Peabody Pharmaceuticals Inc.

PDB-2021

Seeks to license a patented, long-acting drug that:

- provides non-addictive, tamper proof, and opiate-strength relief from acute pain for up to 72 hours
- enhances provider control and minimizes liability by eliminating pills
- reduces overall medication costs to distributors, providers, insurers, and patients

Peabody
Pharmaceuticals

Executive Summary

- Peabody is a Hopkins-based, clinical stage, licensor of a sustained-release buprenorphine product that offers safer delivery to patients and enhanced control to clinicians

- Peabody's forerunning product, Ethiqa XR®, is an FDA-approved, long-acting buprenorphine injectable suspension that has controlled post-procedural pain for up to 72 hours in animals, including non-human primates, since 2014

- Peabody seeks a licensee to translate Ethiqa XR® to treat human pain with a much lower risk of abuse than other opioids

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The Problem:

Treatment of Acute Pain

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Prevalence of Acute Pain

An estimated 80 million Americans[1] suffer annually from acute pain lasting less than one week and the estimated annual economic burden for patients is $373 billion[2]

Cause of Acute Pain

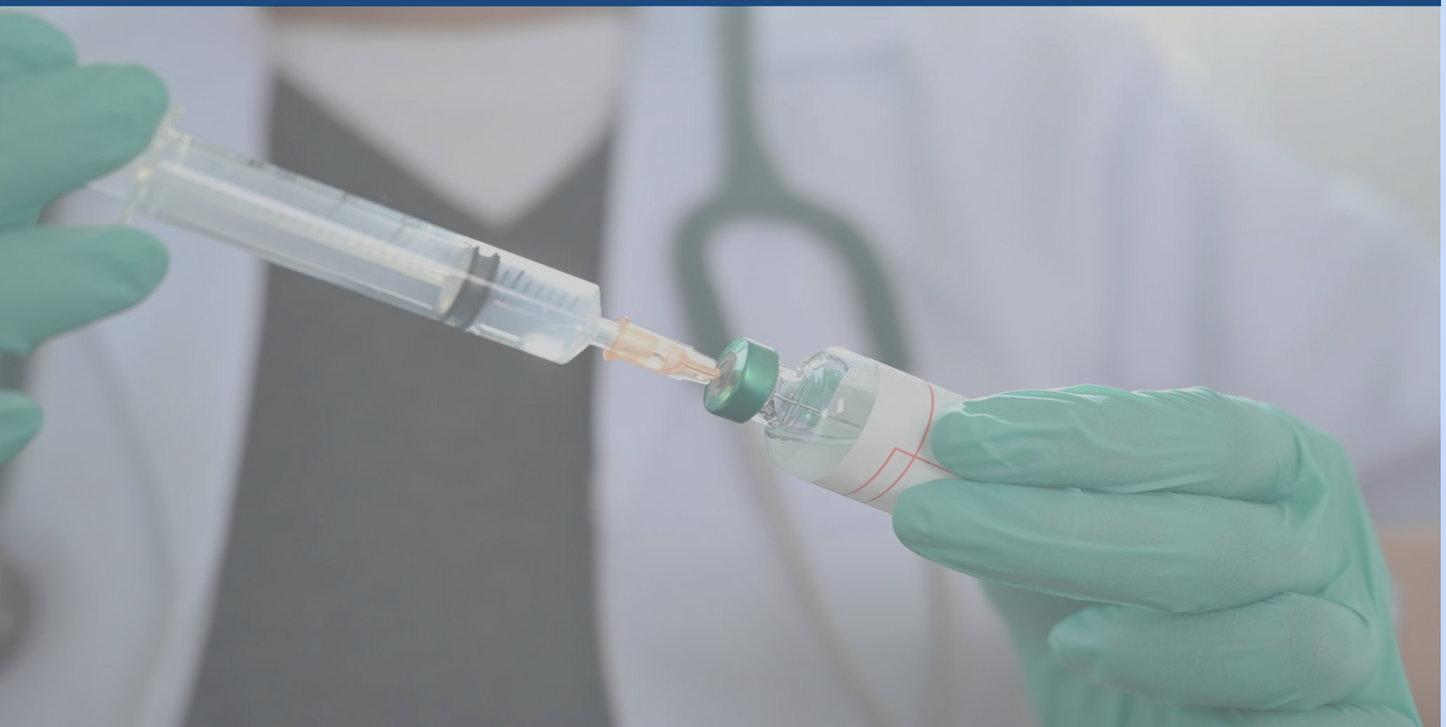
Acute pain arises from outpatient surgeries, dental procedures, bone fractures, sprains, trauma, and battlefield injuries

Unmet Need For a Non-Addictive, Non-Divertible, and Effective Opiate

Opiates remain the frontline treatment for acute pain, BUT they are diverted and abused with unintended consequences. The CDC estimates that prescription opiate overdoses caused about 11,000 deaths in the United States in 2024[3] and 806,000 deaths between 1999-2023[4]

Our Solution (PBD-2021):

Patented Therapeutic Use & Delivery System



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Established Analgesic

Translate a FDA approved and effective veterinary opioid analgesic, Ethiqa XR®, to treat human pain with a much lower risk of abuse than other opioids

Delivery Method

Combine the non-addictive opioid, buprenorphine, with a lipid carrier system to produce a physician-controlled injectable, which eliminates pills and limits the potential for abuse

Strength, Safety, and Diversion Prevention

Buprenorphine is 50x stronger[5] than morphine **AND has a 50-year human safety record.** The lipid carrier system protects the opioid from diversion

Proof of Concept and Data Snapshots

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Pharmacokinetics

Pharmacokinetics data (PK) has confirmed a three-day therapeutic blood concentration in every species tested[6]

- Kappa (and delta) antagonist: “ceiling effect” that greatly increases safety owing to partial antagonism, which allows analgesia peaks and decreases adverse respiratory effects
- Mu selective agonist: less euphoric than other opiates owing to unique agonism, which minimizes abuse potential

Patent Protection

Current patent - 13+ years of protection for drug development, distribution, and profits

Safety Data

50-year safety record of using buprenorphine as a human analgesic

Continued Research

More than 6,000 publications about buprenorphine’s safety since 2015

Patient Acceptance

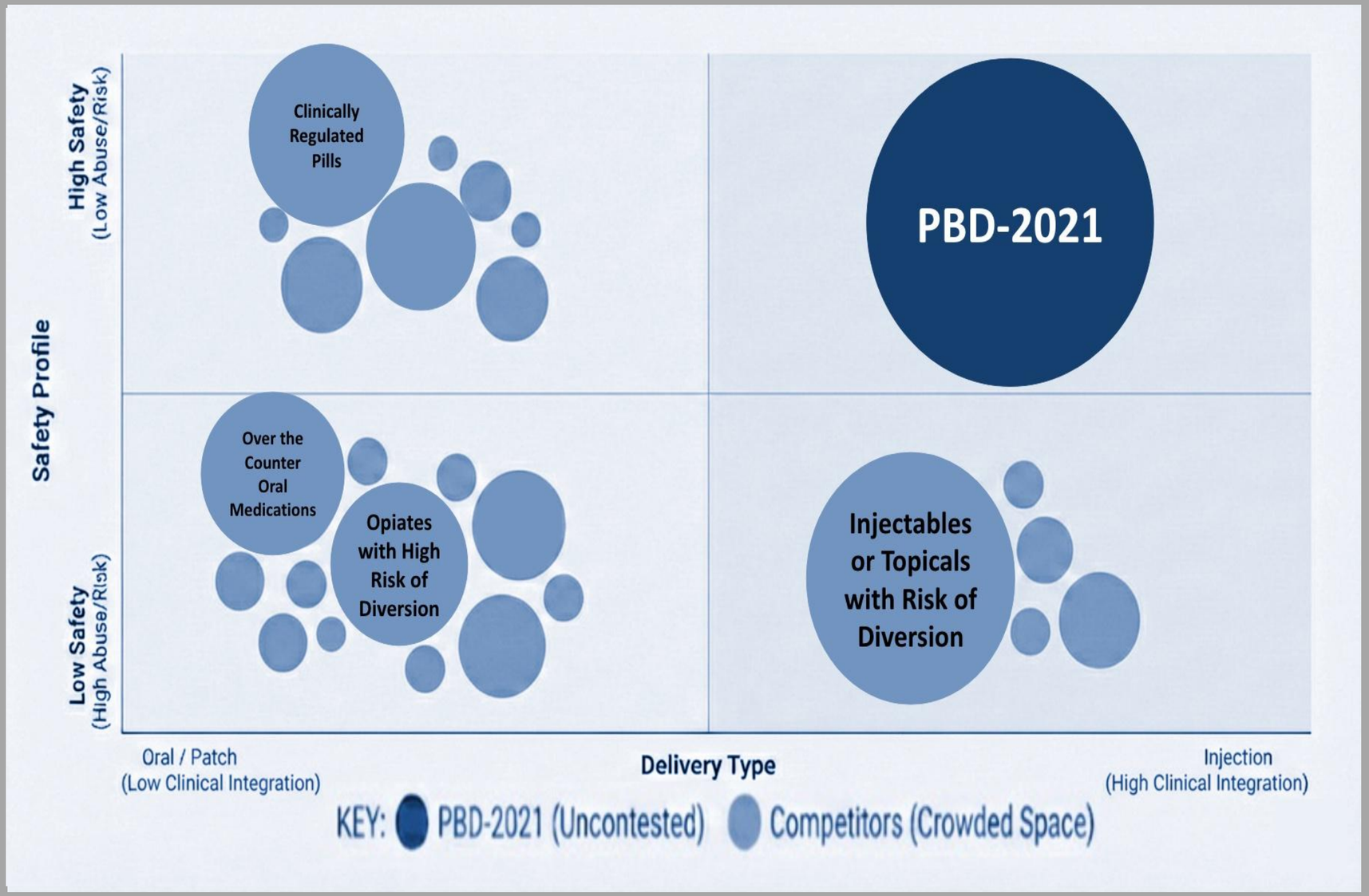
Explosive growth of GLP-1 injection treatments

Competition

(additional discussion on Slide 17)

- **Opiates** and their abuse
- **Non-opioid pain drugs** carry higher risks from potential side effects, including stomach bleeding, kidney failure, and heart problems, and often require opiate rescue for pain therapy
  - **Nonsteroidal Anti-Inflammatory Drugs ("NSAIDs")**, such as ibuprofen (Advil and Motrin), naproxen (Aleve), and diclofenac (Voltaren gel)
  - **Super-NSAIDs**, such as celecoxib (Celebrex), diclofenac (oral Voltaren), and meloxicam (Mobic)
- **Sodium channel inhibitors**, including NaV 1.8 inhibitors, such as Journavx (suzetrigine), provide less pain relief than opioids and users frequently need opiate rescue for pain therapy
- **Local anesthetics**, such as lidocaine and bupivacaine, stop pain signals in nerve cells, but do not provide relief to the central nervous system. **Extended-release local anesthetics**, such as bupivacaine liposome (Exparel) that uses an injection in a surgical site to induce analgesia by anesthesia, also often require opiate rescue for pain therapy
- **Other extended-release buprenorphine suspensions**, such as Brixadi and Sublocade, currently used to treat opioid use disorder ("OUD"), that potentially could be reengineered

Uncontested Space



The “Anti-Addictive” Safety

Standard opioids carry the risk of respiratory depression. The documented safety data suggests an order of magnitude higher safety profile by not affecting the brain stem's breathing centers, which is a top concern for post-op recovery in elderly or obese patients

The "Anti-Diversion" Breakthrough

The product is a complex lipid-extraction challenge injected in a clinic. A potential user cannot "extract" the buprenorphine to get high or sell it on the secondary market (recently backed by a 2024 patent)

The Delivery

While competitors use complex delivery systems, the novel "Butter" delivery system (cholesterol / triglycerides) is biologically inert and avoids the dermal lesions (skin problems) that plague patients using competing long-acting injections

Regulatory Burden (Sch 3 vs Sch 2)

Being a Schedule 3 drug (unlike morphine/OxyContin) means no specialized safes, simplified bookkeeping, and lower regulatory overhead

Comparison Grid

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PBD-2021 Strengths:

Physiologic Safety: Unlike standard opioids, PBD-2021 does not affect the brain stem's breathing centers, significantly reducing overdose risk

Clinician Control: Removing the patient from the supply chain by eliminating "take-home" pills, which are the primary source of diversion

Regulatory Speed: Being Schedule III means hospitals do not need specialized safes or complex bookkeeping, making it cheaper to manage than Schedule II opioids

Competitor Weaknesses:

The "Opiate Rescue" Gap: Competitors like Vertex (Suzetrigine) and Pacira (Exparel) are non-opioids, but patients using them frequently require "rescue" opioids for ongoing and breakthrough pain

Delivery Issues: Long-acting injections from competitors use polymer-bound platforms that can cause dermal lesions, whereas the Peabody lipid system is biologically inert

	High Potency (Opiate Strength)	No Respiratory Depression	Clinician Control (No Pills)	Low Reg Burden (Schedule III or Otherwise)	72hr+ Duration	Absence of Dermal Lesions
Peabody (PBD-2021)	✓	✓	✓	✓	✓	✓
Morphine (Standard of Care)	✓					✓
Ibuprofen (Advil)		✓		✓		✓
Suzetrigine (Journavx)		✓		✓		✓
Exparel (Pacira)		✓	✓	✓	✓	✓
Sublocade/Brixadi	✓	✓	✓	✓	✓	

Marketing Sizing Terms

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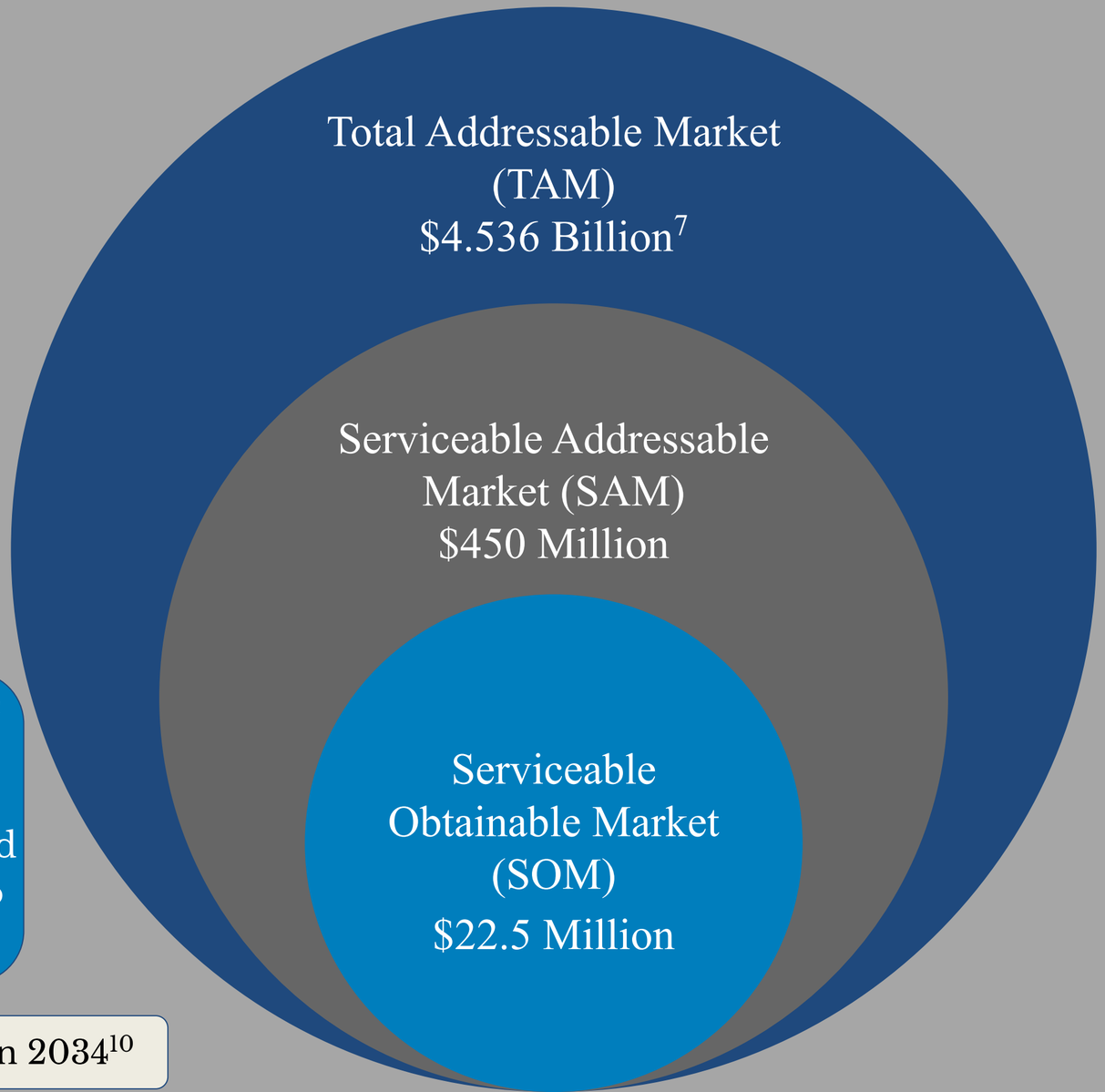
Total Acute Pain Market in the US, UK, France, Germany, Italy, Spain, and Japan in 2025

Post Operative Pain Relief Following ~50 Million Surgeries[8] in the US during 2023 with ~30% of Surgeries are Soft Tissue[9] and $50 revenue per treated surgery and 60% allocation to Peabody

~50 million total U.S. surgeries annually and ~30% are soft tissue surgery types relevant for pain management context and ~50% currently get opioids. Sizing includes a realistic capture in first year (10%) and $50 revenue per treated surgery and 60% allocation to Peabody



DelveInsight projects a $13.579 billion market in those seven countries in 2034[10]

Unit Economics

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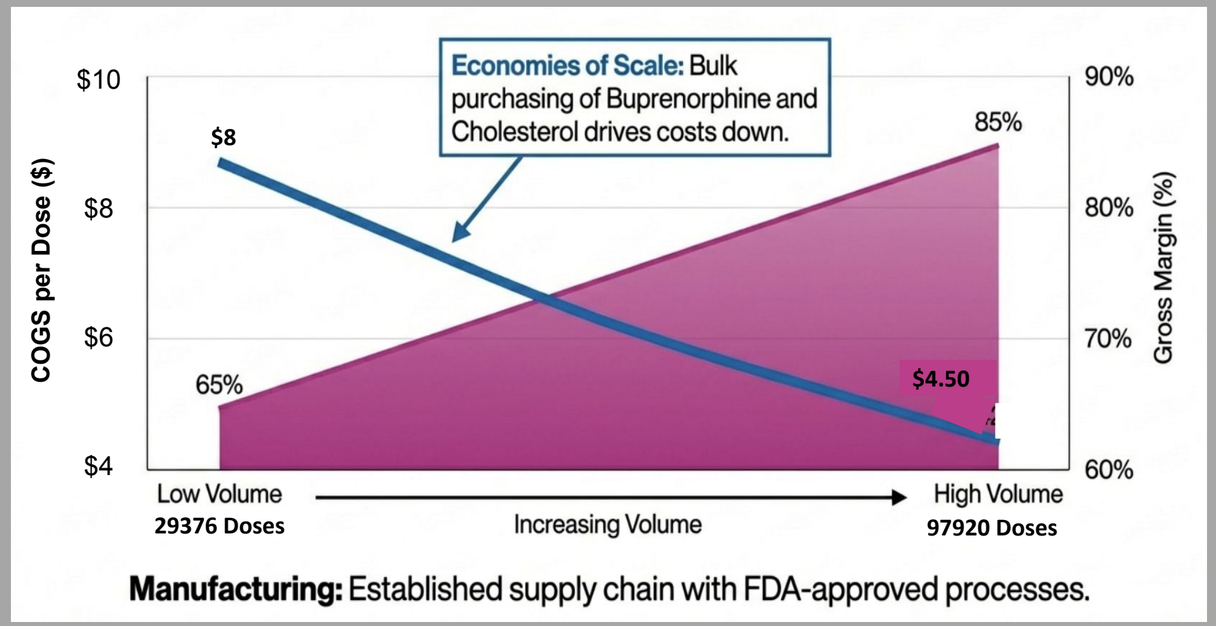
Target Gross Margin: As manufacturing scales and the supply chain (which is already FDA-approved for veterinary use) is optimized, margins are expected to reach 85% or higher

Operational Savings: Reduced regulatory requirements mean no specialized safes, simplified bookkeeping, and lower liability insurance costs for providers



$50 per Dose

Replaces:

- 3 days of pill management
- Nursing administration time
- Diversion liability risk

Licensor / Licensee Agreement

A 60/40 split with net of $30 to licensee/producer and $20 to distributors and providers

Manufacturing Costs

- Low-Volume (6 kilos): Initial production costs are estimated at $8 per dose
- Mid-Volume (10 kilos): Costs drop to $6.60 per dose
- High-Volume (20 kilos): At scale, the cost further decreases to $5.30 per dose

Traction & Milestones

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2014
Ethiqa XR has controlled post-procedural pain for up to 72 hours in animals, including non-human primates, in the US and EU[11]

2015-Current
Additional Safety Publications (6,000+)

IND Application
Application Filed
(ID: 142193)

Patent Protection
United States Patents (2020), (2021) & (2024) with patent protection at least through **2040**

2026
Projected IND Approval

2026-2027
Phase 1 and 2 Clinical Trials

2028
Phase 3 Clinical Trials

2029
FDA Approval and Launch

Financial Projections

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R&D / Clinical Trials Phase (2026–2028)

2026

IND Approval and Phase 1/2 Trials:
Assessment of human safety and pharmacokinetics.

2028

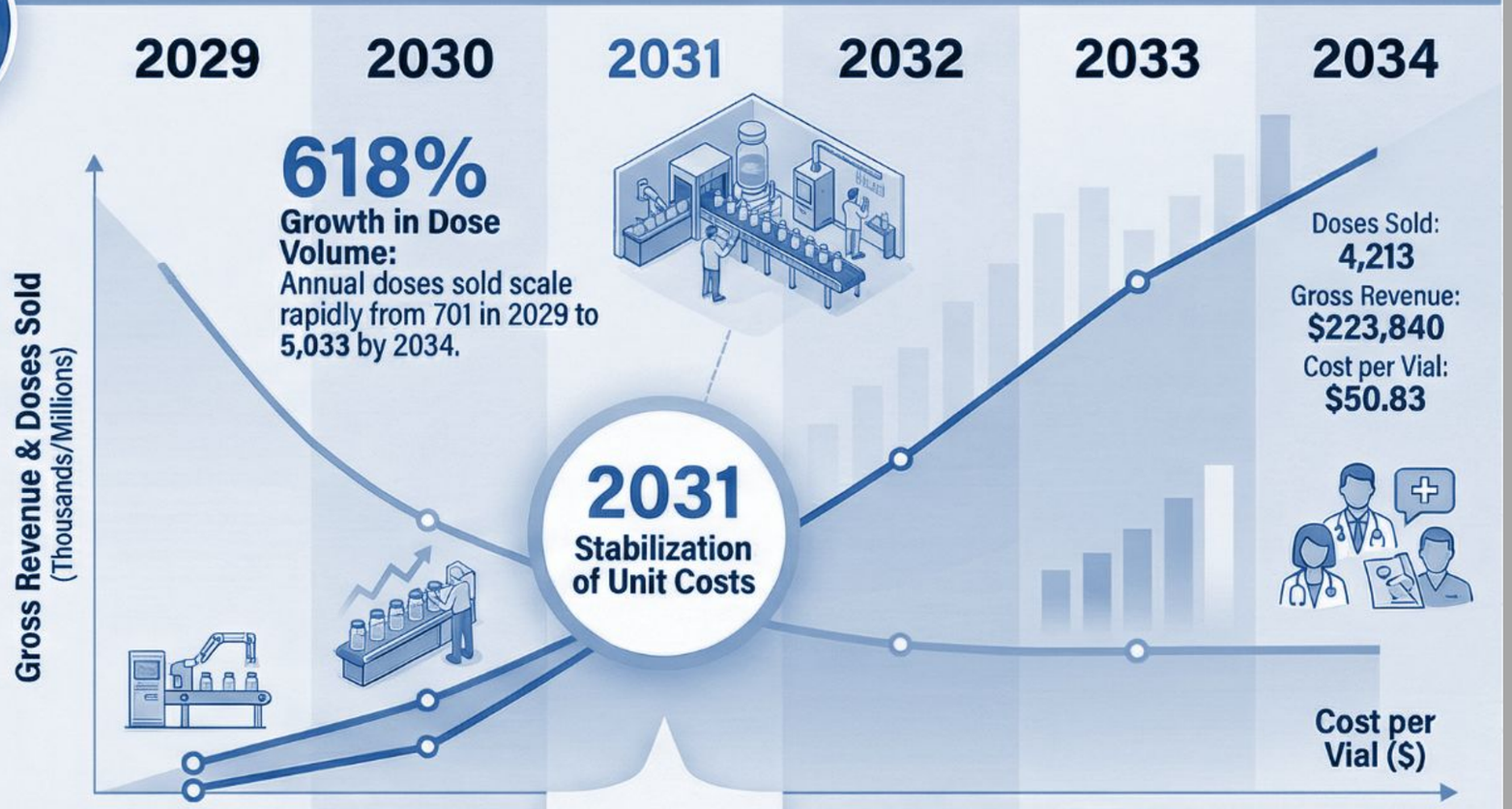
Phase 3 Clinical Trials:
Final stage testing begins; U.S. Department of War expresses funding interest for battlefield pain management.

High-Investment Stage
Requires approximately $13M+ for initial trial tranches and drug manufacturing stability testing.

APPROVED

2029: FDA Approval & Market Launch

Commercial & Scaling Phase



2029
Doses Sold: 701
Gross Revenue: $37,247
Cost per Dose: $9.50

2030
Doses Sold: 2,026
Gross Revenue: $60,061
Cost per Dose: $8.06

2031
Gross Revenue: $107,609
Cost per Dose stabilizes at $6.37 due to economies of scale

2032
Doses Sold: 4,213
Gross Revenue: $223,840
Cost per Dose: $6.37

85% Gross Profit Margin:
High-margin commercial phase allows gross margins to climb from 65% + at launch to 85%

Financing

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IND Funding Needs

- Need to raise the estimated $2-3 million cost to obtain IND approval
  - $800K drug manufacturing (stability testing)
  - $300K additional testing
  - $400-500K animal studies

Obtain Funding for Phase 1 & 2 Clinical Trials

- Phase 1 & 2 costs: $10M total

Negotiate with FDA to Determine Estimated Costs for Phase 3 Trials

- United States Department of Defense has expressed an interest in funding
- Cost per patient in trials: $20-30K

Social Impact

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- The DEA has asked: if the pharmaceutical industry can make a safe, effective, and non-divertible opiate for animals, why not for humans?
- Address acute pain that plagues tens of millions of Americans annually
- Minimize, if not eliminate, abuse, addictions, overdoses, and deaths arising from prescription drugs
- "**One [shot] and done**" as a wonderful complement to the DEA's "One pill can kill" initiative to eliminate opioid pills, which reduces potential liability for clinicians and vendors

Leadership Team and Advisors

- Business Development Team
  - Timothy J. Turner, President, CEO of Bocana Resources Corp. and Bocana Investments, SA
  - Bridget Wood-Turner, Director, retired Dow Chemical manufacturing engineer and current Board Vice President, United Way Galveston County Mainland
  - Dave Allen, CPA, Founder & CEO, Animalgesics
  - Matthew J. Barrett, Consultant, JD, CPA (inactive), Professor Emeritus, Notre Dame Law School
- Technology Development Team
  - Michael Guarnieri, Founder, PhD, MPH, Emeritus Faculty, Johns Hopkins School of Medicine
  - Barry Levinson, PhD, Founder & COO, Fidelis Animal Health
  - Mellar P. Davis, MD
  - Gerard Limerick, MD, PhD
- Scientific Advisory Board
  - Mohamed Al-Ibrahim, MD
  - Mellar P. Davis, MD
  - Kelly Dunn, PhD
  - Barry Levinson, PhD
  - Gerard Limerick, MD, PhD
  - David Saunders, MD

Footnotes

[1] Vertex Pharmaceuticals, The state of pain in America (Mar. 12, 2025), https://www.vrtx.com/stories/state-pain-america/.

[2] International Society for Pharmacoeconomics and Outcomes Research, Inc., Economic Burden of Managing Acute and Chronic Pain in the United States: National Estimates from 2022 Data, https://www.ispor.org/heor-resources/presentations-database/presentation/intl2024-3898/136819.

[3] M. Garnett & A. Miniño, Drug Overdose Deaths in the United States, 2023-2024 (Jan. 29, 2026), https://www.cdc.gov/nchs/data/databriefs/db549.pdf.

[4] U.S. Centers for Disease Control and Prevention, Understanding the Opioid Overdose Epidemic (June 9, 2025, https://www.cdc.gov/overdose-prevention/about/understanding-the-opioid-overdose-epidemic.html.

[5] R. Wolff, et al., Systematic review of efficacy and safety of buprenorphine versus fentanyl or morphine in patients with chronic moderate to severe pain (2012), https://www.ncbi.nlm.nih.gov/books/NBK99111/.

[6] B. Tyler 7 M. Guarnieri, Long-Acting Opioid Analgesics for Acute Pain: Pharmacokinetic Evidence Reviewed, Vet. Sci. 2023, 10(6), 372, *available at* https://www.mdpi.com/2306-7381/10/6/372.

[7] DelveInsight Business Research LLP, Moderate to Severe Acute Pain Market Summary (2025), https://www.delveinsight.com/report-store/moderate-to-severe-acute-pain-market.

[8] U.S. Centers for Disease Control and Prevention, National Center for Health Statistics, Inpatient Surgery, https://www.cdc.gov/nchs/fastats/inpatient-surgery.htm.

[9] Life Science Intelligence, Inc., U.S. Surgical Procedure Volumes: New Technologies & Aging Demographics Having Impact (Oct. 23, 2019), https://www.lifesciencemarketresearch.com/insights/u.s.-procedure-volume-trends-driven-by-new-technologies-demographics.

[10] See DelveInsight, *supra* note 7.

[11] Fidelis Animal Health, Ethiqa XR. The Only FDA-Indexed, Extended-Release Buprenorphine Indicated for Control of Post-Procedure Pain in Captive Rodents, Ferrets, Laboratory Rabbits, and Non-Human Primates, https://ethiqaxr.com/.

Competitor Analysis

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Company / Product	Status	Mechanism	Duration	Delivery	Schedule	Cost per Dose (Est.)	Key Weakness / Threat
Buprenorphine (PBD-21)	IND Filed	MOR Partial Agonist + Lipid Delivery	3-7 Days	SC Injection	III	~$15.00	Regulatory speed (awaiting canine/rodent data).
Suzetrigine (Journavx)	FDA Approved	NaV1.8 Sodium Channel Inhibitor	12 Hours	Oral (Pill)	RX	~$15.50	Oral dosing (patient compliance); lower efficacy in bone pain.
Morphine	Standard of Care	MOR Full Agonist	4-6 Hours	IV/IM/Oral	II	$1.00 - $2.00	High addiction/diversion; respiratory depression; high regulation.
Buprenorphine ER (Sublocade)	FDA Approved (OUD only)	Buprenorphine (ER)	30 Days	SC Injection	IIII	$1,800+ (per mo)	FDA blocks for pain; 30-day duration too long for acute pain.
Buprenorphine ER (Brixadi)	FDA Approved (OUD only)	Buprenorphine (ER)	7-30 Days	SC Injection	III	$500 - $1,000	Limited by "FluidCrystal" tech issues/FDA pain blockade.
Ibuprofen (Advil)	Standard of Care	NSAID / Non-opioid	4-8 Hours	Oral	OTC	<$0.10	Low efficacy for moderate-to-severe acute pain.
Butrans (BDSI)	FDA Approved	MOR Partial Agonist	7 Days	Transdermal Patch	III	$15.00 – $225.00 (per weekly patch)	Application site reactions; delayed onset.
Belbuca (BDSI)	FDA Approved	MOR Partial Agonist	12 Hours	Buccal Film	III	$7.00 – $20.00 (per buccal film)	Limited to opioid-experienced patients; oral irritation.
Buprenex (Indivior)	FDA Approved	MOR Partial Agonist	6 Hours	Injectable (IM/IV)	III	$10.00 – $75.00 (per vial/syringe)	Inpatient only; high potential for abuse if diverted.
Exparel (Pacira)	FDA Approved	Amide local anesthetic	3–4 days	Local Injection or Nerve Block	RX	$185.00 – $350.00	High cost compared to generic bupivacaine; limited to single-dose administration; legal/clinical disputes regarding its superiority over standard anesthetics.
Oxycodone (OxyContin)	Standard of Care	MOR Full Agonist	12 Hours (ER)	Oral (Pill)	II	$1.25 – $14.00	Extremely high addiction potential; high street value.
Fentanyl (Duragesic)	Standard of Care	MOR Full Agonist	72 Hours	Transdermal Patch	II	$7.00 – $30.00 (per 72-hour patch)	High potency (80-100x morphine); fatal overdose risk.
Hydromorphone (Dilaudid)	Standard of Care	MOR Full Agonist	4-6 Hours	Oral/IV	II	$0.20 – $1.00 (generic)	High abuse liability; significant sedation.
Hydrocodone/APAP (Vicodin/Norco)	Standard of Care	MOR Full Agonist + NSAID	4-6 Hours	Oral (Pill)	II	$0.50 – $1.00	Acetaminophen toxicity risk; very widely abused.
Tramadol (Ultram)	Standard of Care	Weak MOR + SNRI	6 Hours	Oral (Pill)	IV	$0.10 – $0.80	Seizure risk; lower efficacy for severe pain.
Naproxen (Aleve)	Standard of Care	NSAID (COX-1/2)	12 Hours	Oral (Pill)	OTC	$0.10 – $0.35 (OTC)	Gastrointestinal (GI) bleeding; renal toxicity.
Acetaminophen (Tylenol)	Standard of Care	Non-salicylate / CNS	4-6 Hours	Oral/IV/Rectal	OTC	$0.03 – $0.50 (OTC)	Hepatotoxicity (liver damage) at high doses.
Pregabalin (Lyrica)	Standard of Care	Alpha-2-delta ligand	8-12 Hours	Oral (Pill)	V	$0.20 – $12.00	Dizziness/weight gain; risk of misuse/withdrawal.
Gabapentin (Neurontin)	Standard of Care	Alpha-2-delta ligand	6-8 Hours	Oral (Pill)	RX	$0.15 – $0.50	Significant sedation ("brain fog"); variable absorption.
Duloxetine (Cymbalta)	Standard of Care	SNRI	24 Hours	Oral (Pill)	RX	$0.20 – $1.50	Long onset (weeks); nausea; withdrawal syndrome.
Lidocaine Patch	Standard of Care	Sodium Channel Blocker	12 Hours	Topical Patch	RX/OTC	$6.00 – $27.00 (per patch)	Localized pain only; poor adherence.

Thank You!

You can get more information and connect with us at
peabodypharmaceuticals.com

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