

New first-in-class sensory neuron specific pain drug treats pain without risk of addiction



neurocarrus.com Monterey, CA  

Technology Healthcare

Highlights

- 1 Drug candidate N-001 provides relief from severe pain in animals caused by inflammation or surgery.
- 2 N-001 cannot enter the brain and therefore cannot cause addiction.
- 3 N-001 provides pain relief equal to prescription drugs without side effects on muscles or balance.
- 4 N-001 is a targeted drug with a unique manufacturing process to discourage competitors.
- 5 There is a massive market for the treatment of severe pain both in the U.S. and abroad.
- 6 Neurocarrus has a strong track record of non-dilutive funding from federal and state government.
- 7 Founder has been working in the space for 25+ years trouble shooting commercial biologicals.
- 8 Patents issued on exclusively licensed technology in both the U.S. and select countries.

Featured Investor



Kurt Stahlfeld
Syndicate Lead

Follow

Invested \$17,000 ⓘ

"I believe that Neurocarrus has the potential to revolutionize pain management. Paul and his team have created an incredibly clever drug that produces long lasting pain relief with no side effects or possibility of addiction. Neurocarrus's N-001 has the potential to become the new standard of care for pain management, improving patient outcomes while eliminating the risk of opioid addiction. With backing from the National Institutes of Health, Neurocarrus is

well on their way to changing the world of pain management and capturing a large portion of a market that approaches \$80B/year.”

Our Team



Paul Blum Co-founder/CEO

25+ years in cell engineering and microbiology, focused on protein drug development. Paul was a professor at U. Nebraska (33 years) and U. California (6 years). After retiring from academics he currently runs Neurocarrus full time.



Derek Allen Research Scientist

Ph.D. focused on protein drug development with emphasis on protein synthesis and purification. Also specialized in bioassays and potency studies.



Jianguo Cheng, MD, Ph.D Board Member

Professor and Director, Cleveland Clinic; Past President, American Academy of Pain Medicine. Highly active in research and pain medicine and strongly supported by NIH. Also an active editor in top pain journals.



Bruce McDonald, JD Board Member

Partner in the intellectual property group at Smith, Gambrell & Russell, LLP; member of the District of Columbia Bar. Specialized in trademark law and intellectual property litigation, particularly negotiation of licensing agreements.



Mark Blum, JD Board Member

Mark is an attorney licensed in California who practices law in California since 1986. For the past three years, he has continued his role as a shareholder, managing member and practicing attorney at Horan Lloyd.



Vicky Valverde-Salas, MD Board Member

Vicky attended MIT majoring in Mathematics, Physics and Biology. He earned an M.D. from the U. Madison Wisconsin Medical School and trained in Family Medicine at Case Western Reserve. For the past 20 years he ran his own medical Primary Care Clinic.

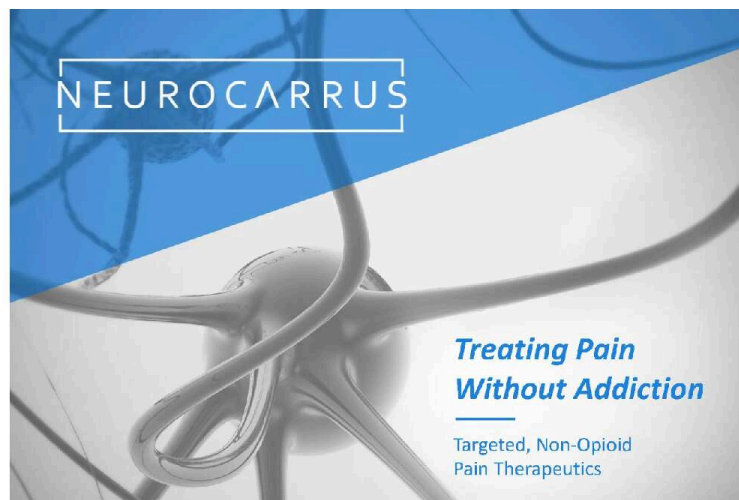
Publications:

Neurocarrus top scientific publications:

Animal efficacy and safety studies

Targeting, mechanism, and efficacy studies

Drug design and engineering studies



Welcome to Neurocarrus!

We are a drug development startup company making a new therapeutic to treat severe human pain without addiction.

Paul Blum our CEO, invented the drug while at the U Nebraska. After retiring from academia, he now works full time at Neurocarrus.

Together with chief scientist Derek Allen and other Neurocarrus staff, our team is highly motivated to bring our drug to market.

Help us fight the opioid epidemic and solve the human tragedy of widespread poorly managed severe pain.

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OPIOID CRISIS IN AMERICA
THE PRESIDENT HAS DECLARED A PUBLIC HEALTH EMERGENCY. NOW WHAT?

Opioid prescriptions in England nearly doubled in 10 years - report
The Guardian

CDC: Opioid overdoses kill almost 5 people every hour in the U.S.

Current drugs for severe pain are addictive and toxic resulting in hundreds of thousands of deaths per year

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Where are the pain drugs?

Why are there no alternative and safe pain drugs already developed?

The answer is that pain was never treated like a disease and remains broadly denied as a significant symptom. Throughout human history, curing pain never had significant investment or funding.

Another reason is that the opioid epidemic scared many pharmaceutical companies and that led to a decision to avoid searching for new pain drugs because of concerns of liability and public criticism.

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Neurocarrus has developed N-001 for treatment of severe pain without addiction or off-target effects

N-001 is a first-in-class long acting anesthetic-like drug. Its unusual duration could reduce or avoid opioid use.

Neurocarrus platform technology is under evaluation for:

- Delivery of other drugs for nerve regeneration
- Nerve fiber imaging as a surgical adjunct

Pain and how N-001 works:

Pain is caused by damage to neurons (called sensory neurons) that lie outside the central nervous system and brain. Therefore the Neurocarrus drug, N-001, was designed to target such neurons located only in the body's peripheral regions and then to calm their excessive activity. This strategy avoids addiction because it avoids the central nervous system.

To target sensory neurons and then treat pain, N-001 had to be multi-functional. N-001 is targeted to sensory neurons not motor neurons and therefore has no effect on muscles. It is only active once it goes inside sensory neurons. Together these two functions limit side effects and distinguishes N-001 from all other pain drugs. Once inside the sensory neuron, N-001 modifies the internal actin-based skeleton to reduce neural signaling.

The Neurocarrus drug acts like a dimmer switch on neurons without blocking sensation. Importantly N-001 is reversible.

Alternatives and Competitors

N-001 is first-in-class

	N-001	Opioids (OxyContin)	Over-the-counter (Tylenol, Ibuprofen)	Anesthesia (Amytal)	Long Lasting Anesthesia (Exparel)
Severe Pain Surgical	X	X		X	X
Non-addictive	X		X	X	X
Long lasting	X				X
Targeted	X				

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N-001 is first-in-class:

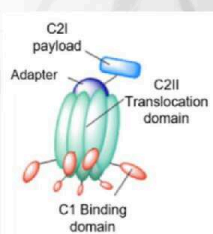
N-001 is a very large protein not a small molecule like oxycontin or ibuprofen. Its large size prevents it from diffusing inside the body and also blocks its entry into the brain. This prevents addiction and makes N-001 unlike all competitor drugs for severe pain.

Sensory neuron targeting avoids side effects such as toxicity and immune reactions. All the competitor drugs of N-001 are un-targeted and have severe side effects that result from their interactions with cells and organs that have nothing to do with pain.

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N-001 Profile

- A rationally designed multifunctional biological (protein) that targets sensory neurons and is active only inside them.
- Cell targeting combined with intracellular activity minimizes side effects and improves likelihood of positive clinical trial outcomes.
- Locally administered at the site of pain, by injection or patch or nerve block, not systemic no CNS effect.
- Preclinical tests measuring efficacy and safety are promising.



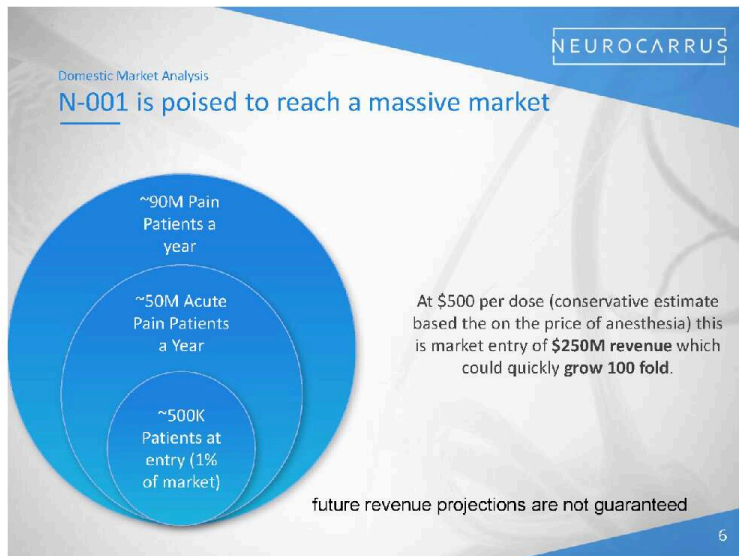
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Origin of N-001:

The idea for N-001 arose from understanding how pain works and the need to avoid side effects such as addiction, suffocation, and intestinal damage caused by opioids. That promoted years of protein design and engineering efforts. Eventually a "rationale" drug was created that had the envisioned properties.

The Neurocarrus drug and its method of synthesis is protected by two US patents. These patents describe the invention and how to make the drug.

Since these patents were issued, Neurocarrus developed new ways of making N-001 resulting in higher yields at lower cost. This opens the door to additional applications of the drug including its use as a delivery platform to regenerate damaged neurons.



The market opportunity and human health:

With an estimated 30% of the population worldwide affected, pain is one the most prevalent health problems in the world. Pain is affecting 56% of American adults, more than diabetes, heart disease, and cancer combined.

Acute pain due to injuries, accidents, labor, and childbirth, or surgeries represents a significant concern for 67.5% of patients admitted to hospitals. There are nearly 50 million surgeries in the US per year that involve pain management.

Unrelieved acute pain is one of the risk factors in the development of chronic pain, with 10% - 50% of patients developing persistent pain after different operations. Specifically, there are over a million orthopedic surgeries performed each year in the US. Total hip and knee arthroplasties are common surgeries in orthopedics with more than 300,000 hip replacements and 600,000 knee replacements performed each year.



Longer acting
than current
anesthesia

Visual proof
of specific
targeting

*Independently confirmed by CRU and Stanford University using double blinded procedures

- \$350K equity funding
- \$200K non-dilutational grant
- \$250K non-dilutational grants
- Conducting independent testing

NEBRASKA
DEPARTMENT OF
ECONOMIC DEVELOPMENT

SBIR
A Small Business Investment Round

NIH
National Institutes of Health

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A history of strong funding:

Neurocarrus has received considerable non dilutive investment (\$3,321,000). These federal and state awards result from confidential reviews by pain experts and business executives coordinated by the awarding sources. They prove that Neurocarrus is highly competitive within the landscape of the US medical establishment. The company has received \$600,000 in private investment resulting in a very promising ratio of 5.6 non-dilutive to dilutive funding for future investors. This means that their investment leverages the much larger federal and state commitments which dictate valuation.

A well developed commercialization plan:

Our current Phase II NIH SBIR award of \$2,780,000 depended on development of a highly detailed commercialization plan that was reviewed and vetted by reviewers. This plan includes near and long term strategies to develop N-001 within the structure of the federal approval process and to fund the development by strategic partnerships.

Accomplishments Since Our Last Wefunder Raise

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Before Wefunder Raise	After Wefunder Raise
<p>IndieBio Incubator Class 6</p> <p>Public Dissemination: First publication: https://doi.org/10.1038/srep23707</p> <p>\$100K non dilutive funding awarded by Nebraska Department of Economic Development.</p>	<p>2020: \$250K non dilutive funding awarded by the US NIH Phase I SBIR program</p> <p>\$91K non dilutive funding awarded by Nebraska Department of Economic Development</p> <p>Partnered with Stanford Medical School and Veterans Administration in Palo Alto CA</p> <p>First U.S. patent issued</p> <p>Public Dissemination: Second publication: https://doi.org/10.1038/s41598-020-69612-9</p> <p>2021: Accepted into the United States NIH Preclinical Screening Platform for Pain</p> <p>Second U.S. patent issued</p> <p>2023: \$2.78M non dilutive funding awarded by the NIH Phase II SBIR program</p> <p>\$100K non dilutive funding awarded by Nebraska Department of Economic Development</p> <p>Public Transparency: Third publication: https://doi.org/10.1038/s41598-020-69612-9</p>

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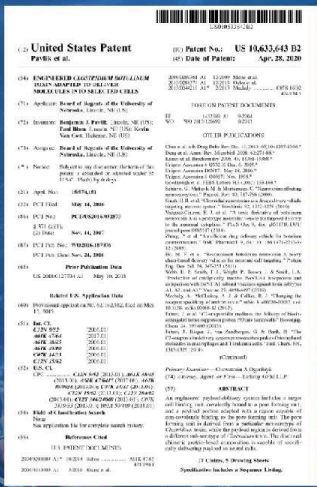
Investor Opportunity and Exit Strategies

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Wefunder investors receive a SAFE in exchange for their investment using a contract between the investor and Wefunder. A SAFE is a Simple Agreement for Future Equity and is like a convertible note but less complicated. When conditions are met such as an Equity Financing of preferred stock, SAFEs convert to preferred stock.

Investors have several potential strategies to make money. Neurocarrus may be acquired and the investor's shares would be bought out at an increased valuation in exchange for cash, or potentially exchanged for shares in the purchasing company. Alternatively, Neurocarrus may go public and undergo an initial public offering (IPO) allowing investor shares to be publically traded and sold.

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Intellectual Property

- Patent No. 10,633,643 "Engineered Clostridium botulinum toxin adapted to deliver molecules into selected cells" issued by the USPTO on April 28, 2020
- Follow on divisional Patent No. 11,118,170 issued May 19, 2021
- Neurocarrus exclusively licensed these patents for all fields-of-use along with a sublicense option.
- PCT US 1632573 has issued in Japan 2017-559588 (6-17-21) and EU and is pending in Canada, Israel, and South Korea.

What does success look like?

Solving severe pain without addiction is its own reward. Financial benefit to early investors will result in part from the ongoing protection of intellectual property.

Neurocarrus has two issued US patents invented by CEO Paul Blum and coworkers. The company continues to pursue protection of its intellectual property by patent protection in other countries. These countries were selected by their current manufacturing ability to make protein drugs. Fortunately, the Covid epidemic revealed and reinforced as highly strategic, the selection of countries made by Neurocarrus.

Neurocarrus will continue its aggressive IP strategy to extend protection of its inventions.



Publications

- Allen et al 2023 Sci Rep PMID: 37479740
- Allen et al 2020 Sci Rep 10, 12789 PMID: 32732905
- Pavlik et al 2017 Current Topics In Peptide and Protein Research 2017 18:1-15
- Pavlik et al 2016 Nature Sci Reports 6:23707 PMID: 27025362

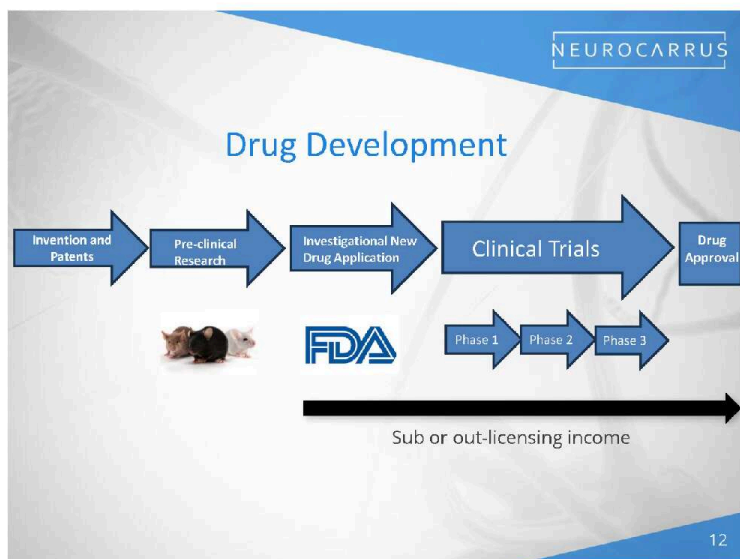
Corporate transparency means honesty and better science:

Unlike pharmaceutical companies, Neurocarrus shares its information. The company continues its tradition of publishing its drug development studies in high ranking journals. This supports the company's philosophy that transparency is a key to success.

These scientific publications, like grant awards, also result from the "peer review process" that guarantees anonymity to reviewers so they can be honest in their critiques and comments. This process strengthens the quality

honest in their critiques and comments. This process strengthens the quality of the science tremendously.

Neurocarrus will continue to publish its scientific studies and that will enhance interest in N-001 and support partnerships with medical schools and companies interested in testing the drug.



Neurocarrus is early stage in its drug development process:

The company's studies are "pre-clinical" meaning before testing in humans. Some of these studies are described in our publications and many more are underway. The Phase II SBIR award indicates the company has made very significant progress and intends to pursue clinical trials at the end of the funding period.

Preclinical testing uses animals to ensure drug benefit and safety before human testing. While the company regrets the dependence on using animals there are no alternatives. However, all attempts are made to minimize this testing and federal guidelines are followed closely in these efforts.

After pre-clinical development and approval of an IND (application for investigative drug), human testing, called clinical trials occur. They are divided into three stages, phase I, II and III. Each of these trials focus on specific outcomes, safety then benefit then more safety and benefit. Clinical trials are expensive. Funding will be pursued from multiple sources including the federal government by grants, from private investors and from strategic partnerships.

Finally, approval for distribution and sales of N-001 will be pursued in concert with pharmaceutical companies to benefit from their marketing and distribution networks.

Team

- Paul Blum, Ph.D.**
CEO U Nebraska-Lincoln and UC Santa Cruz, 33 years protein engineering
- Derek Allen, Ph.D., Research Scientist**
University of Nebraska-Lincoln

Board

- Jianguo Cheng, M.D., Ph.D.**
Professor of Anesthesiology Cleveland Clinic, Former President of American Academy of Pain Medicine
- Vicky Valverde-Salas, MD**
M.D. from the U. Madison Wisconsin Medical School
twenty years experience in running his own private practice and Medical Primary Care Clinic
- Mark Blum, JD**
Attorney licensed in California. A 1986 graduate of University of California College of the Law, San Francisco
- Bruce McDonald, JD**
Partner in the intellectual property group at Smith, Gambrell & Russell, LLP
Member of the District of Columbia Bar

The Neurocarrus team:

Paul Blum, CEO of the company has over 30 years of research experience in protein engineering and microbiology. He leads a multidisciplinary team of investigators including chief scientist Derek Allen, with complementary expertise in pain physiology, protein biochemistry, pharmacology, microscopy, and commercial preclinical drug development.

Continuing efforts to establish drug benefit are led by Stanford University's Dr. David Clark, an expert in post-traumatic chronic pain and pain relief pathways. In addition, the company benefits from widespread interest among scientists and the public in the improvement of pain management.

The Neurocarrus advisory board currently includes doctors and lawyers with a history of interest in human pain and the development of Neurocarrus. Additional members of the company include other scientists and lawyers. Pending new federal funding may add a salaried CFO to the Neurocarrus team to raise private capital and to coordinate strategic deals.

Advisors and collaborators



David Clark, MD., Ph.D. Pain Specialist Advisor and Collaborator Director of pain relief service, VAPHCS; Professor of anesthesiology, perioperative, and pain medicine at Stanford Medical Center; Member of Bio-X, Member of Wu Tsai Neurosciences Institute; 30 years' experience in pain research.



Rebecca Wachs, Ph.D., M.Eng. Chronic Pain Specialist Advisor and Collaborator Assistant Professor of Biological Systems Engineering Graduate Chair University of Nebraska-Lincoln




You Zhou, Ph.D. Microscopy Advisor and Collaborator Research Professor University of Nebraska-Lincoln; Director of UNL microscopy research core facility

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Neurocarrus Partners


Government




Academic



Business



Legal



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