

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549**

FORM 8-K

CURRENT REPORT

Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934

Date of report (date of earliest event reported): January 4, 2023

TONIX PHARMACEUTICALS HOLDING CORP.

(Exact name of registrant as specified in its charter)

Nevada
(State or Other Jurisdiction
of Incorporation)

001-36019
(Commission
File Number)

26-1434750
(IRS Employer
Identification No.)

26 Main Street, Chatham, New Jersey 07928
(Address of principal executive offices) (Zip Code)

Registrant's telephone number, including area code: (862) 904-8182

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions (see General Instruction A.2. below):

- Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
 Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
 Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
 Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock	TNXP	The NASDAQ Capital Market

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§ 230.405 of this chapter) or Rule 12b-2 of the Securities Exchange Act of 1934 (§ 240.12b-2 of this chapter).

Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Item 7.01 Regulation FD Disclosure.

On January 4, 2023, Tonix Pharmaceuticals Holding Corp. (the "Company") announced the appointment of Zeil Rosenberg, M.D., M.P.H. as its Executive Vice President, Medical. A copy of the press release which discusses this matter is furnished hereto as Exhibit 99.01, and incorporated herein by reference.

The Company updated its investor presentation, which is used to conduct meetings with investors, stockholders and analysts and at investor conferences, and which the Company intends to place on its website, which may contain nonpublic information. A copy of the presentation is filed as Exhibit 99.02 hereto and incorporated herein by reference.

The information in this Item 7.01 of this Current Report on Form 8-K, including Exhibits 99.01 and 99.02 attached hereto, shall not be deemed "filed" for purposes of Section 18 of the United States Securities Exchange Act of 1934 (the "Exchange Act") or otherwise subject to the liabilities of that section, nor shall they be deemed incorporated by reference in any filing under the United States Securities Act of 1933 or the Exchange Act, except as shall be expressly set forth by specific reference in such a filing.

Item 8.01. Other Events.

On January 4, 2023, the Company announced the appointment of Dr. Rosenberg, M.D., M.P.H. as its Executive Vice President, Medical. Dr. Rosenberg will be responsible for leading the Company's clinical development strategy efforts for vaccines and antivirals.

Forward-Looking Statements

This Current Report on Form 8-K contains certain forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934 and Private Securities Litigation Reform Act, as amended, including those relating to the Company's product development, clinical trials, clinical and regulatory timelines, market opportunity, competitive position, possible or assumed future results of operations, business strategies, potential growth opportunities and other statement that are predictive in nature. These forward-looking statements are based on current expectations, estimates, forecasts and projections about the industry and markets in which we operate and management's current beliefs and assumptions.

These statements may be identified by the use of forward-looking expressions, including, but not limited to, “expect,” “anticipate,” “intend,” “plan,” “believe,” “estimate,” “potential,” “predict,” “project,” “should,” “would” and similar expressions and the negatives of those terms. These statements relate to future events or our financial performance and involve known and unknown risks, uncertainties, and other factors which may cause actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements. Such factors include those set forth in the Company’s filings with the SEC. Prospective investors are cautioned not to place undue reliance on such forward-looking statements, which speak only as of the date of this press release. The Company undertakes no obligation to publicly update any forward-looking statement, whether as a result of new information, future events or otherwise.

Item 9.01 Financial Statements and Exhibits.

(d)	Exhibit No.	Description.
	99.01	Press release of the Company, dated January 4, 2023
	99.02	Corporate Presentation by the Company for January 2023
	104	Cover Page Interactive Data File (embedded within the Inline XBRL document)

SIGNATURE

Pursuant to the requirement of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

TONIX PHARMACEUTICALS HOLDING CORP.

Date: January 4, 2023

By: /s/ Bradley Saenger
Bradley Saenger
Chief Financial Officer

Tonix Pharmaceuticals Appoints Zeil Rosenberg, M.D., M.P.H., as Executive Vice President, Medical for Infectious Disease Programs

Dr. Rosenberg Will Lead Clinical Development of Tonix's Vaccine and Antiviral Programs

CHATHAM, N.J., January 4, 2023 – Tonix Pharmaceuticals Holding Corp. (Nasdaq: TNXP) (Tonix or the Company), a clinical-stage biopharmaceutical company, today announced the appointment of Zeil Rosenberg, M.D., M.P.H. as its new Executive Vice President, Medical. In this role, Dr. Rosenberg will be responsible for leading Tonix's clinical development efforts for vaccines and antivirals. Dr. Rosenberg will be based in the Company's Chatham, N.J. headquarters, and as part of his role will oversee the clinical development of Tonix's vaccine for smallpox and monkeypox, TNX-801, the vaccine for COVID-19, TNX-1850, and the antiviral anti-SARS-CoV-2 spike protein monoclonal antibodies, TNX-3600 and TNX-3800, to protect immunocompromised individuals from severe COVID-19.

"We are pleased to welcome Dr. Rosenberg to Tonix's clinical team to lead the development of our infectious disease programs at a time when Tonix continues to make meaningful progress in the clinical development of multiple programs within its robust pipeline," said Seth Lederman, M.D., Chief Executive Officer of Tonix Pharmaceuticals.

"Dr. Rosenberg brings to our team expertise as an infectious disease drug developer and we are fortunate to have someone with Dr. Rosenberg's skills, vision and operational expertise join at a pivotal time in the evolution of our infectious disease product portfolio, with our vaccine candidate for monkeypox, TNX-801, expected to enter clinical testing in 2023, and TNX-3600 and TNX-3800 moving ahead in pre-clinical development to address the need for anti-SARS-CoV-2 monoclonal antibodies for immunocompromised individuals," said Gregory Sullivan, M.D., Chief Medical Officer of Tonix Pharmaceuticals. "At Becton, Dickinson and Company (BD), Dr. Rosenberg worked on the development of the BD Bifurcated Needle[®], a safety-engineered improved bifurcated needle device for the percutaneous administration of live virus vaccinia vaccines, as well as BD VaxiNet[®], a data monitoring system to improve patient safety in smallpox vaccine mass immunization efforts, which we believe have direct relevance to our recombinant poxvirus (RPV) platform."

"I am thrilled to join Tonix's executive management team and lead the clinical development of its infectious disease portfolio," said Dr. Rosenberg. "I look forward to working together with the talented Tonix team to advance the Company's portfolio of promising vaccines and antiviral therapies and help bring them to as many appropriate patients as possible."

Dr. Rosenberg was most recently at PPD, part of Thermo Fisher Scientific, serving as Executive Director, Biotech and as Therapeutic Area Head for Vaccines at its Accelerated Enrollment Solutions Group, where he provided leadership on multiple successful COVID-19 vaccine clinical trials. At BD he was Worldwide Business Leader and Medical Director for Immunization, and was Vice President for Medical Affairs at Admera Health, a medical diagnostics company focused on precision medicine. He was key to the launch of a global public private partnership, including UNICEF and WHO, to help eliminate maternal and neonatal tetanus through immunization, resulting in the significant reduction of neonatal mortality. He served as National Immunization Advisor to the Indonesian Ministry of Health in Jakarta, sponsored by the U.S. Agency for International Development (USAID), and as Chief Technical Officer for Immunization at USAID, Washington, D.C.

Dr. Rosenberg received his B.A. with Honors and Distinction at Stanford University, earned his M.D. at the University of California, San Francisco and completed his internship and residency at Mount Sinai and Cornell University Medical College, respectively. He holds a Masters of Public Health from Columbia University. Dr. Rosenberg is an elected Fellow of both the American College of Preventive Medicine and the New York Academy of Medicine, and Specialty Fellow of the American Academy of Pediatrics. He has served as AAS Science, Engineering and Diplomacy Fellow.

Tonix Pharmaceuticals Holding Corp.*

Tonix is a clinical-stage biopharmaceutical company focused on discovering, licensing, acquiring and developing therapeutics to treat and prevent human disease and alleviate suffering. Tonix's portfolio is composed of central nervous system (CNS), rare disease, immunology and infectious disease product candidates. Tonix's CNS portfolio includes both small molecules and biologics to treat pain, neurologic, psychiatric and addiction conditions. Tonix's lead CNS candidate, TNX-102 SL (cyclobenzaprine HCl sublingual tablet), is in mid-Phase 3 development for the management of fibromyalgia with a new Phase 3 study launched in the second quarter of 2022 and interim data expected in the second quarter of 2023. TNX-102 SL is also being developed to treat Long COVID, a chronic post-acute COVID-19 condition. Tonix initiated a Phase 2 study in Long COVID in the third quarter of 2022 and expects interim data in the third quarter of 2023. TNX-1300 (cocaine esterase) is a biologic designed to treat cocaine intoxication and has been granted Breakthrough Therapy designation by the FDA. A Phase 2 study of TNX-1300 is expected to be initiated in the first quarter of 2023. TNX-1900 (intranasal potentiated oxytocin), a small molecule in development for chronic migraine, is expected to enter the clinic with a Phase 2 study in the first quarter of 2023. TNX-601 ER (tianeptine hemioxalate extended-release tablets) is a once-daily formulation of tianeptine being developed as a potential treatment for major depressive disorder (MDD) with a Phase 2 study expected to be initiated in the first quarter of 2023. Tonix's rare disease portfolio includes TNX-2900 (intranasal potentiated oxytocin) for the treatment of Prader-Willi syndrome. TNX-2900 has been granted Orphan Drug designation by the FDA. Tonix's immunology portfolio includes biologics to address organ transplant rejection, autoimmunity and cancer, including TNX-1500, which is a humanized monoclonal antibody targeting CD40-ligand (CD40L or CD154) being developed for the prevention of allograft and xenograft rejection and for the treatment of autoimmune diseases. A Phase 1 study of TNX-1500 is expected to be initiated in the first half of 2023. Tonix's infectious disease pipeline includes a vaccine in development to prevent smallpox and monkeypox, TNX-801, a next-generation vaccine to prevent COVID-19, TNX-1850, a platform to make fully human monoclonal antibodies to treat COVID-19, TNX-3600, and humanized anti-SARS-CoV-2 monoclonal antibodies, TNX-3800, recently licensed from Curia. TNX-801, Tonix's vaccine in development to prevent smallpox and monkeypox, also serves as the live virus vaccine platform or recombinant pox vaccine (RPV) platform for other infectious diseases. A Phase 1 study of TNX-801 is expected to be initiated in Kenya in the second half of 2023.

* All of Tonix's product candidates are investigational new drugs or biologics and have not been approved for any indication.

This press release and further information about Tonix can be found at www.tonixpharma.com.

Forward Looking Statements

Certain statements in this press release are forward-looking within the meaning of the Private Securities Litigation Reform Act of 1995. These statements may be identified by the use of forward-looking words such as "anticipate," "believe," "forecast," "estimate," "expect," and "intend," among others. These forward-looking statements are based on Tonix's current expectations and actual results could differ materially. There are a number of factors that could cause actual events to differ materially from those indicated by such forward-looking statements. These factors include, but are not limited to, risks related to the failure to obtain FDA clearances or approvals and noncompliance with FDA regulations; delays and uncertainties caused by the global COVID-19 pandemic; risks related to the timing and progress of clinical development of our product candidates; our need for additional financing; uncertainties of patent protection and litigation; uncertainties of government or third party payor reimbursement; limited research and development efforts and dependence upon third parties; and substantial competition. As with any pharmaceutical under development, there are significant risks in the development, regulatory approval and commercialization of new products. Tonix does not undertake an obligation to update or revise any forward-looking statement. Investors

should read the risk factors set forth in the Annual Report on Form 10-K for the year ended December 31, 2021, as filed with the Securities and Exchange Commission (the “SEC”) on March 14, 2022, and periodic reports filed with the SEC on or after the date thereof. All of Tonix’s forward-looking statements are expressly qualified by all such risk factors and other cautionary statements. The information set forth herein speaks only as of the date thereof.

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TONIX
PHARMACEUTICALS

**INVESTOR
PRESENTATION**

NASDAQ: TNXP

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Cautionary Note on Forward-Looking Statements

Certain statements in this presentation regarding strategic plans, expectations and objectives for future operations or results are “forward-looking statements” as defined by the Private Securities Litigation Reform Act of 1995. These statements may be identified by the use of forward-looking words such as “anticipate,” “believe,” “forecast,” “estimate” and “intend,” among others. These forward-looking statements are based on Tonix’s current expectations and actual results could differ materially. There are a number of factors that could cause actual events to differ materially from those indicated by such forward-looking statements. These factors include, but are not limited to, the risks related to failure to obtain FDA clearances or approvals and noncompliance with FDA regulations; delays and uncertainties caused by the global COVID-19 pandemic; risks related to the timing and progress of clinical development of our product candidates; our need for additional financing; uncertainties of patent protection and litigation; uncertainties of government or third party payor reimbursement; limited research and development efforts and dependence upon third parties; and substantial competition. As with any pharmaceutical under development, there are significant risks in the development, regulatory approval and commercialization of new products. The forward-looking statements in this presentation are made as of the date of this presentation, even if subsequently made available by Tonix on its website or otherwise. Tonix does not undertake an obligation to update or revise any forward-looking statement, except as required by law. Investors should read the risk factors set forth in the Annual Report on Form 10-K for the year ended December 31, 2021, as filed with the Securities and Exchange Commission (the “SEC”) on March 14, 2022, and periodic reports and current reports filed with the SEC on or after the date thereof. All of Tonix’s forward-looking statements are expressly qualified by all such risk factors and other cautionary statements.

Who We Are



OUR MISSION

Tonix Pharmaceuticals is committed to improving population health by **inventing and developing** innovative therapies and vaccines, through **broad in-house capabilities and creative collaborations**, to help address important unmet needs.



OUR VISION

Tonix strives to be a leader in providing **novel drug therapies and vaccines** to **improve population health around the world**.



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Investment Highlights



DIVERSE PIPELINE

Tonix's core focus is on **central nervous system** disorders, but we also target unmet needs across multiple therapeutic areas including **immunology, infectious disease** and **rare disease**.



IN-HOUSE CAPABILITIES

Investment in domestic, **in-house, R&D and manufacturing** to accelerate development timelines and improve the ability to respond to pandemics.



STRATEGIC PARTNERSHIPS

Partnering strategically with other **biotech companies, world-class academic and non-profit research organizations** to bring innovative therapeutics to market faster.



FINANCIAL POSITION

Tonix had **\$140 M of cash** as of 9/30/22. Tonix has no debt.



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Pipeline: Key Programs

Candidates*	Indication	Status/Next Milestone
TNX-102 SL ¹	Fibromyalgia (FM) Posttraumatic Stress Disorder (PTSD) Long COVID (PASC ²)	Mid-Phase 3 - >50% enrolled Phase 2, Targeted 2Q 2023 Start Phase 2 - enrolling
TNX-1300 ³	Cocaine Intoxication - <i>FDA Breakthrough Designation</i>	Mid-Phase 2, Targeted 1Q 2023 Start
TNX-1900 ⁴	Migraine, Craniofacial Pain and Binge Eating Disorder	Phase 2, Targeted 1Q 2023 Start ⁵
TNX-601 ER	Depression, PTSD, Neurocognitive Dysfunction from Steroids	Phase 2, Targeted 1Q 2023 Start ⁶
TNX-1600 ⁷	Depression, PTSD and ADHD	Preclinical
TNX-2900 ⁸	Prader-Willi Syndrome - <i>FDA Orphan Drug Designation</i>	Preclinical
TNX-1500 ⁹	Organ Transplant Rejection/ Autoimmune Conditions	Phase 1, Targeted 1H 2023 Start
TNX-1700 ¹⁰	Gastric and colorectal cancers	Preclinical
TNX-801 ¹¹	Smallpox and monkeypox vaccine	Phase 1, Targeted 2H 2023 Start
TNX-1850 ¹²	COVID-19 Vaccine (horsepox-based live virus vaccine)	Preclinical
TNX-2300 ¹³	COVID-19 Vaccine	Preclinical
TNX-3600 ¹⁴	COVID-19 Therapeutic Platform (fully human monoclonal antibodies)	Preclinical
TNX-3700 ¹⁵	COVID-19 Vaccine (zinc nanoparticle mRNA technology)	Preclinical
TNX-3800 ¹⁶	COVID-19 Therapeutic/Preventative (humanized monoclonal antibodies)	Preclinical

*All of Tonix's product candidates are investigational new drugs or biologics and have not been approved for any indication.
 TNX-102 SL (cyclobenzaprine HCl sublingual tablets) is also in development for Agitation in Alzheimer's Disease (AAD) and Alcohol Use Disorder (AUD). Both indications are Phase 2 ready.

¹Post-Acute Sequelae of COVID-19.

²TNX-1300 (double-mutant cocaine esterase) was licensed from Columbia University.

³Acquired from Trigemina, license agreement with Stanford University. IND cleared for the prevention of migraine indication; Planned Binge Eating Disorder study is expected to be investigator initiated.

⁴A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900. Phase 2 for the prevention of migraine headache expected to start 1Q 2023

⁵Phase 1 trial for formulation development was completed outside of the U.S. Phase 2 expected to start 1Q 2023

⁶Acquired from TRImaran Pharma; license agreement with Wayne State University

⁷Co-exclusive license agreement with French National Institute of Health and Medical Research (Inserm)

⁸anti-CD40L humanized monoclonal antibody

⁹Recombinant trefol factor 2 (TFF2) based protein; licensed from Columbia University

¹⁰Live attenuated vaccine based on horsepox virus

¹¹Live attenuated vaccine based on horsepox virus vector, expressed SARS-CoV-2 spike protein. TNX-1850 is based on the BA.2 variant spike protein.

¹²Live attenuated vaccine based on bovine parainfluenza (BPI) virus

¹³Fully human monoclonal antibody generated from COVID-19 convalescent patients

¹⁴COVID vaccine based on mRNA in zinc nanoparticle (ZNP) formulation with CD40L molecular trigger

¹⁵Humanized monoclonal antibody generated from mice immunized with SARS-CoV2 spike protein

¹⁶Humanized monoclonal antibody generated from mice immunized with SARS-CoV2 spike protein

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**CNS:
KEY CANDIDATES**

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Four CNS drugs¹ entering Phase 2 trials in 1H23

Three Potential Pivotal Studies in addition to two enrolling studies



- **In Phase 3:**
 - TNX-102 SL for fibromyalgia (>50% enrolled) Potential Pivotal Study
 - **In Phase 2:**
 - TNX-102 SL for fibromyalgia-type Long COVID Potential Pivotal Study
-
- **Entering Phase 2 in 1H23**
 - TNX-1300 for cocaine intoxication (breakthrough therapy designation) Potential Pivotal Study
 - TNX-601 CR for major depressive disorder (new mechanism for US patients) Potential Pivotal Study
 - TNX-1900 for migraine headache (new mechanism for US patients) Potential Pivotal Study
 - TNX-102 SL for PTSD

¹Not approved for any indication



TNX-102 SL* Cyclobenzaprine (Protectic[®]) Pipeline in a Product



A unique, sublingual formulation of cyclobenzaprine designed to optimize delivery and absorption

Potent binding and antagonist activities at the serotonin-5-HT_{2A}, α₁-adrenergic, histaminergic-H₁, and muscarinic-M₁ receptors to facilitate restorative sleep

Innovative and proprietary PROTECTIC[®] Rapid drug exposure following nighttime administration

Differentiators:

Relative to Oral Cyclobenzaprine

- Lower daytime exposure
- Avoids first-pass metabolism
- Reduces risk of pharmacological interference from major metabolite

Relative to Standard of Care

- Potential for better tolerability while maintaining efficacy

Patents Issued

*TNX-102 SL has not been approved for any indication.

Fibromyalgia

Status: Mid-Phase 3

- One positive Phase 3 study (RELIEF) completed
- Second Phase 3 study (RALLY) missed primary endpoint
- Confirmatory Phase 3 study (RESILIENT) is currently enrolling
 - >50% enrolled

Next Steps: Interim analysis results expected 2Q 2023

Long COVID

Status: Phase 2

- Phase 2 study (PREVAIL) is currently enrolling

Next Steps: Interim analysis results expected 3Q 2023

Posttraumatic Stress Disorder (PTSD)

Status: Mid-Phase 2

- One Phase 2 study (AtEase) completed
- Two Phase 3 studies (HONOR, RECOVERY) conducted

Next Steps: Initiate Phase 2 trial 2Q 2023



TNX-102 SL*: Fibromyalgia

Cyclobenzaprine Protectic® Sublingual Tablets



PROFILE

Fibromyalgia (FM) is a chronic pain disorder resulting from amplified sensory and pain signaling within the CNS

- Afflicts an estimated 6-12 million adults in the U.S., approximately 90% of whom are women¹
- Symptoms include chronic widespread pain, nonrestorative sleep, fatigue, and cognitive dysfunction
- Patients struggle with daily activities, have impaired quality of life, and frequently are disabled
- Physicians and patients report common dissatisfaction with currently marketed products



When the check engine light malfunctions, the light is on even though the car is not malfunctioning

Patents Issued

¹American Chronic Pain Association (www.theacpa.org, 2019)

DEVELOPMENT PROGRAM

Market Entry: Fibromyalgia

Additional Indications: Long COVID, PTSD, Agitation in Alzheimer's, Alcohol Use Disorder

Status: One Positive Phase 3 study RELIEF completed

Second Phase 3 study RALLY missed primary endpoint

Confirmatory Phase 3 study RESILIENT is currently enrolling

Next Steps: Interim analysis results expected 2Q 2023

*TNX-102 SL has not been approved for any indication.

Phase 3 RESILIENT Study Design

General study characteristics:

- Randomized, double-blind, placebo-controlled study in fibromyalgia
- U.S. sites only, expected to enroll approximately 470 patients
- One unblinded interim analysis based on 50% of randomized participants

Primary Endpoint:

- Daily diary pain severity score change from baseline to Week 14 (TNX-102 SL vs. placebo)
 - Weekly averages of the daily numerical rating scale scores
 - Analyzed by mixed model repeated measures with multiple imputation (MMRM with MI)

TNX-102 SL once-daily at bedtime
5.6 mg (2 x 2.8 mg tablets)*

Placebo once-daily at bedtime

*Two week run in at 2.8 mg dose at bedtime, followed by 12 weeks at 5.6 mg dose

14 weeks



TNX-102 SL*: Long COVID (PASC) Cyclobenzaprine Protectic® Sublingual Tablets

PROFILE

- Occurs in approximately 13% of recovered COVID-19 patients¹
- As many as 40% of Long COVID patients experience multi-site pain, a hallmark of fibromyalgia^{2,3}



Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Fibromyalgia-Type Long COVID (PASC)

Additional Indications: Fibromyalgia, PTSD, Agitation in Alzheimer's, Alcohol Use Disorder

Status: Phase 2 study PREVAIL is currently enrolling

Next Steps: Interim analysis results expected 3Q 2023

*TNX-102 SL has not been approved for any indication.

¹September 1, 2022. CDC - <https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/index.html>
²Harris, H. et al. Tonix data on file. 2022
³TrNetX Analytics

Phase 2 PREVAIL Study Design

General study characteristics:

- Randomized, double-blind, placebo-controlled study in fibromyalgia-type Long COVID
- Approximately 30 sites in the U.S. and is expected to enroll approximately 470 patients
- One unblinded interim analysis based on 50% of randomized participants

Primary Endpoint:

- Daily self-reported worst pain intensity change from baseline at Week 14 (TNX-102 SL vs. placebo)
 - Weekly averages of the daily numerical rating scale scores
 - Analyzed by mixed model repeated measures with multiple imputation (MMRM with MI)

TNX-102 SL once-daily at bedtime
5.6 mg (2 x 2.8 mg tablets)*

Placebo once-daily at bedtime

*Two week run in at 2.8 mg dose at bedtime, followed by 12 weeks at 5.6 mg dose

14 weeks



TNX 102 SL*: Posttraumatic Stress disorder (PTSD) Cyclobenzaprine Protectic® Sublingual Tablets

PROFILE

PTSD is a serious chronic psychiatric illness

- Defined as maladaptive prolonged stress response which occurs after experiencing severely injurious traumatic event(s)

Affects approximately 12 million Americans adults^{1,2}

Large unmet clinical need and limited effective therapies available

- Advances in pharmacological treatments beyond the currently approved SSRIs (e.g., Zoloft® (sertraline), Paxil® (paroxetine)) are needed³

DEVELOPMENT PROGRAM

Market Entry: PTSD

Additional Indications: Fibromyalgia, Long COVID, Agitation in Alzheimer's, Alcohol Use Disorder

Status: One Phase 2 study (AtEase) completed

Two Phase 3 studies (HONOR, RECOVERY) conducted

Next Steps: 2Q 2023 Initiate Phase 2 Trial

Patents Issued

*TNX-102 SL has not been approved for any indication.

¹Goldstein RB, et al. The epidemiology of DSM-5 posttraumatic stress disorder in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions-III. *Soc Psychiatry Psychiatr Epidemiol.* 2016;51(8):1137-1148.
²Pietrzak RH, et al. Prevalence and Axis I comorbidity of full and partial posttraumatic stress disorder in the United States: results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *J Anxiety Disord.* 2011;25(3):456-465
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³Cain, C. K., et al. Targeting memory processes with drugs to prevent or cure PTSD. *Expert Opin Investig Drugs.* 2012; 21(9), 1323-1350



TNX-1300*: Cocaine Intoxication Cocaine Esterase (CocE)

PROFILE

Cocaine is the main cause for drug-related ED visits¹

CocE is a recombinant protein that degrades cocaine in the bloodstream

- Rapidly reverses physiologic effects of cocaine
- Drops plasma exposure by 90% in 2 minutes

Differentiators: Rapidly metabolizes cocaine in the bloodstream; no other product currently on the market for this indication



Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Cocaine Intoxication

Status: Mid-Phase 2

Next Steps: Initiate new Phase 2 1Q 2023 pending FDA agreement

- Single-blind, placebo (+ usual care) controlled, randomized, potentially pivotal study

FDA Breakthrough Therapy Designation

Awarded Cooperative Agreement Grant from National Institute on Drug Abuse (NIDA)

¹Havakuk O et al. *J Am Coll Cardiol.* 2017;70:101-113.
 ED = emergency department.

© 2023 Tonix Pharmaceuticals Holding Corp. *TNX-1300 has not been approved for any indication.





TNX-601 ER*: Depression Tianeptine Hemioxalate Extended-Release Tablets

PROFILE

- A novel, oral, extended-release once-daily tablet
- Indirectly modulates the glutamatergic system
- Treatment effect of tianeptine in depression is well-established

Differentiators:

Relative to Tianeptine IR:

- Once daily dosing

Relative to traditional anti-depressants:

- Unique mechanism of action
- Tianeptine sodium IR has similar efficacy but fewer side effects than traditional anti-depressants

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Major Depressive Disorder

Additional Indications: PTSD, Neurocognitive Disorder From Corticosteroids

Status: Phase 2 ready

Next Steps: Initiate a Phase 2 potentially pivotal study 1Q 2023

- Double-blind, placebo-controlled, parallel-group, randomized,
- Expected to enroll approximately 300 patients across 30 sites in the US

*TNX-601 ER has not been approved for any indication.

AMPA=α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid; MAOI=monoamine oxidase inhibitors; NMDA=N-methyl-D-aspartate.

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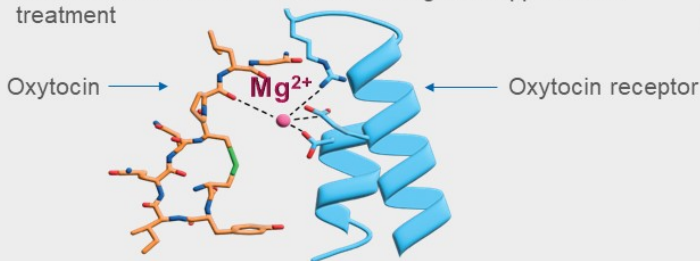
TNX-1900*: Migraine Intranasal Potentiated Oxytocin (OT) with Magnesium



PROFILE

- Intranasal OT has potential utility in treating migraine¹
- Magnesium is known to potentiate the binding of OT to its receptor^{2,3}
- One billion individuals worldwide suffer from migraines

Differentiator: Novel non-CGRP antagonist approach to treatment



Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Chronic Migraine

Additional Indications: Acute Migraine, Craniofacial Pain, Insulin Resistance, Binge Eating Disorder

Status: Phase 2 ready⁴

Next Steps: 1Q 2023 Initiate Phase 2 Trial and Investigator Initiated Phase 2 Trial in Binge Eating Disorder

*TNX-1900 has not been approved for any indication. CGRP = calcitonin gene-related peptide.

¹Tzabazis A, et al. Oxytocin and Migraine Headache. Headache. 2017 May;57 Suppl 2:64-75. doi: 10.1111/head.13082. PMID: 28485846.

²Antoni FA, Chadio SE. Essential role of magnesium in oxytocin-receptor affinity and ligand specificity. Biochem J. 1989 Jan 15;257(2):611-4. doi: 10.1042/bj2570611. PMID: 2539090; PMCID: PMC1135623.

³Meyerowitz J, G., et al. The oxytocin signaling complex reveals a molecular switch for cation dependence. Nat Struct Mol Biol (2022). (https://doi.org/10.1038/s41594-022-00728-4)

⁴A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900 © 2023 Tonix Pharmaceuticals Holding Corp.





**RARE DISEASE:
KEY CANDIDATES**

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**TNX-2900*: Hyperphagia in Prader-Willi Syndrome
Intranasal Potentiated Oxytocin (OT) with Magnesium**



RARE DISEASE PORTFOLIO

PROFILE

Prader-Willi Syndrome is the most common genetic cause of life-threatening childhood obesity

- Rare disease occurring in 1 in 10,000 to 1 in 30,000 births

Differentiator: No approved therapeutic currently on the market for hyperphagia in PWS

Dangers of PWS Hyperphagia:



DEVELOPMENT PROGRAM

Market Entry: Hyperphagia in Prader-Willi Syndrome

Additional Indications: Rare Hyperphagia Conditions

Status: Pre-IND

Next Steps: IND preparation

Patents Issued

*TNX-2900 is in the pre-IND stage of development and has not been approved for any indication.

¹Miller JL, et al. *Am J Med Genet A*. 2011;155A(5):1040-1049.
²Butler MG, et al. *Genet Med*. 2017;19(6):635-642.
³Butler MG. NORD. Updated 2018. Accessed May 25, 2022. <https://rarediseases.org/rare-diseases/prader-willi-syndrome/>
⁴Prader-Willi Syndrome Association USA. Accessed May 25, 2022. <https://www.pwsausa.org/what-is-prader-willi-syndrome/>
⁵Muscogiuri G, et al. *J Endocrinol Invest*. 2021;44(10):2057-2070.
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IMMUNOLOGY: KEY CANDIDATES

TNX-1500*



Next Generation α -CD40 Ligand (CD40L) Antibody

The CD40-CD40L pathway is a pivotal immune system modulator and a well-established and promising treatment target

Differentiators: Expected to deliver efficacy without compromising safety

First Generation: Development halted due to thromboembolic (TE) complications—blood clots—traced to Fc gamma receptor (Fc γ R)

Second Generation: Eliminated the Fc γ R TE complication but potency and half life was reduced, limiting utility

Third Generation (TNX-1500): Re-engineered to better modulate the binding of Fc γ R while preserving FcRn function.

*TNX-1500 is in the pre-IND stage of development and has not been approved for any indication. Patents filed.

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Prevention of Allograft Rejection

Status: Preclinical

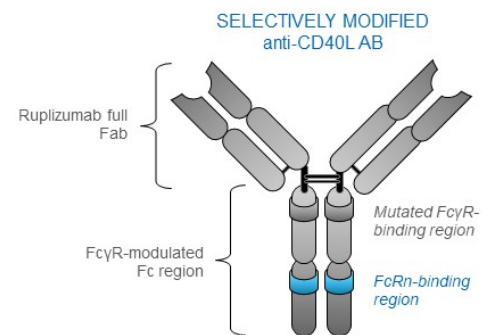
- Collaborations ongoing with Mass General Hospital on heart and kidney transplantation in non-human primates

Next Steps: Initiate Phase 1 study 1H 2023

Autoimmune Disease

Status: Potential future indication

- These indications require large studies, but represent large target markets



Contains the full ruplizumab Fab and the engineered Fc region that modulates Fc γ R-binding, while preserving FcRn function.

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TNX-1700*: Gastric and Colorectal Cancers

Recombinant Trefoil Factor 2 (rTFF2) Fusion Protein



Potential New Cancer Treatment

- TNX-1700 (rTFF2) has effects on cancer by altering the tumor micro-environment
- Mechanism of action: suppresses myeloid-derived suppressor cells and activates anti-cancer CD8+ T cells
- Potential synergy with anti-PD-1 or anti-PD-L1 monoclonal antibodies (mAbs)

Preclinical Evidence for Inhibiting Growth of Cancer Cells

- Data showed that TFF2-CTP augmented the efficacy of mAb anti-PD-1 therapy. Anti-PD-1 in combination with TFF2-CTP showed greater anti-tumor activity in PD-L1-overexpressing mice

Licensed from Columbia University

- Developing in partnership under sponsored research agreement

Market Entry: Immuno-oncology, combination therapy with PD1 blockers for gastric and colorectal cancer

Status: Preclinical

Next Steps: Animal studies ongoing

Differentiator: No product yet identified consistently augments PD1 effects on cold tumors

Patents Filed

*TNX-1700 is in the pre-IND stage of development and has not been approved for any indication.

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**INFECTIOUS
DISEASE: KEY
CANDIDATES**

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TNX-801 & TNX-1850*

Recombinant Pox Vaccine (RPV) Platform Using Live Virus Technology



Differentiators:

- **Live virus vaccines are the most established vaccine technology**
 - Starting with Edward Jenner's smallpox vaccine, the first vaccine, which eradicated smallpox
 - Prevents forward transmission
 - Effective in eliciting durable or long-term immunity
- **Economical to manufacture at scale**
 - Low dose because replication amplifies dose in vivo
 - Single shot administration
- **Standard refrigeration required for shipping and storage**

*TNX-801 and TNX-1850 are in the pre-IND stage of development and has not been approved for any indication. Patents filed.
 †Noyce RS, et al. Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments. PLoS One. 2018;Jan 19;13(1):e0188453.
 ‡Brennan, Z. Endpoints March 2, 2022 (<https://endpts.com/weaker-omicron-variant-is-great-news-for-the-world-but-bad-news-for-covid-related-clinical-trials/>)

Monkeypox and Smallpox Vaccine

Status: Preclinical

- TNX-801 is a cloned version of horsepox¹ (without any insert) purified from cell culture

Next Steps: Developing GMP manufacturing; Initiate Phase 1 Trial 2H 2023

COVID-19 Vaccine

Status: Preclinical

- First version TNX-1800 encodes spike protein from SARS-CoV-2, Wuhan strain
- Planned new version TNX-1850 encode spike protein from SARS-CoV-2 BA.2 strain²

Next Steps: Developing TNX-1850 (BA.2) version

TNX-801*
schHPXV (Horsepox)
212,811 bp



TNX-1800
rHPXV/SARS-CoV-2 S
210,963 bp



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Additional Infectious Disease Therapeutics in Development

TNX-2300*: Live Virus Vaccine Based on Bovine Parainfluenza (BPI) Virus

Market Entry: COVID-19 Vaccine

Status: Preclinical

Next Steps: Animal studies with Kansas State University (KSU) to test the effect of co-expression of CD40-ligand to stimulate T cell immunity

TNX-3600*: (Fully Human Monoclonal Antibody Platform) and TNX-3800 (Humanized Mouse Monoclonal Antibodies)

Market Entry: COVID-19 Therapeutic and Preventative for Immuno-compromised Individuals

Status: Preclinical

Next Steps: Study inhibition of SARS CoV-2 variants in tissue culture; initiate animal studies

TNX-3700*: Zinc Nanoparticle (ZNP) Formulation for mRNA Vaccines

Market Entry: Booster for COVID-19 Vaccines

Status: Preclinical

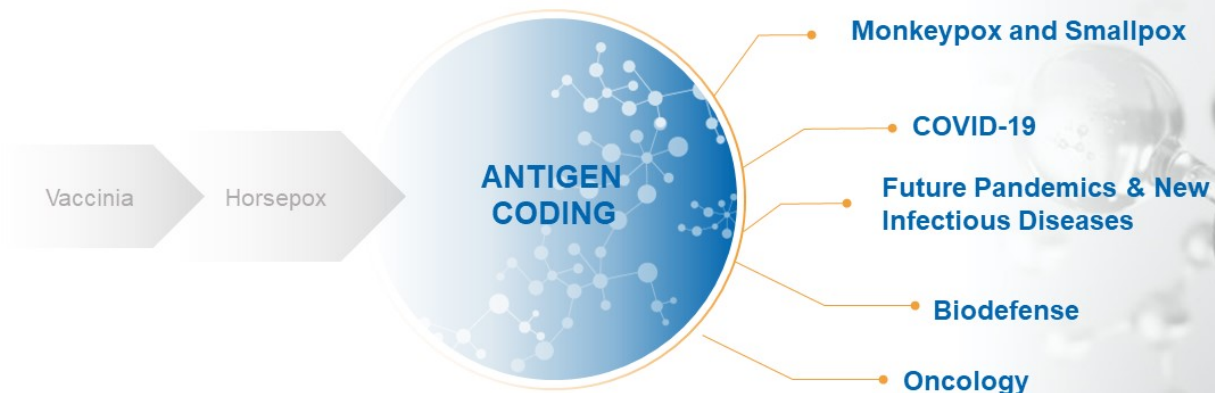
Next Steps: Research at KSU on CoV-2 spike based vaccine in tissue culture and animals; initiate animal studies

*TNX-2300, TNX-3600 and TNX-3700 are in the pre-IND stage of development and has not been approved for any indication.

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Live Virus Vaccine Platform: Recombinant Pox Vaccine (RPV) Technology for Emerging Infectious Diseases and Oncolytics



RPV VECTOR BELIEVED SIMILAR TO EDWARD JENNER'S VACCINE¹⁻³

Using Proven Science To Address Challenging Disease States, We Have Created A Programmable Technology Platform Aimed At Combating Future Threats To Public Health

¹Shrick, L. N Engl J Med 2017; 377:1491-1492. DOI: 10.1056/NEJMc1707600
²Esparza, J. Vaccine. 2020 Jun 19; 38(30): 4773-4779. doi: 10.1016/j.vaccine.2020.05.037
³Brinkmann, A. Genome Biol. 2020; 21: 286. doi: 10.1186/s13059-020-02202-0

Internal Development & Manufacturing Capabilities

Infectious Disease R&D Center (RDC) – Frederick, MD

- **Function:** Accelerated development of vaccines and antiviral drugs against COVID-19, its variants and other infectious diseases
- **Description:** ~48,000 square feet, BSL-2 with some areas designated BSL-3
- **Status:** Operational



Advanced Development Center (ADC) – North Dartmouth, MA

- **Function:** Development and clinical scale manufacturing of biologics
- **Description:** ~45,000 square feet, BSL-2
- **Status:** Operational



Commercial Manufacturing Center (CMC) – Hamilton, MT

- **Function:** Phase 3 and Commercial scale manufacturing of biologics
- **Description:** ~44-acre green field site, planned BSL-2
- **Status:** Planning for site enabling work in 2023



Architectural Rendering

FUTURE OUTLOOK

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Management Team



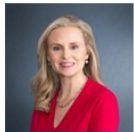
Seth Lederman, MD
Co-Founder, CEO & Chairman



Gregory Sullivan, MD
Chief Medical Officer



Bradley Saenger, CPA
Chief Financial Officer



Jessica Morris
Chief Operating Officer



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Milestones: Recently Completed and Upcoming*

- ✓ 2nd Quarter 2022 Phase 3 RESILIENT study start of TNX-102 SL for the management of fibromyalgia
- ✓ 3rd Quarter 2022 Phase 2 PREVAIL study start of TNX-102 SL for the treatment of Long COVID

Expected Data

- 2nd Quarter 2023 Interim analysis results of Phase 3 RESILIENT study of TNX-102 SL in fibromyalgia
- 3rd Quarter 2023 Interim analysis results of Phase 2 PREVAIL study of TNX-102 SL in Long COVID

Expected Clinical Trial Initiations

- 1st Quarter 2023 Phase 2 study start of TNX-1900 for the treatment of migraine
- 1st Quarter 2023 Phase 2 study start of TNX-1300 for the treatment of cocaine intoxication
- 1st Quarter 2023 Phase 2 study start of TNX-601 ER for the treatment of major depressive disorder
- 2nd Quarter 2023 Phase 2 study start of TNX-102 SL for the treatment of PTSD
- 2nd Quarter 2023 Phase 1 study start of TNX-1500 for prevention of allograft rejection
- 2nd Half 2023 Phase 1 study start of TNX-801 for prevention of monkeypox and smallpox

*We cannot predict whether the global COVID-19 pandemic will impact the timing of these milestones.

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THANK YOU

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