS ...... 155
Figure 4-4: An algorithm for the management of peripheral neuropathic pain.... 168
Figure 4-5: Algorithm for management of patients with chronic pain and depression .......... 173
Figure 5-1: Powder Injection Systems ............ 204
Figure 5-2: Penetration of CSF into spinal cord . 213
Figure 5-3: Disposition of opioids after intrathecal administration ..... 214
Figure 6-1: Attributes of the ideal analgesic ..... 227
Figure 6-2: Nerve targeting drug delivery system for gene therapy of pain ...... 275
Figure 8-1: Unfulfilled needs in the treatment for chronic pain.......... 335
Figure 9-1: Impact of new technologies on pain therapeutics .......... 344
Figure 9-2: Essential components of personalized management of pain .......... 347
Figure 9-3: Genetic and non-genetic factors affecting efficacy and side effects of opioids ... 350
# How to Buy...

Pain Therapeutics - Drugs, Markets and Companies [Report Updated: 08-09-2017]

## Option 1 - Online

Go to our website and pay online with any major debit or credit card:

https://www.bioportfolio.co.uk/product/117633

## Option 2 - Request a Proforma Invoice

Fill in the details below, and either Scan this page and email it to us at pdb@bioportfolio.co.uk or Fax it to us at +44 (0)1305 791844. We will send you a Proforma Invoice and deliver your report on settlement.

- **Your Name:**
- **Job Title:**
- **Your Email:**
- **Your Contact Phone:**
- **Company Name:**
- **Address:**
- **Post/Zip Code:**
- **Country:**
- **P.O. Number:**
- **Any Other Instructions:**

**Price:**
- $3400

**Payment Options:** (please tick one)
- **Online Credit Card** (we will email you the invoice with a payment link)
- **Direct Wire Transfer** (we will email you the invoice with our bank details)

**Authorising Signature:**

## Option 3 - Phone Us on +44 (0)7887 945155

We will be delighted to give you our personal attention.