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): February 1, 2023

TONIX PHARMACEUTICALS HOLDING CORP.

(Exact name of registrant as specified in its charter)

Nevada	**001-36019**	**26-1434750**
(State or Other Jurisdiction of Incorporation)	**(Commission File Number)**	**(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 February 1, 2023, Tonix Pharmaceuticals Holding Corp. (the "Company") announced that it entered into a sponsored research agreement with the University of Maryland, Baltimore ("UMB") for the prevention of rejection in heart xenograft transplantation in animals utilizing the Company's TNX-1500 product candidate, an Fc-modified humanized monoclonal antibody directed against CD40-ligan. 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 February 1, 2023, the Company announced that it entered into a sponsored research agreement with the UMB for the prevention of rejection in heart xenograft transplantation in animals utilizing TNX-1500. The Company believes that a positive result from the preclinical research study may potentially help support an Investigational New Drug ("IND") application and human clinical studies of TNX-1500. The primary objective of the preclinical research study is to study the activity of TNX-1500 in preventing cardiac xenograft rejection in animals to support an IND application for human studies. UMB's preclinical studies will utilize genetically-modified porcine hearts. Muhammad M. Mohiuddin, M.D., MBBS, Professor of Surgery, and Director, Cardiac Xenotransplantation Program, University of Maryland School of Medicine, is the principal investigator.

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 February 1, 2023
99.02	Corporate Presentation by the Company for February 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: February 1, 2023

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

Exhibit 99.01

Tonix Pharmaceuticals Announces Research Agreement with University of Maryland, Baltimore, to Study TNX-1500 (Fc-modified anti-CD40L mAb) for the Prevention of Rejection in Heart Xenograft Transplantation in Animals

Research Study to Assess the Role of TNX-1500 in the Prevention of Heart Xenograft Rejection

Preclinical Xenotransplantation Studies are Expected to Support Regulatory Filings for TNX-1500

CHATHAM, N.J., February 1, 2023 – Tonix Pharmaceuticals Holding Corp. (Nasdaq: TNXP) (Tonix or the Company), a clinical-stage biopharmaceutical company, today announced that it has entered into a sponsored research agreement with the University of Maryland, Baltimore (UMB), for the prevention of rejection in heart xenograft transplantation in animals utilizing TNX-1500[1], an Fc-modified humanized monoclonal antibody directed against CD40-ligand. UMB's preclinical studies will utilize genetically-modified porcine hearts supplied by Revivicor, Inc., a subsidiary of United Therapeutics Corporation. The principal investigator is Muhammad M. Mohiuddin, M.D., MBBS, Professor of Surgery, and Director, Cardiac Xenotransplantation Program, University of Maryland School of Medicine.

"We are excited to collaborate with the University of Maryland and Dr. Mohiuddin on the development of TNX-1500 for the prevention of rejection in xenograft transplantation," said Seth Lederman, M.D., Chief Executive Officer of Tonix Pharmaceuticals. "TNX-1500 is a third generation anti-CD40L monoclonal antibody that has been designed by protein engineering to decrease FcγRII binding and to reduce the potential for thrombosis. Previous preclinical studies in non-human primates demonstrated that TNX-1500 showed activity in preventing allograft and xenograft organ rejection and was well tolerated. A positive result from this study would potentially help support an Investigational New Drug (IND) application and human clinical studies."

"Despite exciting advancements in the field of xenotransplantation, better therapeutics are needed to prevent xenograft organ rejection," said Dr. Mohiuddin. "Several lines of research indicate that anti-CD40L is required for long term xenograft acceptance. We are excited to collaborate in support of developing an effective immunosuppression regimen for patients requiring xenograft transplantation."

The primary objective of the preclinical research study is to study the activity of TNX-1500 in preventing cardiac xenograft rejection in animals to support an IND application for human studies.

About TNX-1500

TNX-1500 (Fc-modified anti-CD40L mAb) is a humanized monoclonal antibody that interacts with the CD40-ligand (CD40L), which is also known as CD154. TNX-1500 is being developed for the prevention of allograft and xenograft rejection, for the treatment of autoimmune diseases and for the prevention of graft-versus-host disease (GvHD) after hematopoietic stem cell transplantation (HCT). A Phase 1 study of TNX-1500 is expected to be initiated in the second quarter of 2023. TNX-1500 is a third generation anti-CD40L mAb that has been designed by protein engineering to decrease FcγRII binding and to reduce the potential for thrombosis. In June 2022, Tonix announced data from three oral presentations at the 2022 American Transplant Congress of animal studies found that TNX-1500 showed activity in preventing organ rejection and was well tolerated in non-human primates. In those studies, blockade of CD40L with TNX-1500 monotherapy consistently and safely prevented pathologic alloimmunity in non-human primate models of cardiac and kidney allograft transplantation without clinical thrombosis. Copies of the presentations are available under Scientific Presentations on the Tonix Pharmaceuticals corporate website at www.tonixpharma.com.

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[1] *TNX-1500 is a biologic at the pre-IND stage of development and has not been approved for any indication*

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. 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 second 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 second quarter 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

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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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Exhibit 99.02

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.

TONIX PHARMACEUTICALS

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.**

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 approximately **$120 M in cash and cash equivalents** as of 12/31/22. Tonix has no debt.

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 - *FDA Breakthrough Designation*	Mid-Phase 2, Targeted 2Q 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 - *FDA Orphan Drug Designation*	Preclinical
TNX-1500[9]	Organ Transplant Rejection/ Autoimmune Conditions	Phase 1, Targeted 2Q 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.*
[1]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.
[2]Post-Acute Sequelae of COVID-19.
[3]TNX-1300 (double-mutant cocaine esterase) was licensed from Columbia University.
[4]Acquired 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.
[5]A 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
[6] Phase 1 trial for formulation development was completed outside of the U.S; Phase 2 expected to start 1Q 2023
[7]Acquired from TRImaran Pharma; license agreement with Wayne State University
[8]Co-exclusive license agreement with French National Institute of Health and Medical Research (Inserm)
[9]anti-CD40L humanized monoclonal antibody
[10]Recombinant trefoil factor 2 (rTFF2) based protein; licensed from Columbia University
[11]Live attenuated vaccine based on horsepox virus
[12]Live attenuated vaccine based on horsepox virus vector, expressed SARS-CoV-2 spike protein. TNX-1850 is based on the BA.2 variant spike protein.
[13]Live attenuated vaccine based on bovine parainfluenza (BPI) virus
[14]Fully human monoclonal antibody generated from COVID-19 convalescent patients
[15]COVID vaccine based on mRNA in zinc nanoparticle (ZNP) formulation with CD40L molecular trigger
[16]Humanized monoclonal antibody generated from mice immunized with SARS-CoV02 spike protein

TONIX PHARMACEUTICALS

Four CNS drugs[1] entering Phase 2 trials in 1H23
Three Potential Pivotal Studies in addition to two enrolling studies

CNS PORTFOLIO

- **In Phase 3:**
  - TNX-102 SL for fibromyalgia (>50% enrolled) — Potential Pivotal Study
- **In Phase 2:**
  - TNX-102 SL for fibromyalgia-type Long COVID

- **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

[1]Not approved for any indication

TONIX PHARMACEUTICALS

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-HT2A, 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: Trial enrollment is in process

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

TONIX PHARMACEUTICALS

TNX-102 SL*: Fibromyalgia
Cyclobenzaprine Protectic® Sublingual Tablets

CNS PORTFOLIO

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 women[1]
- 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

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.

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

TONIX PHARMACEUTICALS

CNS PORTFOLIO

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)*

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

Placebo once-daily at bedtime

14 weeks

TONIX PHARMACEUTICALS

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

CNS PORTFOLIO

PROFILE

- Occurs in approximately 13% of recovered COVID-19 patients[1]
- 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: Trial enrollment is in process

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

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

TONIX PHARMACEUTICALS

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

CNS PORTFOLIO

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 needed[3]

Patents Issued

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: Initiate Phase 2 trial 2Q 2023

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

[1]Goldstein 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.
[2]Pietrzak 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.
[3]Cain, C. K., et al. Targeting memory processes with drugs to prevent or cure PTSD. Expert Opin Investig Drugs. 2012; 21(9), 1323-1350

TONIX PHARMACEUTICALS

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

CNS PORTFOLIO

PROFILE

Cocaine is the main cause for drug-related ED visits[1]

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 trial 2Q 2023 pending FDA agreement

- Single-blind, placebo (+ usual care) controlled, randomized, potentially pivotal study
- Expected to enroll approximately 60 emergency department patients at sites in the US

FDA Breakthrough Therapy Designation

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

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

TONIX PHARMACEUTICALS

 *TNX-1300 has not been approved for any indication.

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

CNS PORTFOLIO

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
- 6-week treatment period
- 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.

TONIX PHARMACEUTICALS

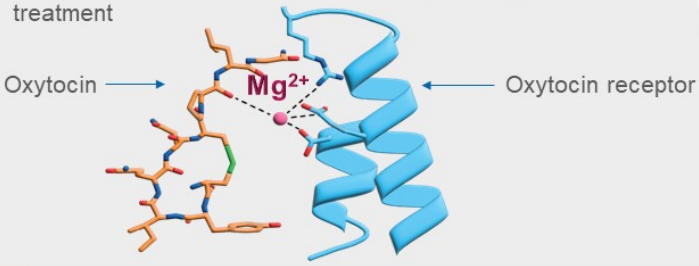
TNX-1900*: Migraine
Intranasal Potentiated Oxytocin (OT) with Magnesium

CNS PORTFOLIO

PROFILE

- Intranasal OT has potential utility in treating migraine[1]
- 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 ready[4]

Next Steps: Investigator initiated Phase 2 trial in binge eating disorder 1Q 2023

Phase 2 trial in migraine 1Q 2023:

- Double-blind, placebo-controlled (three arms– two treatment regimens and one placebo), randomized
- 12 weeks of double-blind treatment with a 2-week follow-up safety phase
- Expected to enroll approximately 300 patients across 25 sites in the US

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

[1]Tzabazis A, et al. Oxytocin and Migraine Headache. Headache. 2017 May;57 Suppl 2:64-75. doi: 10.1111/head.13082. PMID: 28485846.
[2]Antoni 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.
[3]Meyerowitz, 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)
[4]A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900

TONIX PHARMACEUTICALS

TONIX PHARMACEUTICALS

RARE DISEASE: KEY CANDIDATES

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:

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Hyperphagia in Prader-Willi Syndrome

Additional Indications: Rare Hyperphagia Conditions

Status: Pre-IND

Next Steps: IND preparation

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

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

TONIX PHARMACEUTICALS

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 (FcγR)

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

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

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

Prevention of Allograft Rejection

Status: Preclinical

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

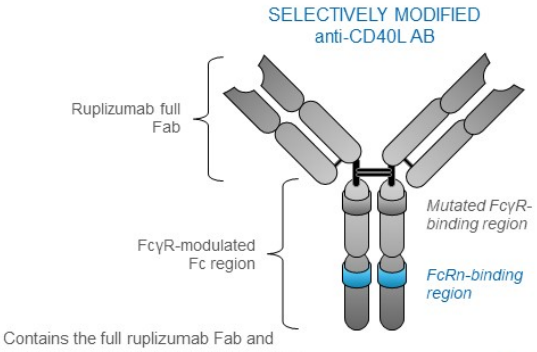
Next Steps: Initiate Phase 1 study 2Q 2023

Autoimmune Diseases

Status: Potential future indications include:

Sjögren's Syndrome, Systemic Lupus Erythematosus

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



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

TONIX PHARMACEUTICALS

Other anti-CD40L Monoclonal Antibodies in Development

UCB (Co-developed with Biogen) – Systemic Lupus Erythematosus (SLE)

- Phase 3 Trial Currently Enrolling (NCT04294667)
  - Topline results expected 1H 2024[1]
- Dapirolizumab pegol (pegylated Fab)

Horizon (Agreed to be acquired by Amgen) – Sjögren's Syndrome (SjS)

- Two Positive Phase 2 studies reported[2,3]
- Dazodalibep (tn03 fusion protein)

Sanofi – Sjögren's Syndrome (SjS), Multiple Sclerosis (MS), Systemic Lupus Erythematosus (SLE)

- Phase 2 Trial Currently Enrolling in SjS (NCT04572841) and SLE (NCT05039840)
- Active Phase 2 Trial in Relapsing MS (NCT04879628)
- SAR441344 (Fc-modified)

Eledon – Amyotrophic Lateral Sclerosis (ALS) and Kidney Transplant

- Phase 2 Trial Completed in ALS (NCT04322149)
- Phase 1/2 Trial Currently Enrolling in Kidney Transplant (NCT05027906)
- Tegoprubart, f.k.a. AT-1501 (Fc-modified)

[1]https://www.ucb.com/our-science/pipeline
[2]https://ir.horizontherapeutics.com/news-releases/news-release-details/horizon-therapeutics-plc-announces-phase-2-trial-evaluating
[3]https://ir.horizontherapeutics.com/news-releases/news-release-details/horizon-therapeutics-plc-announces-phase-2-trial-evaluating-0

IMMUNOLOGY PORTFOLIO

TONIX PHARMACEUTICALS

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

Patents Filed

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

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

IMMUNOLOGY PORTFOLIO

TONIX PHARMACEUTICALS

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.

[1]Noyce RS, et al. Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments. PLoS One. 2018 Jan 19;13(1):e0188453.

[2]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 horsepox[1] (without any insert) purified from cell culture

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

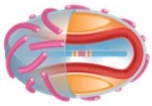
COVID-19 Vaccine

Status: Preclinical

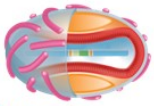
- First version TNX-1800 encodes spike protein from SARS-CoV-2, Wuhan strain
- Planned new version TNX-1850 encode spike protein from SARS-CoV-2 BA.2 strain[2]

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

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



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



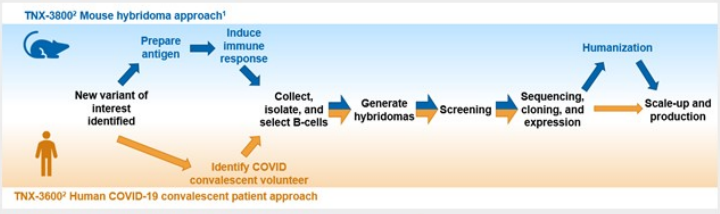
TONIX PHARMACEUTICALS

TNX-3600*: COVID-19 Therapeutic/Preventative
Fully Human Monoclonal Antibody

INFECTIOUS DISEASE PORTFOLIO

PROFILE

- Fully human monoclonal antibodies
- Generated from SARS-CoV-2+ asymptomatic individuals or COVID-19 convalescent patients
- Potential to be scaled up quickly and combined with other monoclonal antibodies
- Collaboration with Columbia University



Patents Filed

DEVELOPMENT PROGRAM

Market Entry: COVID-19 treatment and prophylaxis in immuno-compromised individuals

Status: Preclinical

Next Steps: Study inhibition of SARS CoV-2 variants in tissue culture; initiate animal studies in 1H 2023

Differentiators: Potential to decrease response time to newly identified COVID-19 variants, relative to generating murine mAbs followed by humanization

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

[1]Lu R-M, Hwang Y-C, Liu IJ, et al. Development of therapeutic antibodies for the treatment of diseases. J Biomed Sci. 2020;27(1):1. doi:10.1186/s12929-019-0592-z

[2]TNX-3600 and TNX-3800 are the designations for a series of monoclonal antibodies; each is in the pre-IND stage of development and has not been approved for any indication.

TONIX PHARMACEUTICALS

TNX-3800*: COVID-19 Therapeutic/Preventative
Humanized Mouse Monoclonal Antibodies

PROFILE

- Humanized monoclonal antibodies
- Generated from mice immunized with SARS-CoV-2 spike protein
- Exclusive license from Curia Global, Inc.

Differentiators: To date, EUA-approved products have been derived from the blood of COVID-convalescent patients or a humanized mouse[1,2]

Relative to fully humanized mAbs:

- Murine mAbs discovered by Curia and licensed by Tonix represent a potential new approach to treating SARS-CoV-2 infection
- Murine mAbs have the potential to neutralize a broader spectrum of SARS-CoV-2 variants and may be more difficult to evade as we face expanding variant pool from both convergent and divergent evolution[3]

Patents Filed

DEVELOPMENT PROGRAM

Market Entry: COVID-19 treatment and prophylaxis in immuno-compromised individuals

Status: Preclinical

Next Steps: Study inhibition of SARS CoV-2 variants in tissue culture; initiate animal studies in 1H 2023

*TNX-3800 is in the pre-IND stage of development and has not been approved for any indication.

[1]Hansen J et al. Science. 2020 Aug 21;369(6506):1010-1014. Doi: 10.1126/science.abd0827
[2]Asdaq, S.M.B. et al. A Patent Review on the Therapeutic Application of Monoclonal Antibodies in COVID-19. Int. J. Mol. Sci. 2021, 22, 11953. https://doi.org/10.3390/ijms222111953
[3]Callaway, E. Oct 28 2022. Nature (News). COVID 'variant soup' is making winter surges hard to predict: Descendants of Omicron are proliferating worldwide — and the same mutations are coming up again and again. www.nature.com/articles/d41586-022-03445-6

Additional Infectious Disease Therapeutics in Development

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

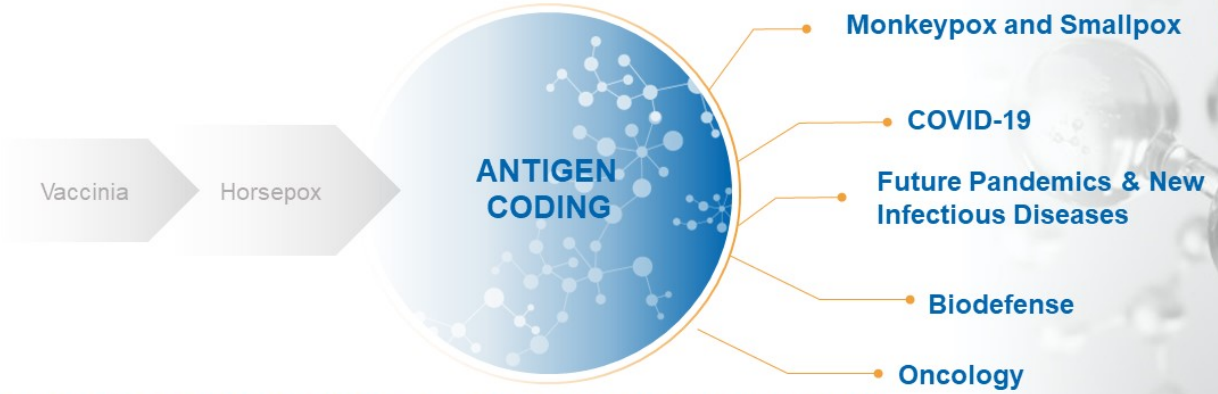
Market Entry: COVID-19 Vaccine
Status: Preclinical
Next Steps: Animal studies with Kansas State University (KSU) to test the effect of co-expression of CD40-ligand to stimulate T cell immunity

TNX-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 in 1H 2023

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

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



RPV VECTOR BELIEVED SIMILAR TO EDWARD JENNER'S VACCINE[1-3]

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

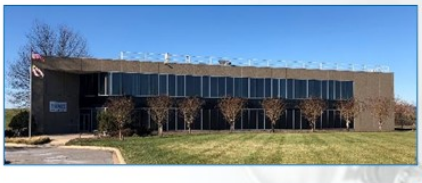
[1]Shrick, L. N Engl J Med 2017; 377:1491-1492. DOI: 10.1056/NEJMc1707600
[2]Esparza, J. Vaccine. 2020 Jun 19; 38(30): 4773–4779. doi: 10.1016/j.vaccine.2020.05.037
[3]Brinkmann, A. Genome Biol. 2020; 21: 286. doi: 10.1186/s13059-020-02202-0

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

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

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

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-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 Quarter 2023 Phase 2 study start of TNX-1300 for the treatment of cocaine intoxication
- ❑ 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.

TONIX PHARMACEUTICALS

THANK YOU