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): March 17, 2021

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.)**

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

Registrant's telephone number, including area code: (212) 980-9155

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 Global 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 March 17, 2021, Tonix Pharmaceuticals Holding Corp. (the "Company") issued a press release announcing positive COVID-19 efficacy results in non-human primates vaccinated with its TNX-1800 vaccine candidate and challenged with live SARS-CoV-2. A copy of the press release is furnished as Exhibit 99.01 hereto and incorporated herein by reference.

The Company also updated its investor presentations, which are 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. Copy of the presentations are filed as Exhibits 99.02 and 99.03 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, 99.02 and 99.03 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 March 17, 2021, the Company announced preliminary results following vaccination of non-human primates with TNX-1800 (modified horsepox virus, live vaccine), a live attenuated COVID-19 vaccine candidate engineered to express the SARS-CoV-2 (CoV-2) spike protein. Immunogenicity and protective efficacy of single-dose TNX-1800 were assessed at two dose levels (n=4 per group). At Day 41 after the vaccination, animals were challenged with live SARS-CoV-2 through intra-nasal and intra-tracheal routes. Protection was assessed at Day 47, six days after challenge. The research is part of an ongoing collaboration between Southern Research, the University of Alberta and Tonix. All eight animals vaccinated with TNX-1800 had undetectable SARS-CoV-2 in their upper and lower airways 6 days after challenge with SARS-CoV-2

Key features and results:

- **STUDY DESIGN**: This study of non-human primates compared TNX-1800 (modified horsepox virus encoding CoV-2 spike protein) to TNX-801 (horsepox virus, live vaccine) at two doses. Also a control group received a placebo. Each of these five groups (TNX-1800 high and low dose; TNX-801 high and low dose and placebo) included four animals.

- **CoV-2 CHALLENGE**: At day 41 after vaccination (or placebo), each animal was exposed to SARS-COV-2 by intra-tracheal (1 x 10^6 $TCID_{50}$) and intra-nasal (1 x 10^6 $TCID_{50}$) administration.
- **DETECTION OF SARS-COV-2 in Upper and Lower Airway**: Upper airway virus was studied by oropharyngeal swabs and lower airway virus by tracheal lavage using qRT-PCR to determine the number of genome copies of SARS-CoV-2 present in the samples. Six days after challenge, no (0/8) samples taken from animals vaccinated with TNX-1800 showed infection (more than 1,000 genome copies of SARS CoV-2) in either upper or lower airway samples. In contrast, all (8/8) animals vaccinated with the control vaccine TNX-801 showed infection in either the upper or lower airway samples as did all (4/4) monkeys vaccinated with vehicle control.
- **NEUTRALIZING ANTI-CoV-2 ANTIBODIES** : At day 14 after a single vaccination, all eight of the TNX-1800 vaccinated animals made anti-CoV-2 neutralizing antibodies (≥1:40 titer) and, as expected, none of the eight TNX-801 vaccinated control animals, or any of the four animals in the placebo group made anti-CoV-2 neutralizing antibodies (≤1:10 titer). At 6 days after CoV-2 challenge, TNX-1800 vaccinated animals showed neutralizing antibody titers of (≥1:1280 titer). The level of neutralizing anti-CoV-2 antibody production was similar between the low and high dose TNX-1800 groups (1 x 10^6 Plaque Forming Units [PFU] and 3 x 10^6 PFU, (respectively). For unvaccinated animals challenged with SARS-CoV-2, neutralizing antibodies were measurable after vaccination (≥1:40 titer) that were lower and appeared later than neutralizing antibodies in TNX-1800 vaccinated animals.
- **TOLERABILITY**: TNX-1800 and TNX-801 were well tolerated at both doses.
- **SKIN *TAKE* BIOMARKER**: Further, as an expected additional outcome, all 16 animals vaccinated with either dose of TNX-1800 or the control TNX-801 manifested a "take", or cutaneous response, signaling that the horsepox vector elicits a strong T cell immune response.
- **DOSE:** These results support the expectation that TNX-1800 at the low dose of 1 x 10^6 PFU is an appropriate dose for a one-shot vaccine in humans and indicate that 100 doses per vial is the target format for commercialization, which is well suited to manufacturing and distribution at large scale.

- **CONCLUSIONS**: Together, these data show that TNX-1800 induces protection against SARS-COV-2 infection in non-human primates. These data confirm that "take" is a biomarker of protection of upper and lower airways from SARS-CoV-2 challenge, and a biomarker of immunological response to TNX-1800's cargo COVID-19 antigen, which is the CoV-2 spike protein.
- **NEXT PHASE**: Phase 1 human study targeted to start in the second half of 2021, following Investigational New Drug (IND) clearance by the U.S. Food and Drug Administration (FDA) and the production of GMP material.

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 results of the Phase 3 RELIEF study, 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 March 17, 2021
99.02	Corporate Presentation by the Company for March 2021
99.03	Abbreviated Corporate Presentation by the Company for March 2021

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: March 17, 2021

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

Exhibit 99.01

Tonix Pharmaceuticals Reports Positive COVID-19 Vaccine Efficacy Results in Non-Human Primates Vaccinated with TNX-1800 and Challenged with Live SARS-CoV-2

Vaccine Candidate TNX-1800 Protected Both Upper and Lower Airways After Challenge with SARS-CoV-2, Suggesting an Ability to Block Forward Transmission

TNX-1800 is Based on a Proprietary Vaccine Platform Designed to Stimulate Long Term T cell Immunity

CHATHAM, N.J., March 17, 2021 - Tonix Pharmaceuticals Holding Corp. (Nasdaq: TNXP) (Tonix or the Company), a clinical-stage biopharmaceutical company, today announced preliminary results following vaccination of non-human primates with TNX-1800 (modified horsepox virus, live vaccine), a live attenuated COVID-19 vaccine candidate engineered to express the SARS-CoV-2 (CoV-2) spike protein. Immunogenicity and protective efficacy of single-dose TNX-1800 were assessed at two dose levels (n=4 per group). At Day 41 after the vaccination, animals were challenged with live SARS-CoV-2 through intra-nasal and intra-tracheal routes. Protection was assessed at Day 47, six days after challenge. The research is part of an ongoing collaboration between Southern Research, the University of Alberta and Tonix.

“We are pleased that all eight animals vaccinated with TNX-1800 had undetectable SARS-CoV-2 in their upper and lower airways 6 days after challenge with SARS-CoV-2,” said Seth Lederman, M.D., President and Chief Executive Officer of Tonix Pharmaceuticals. “Today’s results are from the second phase of a study in which TNX-1800 vaccinated and control animals were challenged with SARS-CoV-2. Last Fall, we reported that all eight of animals vaccinated manifested ‘takes’, a skin reaction to horsepox vaccination which is a validated biomarker of functional T cell immunity, and that vaccination was associated with neutralizing antibodies in each case. The positive results of the protection from live CoV-2 challenge that we are reporting today validate the capacity for TNX-1800 to protect against COVID-19, and also validate the ‘take’ after TNX-1800 vaccination as a biomarker for functional T cell immunity.”

Dr. Lederman continued, “ ’Take‘ is considered important because it is otherwise difficult and costly to measure the T cell response to a vaccine. Vaccines that elicit a strong T cell response, like horsepox and closely related vaccinia, have been established to provide long-term, durable immunity and to block forward transmission. Single dose horsepox and vaccinia vaccination led to the eradication of smallpox, which, like CoV-2 is transmitted by the respiratory route. In the successful campaign to eradicate smallpox, ‘take’ was used as a biomarker for protective immunity. We believe the absence of detectable CoV-2 in the upper or lower airways shows the potential for TNX-1800 to decrease shedding of virus and is consistent with decreased transmission.”

“Although many successful vaccines have been put into use around the world, much remains unknown about COVID-19, its emerging variants, and the durability of current vaccines,” Dr. Lederman continued “We designed TNX-1800 as a single dose vaccine using a vector known to provide long term T cell immunity. This was originally demonstrated by the vector’s use as the backbone of Edward Jenner’s smallpox vaccine which typically provided lifetime immunity with a single dose. Moreover, by preventing forward transmission of the smallpox virus, it became a defining force in establishing herd immunity .Like Jenner’s smallpox vaccine, TNX-1800 can be scaled up for manufacturing and will not require a costly and cumbersome cold chain for distribution and storage. It will also be glass-sparing, with 100 doses filled per vial. These features, coupled with the results announced today, encourage us to advance TNX-1800 to human Phase 1 trials in the second half of 2021 when we expect to have Good Manufacturing Practice, or cGMP, quality TNX-1800 available.”

The Company believes the findings also demonstrate the flexibility of the horsepox vaccine platform and its capability to be tailored to other diseases of interest in military and civilian populations.

Key features and results:

- **STUDY DESIGN**: This study of non-human primates compared TNX-1800 (modified horsepox virus encoding CoV-2 spike protein) to TNX-801 (horsepox virus, live vaccine) at two doses. Also a control group received a placebo. Each of these five groups (TNX-1800 high and low dose; TNX-801 high and low dose and placebo) included four animals.
- **CoV-2 CHALLENGE**: At day 41 after vaccination (or placebo), each animal was exposed to SARS-COV-2 by intra-tracheal (1×10^6 $TCID_{50}$) and intra-nasal (1×10^6 $TCID_{50}$) administration.
- **DETECTION OF SARS-COV-2 in Upper and Lower Airway**: Upper airway virus was studied by oropharyngeal swabs and lower airway virus by tracheal lavage using qRT-PCR to determine the number of genome copies of SARS-CoV-2 present in the samples. Six days after challenge, no (0/8) samples taken from animals vaccinated with TNX-1800 showed infection (more than 1,000 genome copies of SARS CoV-2) in either upper or lower airway samples. In contrast, all (8/8) animals vaccinated with the control vaccine TNX-801 showed infection in either the upper or lower airway samples as did all (4/4) monkeys vaccinated with vehicle control.
- **NEUTRALIZING ANTI-CoV-2 ANTIBODIES**: At day 14 after a single vaccination, all eight of the TNX-1800 vaccinated animals made anti-CoV-2 neutralizing antibodies (≥1:40 titer) and, as expected, none of the eight TNX-801 vaccinated control animals, or any of the four animals in the placebo group made anti-CoV-2 neutralizing antibodies (≤1:10 titer). At 6 days after CoV-2 challenge, TNX-1800 vaccinated animals showed neutralizing antibody titers of (≥1:1280 titer). The level of neutralizing anti-CoV-2 antibody production was similar between the low and high dose TNX-1800 groups (1×10^6 Plaque Forming Units [PFU] and 3×10^6 PFU, (respectively). For unvaccinated animals challenged with SARS-CoV-2, neutralizing antibodies were measurable after vaccination (≥1:40 titer) that were lower and appeared later than neutralizing antibodies in TNX-1800 vaccinated animals.
- **TOLERABILITY**: TNX-1800 and TNX-801 were well tolerated at both doses.
- **SKIN *TAKE* BIOMARKER**: Further, as an expected additional outcome, all 16 animals vaccinated with either dose of TNX-1800 or the control TNX-801 manifested a “take”, or cutaneous response, signaling that the horsepox vector elicits a strong T cell immune response.
- **DOSE:** These results support the expectation that TNX-1800 at the low dose of 1×10^6 PFU is an appropriate dose for a one-shot vaccine in humans and indicate that 100 doses per vial is the target format for commercialization, which is well suited to manufacturing and distribution at large scale.
- **CONCLUSIONS**: Together, these data show that TNX-1800 induces protection against SARS-COV-2 infection in non-human primates. These data confirm that “take” is a biomarker of protection of upper and lower airways from SARS-CoV-2 challenge, and a biomarker of immunological response to TNX-1800’s cargo COVID-19 antigen, which is the CoV-2 spike protein.
- **NEXT PHASE**: Phase 1 human study targeted to start in the second half of 2021, following Investigational New Drug (IND) clearance by the U.S. Food and Drug Administration (FDA) and the production of GMP material.

Anthony Macaluso, Ph.D., Executive Vice President, Strategic Development at Tonix said,"In addition to their impact on the development of a COVID-19 vaccine, these data also demonstrate the utility of horsepox as a vaccine platform that can be used to address many other diseases of interest to the military and the general public. The horsepox platform has the following attributes favorable for vaccine development: strong induction of both B and T cell immunity; amenability to genetic modification; and the ability to express multiple genes, either alone or in combination. In addition, the horsepox vaccine platform allows for rapid scalability of manufacturing, which is a key advantage of the horsepox virus over other platforms such as non-replicating viruses, DNA/RNA, or protein subunit vaccines."

About TNX-1800

TNX-1800 is a live modified horsepox virus vaccine for percutaneous administration that is designed to express the Spike protein of the SARS-CoV-2 virus and to elicit a predominant T cell response. Horsepox and vaccinia are closely related orthopoxviruses that are believed to share a common ancestor. Tonix's TNX-1800 vaccine candidate is administered percutaneously using a two-pronged, or "bifurcated" needle. TNX-1800 is based on a horsepox vector, which is a live replicating, attenuated virus that elicits a strong immune response. The major cutaneous reaction or "take" to vaccinia vaccine was described by Dr. Edward Jenner in 1796 and has been used since then as a biomarker for protective immunity to smallpox, including in the World Health Organization's accelerated smallpox eradication program that successfully eradicated smallpox in the 1960's. The "take" is a measure of functional T cell immunity validated by the eradication of smallpox, a respiratory-transmitted disease caused by variola. Tonix's proprietary horsepox vector is believed to be more closely related to Jenner's vaccinia vaccine than modern vaccinia vaccines, which appear to have evolved by deletions and mutations to a phenotype of larger plaque size in tissue culture and greater virulence in mice. Live replicating orthopoxviruses, like vaccinia or horsepox, can be engineered to express foreign genes and have been explored as platforms for vaccine development because they possess; (1) large packaging capacity for exogenous DNA inserts, (2) precise virus-specific control of exogenous gene insert expression, (3) lack of persistence or genomic integration in the host, (4) strong immunogenicity as a vaccine, (5) ability to rapidly generate vector/insert constructs, (6) readily manufacturable at scale, and (7) ability to provide direct antigen presentation. Relative to vaccinia, horsepox has substantially decreased virulence in mice[1]. Horsepox-based vaccines are designed to be single dose, vial-sparing vaccines that can be manufactured using conventional cell culture systems, with the potential for mass scale production and packaging in multi-dose vials.

[1]Noyce RS, et al. (2018) PLoS One. 13(1):e0188453

About Southern Research

Founded in 1941, Southern Research (SR) is an independent, 501(c)(3) nonprofit, scientific research organization with more than 400 scientists and engineers working across three divisions: Drug Discovery, Drug Development, and Engineering. SR has supported the pharmaceutical, biotechnology, defense, aerospace, environmental, and energy industries. SR works on behalf of the National Institutes of Health, the U.S. Department of Defense, the U.S. Department of Energy, NASA and other major aerospace firms, utility companies, and other external academic, industry and government agencies. SR pursues entrepreneurial and collaborative initiatives to develop and maintain a pipeline of intellectual property and innovative technologies that positively impact real-world problems. SR has numerous ongoing drug discovery programs, which encompass drug discovery programs to combat various forms of cancer, Alzheimer's, schizophrenia, opioid use disorder, human immunodeficiency virus, disease, Parkinson's, tuberculosis, influenza, and others. SR's strong history, which includes over 75 years of successful collaborations to solve complex problems, has led to the discovery of seven FDA-approved cancer drugs—a number rivaling any other U.S. research institute. Furthermore, experts at SR are well-equipped to assist with the challenging landscapes of drug design and development technologies and market viability. SR is headquartered in Birmingham, Alabama with additional laboratories and offices in Frederick, Maryland.

Further information about SR can be found athttps://southernresearch.org/

About Tonix Pharmaceuticals Holding Corp.

Tonix is a clinical-stage biopharmaceutical company focused on discovering, licensing, acquiring and developing small molecules and biologics to treat and prevent human disease and alleviate suffering. Tonix's portfolio is primarily composed of central nervous system (CNS) and immunology product candidates. The CNS portfolio includes both small molecules and biologics to treat pain, neurologic, psychiatric and addiction conditions. Tonix's lead CNS candidate, TNX-102 SL[1], is in mid-Phase 3 development for the management of fibromyalgia, and positive data on the RELIEF Phase 3 trial were recently reported. The Company expects interim data from a second Phase 3 study, RALLY, in the third quarter of 2021[2] and topline data in the fourth quarter of 2021. The immunology portfolio includes vaccines to prevent infectious diseases and biologics to address immunosuppression, cancer, and autoimmune diseases. Tonix's lead vaccine candidate, TNX-1800 [3], is a live replicating vaccine based on the horsepox viral vector platform to protect against COVID-19, primarily by eliciting a T cell response. Tonix reported positive efficacy data from animal studies of TNX-1800 in the first quarter of 2021. TNX-801[3], live horsepox virus vaccine for percutaneous administration, is in development to protect against smallpox and monkeypox.

[1]TNX-102 SL is an investigational new drug and has not been approved for any indication.

[2]Pending submission and agreement from FDA on statistical analysis plan.

[3]TNX-1800 and TNX-801 are investigational new 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 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, 2020, as filed with the Securities and Exchange Commission (the "SEC") on March 15, 2021, 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.

Contacts

Jessica Morris (corporate)
Tonix Pharmaceuticals
investor.relations@tonixpharma.com
(862) 904-8182

Olipriya Das, Ph.D. (media)
Russo Partners

Olipriya.Das@russopartnersllc.com
(646) 942-5588

Peter Vozzo (investors)
Westwicke/ICR
peter.vozzo@westwicke.com
(443) 213-0505

Exhibit 99.02

Investor Presentation
NASDAQ:TNXP

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TONIX PHARMACEUTICALS

March 2021

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Cautionary Note on Forward-Looking Statements

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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, risks related to failure to obtain U.S. Food and Drug Administration clearances or approvals and noncompliance with its regulations; our need for additional financing; delays and uncertainties caused by the global COVID-19 pandemic; substantial competition; uncertainties of patent protection and litigation; uncertainties of government or third party payor reimbursement; limited research and development efforts and dependence upon third parties. 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, 2020, as filed with the Securities and Exchange Commission (the "SEC") on March 15, 2021, 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

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Who We Are – Mission And Purpose

Clinical-stage biopharmaceutical company that invents and develops medicines to help patients manage the central nervous system (CNS) and immunology diseases.

"Advancing science to improve patient care and public health"

Our Pipeline – CNS Portfolio

	CANDIDATES	INDICATION	STATUS
CNS Portfolio	**TNX-102 SL[1]**	**Fibromyalgia (FM) - Lead Program**	**Mid-Phase 3 – ongoing**
		PTSD	Phase 3 ready
		Agitation in Alzheimer's	Phase 2 ready
		Alcohol Use Disorder	Phase 2 ready
	TNX-1300[2]	Cocaine Intoxication / Overdose	Phase 2
	TNX-1900[3]	Migraine and Craniofacial Pain	Clinical – pre-IND[4]
	TNX-2900[5]	Prader-Willi Syndrome	Clinical – pre-IND
	TNX-601 CR	Depression, PTSD, Neurocognitive Dysfunction from Corticosteroids	Clinical – pre-IND[6]
	TNX-1600[7]	Depression, PTSD and ADHD	Preclinical

[1]TNX-102 SL (cyclobenzaprine HCl sublingual tablets) is an investigational new drug and has not been approved for any indication.
[2]TNX-1300 (T172R/G173Q double-mutant cocaine esterase 200 mg, i.v. solution) is an investigational new biologic and has not been approved for any indication; licensed from Columbia University.
[3]Acquired from Trigemina; license agreement with Stanford University
[4]A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900
[5]Co-exclusive license agreement with French National Institute of Health and Medical Research (Inserm)
[6]TNX-601 CR is in the pre-IND stage in the U.S.; a Phase 1 trial for formulation development was recently completed outside of the U.S.
[7]Acquired from TRImaran Pharma; license agreement with Wayne State University

Our Pipeline – Immunology & Biodefense Portfolio

	CANDIDATES	INDICATION	STATUS
Immunology Portfolio	**TNX-1800**	**Covid-19 vaccine – Prioritized Program[1]**	**Preclinical**
	TNX-2100	SARS-CoV-2 skin test for T cell immunity[2]	Pre-IND
	TNX-2300	Covid-19 vaccine[3]	Preclinical
	TNX-801	Smallpox and monkeypox preventing vaccine[4]	Preclinical
	TNX-1500	Organ Transplant Rejection/Autoimmune Conditions[5]	Preclinical
	TNX-1700	Gastric and pancreatic cancers[6]	Preclinical
	TNX-701	Radioprotection	Preclinical

[1]Live attenuated vaccine based on horsepox virus vector
[2]*In vivo* diagnostic: SARS-CoV-2 peptide epitope mixtures for intradermal administration to measure delayed-type hypersensitivity to SARS-CoV-2
[3]Live attenuated vaccine based on bovine parainfluenza virus vector; option for license with Kansas State University
[4]Live attenuated vaccine based on horsepox virus
[5]anti-CD40L humanized monoclonal antibody
[6]recombinant trefoil factor 2 (TFF2) based protein; licensed from Columbia University

TNX-102-SL[1]: New Potential Treatment for the Management of Fibromyalgia

[1]TNX-102 SL (cyclobenzaprine HCl sublingual tablets) is an investigational new drug and has not been approved for any indication.

TNX-102 SL FM Lead Program Background on Fibromyalgia

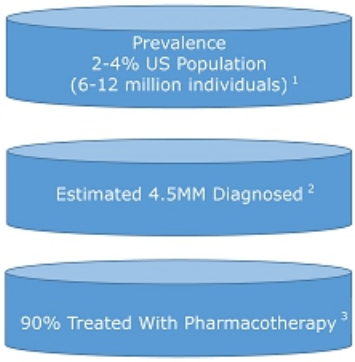
Fibromyalgia (FM):

A chronic condition

Core symptoms:
- widespread pain
- sleep disturbance
- fatigue
- cognitive symptoms.

Significant disabilities (impaired daily function).

Course of disease can last decades



1.American Chronic Pain Association (www.theacpa.org, 2019)
2.Walitt, B., Nahin, R.L., Katz, R.S., Bergman, M.J., Wolfe, F. (2015). The Prevalence and Characteristics of Fibromyalgia in the 2012 National Health Interview Survey. *PLoS One*; 10(0): e0138024.
3. Decision Resources, Fibromyalgia, 2012

Challenges with Current Pharmacotherapy

Limitations of Current Therapies

Fewer than half of those treated for fibromyalgia receive relief from the three FDA-approved drugs[1]
- Lack of overall response leading to discontinuation or augmentation
- Lack of tolerability leading to discontinuation or reduction in dose (underdosing)

Current Treatment Patterns As A Result of Limitations

Switch Rates/Rotation/Discontinuation
- Over 50% of patient starting an FDA approved therapy for FM switch or discontinue therapy after 12 months[2]

Polypharmacy
- Average patient is using 2.6 drugs for treating their fibromyalgia, 50% of patients take 3 or more medications concomitantly[3]

Opioid usage is not uncommon

Market Dissatisfaction

Only 43% of patients indicated that they are satisfied with their medication for FM[5]

1. Frost and Sullivan, 2010
2. Liu et al., 2016
3. Robinson et al., 2012; prospective observational study with 1,700 participants with fibromyalgia.
4. Sarmento et al., J Opioid Manag 2019; 15(6):460-77 – prescription opioid usage among diagnosed FM patients at one site
5. Robinson et al., 2013; prospective observational study with 1,700 participants with fibromyalgia

Fibromyalgia Unmet Need and Ideal Treatment Profile

Unmet Medical Need:

Current treatment patterns indicate that new, more effective, and better-tolerated treatments are necessary for management of FM[1]

Ideal Treatment Profile:

Treats FM as a syndrome

Relief from major symptoms (pain, sleep disturbances, fatigue)
Reduces disability and improves daily living (global function)

Well tolerated with low discontinuation
- Low systemic side-effects
- No daytime somnolence
- No weight gain or impact on sexual function

Suitable for chronic use
- Not scheduled
- Non opioid
- Non abuse potential

Source: 1. Yang, et al, 2016

TNX-102 SL: Engineered to Treat FM

This unique formulation of cyclobenzaprine has been designed to optimize delivery and absorption, while minimizing the potential residual effects of oral formulations of cyclobenzaprine.

Innovative and proprietary Protectic® delivery technology

- Overcomes mucosal absorption barrier
- Allows sublingual (SL) administration to achieves relevant systemic drug exposure
- Stable SL tablet formulation

- **Benefits of sublingual delivery**
  - Rapid drug exposure following nighttime administration
  - Lower daytime exposure
  - Avoids first-pass metabolism
    - Reduces risk of pharmacological interference from major metabolite

No recognized abuse or dependency concerns

TNX-102 SL 5.6 mg: Results from Completed Positive Phase 3 RELIEF Study

Completed Positive Trial in FM:

- Topline results announced in December 2020
- 503 participants randomized across 39 sites in U.S.
- 95% of participants were women

Topline Efficacy Results:

- Achieved statistical significance in the pre-specified primary efficacy endpoint of reducing daily pain (p=0.01)
- Activity shown in key secondary endpoints measuring improvements in sleep and fatigue

Safety:

- Well tolerated; side effects consistent with known side effects of cyclobenzaprine; no new safety signals observed

Positive Phase 3 F304/RELIEF Study: Design

General study characteristics:

- Randomized, double-blind, placebo-controlled study in fibromyalgia in 39 U.S. sites (full sample size N=503)
- Adaptive Design: one unblinded interim analysis based on 50% of randomized participants

TNX-102 SL once-daily at bedtime
5.6 mg (2 x 2.8 mg tablets)[1] *N= 248*

Placebo once-daily at bedtime
N= 255

14 weeks

[1]Two week run- in at 2.8 mg dose at bedtime, followed by 12 weeks at 5.6 mg dose

Primary endpoint (Week 14):

- Daily diary pain severity score change (TNX-102 SL 5.6 mg vs. placebo) from baseline in the weekly average as measured by the numerical rating scale (NRS), using mixed model repeated measures analysis with multiple imputation (MMRM with MI)

Key Secondary endpoints (Week 14):

- Patient Global Impression of Change responder analysis
- Fibromyalgia Impact Questionnaire - Revised (FIQ-R) Symptom Domain score
- FIQ-R Function Domain score
- PROMIS Sleep Disturbance instrument T-score
- PROMIS Fatigue instrument T-score
- Weekly average of the daily diary assessment of sleep quality

Pivotal efficacy study to support NDA approval

F304/RELIEF Study Topline Data: Statistical Significance Achieved on Pre-specified Primary Efficacy Endpoint (p=0.01)

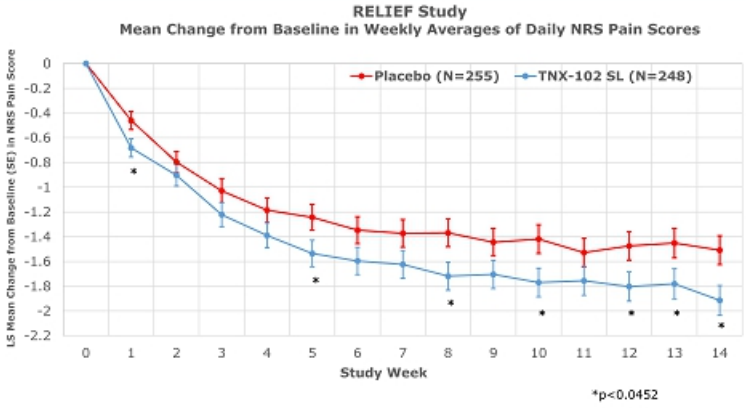
Primary Outcome Measure at Week 14	Placebo (N=255)	TNX-102 SL[2] (N=248)	Treatment Difference	P value
	LS Mean Change from Baseline (SE)	LS Mean Change from Baseline (SE)	Difference in LS Mean Change from Baseline Between TNX-102 SL and Placebo (SE)	
Daily Pain Diary, NRS	-1.5 (0.12)	-1.9 (0.12)	-0.4 (0.16)	**0.010***

Statistical Method: Mixed Model Repeated Measures analysis with Multiple Imputation
*p<0.0452 (requisite p-value hurdle for full study after Interim Analysis)
[1] Same primary endpoint analysis for FDA approvals of Cymbalta® and Lyrica® in fibromyalgia
Abbreviations: LS = least squares; NRS = numeric rating scale; SE = standard error

- Primary efficacy analysis also supported by an exploratory 30% responder analysis of daily diary pain, which indicated 46.8% on TNX-102 SL versus 34.9% on placebo achieved a 30 percent or greater reduction in pain (logistic regression; odds ratio [95% CI]: 1.67 [1.16, 2.40]; p=0.006)
  - 30% responder analysis was the primary analysis in F301 AFFIRM study of TNX-102 SL 2.8 mg
  - Also was the same primary endpoint analysis for FDA approval of Savella® for fibromyalgia

[2] TNX-102 SL is in clinical stage of development and not approved for any indication

F304/RELIEF Study: Primary Efficacy Endpoint Results (continued)



F304/RELIEF Study: Key Secondary Efficacy Endpoints

Outcome Measure at Week 14	Intent-to-Treat Analysis[1]	*P*-value
Non-Specific		
Patient Global Impression of Change	Responder Analysis: Proportion "Much Improved" or "Very Much Improved"	0.058
Fibromyalgia Syndrome-Related		
FIQ-R Symptom Domain	Mean Change from Baseline	0.007#
FIQ-R Function Domain	Mean Change from Baseline	0.009#
PROMIS Fatigue	Mean Change from Baseline	0.018#
Daily Sleep Quality Diary, NRS	Mean Change from Baseline	<0.001#
PROMIS Sleep Disturbance	Mean Change from Baseline	<0.001#

* nominally significant at p<0.0452
[1] Combined periods (pre- and post-interim analysis); responder analysis is by Logistic Regression (missing = non-responder); the five mean change analyses are by Mixed Model Repeated Measures with Multiple Imputation
Abbreviations: FIQ-R = Fibromyalgia Impact Questionnaire – Revised; NRS = numeric rating scale; PROMIS = Patient-Reported Outcomes Measurement Information System

*TNX-102 SL is in clinical stage of development and not approved for any indication

F304/RELIEF Study: Continuous Responder Analysis (CRA) Graph

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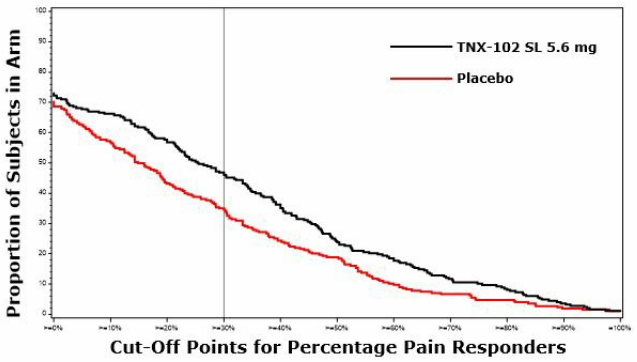
- The CRA graph allows one to see the proportion of responders over an entire range of cut-off points
- For example, >=30% improvement in pain is considered clinically meaningful in pain studies
- Looking at that vertical line at >=30% and visualizing a horizontal line to the y-axis tells you the proportion of each arm that achieved that level of pain improvement or better (47% for TNX-102 SL and 35% for placebo)
- It can be seen that TNX-102 SL separates from placebo, always at a higher proportion, up to about >=95% improvement



Adverse Events* (AEs) in F304/RELIEF Study

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	TNX-102 SL (N=248)		Placebo (N=255)		Total (N=503)	
Administration Site Reactions	**N**	**%**	**N**	**%**	**N**	**%**
Tongue/mouth numbness	43	17.3	2	0.8	45	8.9
Tongue/mouth pain/discomfort	29	11.7	5	2.0	34	6.8
Taste impairment	16	6.5	1	0.4	17	3.4
Tongue/mouth tingling	14	5.6	1	0.4	15	3.0
Systemic Adverse Events	**N**	**%**	**N**	**%**	**N**	**%**
Somnolence/Sedation	14	5.6	3	1.2	17	3.4

* Table reports only AEs at rate of greater than 5% in either treatment arm

No serious and unexpected AEs in RELIEF related to TNX-102 SL

- Systemic AEs comparable with prior studies and consistent with approved oral cyclobenzaprine product labeling
- Oral AEs similar to prior studies with TNX-102 SL, although tongue/mouth numbness at about half the rate in RELIEF

Safety and Tolerability in F304/RELIEF Study

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- No new safety signals in RELIEF at TNX-102 SL 5.6 mg dose
- 82.3% in active arm and 83.5% in placebo arm completed the study
- 8.9% in active arm and 3.9% in placebo arm discontinued due to adverse events
- 7 SAEs in study: 2 in active arm and 5 in placebo arm
  - Of 2 in active arm, one was motor vehicle accident with multiple bone fractures, and other was pneumonia due to infection; both deemed unrelated to TNX-102 SL
- Similar oral administration site reactions as in prior studies with TNX-102 SL
- Overall low rates of systemic side effects, highest being somnolence/sedation at 5.6% in active group, 1.2% in placebo

TNX-102 SL 5.6 mg for Fibromyalgia: 2nd Phase 3 F306/RALLY Study – Enrollment Ongoing

General study characteristics:

- Randomized, double-blind, placebo-controlled study in fibromyalgia in approximately 40 U.S. sites (N=670)
- Adaptive Design: one unblinded interim analysis based on 50% of randomized participants [1]

TNX-102 SL once-daily at bedtime
5.6 mg (2 x 2.8 mg tablets)[2] *N= ~335*[3]

Placebo once-daily at bedtime
N= ~335[3]

14 weeks

[1]Pending submission and agreement from FDA on statistical analysis plan
[2]Two week run in at 2.8 mg dose at bedtime, followed by 12 weeks at 5.6 mg dose
[3]Pending agreement from FDA on protocol amendment
PROMIS = Patient-Reported Outcomes Measurement Information System

Primary endpoint (Week 14):

- Daily diary pain severity score change (TNX-102 SL 5.6 mg vs. placebo) from baseline in the weekly average as measured by the numerical rating scale (NRS), using mixed model repeated measures analysis with multiple imputation (MMRM with MI)

Key Secondary endpoints (Week 14) include[1]:

- Daily diary sleep quality NRS score change
- Fibromyalgia Impact Questionnaire – Revised (FIQR): Symptoms Domain change
- PROMIS Fatigue instrument change

Interim results expected in 3rd quarter 2021

- Interim cohort recruited in March 2021

Topline results expected in 4th quarter 2021

Potential pivotal efficacy study to support NDA approval

Approved Fibromyalgia Pharmacotherapies

Pfizer

- Drug: Lyrica® or pregabalin (U.S. patent expired in 2018)
- Approved: 2004
- Mechanism: modulates nerve impulses involved in the transmission of pain through selective binding to the alpha2-delta protein of the voltage-gated calcium channels in CNS tissues
- Peak Sales: Approximately $5 billion (including all approved indications)

Lilly

- Drug: Cymbalta® or duloxetine (U.S. patent expired 2014)
- Approved: 2004
- Mechanism: serotonin and norepinephrine reuptake inhibitor (SNRI)
- Peak Sales: Approximately $5 billion (including all approved indications)

Abbvie (developed by Forest Laboratories)

- Drug: Savella® or milnacipran (on patent)
- Approved: 2009
- Mechanism: serotonin and norepinephrine reuptake inhibitor (SNRI)
- Peak Sales: Approximately $130 million (approved for fibromyalgia indication only)

Other Fibromyalgia Pharmacotherapies in Development in the U.S.

Axsome Therapeutics - AXS-14

- Drug: esreboxetine
- Mechanism: Selective norepinephrine reuptake inhibitor
- Developmental Stage: At least mid-Phase 3 (Phase 2 and Phase 3 trial positive*)

Aptinyx - NYX-2925

- Drug: ((2S, 3R)-3-hydroxy-2-((R)-5-isobutyryl-1-oxo-2,5-diazaspiro(3.4)octan-2-yl)butanamide)
- Mechanism: NMDA receptor modulator
- Developmental Stage: Phase 2 study is "active, not recruiting"

Teva - Ajovy®

- Drug: fremanezumab
- Anti-CGRP antibody
- Developmental Stage: Phase 2 proof-of-concept study "recruiting"

Virios Therapeutics – IMC-1

- Drug: Combination of famciclovir and celecoxib
- Anti-viral (herpes simplex) and COX-2 inhibitor non-steroidal anti-inflammatory drug (NSAID)
- Developmental Stage: Phase 2a completed

*licensed from Pfizer, Jan 2020

TNX-102 SL Intellectual Property – U.S. Protection expected until 2035

Composition of matter (eutectic): Protection expected to 2034/2035	• United States Patent and Trademark Office (USPTO) issued United States Patent No. 9636408 in May 2017, Patent No. 9956188 in May 2018, Patent No. 10117936 in November 2018, and Patent No. 10864175 on December 2020 •European Patent Office (EPO) issued European Patent No. 2968992 in December 2019 (validated in 37 countries). Opposition filed in October 2020 by Hexal AG • China National Intellectual Property Administration issued Chinese Patent No. ZL 201480024011.1 in April 2019 •Japanese Patent Office (JPO) issued Japanese Patent No. 6310542 in March 2018 •8 granted patents (Indonesia, Saudi Arabia, New Zealand, Australia, Mexico, Taiwan, Israel, South Africa) •11 patent applications pending (1 being allowed in Canada)
Composition of matter (sublingual): Protection expected to 2033	• NZIPO issued New Zealand Patent No. 631144 in March 2017 and Patent No. 726488 in January 2019 • Taiwanese Intellectual Property Office issued Taiwanese Patent No. I590820 in July 2017, Patent No. I642429 in December 2018 and Patent No. I683660 in February 2020 • Australian Patent Office issued Australian Patent No. 2013274003 in October 2018 and Patent No. 2018241128 in September 2020 • JPO issued Japanese Patent No. 6259452 in December 2017 • 20 patent applications pending (1 being allowed in Mexico)

Opportunities to Expand TNX-102 SL to Other Indications

Role of sleep disturbance more established in common psychiatric and neurological/pain disorders

- Recognized as a core symptom of many of these disorders
- Traditional sleep medications, which increase sleep quantity, may not provide benefit (benzodiazepines in major depression) or are contraindicated

Psychiatric Disorders
- Stress Disorders (PTSD)
- Mood Disorders (Depression)
- Anxiety Disorders
- Addiction (Alcohol Use Disorder)

Psychiatric Symptoms of Neurological Disorders
- Agitation in Alzheimer's
- Psychosis in Parkinson's, Alzheimer's and other dementias

Chronic Pain States
- Chronic wide-spread pain (fibromyalgia)
- Osteoarthritis

Growing recognition that there are many disorders where sleep disturbances may have a role in the pathophysiology (cardiovascular, metabolic, neurologic)

- Sleep quality plays a homeostatic role *in several disorders*

TNX-1800[1] , TNX-2300[1]: COVID-19 Vaccine Candidates

and

TNX-2100[1]: Diagnostic Product Candidate to Test for SARS-CoV-2 T Cell Immunity

[1]TNX-1800, TNX-2300 and TNX-2100 are in the pre-IND stage of development and have not been approved for any indication.

TNX-1800[1]: a COVID-19 Vaccine Candidate

- **Utilizes Tonix's proprietary horsepox virus as a vector**
  - Encodes a protein from SARS-CoV-2, the cause of COVID-19
  - Developed in collaboration with University of Alberta, Canada
- **Animal testing with Southern Research Institute**
  - Non-human primate immune response positive results reported in 4th quarter 2020
  - Non-human primate CoV-2 challenge testing positive data reported in 1st quarter 2021
    - TNX-1800 vaccinated animals had undetectable CoV-2 by PCR in oropharyngeal swabs and tracheal lavage
- **Manufacturing agreement with FUJIFILM Diosynth**
  - Development for Good Manufacturing Practice (GMP) manufacturing for human trials
  - GMP[2] clinical supply expected to be ready for a Phase 1 human trial in 2nd half of 2021[3]

[1]TNX-1800 (horsepox/Cov-2 spike live vaccine) is at the pre-IND stage of development
[2] Good Manufacturing Practice = GMP
[3] We cannot predict whether the global COVID-19 pandemic will impact the timing of these milestones

Concerns With Current COVID-19 Vaccines with Emergency Use Authorization (EUA)

- **Durability of protection**
  - Are vaccinated people protected one year later?
  - Durable protection is associated with T cell response
- **Protection against death/ventilator support**
  - Protection against severe disease and death would be strong motivations for many to be vaccinated
- **Protection against forward transmission**
  - Highly contagious nature of CoV-2 is a major problem driving pandemic
- **Safety of vaccine**
  - Risk:benefit for different age groups may vary – e.g. adults below 30 have low risk of disease
- **No biomarker of protection**
  - No test to establish protection from vaccination
- **Cost and accessibility**
  - High production cost and issues with cold-chain distribution

Warp-Speed COVID-19 Vaccines: Live Virus Vaccines Take Longer to Develop

mRNA	
• Moderna (mRNA-1273, LNP[1]-encapsulated CoV-2 Spike ["Spike"] mRNA)	EUA[2]
• Pfizer & BioNTech (LNP-encapsulated Spike mRNA)	EUA
Subunit	
• Sanofi/GSK (recombinant Spike protein with adjuvant[3])	In Phase 3
• Novavax (NVX-CoV2373, recombinant Spike protein with adjuvant[4])	In Phase 3
Non-replicating virus	
• J&J (Ad26.COV2-S, Ad26 encoding Spike)	EUA in U.S. and Canada
• Astra-Zeneca/Oxford (AZD1222, ChAdOx-1 encoding Spike)	In Phase 3 (EUA in UK, Europe, Canada and India)
Live attenuated virus	
• Merck (TMV-083, modified measles[5]-encoding Spike)	Terminated Jan '21 - Phase 1[6]
• Merck (V591, pseudo-typed VSV[7]-encoding Spike)	Terminated Jan '21 - Phase 1[6]

[1]Lipid Nanoparticle = "LNP"
[2]Emergency Use Authorization = "EUA"
[3]GSK adjuvant AS03 contains squalene, DL-α-tocopherol and polysorbate
[4]Novavax adjuvant Matrix-M1 contains saponin extracted from the Quillaja saponaria Molina tree

[5]Measles-based vaccine, acquisition of Themis, collaboration with Institute Pasteur
[6]Merck Discontinues Development of SARS-CoV-2/COVID-19 Vaccine Candidates; Continues Development of Two Investigational Therapeutic Candidates - Merck.com
[7]VSV = vesicular stomatitis virus; collaboration with IAVI = International AIDS Vaccine Initiative

COVID-19 Vaccine Landscape

- **We expect more than one vaccine will be approved by FDA**
  - Different vaccines for different individuals
- **More than 150 vaccines in development**
  - Diversity of approaches is important since protective immunity is not yet understood
  - Technologies range from never tested before (mRNA) to 220 years old
  - Uncertainty exists around efficacy, durability and importantly, safety
- **Live attenuated vector systems in development include:**
  - Tonix (horsepox), Tonix (bovine parainfluenza), Zydus Cadila (measles-based)

Live, Attenuated Virus Vaccines for Other Infectious Diseases[1]

- **Long term, durable immunity**
  - Expected to stimulate T cells and provide years to decades of protection
- **Single administration, scalable manufacturing**
  - Low dose is amplified by replication, mRNA and protein synthesis at vaccination site
- **Block forward transmission (infectivity)**
  - Key to conferring herd immunity and protecting immunocompromised

[1]For example, the eradication of smallpox, containment of measles, mumps, and rubella

TNX-1800[1]: Engineered for Long-term Immunity

Based on "vaccinia" vaccine developed more than 200 years ago by Dr. Edward Jenner to prevent smallpox

- TNX-1800 has 99.7% colinear identity with circa 1860 smallpox vaccine[2]
- Eradicated smallpox (only viral disease ever eradicated)
- Elicits durable (many decades) T cell immunity
- Single dose protection without adjuvants
- Manufacturable at scale
- Minimal "cold chain" supply issues
- Glass-sparing packaging owing to small unit dose

Genetic analysis of early vaccines indicates that Tonix's "horsepox" is closely related to Edward Jenner's "vaccinia"

- Modern "vaccinia" evolved during the 220 years it was propagated by primitive methods – for over 120 years before "viruses" were identified

[1]TNX-1800 (horsepox/Cov-2 spike live vaccine) is at the pre-IND stage of development
[2]Brinkmann A et al, Genome Biology (2020) 21:286 https://doi.org/10.1186/s13059-020-02202-0

TNX-1800 Vaccination of Non-Human Primates Elicited Anti-SARS-CoV-2 Neutralizing Antibodies and Skin Reaction or "Take" in All Eight Animals

STUDY DESIGN:

- Compares TNX-1800 (modified horsepox virus encoding CoV-2 spike protein) to TNX-801 (horsepox virus, live vaccine) at two doses in non-human primates. A control group received a placebo.
- Each of these five groups (TNX-1800 high and low dose; TNX-801 high and low dose and placebo) includes four animals.

NEUTRALIZING ANTI-CoV-2 ANTIBODIES:

- At Day 14 after a single vaccination, all eight of the TNX-1800 vaccinated animals made anti-CoV-2 neutralizing antibodies (≥1:40 titer).
- None of the eight TNX-801 vaccinated control animals, or any of the four animals in the placebo group, made anti-CoV-2 neutralizing antibodies (≤1:10 titer).
- Level of neutralizing anti-CoV-2 antibody production was similar between the low and high dose TNX-1800 groups (1 x 10^6 Plaque Forming Units [PFU]) and 3 x 10^6 PFU, respectively.

SKIN *TAKE* BIOMARKER:

- All 16 animals vaccinated with either dose of TNX-1800 or the control TNX-801 manifested a "take", or cutaneous response, signaling that the horsepox vector elicited a strong T cell immune response.

TNX-1800 Vaccination and SARS-CoV-2 Challenge of Non-Human Primates Findings and Conclusions

TOLERABILITY:

- TNX-1800 and TNX-801 were well tolerated at both doses.

CHALLENGE WITH SARS-COV-2:

- 41 days after vaccination, the TNX-1800 vaccinated and control animals were challenged with CoV-2. Day 6 after challenge, TNX-1800 vaccinated animals had undetectable SARS-CoV-2 by PCR in oropharyngeal swabs and tracheal lavage.

DOSE:

- Supports the expectation that TNX-1800 at the low dose of 1 x 10^6 PFU is an appropriate dose for a one-shot vaccine in humans.
- Indicates that 100 doses per vial is the target format for commercialization, which is suited to manufacturing and distribution at large scale.

CONCLUSIONS:

- TNX-1800 induces a strong immune response to SARS-CoV-2 in non-human primates and is capable of decreasing viral load in oropharynx and trachea consistent with decreased transmission.
- Data confirm that "take" is a biomarker of a strong immunological response to TNX-1800's vector, horsepox virus vaccine, and also indicate that "take" is predictive of a neutralizing antibody response to CoV-2 spike protein and protection of upper and lower airways.

Why Use a Horsepox Platform for a Vaccine?

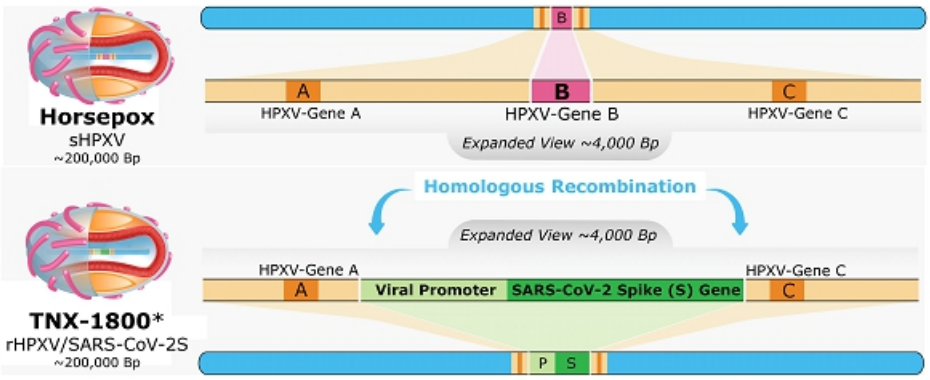
Horsepox can be engineered to express foreign genes

- Lack of persistence or genomic integration in the host
- Strong immunogenicity as a vaccine
- Readily manufacture at scale
- Live, attenuated vaccine – direct antigen presentation

Potential advantages of horsepox over vaccinia

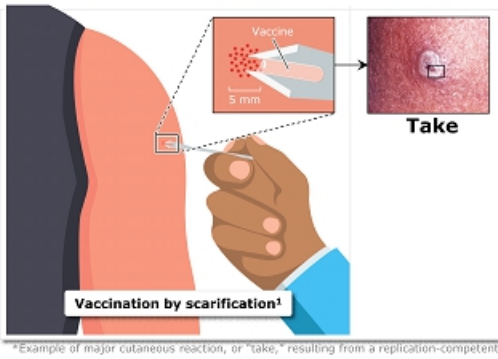
- Maintains strong immunogenicity with potentially improved tolerability
- Relative to non-replicating vaccinia, horsepox's replication in human cells provides direct antigen presentation, which is expected to trigger a T cell immune response, by Class I Major Histocompatibility Complex (MHC) Antigens
- Horsepox may behave differently than vaccinia as a vector, in part because of its different repertoire of genes that modulate immune responses and host range

TNX-1800 is Based on a Horsepox Virus (HPXV) Vector Designed to Express SARS-CoV-2 S Protein



*TNX-1800 is at the pre-IND stage of development

Vaccinia Induces a Skin Reaction Called "Take" – Described by Dr. Edward Jenner



Take

- **Biomarker of protection**
  - Smallpox was eradicated using this marker
  - Revaccination indicated for recipients without "take"
- **Measure of T cell immunity**
  - No need for blood draws or complex laboratory studies
  - No other functional T cell assay is approved or in clinical use for vaccination

*Example of major cutaneous reaction, or "take," resulting from a replication-competent live-virus vaccine delivered via scarification, indicating successful vaccination[1-3]

1.Fulginiti VA, et al. *Clin Infect Dis.* 2003;37(2):241-250.
2.Liu L, et al. *Nature Med.* 2010;16(2):224-228.
3.Centers for Disease Control and Prevention. Accessed April 15, 2020. https://phil.cdc.gov/Details.aspx?pid=3276

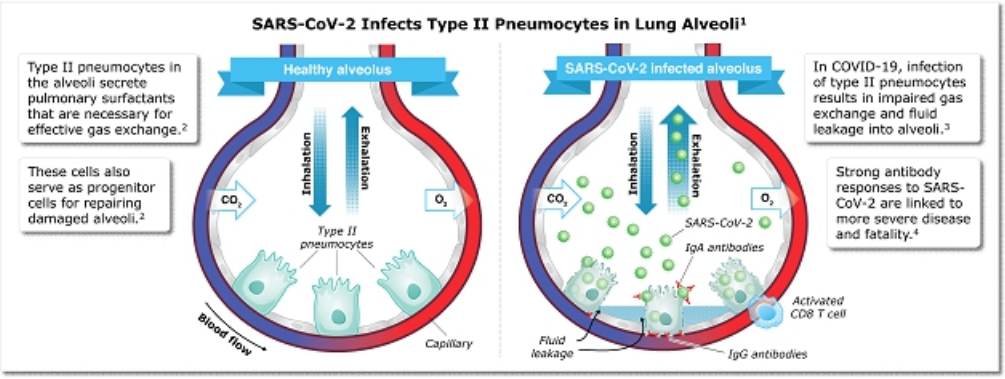
Unique Challenges of SARS-CoV-2

SARS		SARS-CoV-2
Rate of death[1,2] **~10%**	The death rate for COVID-19 is significantly lower compared to SARS.[1,2,4] However, due to its virulence, SARS-CoV-2 has resulted in far more deaths[5]	*Rate of death*[1,4] **0.003% - 5.4%**
Deaths[2] **744**		*Deaths (as of Mar 2021)*[5] **>2,500,000**
Rate of infectivity[1] **0.4**	SARS-CoV-2 is more infectious, has a longer incubation time, and presents asymptomatically in more individuals, making it highly spreadable[1]	*Rate of infectivity*[1,4] **~2.5**
Incubation time[2] **2-7 days**		*Incubation time*[2,4] **6-14 days**
Asymptomatic[3] **~13%**		*Asymptomatic*[4] **~40%**

1. Cascella M, et al. *Eur Rev Med Pharmacol Sci.* 2020;24:2781-2783.
2. Rabaan AA, et al. *Le Infezioni in Medicina.* 2020;28(2):174-184.
3. Wilder-Smith A, et al. *Emerg Infect Dis.* 2020;11(7):1142-1145.
4. Centers for Disease Control and Prevention. Accessed November 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/planning-scenarios.html
5. Johns Hopkins University. Accessed March 2021. https://coronavirus.jhu.edu/map.html

Infection of Type II Pneumocytes Can Lead to Lethal Respiratory Illness

37

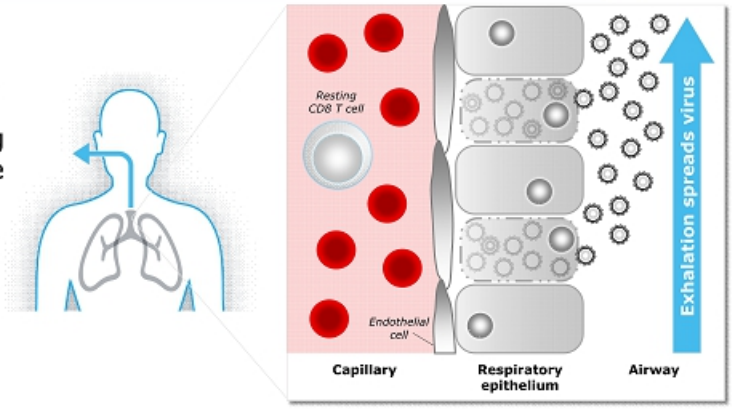


1. Knudsen L, et al. *Histochem Cell Biol*. 2018;150(6):661-676.
2. Hasan RD. *Am J Physiol Lung Cell Mol Physiol*. 2020;319(1):L115-L120.
3. Xu Z, et al. *Lancet Respir Med*. 2020;8(4):420-422.
4. Lee WS, et al. *Nat Microbiol*. 2020;5:1185-1191.

SARS-CoV-2 Hijacks the Respiratory System to Spread Contagious Virus

38

- Virus factories release virions by continuous budding
- Breathing, speaking or coughing has the potential to release virions into the air and transmit infection to others

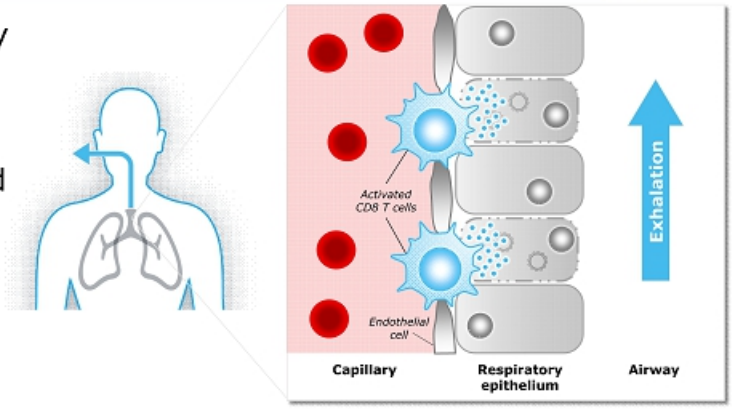


Bar-On YM, et al. *eLife*. 2020;9:e57309.

CoV-2 Specific T Cells Kill the Virus Factories

39

- Natural immunity or vaccine protection has the potential to decrease forward transmission
- T cells specifically kill virally infected cells



Bar-On YM, et al. *eLife*. 2020;9:e57309.

Contrasting T cell and Antibody Immunity

- **T cell immunity**
  - ***Durable or long-lived (many years)***
  - Recognize fragments of pathogens on the surfaces of infected cells
  - Cannot recognize pathogens directly
  - Potential to clear viral infections (by killing infected cells)
  - Potential to block forward transmission (contagion) by infected people
- **Antibody immunity**
  - ***Temporary or short-lived (typically 3-6 months)***
  - Recognize pathogens directly
  - Potential to block viral entry (by recognizing pathogens)
  - Can only recognize virally infected cells that express viral surface proteins

TNX-1800: Potential Development and Uses

- **Potential to protect against CoV-2 Variants**
  - T cell epitopes are short stretches of peptides (~8-14 aa fragments) that so far seem to be conserved between variants
  - Clinical trials will test potential protection against CoV-2 variants
    - For example, the "British" (B.1.1.7), "Brazilian" (P.1) and "South African" (B.1.351) strains have emerged
    - B.1.351 may elude the protection conferred by certain vaccines against other strains
- **Pre- and Post-pandemic vaccine**
  - Development will begin with clinical trials in adults
  - Subsequent development will focus on children
    - Analogous to the historical use of horsepox and vaccinia as childhood immunizations to prevent (and ultimately eradicate) smallpox
  - Potential to block forward transmission (contagion) by infected people
  - Trial participants will be stratified by pre-existing antibody and T cell immunity
    - TNX-2100[1] skin test (slide 56) may be used to stratify for T cell immunity

[1]TNX-2100 (SARS-CoV-2 epitope peptide mixtures for intradermal administration) is at the pre-IND stage of development

TNX-2300, 2nd SARS-CoV-2 Vaccine Platform: Bovine Parainfluenza (BPI) Virus

Collaboration with Kansas State University to develop a vaccine candidate for the prevention of COVID-19

- Utilizes a novel live attenuated vaccine vector platform and the CD40-ligand to stimulate T cell immunity
- TNX-2300[1] drives expression of CoV-2 spike and CD40-L

Live attenuated vaccines based on bovine parainfluenza virus[2-6]

- Previously has been shown to be an effective antigen delivery vector in humans, notably well tolerated in infants and children
- Vector is well suited for mucosal immunization using a nasal atomizer, but it can also be delivered parenterally

[1]Pre-IND stage of development; [2]Halle, AA *et al. J Gen. Virology* (2003) 84:2153–2162; [3]Halle, AA *et al. J Virology* (2000) 74 (24): 11626–11635; [4]Karron RA *et al. J Inf Dis* (1995) 171: 1107-14; [5]Karron RA *et al. Vaccine* (2012) 30: 3975– 3981; [6]Schmidt AC *et al. J Virology* (2001) 75(10): 4594–4603

TNX-2100[1]: Potential Skin Test to Measure SARS-CoV-2 Exposure and T Cell Immunity

TNX-2100 (SARS-CoV-2 epitope peptide mixtures for intradermal administration)

- Based on mixtures of synthetic peptides for intradermal administration
- Designed to elicit delayed-type hypersensitivity (DTH) in individuals who have been exposed to SARS-CoV-2 or who have been successfully vaccinated
- Potential to measure the presence and strength of functional *in vivo* T cell immunity

Potentially scalable test for widespread use

- Adaptive Biotech's T Detect™ COVID received FDA EUA – based on genetic analysis of T cell receptors
- Other tests[2] for T cell immunity to SARS-CoV-2 require specialized laboratories and are not amenable to standardization

[1]TNX-2100 is in the pre-IND stage of development and has not been approved for any indication.
[2]Intracellular cytokine staining (ICS) measured by flow cytometry after *in vitro* stimulation of purified peripheral blood mononuclear cells

TNX-2100: Potential Uses and Development Plans

TNX-2100 has the potential to serve as:

- a biomarker for cellular immunity and protective immunity
- a method to stratify participants in COVID-19 vaccine trials by immune status
- an endpoint in COVID-19 vaccine trials
- a biomarker of durability of vaccine protection

FDA feedback on pre-IND meeting questions received in February 2021

Development plans

- Peptides have been manufactured under current good manufacturing process or cGMP
- Second quarter 2021: Plan to submit IND
- Second half 2021: Plan to initiate clinical testing pending approval of IND

TNX-1300[1]: New Potential Treatment for Cocaine Intoxication

[1]TNX-1300 is an investigational new biologic and has not been approved for any indication.

TNX-1300* for the Treatment of Cocaine Intoxication

Recombinant protein that degrades cocaine in the bloodstream[1]

- Double-mutant cocaine esterase (CocE)
- CocE was identified in a bacterium (*Rhodococcus*) that use cocaine as its sole source of carbon and nitrogen and that grow in soil surrounding coca plants[2]
- CocE catalyzes the breakdown of cocaine into metabolites ecgonine methyl ester and benzoic acid

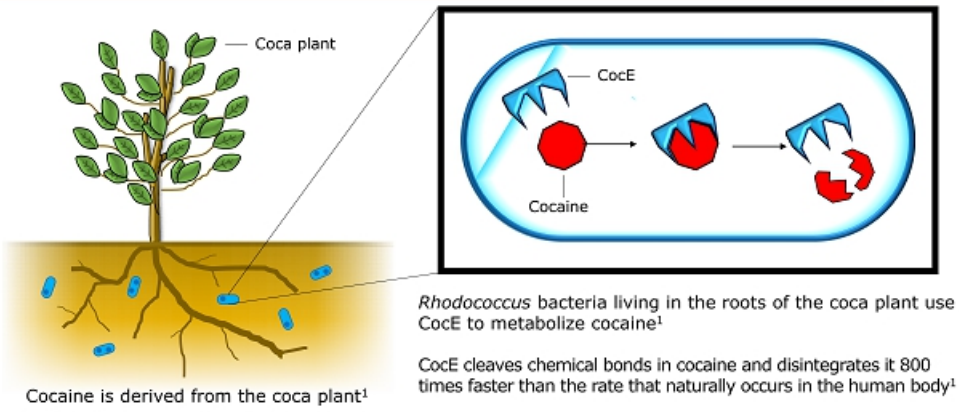
Phase 2 study completed by Reckitt Benckiser (TNX-1300 was formerly RBP-8000)[3]

- Volunteer cocaine abusers received cocaine 50 mg *i.v.* infusion over 10 minutes
- TNX-1300 given one minute after completion of cocaine infusion
  - Rapidly reversed the physiologic effects of cocaine; cocaine plasma exposures dropped by 90% within two minutes
  - Well tolerated with the most frequently reported adverse events being gastrointestinal disorders (including dry mouth, nausea); nervous systems disorders (including headache, dizziness) and skin and subcutaneous tissue disorders (including hyperhidrosis, dermatitis)

**TNX-1300 (T172R/G173Q double-mutant cocaine esterase 200 mg, i.v. solution) is an investigational new biologic and has not been approved for any indication.*

[1] Gao D et al, Mol Pharmacol. 2009. 75(2):318-23.
[2] Bresler MM et al, Appl Environ Microbiol. 2000. 66(3):904-8.
[3] Nasser AF et al, J Addict Dis, 2014;33(4):289-302.

TNX-1300 (Cocaine Esterase or CocE) Is a Fast-acting Cocaine Antidote



Cocaine is derived from the coca plant[1]

Rhodococcus bacteria living in the roots of the coca plant use CocE to metabolize cocaine[1]

CocE cleaves chemical bonds in cocaine and disintegrates it 800 times faster than the rate that naturally occurs in the human body[1]

[1]Narasimhan D et al. *Future Med Chem*. 2012.

TNX-1300 Development Plan

- **Targeting to initiate a Phase 2 open-label, randomized pilot study of TNX-1300 in the second quarter of 2021**
- **Emergency department (ED) setting with patients coming in for treatment of cocaine and/or polysubstance intoxication**
- **Objectives**
  - Primary: To evaluate the safety of TNX-1300 in the ED setting
  - Secondary:
    - To evaluate TNX-1300 in the management of cardiovascular (CV) and other signs and symptoms associated with cocaine intoxication compared to usual care (UC) alone
    - To demonstrate reduction of plasma cocaine, cocaethylene, and ecgonine methyl ester levels after TNX-1300 administration and compare cocaine and cocaethylene levels of TNX-1300 group to those in UC alone

TNX-1900[1]: Intranasal Potentiated Oxytocin for Migraine and Craniofacial Pain

and

TNX-2900[1]: Intranasal Potentiated Oxytocin for Prader-Willi Syndrome

[1]TNX-1900 and TNX-2900 are in the pre-IND stage of development.

TNX-1900 (Intranasal Potentiated Oxytocin) for the Treatment of Migraine and Craniofacial Pain – Overview

Novel intranasal (i.n.) oxytocin (OT) formulation being developed as a prophylactic treatment for chronic migraine

- Based on a propriety formulation of oxytocin*, a naturally occurring human hormone that acts as a neurotransmitter in the brain, and magnesium
- Magnesium is known to potentiate the binding of oxytocin to its receptor[1]

Clinical and preliminary research has shown that low oxytocin levels in the body can lead to increase in headache frequency, and that increased oxytocin levels can relieve headaches

- Certain other chronic pain conditions are also associated with decreased oxytocin levels

Oxytocin when delivered via the nasal route, results in enhanced binding of oxytocin to receptors on neurons in the trigeminal system, inhibiting transmission of pain signals

Intranasal oxytocin has been shown in animals that it can also block CGRP release, a pathway known to be critical to the pathogenesis of migraine attacks.

*Oxytocin is approved by the U.S. Food and Drug Administration (FDA) as Pitocin®, an intravenous infusion or intramuscular injection drug, for use in pregnant women to induce labor. An intranasal form of oxytocin was marketed by Novartis to assist in nursing as Syntocinon®, but the product was withdrawn and the New Drug Application (NDA) has been discontinued.

1. Antoni and Chadio, 1989

TNX-1900 for the Treatment of Migraine – Prevalence

One billion individuals worldwide suffer from migraines (~14% of population)[1]

Migraine is the second leading cause of years lived with disability[1]

In U.S., the estimated cost of all migraine headaches was $78 billion in 2014[2]

- Approximately 30% of those costs ($23 billion) were direct medical costs

Chronic migraine (≥ 15 headaches / month) effects about 1-2% of individuals[3]

- 75-150 million individuals worldwide
- 3-7 million in the U.S.

CGRP antibodies are the only migraine specific prophylaxis drugs approved in decades

- Requires parenteral administration (systemic effects on peripheral CGRP pathways)
- Long term safety concerns with prolonged systemic blockade of CGRP receptor[4]

[1] GBD 2016 Headache Collaborators, Global, regional, and national burden of migraine and tension-type headache, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016, Lancet Neurol 2018; 17: 954–76
[2] Gooch, C. L., et al., The Burden of Neurological Disease in the United States: A Summary Report and Call to Action. Ann Neurol. 2017; 81:479-484
[3] Natoli et al., Global prevalence of chronic migraine: a systematic review, Cephalagia, 2010, 30:599-609
[4] Robbins, At Stake: The Possible Long-Term Side Effects of CGRP Antagonists, https://www.practicalpainmanagement.com/pain/headache/stake-possible-long-term-side-effects-cgrp-antagonists, accessed November 8, 2020.

TNX-1900 for the Treatment of Migraine – Mechanism of Action

Preclinical research showed that nasally applied TNX-1900 selectively inhibits the activity of trigeminal pain-sensing nerve cells and blocks the release of CGRP

- TNX-1900 is believed to interrupt pain signals at the trigeminal ganglia by suppressing electrical impulses, a potentially different activity than drugs that just block CGRP

Migraine attacks are caused, in part, by the release of CGRP from pain-sensing nerve cells that are part of the trigeminal system

- The CGRP binds to receptors on other nerve cells and starts a cascade of events that eventually results in a severe headache. This, in turn, reduces various kinds of trigeminal nerve associated pain and prevents CGRP from acting at receptors in the central nervous system that are involved in migraine.

We believe targeted delivery of oxytocin could translate into selective blockade of CGRP release in the trigeminal ganglion and not throughout the body, which could be a potential safety advantage over systemic CGRP inhibition

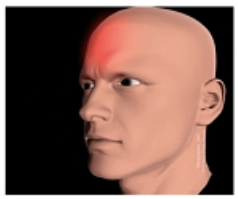
- In addition, daily dosing is more quickly reversible, in contrast to monthly or quarterly dosing, giving physicians and their patients greater control

TNX-1900 for the Treatment of Migraine – Mechanism of Action (continued)

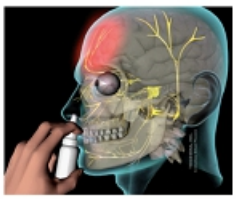
CGRP: NEUROTRANSMITTER THAT HAS BEEN VALIDATED AS KEY MIGRAINE TARGET

TNX-1900 believed to partially block release of CGRP in the trigeminal nerve

Proprietary Nasal to Brain Delivery



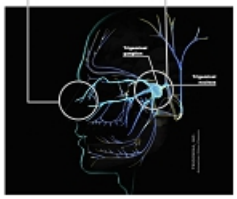
HEAD PAIN



PATIENT USES TNX-1900

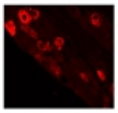
Permeates nasal mucosa

Transported to trigeminal system and brain

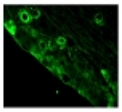


TARGETED DELIVERY

Oxytocin Receptors Co-Localize with CGRP in most Trigeminal Ganglia Neurons

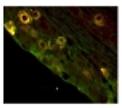


Oxytocin Receptors



CGRP

Overlay of Oxytocin Receptors and CGRP Staining



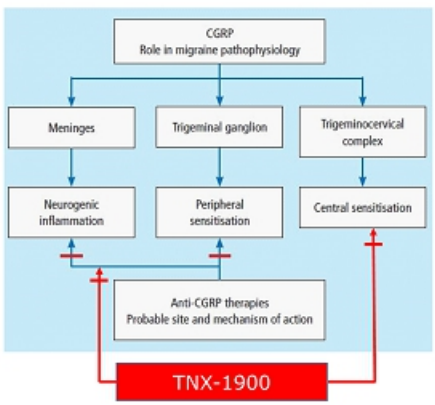
Abbrev. CGRP, calcitonin gene-related peptide

TNX-1900: Mechanism of Action (continued)

In animal models, intranasal oxytocin concentrates in the trigeminal system

Inhibits trigeminal neuronal firing, and decreases CGRP (and PACP) release onto meningeal vasculature and within the brainstem

- **Believed to have effects on:**
  - Neurogenic inflammation
  - Peripheral sensitization, where CGRP otherwise promotes neuronal-glial signaling of pain to trigeminal ganglion
  - Central sensitization, in which CGRP otherwise causes sensitization of NMDA receptor, reducing threshold for glutamate – creating allodynia
- **Anti-CGRP antibodies may only work on inflammation and peripheral sensitization**
  - Due to poor blood brain barrier penetration



Abbrev. CGRP, calcitonin gene-related peptide; PACP, pituitary adenylate cyclase-activating peptide
Figure adapted from Krishnaswamy R et al. Anti-CGRP monoclonal antibodies: breakthrough in migraine therapeutics. Progress in Neurology and Psychiatry. Vol 23.03, July-Sept, 2019.

TNX-1900 for the Treatment of Migraine – Development Status

In June 2020, Tonix acquired a proprietary formulation of nasal oxytocin solution for intranasal delivery from Trigemina

Also acquired migraine and pain treatment technologies of Trigemina, Inc. and assumed license for some of technologies from Stanford University

A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900

Completed by Trigemina prior to acquisition

Tonix plans to submit an IND application for this program to the FDA in the second quarter of 2021

Targeting start of a Phase 2 study of TNX-1900 for the prophylactic treatment of chronic migraine in the U.S. in the third quarter of 2021

- Primary endpoint expected to be mean change in number of migraine headache days from the last 28 days of baseline to the last 28 days of treatment in each treatment group

TNX-2900 for the Treatment of Prader-Willi Syndrome – Overview

TNX-2900 is also based on Tonix's patented intranasal potentiated oxytocin formulation and expands on this work

Prader-Willi syndrome is the most common genetic cause of life-threatening childhood obesity[1]

- Results in lack of suckling in infants and, in children and adults, severe hyperphagia, an overriding physiological drive to eat, leading to severe obesity and other complications associated with significant mortality
- No approved treatment for either the suckling deficit in babies or the obesity and hyperphagia in older children associated with Prader-Willi syndrome.
- Orphan disease occurring in approximately one in 15,000 births

Intranasal oxytocin has been shown to improve suckling in newborn animals but also suppresses feeding behaviors in adult animal models.

- Tonix's patented potentiated oxytocin formulation is believed to increase specificity for oxytocin receptors relative to vasopressin receptors as well as to enhance the potency of oxytocin.

Tonix intends to submit applications to the FDA for Orphan Drug and Fast Track designations for TNX-2900

[1]Foundation for Prader-Willi Research (fpwr.org).

TNX-1500[1]: Monoclonal Antibody directed against CD40-Ligand for Organ Transplant Rejection and Autoimmune Conditions

[1]TNX-1500 is in the pre-IND stage of development.

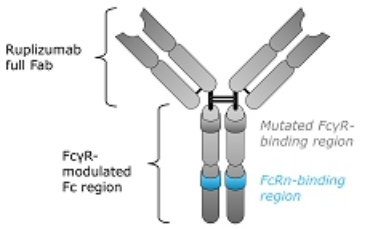
TNX 1500, a New CD40 Ligand (CD40L) Antibody, for the Prevention of Allograft Rejection

The CD40-CD40L pathway is a pivotal immune system modulator and is a well-established and very promising treatment target to more safely prevent allograft rejection[1]

- **First Generation:** Development *halted due to thromboembolic complications (TE) – blood clots*. TE complications traced to Fc gamma receptor
- **Second Generation:** Eliminated the Fc gamma receptor (TE complication) but *potency and half life reduced which limited utility*
- **TNX-1500 Third Generation**: Re-engineered based on greater understanding of the Fc gamma receptor. Modulated the binding of FcγR while preserving FcRn function
  - Expected to deliver efficacy without compromising safety

Tonix expects to have GMP product ready in the third quarter of 2021 for TNX-1500

Selectively Modified Anti-CD40L Ab



TNX-1500 contains the full ruplizumab Fab and the engineered Fc region that modulates FcγR-binding, while preserving FcRn function.

1. Camilleri B, et al. *Exp Clin Transplant.* 2016;14(5):471-483.

Pipeline[1] Summary – by Select Therapeutic Areas

Pain

- **TNX-102 SL (sublingual cyclobenzaprine) for fibromyalgia**
  Phase 3/RELIEF
  Phase 3/RALLY
- **TNX-1900 (intranasal oxytocin) for craniofacial pain**
  Clinical – pre-IND stage

Psychiatry

- **TNX-102 SL (sublingual cyclobenzaprine) for PTSD**
  Phase 3/RECOVERY
- **TNX-102 SL (sublingual cyclobenzaprine) for agitation in Alzheimer's**
  Phase 2 ready
  FDA Fast Track designation
- **TNX-601 CR (tianeptine oxalate and naloxone) for depression and PTSD**
  Clinical - Pre-IND stage
- **TNX-1600 (triple reuptake inhibitor[2]) for PTSD, Depression and ADHD[3]**
  Preclinical

Addiction Medicine

- **TNX-1300 (cocaine esterase) for cocaine intoxication**
  Phase 2
  FDA Breakthrough Therapy designation
- **TNX-102 SL (sublingual cyclobenzaprine) for alcohol use disorder**
  Phase 2 ready

Neurology

- **TNX-1900 (intranasal oxytocin) for migraine**
  Clinical – pre-IND stage

Rare/Orphan Disease

- **TNX-2900 (intranasal oxytocin) for Prader-Willi syndrome**
  Clinical – pre-IND stage

[1] Experimental new medicines and biologics, not approved for any indication
[2] (2S,4R,5R)-5-(((2-aminobenzo[d]thiazol-6-yl)methyl)amino)-2-(bis(4-fluorophenyl)methyl)tetrahydro-2H-pyran-4-ol) is an inhibitor of reuptake of three monoamine neurotransmitters (serotonin, norepinephrine and dopamine) – licensed from Wayne State University
[3] ADHD = attention deficit hyperactivity disorder

Pipeline[1] Summary – by Select Therapeutic Areas (continued)

Public Health

- **TNX-1800 (live modified horsepox vaccine) for preventing COVID-19**
  Preclinical
- **TNX-2300 (live bovine parainfluenza vaccine) for preventing COVID-19**
  Preclinical
- **TNX-2100 (DTH skin test) for detecting exposure and T cell immunity to SARS-CoV-2**
  Pre-IND

Biodefense

- **TNX-801 (live horsepox vaccine) for preventing smallpox and monkeypox**
  Preclinical
- **TNX-701 (oral radioprotective agent) for radioprotection**
  Preclinical

Transplantation/ Autoimmunity

- **TNX-1500 (anti-CD40-Ligand) for preventing rejection of solid organ transplants**
  Preclinical
- **TNX-1500 (anti-CD40-Ligand) for treating autoimmune disease**
  Preclinical

Oncology

- **TNX-1700 (rTFF2[2]) for treatment of gastric and pancreatic cancer**
  Preclinical

[1] Experimental new medicines and biologics, not approved for any indication
[2] Recombinant Trefoil Family Factor 2 – licensed from Columbia University

Financial Overview

NASDAQ: TNXP	
Cash and cash equivalents, December 31, 2020	Approximately $77 million
Gross proceeds from registered direct equity offerings in 1Q2021	Approximately $110 million
Shares outstanding as of March 15, 2021	Approximately 324 million

Milestones – Recently Completed and Upcoming[1]

✓ 4th Quarter 2020	Non-human primate immune response positive results reported
✓ 4th Quarter 2020	Positive topline data from TNX-102 SL Phase 3 F304/RELIEF study in fibromyalgia reported
✓ 1st Quarter 2021	Non-human primate positive efficacy data from TNX-1800 in COVID-19 models reported
❑ **2ND Quarter 2021**	**Initiation of Phase 2 open-label safety study of TNX-1300 in ED setting for cocaine intoxication**
❑ **2nd Quarter 2021**	**Submission of IND application for TNX-2100 for SARS-CoV-2 skin test**
❑ **2nd Quarter 2021**	**Submission of IND application for TNX-1900 for the treatment of migraine**
❑ **3rd Quarter 2021**	**Initiation of Phase 2 study of TNX-1900 for the treatment of migraine**
❑ **3rd Quarter 2021**	**Interim analysis of TNX-102 SL Phase 3 F306/RALLY study in fibromyalgia expected**
❑ **4th Quarter 2021**	**Topline data from TNX-102 SL Phase 3 F306/RALLY study in fibromyalgia expected**
❑ **2nd Half 2021**	**Initiation of Phase 1 safety study of TNX-1800 for COVID-19 expected**
❑ **2nd Half 2021**	**Initiation of clinical trials for TNX-2100 SARS-CoV-2 skin test expected**

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

Management Team

Seth Lederman, MD
President & CEO

TARGENT · Fusilev (levofolinate) for injection · vela

Gregory Sullivan, MD
Chief Medical Officer

Bradley Saenger, CPA
Chief Financial Officer

Shire · VERTEX · Steward Health Care System · pwc

Jessica Morris
Chief Operating Officer

Deutsche Bank · svb Silicon Valley Bank · American Capital

TONIX PHARMACEUTICALS

Thank You!

Exhibit 99.03

Investor Presentation
NASDAQ:TNXP

1

TONIX PHARMACEUTICALS

March 2021

Version P0281 3-17-2021 (Doc 0801)

Cautionary Note on Forward-Looking Statements

2

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, risks related to failure to obtain U.S. Food and Drug Administration clearances or approvals and noncompliance with its regulations; our need for additional financing; delays and uncertainties caused by the global COVID-19 pandemic; substantial competition; uncertainties of patent protection and litigation; uncertainties of government or third party payor reimbursement; limited research and development efforts and dependence upon third parties. 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, 2020, as filed with the Securities and Exchange Commission (the "SEC") on March 15, 2021, 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

3

Who We Are – Mission And Purpose

Clinical-stage biopharmaceutical company that invents and develops medicines to help patients manage the central nervous system (CNS) and immunology diseases.

"Advancing science to improve patient care and public health"

Our Pipeline – CNS Portfolio

	CANDIDATES	INDICATION	STATUS
CNS Portfolio	TNX-102 SL[1]	**Fibromyalgia (FM) - Lead Program**	**Mid-Phase 3 – ongoing**
		PTSD	Phase 3 ready
		Agitation in Alzheimer's	Phase 2 ready
		Alcohol Use Disorder	Phase 2 ready
	TNX-1300[2]	Cocaine Intoxication / Overdose	Phase 2
	TNX-1900[3]	Migraine and Craniofacial Pain	Clinical – pre-IND[4]
	TNX-2900[5]	Prader-Willi Syndrome	Clinical – pre-IND
	TNX-601 CR	Depression, PTSD, Neurocognitive Dysfunction from Corticosteroids	Clinical – pre-IND[6]
	TNX-1600[7]	Depression, PTSD and ADHD	Preclinical

[1]TNX-102 SL (cyclobenzaprine HCl sublingual tablets) is an investigational new drug and has not been approved for any indication.
[2]TNX-1300 (T172R/G173Q double-mutant cocaine esterase 200 mg, i.v. solution) is an investigational new biologic and has not been approved for any indication; licensed from Columbia University.
[3]Acquired from Trigemina; license agreement with Stanford University
[4]A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900
[5]Co-exclusive license agreement with French National Institute of Health and Medical Research (Inserm)
[6]TNX-601 CR is in the pre-IND stage in the U.S.; a Phase 1 trial for formulation development was recently completed outside of the U.S.
[7]Acquired from TRImaran Pharma; license agreement with Wayne State University

Our Pipeline – Immunology & Biodefense Portfolio

	CANDIDATES	INDICATION	STATUS
Immunology Portfolio	**TNX-1800**	**Covid-19 vaccine – Prioritized Program[1]**	**Preclinical**
	TNX-2100	SARS-CoV-2 skin test for T cell immunity[2]	Pre-IND
	TNX-2300	Covid-19 vaccine[3]	Preclinical
	TNX-801	Smallpox and monkeypox preventing vaccine[4]	Preclinical
	TNX-1500	Organ Transplant Rejection/Autoimmune Conditions[5]	Preclinical
	TNX-1700	Gastric and pancreatic cancers[6]	Preclinical
	TNX-701	Radioprotection	Preclinical

[1]Live attenuated vaccine based on horsepox virus vector
[2]*In vivo* diagnostic: SARS-CoV-2 peptide epitope mixtures for intradermal administration to measure delayed-type hypersensitivity to SARS-CoV-2
[3]Live attenuated vaccine based on bovine parainfluenza virus vector; option for license with Kansas State University
[4]Live attenuated vaccine based on horsepox virus
[5]anti-CD40L humanized monoclonal antibody
[6]recombinant trefoil factor 2 (TFF2) based protein; licensed from Columbia University

TNX-102 SL FM Lead Program Background on Fibromyalgia

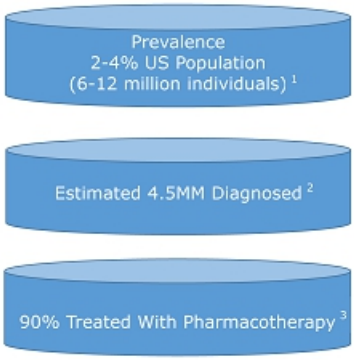
Fibromyalgia (FM):

A chronic condition

Core symptoms:
- widespread pain
- sleep disturbance
- fatigue
- cognitive symptoms.

Significant disabilities (impaired daily function).

Course of disease can last decades



1 American Chronic Pain Association (www.theacpa.org, 2019)
2 Wolfe, B., Nahin, R.L., Katz, R.S., Bergman, M.J., Wolfe, F. (2015). The Prevalence and Characteristics of Fibromyalgia in the 2012 National Health Interview Survey. *PLoS One*; 10(6): e0138024.
3. Decision Resources, Fibromyalgia, 2012

Challenges with Current Pharmacotherapy

Limitations of Current Therapies

Fewer than half of those treated for fibromyalgia receive relief from the three FDA-approved drugs[1]

- Lack of overall response leading to discontinuation or augmentation
- Lack of tolerability leading to discontinuation or reduction in dose (underdosing)

Current Treatment Patterns As A Result of Limitations

Switch Rates/Rotation/Discontinuation

- Over 50% of patient starting an FDA approved therapy for FM switch or discontinue therapy after 12 months[2]

Polypharmacy

- Average patient is using 2.6 drugs for treating their fibromyalgia, 50% of patients take 3 or more medications concomitantly[3]

Opioid usage is not uncommon

Market Dissatisfaction

Only 43% of patients indicated that they are satisfied with their medication for FM[5]

1. Frost and Sullivan, 2010
2. Liu et al., 2016
3. Robinson et al., 2012; prospective observational study with 1,700 participants with fibromyalgia
4. Sarmento et al. J Opioid Manag 2019; 15(6):460-77 – prescription opioid usage among diagnosed FM patients at one site
5. Robinson et al., 2013; prospective observational study with 1,700 participants with fibromyalgia

Fibromyalgia Unmet Need and Ideal Treatment Profile

Unmet Medical Need:

Current treatment patterns indicate that new, more effective, and better-tolerated treatments are necessary for management of FM[1]

Ideal Treatment Profile:

Treats FM as a syndrome

Relief from major symptoms (pain, sleep disturbances, fatigue)
Reduces disability and improves daily living (global function)

Well tolerated with low discontinuation

- Low systemic side-effects
- No daytime somnolence
- No weight gain or impact on sexual function

Suitable for chronic use

- Not scheduled
- Non opioid
- Non abuse potential

Source: 1. Yang, et al, 2016

TNX-102 SL: Engineered to Treat FM

This unique formulation of cyclobenzaprine has been designed to optimize delivery and absorption, while minimizing the potential residual effects of oral formulations of cyclobenzaprine.

Innovative and proprietary Protectic® delivery technology

- Overcomes mucosal absorption barrier
- Allows sublingual (SL) administration to achieves relevant systemic drug exposure
- Stable SL tablet formulation

- **Benefits of sublingual delivery**
  - Rapid drug exposure following nighttime administration
  - Lower daytime exposure
  - Avoids first-pass metabolism
    - Reduces risk of pharmacological interference from major metabolite

No recognized abuse or dependency concerns

Phase 3 F304/RELIEF Study: Design

General study characteristics:

- Randomized, double-blind, placebo-controlled study in fibromyalgia
- Adaptive Design: one unblinded interim analysis based on 50% of randomized participants

TNX-102 SL once-daily at bedtime
5.6 mg (2 x 2.8 mg tablets)[1] *N= 248*

Placebo once-daily at bedtime
N= 255

14 weeks

[1]Two week run in at 2.8 mg dose at bedtime, followed by 12 weeks at 5.6 mg dose

Primary endpoint (Week 14):

- Daily diary pain severity score change from baseline

Key Secondary endpoints (Week 14):

Symptom Relief
- PROMIS Sleep Disturbance instrument T-score
- PROMIS Fatigue instrument T-score
- FIQ-R Symptom Domain score

Global function
- PGIC responder analysis
- FIQ-R Function Domain score

Pivotal efficacy study to support NDA approval

F304/RELIEF Study Topline Primary Efficacy Endpoint

Positive outcome for primary endpoint (daily pain) at Week 14

Primary Outcome Measure at Week 14	Placebo (N=255)	TNX-102 SL[2] (N=248)	Treatment Difference	P value
LS Mean Change from Baseline (SE)	-1.5 (0.12)	-1.9 (0.12)	-0.4 (0.16)	**0.010***

Statistical Method: Mixed Model Repeated Measures analysis with Multiple Imputation
*p<0.0452 (requisite p-value hurdle for full study after Interim Analysis)
[1] Same primary endpoint analysis for FDA approvals of Cymbalta® and Lyrica® in fibromyalgia
Abbreviations: LS = least squares; NRS = numeric rating scale; SE = standard error

[2] TNX-102 SL is in clinical stage of development and not approved for any indication

Pain Relief Responder Analysis

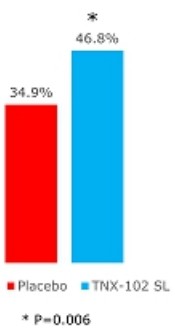
A ≥30% reduction in pain is considered clinically meaningful in pain studies

Primary efficacy analysis supported by 30% responder analysis of daily diary pain

- 47% of patients treated with TNX-102 SL versus 35% on placebo achieved a 30 percent or greater reduction in pain at Week 14

(logistic regression; odds ratio [95% CI]: 1.67 [1.16, 2.40]; p=0.006)

Comparable to numeric values published for other drugs approved for FM[1,2,3,4]



1. Arnold et al., 2005
2. Russell et al., 2008
3. Mease et al., 2008
4. Arnold et al., 2008

F304/RELIEF Study: Key Secondary Efficacy Endpoints

Outcome Measure at Week 14	Intent-to-Treat Analysis[1]	*P*-value
Non-Specific		
Patient Global Impression of Change	Responder Analysis: Proportion "Much Improved" or "Very Much Improved"	0.058
Fibromyalgia Syndrome-Related		
FIQ-R Symptom Domain	Mean Change from Baseline	0.007#
FIQ-R Function Domain	Mean Change from Baseline	0.009#
PROMIS Fatigue	Mean Change from Baseline	0.018#
Daily Sleep Quality Diary, NRS	Mean Change from Baseline	<0.001#
PROMIS Sleep Disturbance	Mean Change from Baseline	<0.001#

* nominally significant at p<0.0452
[1] Combined periods (pre- and post-interim analysis); responder analysis is by Logistic Regression (missing = non-responder); the five mean change analyses are by Mixed Model Repeated Measures with Multiple Imputation
Abbreviations: FIQ-R = Fibromyalgia Impact Questionnaire – Revised; NRS = numeric rating scale; PROMIS = Patient-Reported Outcomes Measurement Information System

*TNX-102 SL is in clinical stage of development and not approved for any indication

Adverse Events*(AEs) in F304/RELIEF Study

Those AEs reported at rate of greater than 5% in either treatment arm

Systemic Adverse Events	Placebo N=255	TNX-102 SL 5.6 mg N=248
Somnolence/Sedation	1.2%	5.6%
Local Administration Site Reactions		
Tongue/mouth numbness	0.8%	17.3%
Tongue/mouth pain/discomfort	2.0%	11.7%
Taste impairment	0.4%	6.5%
Tongue/mouth tingling	0.4%	5.6%

* Table reports only AEs at rate of greater than 5% in either treatment arm

Discontinuation rate due to adverse events: 8.9% TNX-102 SL compared to 3.9% for placebo

No serious and unexpected AEs in RELIEF related to TNX-102 SL

- Systemic AEs comparable with prior studies
- Oral AEs similar to prior studies with TNX-102 SL, although tongue/mouth numbness at about half the rate in RELIEF

Approved Fibromyalgia Pharmacotherapies

Pfizer

- Drug: Lyrica® or pregabalin (U.S. patent expired in 2018)
- Approved: 2004
- Mechanism: modulates nerve impulses involved in the transmission of pain through selective binding to the alpha2-delta protein of the voltage-gated calcium channels in CNS tissues
- Peak Sales: Approximately $5 billion (including all approved indications)

Lilly

- Drug: Cymbalta® or duloxetine (U.S. patent expired 2014)
- Approved: 2004
- Mechanism: serotonin and norepinephrine reuptake inhibitor (SNRI)
- Peak Sales: Approximately $5 billion (including all approved indications)

Abbvie (developed by Forest Laboratories)

- Drug: Savella® or milnacipran (on patent)
- Approved: 2009
- Mechanism: serotonin and norepinephrine reuptake inhibitor (SNRI)
- Peak Sales: Approximately $130 million (approved for fibromyalgia indication only)

TNX-102 SL for FM: Next Steps

2nd Phase 3 study, RALLY (F306)

- Same protocol design as RELIEF study but with 200 more patients[1]
- Enrollment began in September 2020
- Interim cohort recruited in March 2021
- Interim analysis results expected in 3rd quarter 2021[2]
- Topline results expected in 4th quarter of 2021

Following positive results from RALLY, an NDA could potentially be filed in 2022

- Long term safety exposure studies completed
- GMP manufacturing processes mature and 36-month stability established

[1]Pending agreement from FDA on protocol amendment
[2]Pending submission and agreement from FDA on statistical analysis plan

TNX-102 SL Intellectual Property – U.S. Protection expected until 2035

Composition of matter (eutectic): Protection expected to 2034/2035	• United States Patent and Trademark Office (USPTO) issued United States Patent No. 9636408 in May 2017, Patent No. 9956188 in May 2018, Patent No. 10117936 in November 2018, and Patent No. 10864175 on December 2020 •European Patent Office (EPO) issued European Patent No. 2968992 in December 2019 (validated in 37 countries). Opposition filed in October 2020 by Hexal AG • China National Intellectual Property Administration issued Chinese Patent No. ZL 201480024011.1 in April 2019 •Japanese Patent Office (JPO) issued Japanese Patent No. 6310542 in March 2018 •8 granted patents (Indonesia, Saudi Arabia, New Zealand, Australia, Mexico, Taiwan, Israel, South Africa) •11 patent applications pending (1 being allowed in Canada)
Composition of matter (sublingual): Protection expected to 2033	• NZIPO issued New Zealand Patent No. 631144 in March 2017 and Patent No. 726488 in January 2019 • Taiwanese Intellectual Property Office issued Taiwanese Patent No. I590820 in July 2017, Patent No. I642429 in December 2018 and Patent No. I683660 in February 2020 • Australian Patent Office issued Australian Patent No. 2013274003 in October 2018 and Patent No. 2018241128 in September 2020 • JPO issued Japanese Patent No. 6259452 in December 2017 • 20 patent applications pending (1 being allowed in Mexico)

COVID-19 Vaccines: Still Uncertainty

Durability of protection

- Are vaccinated people protected one year later?
- Durable protection is associated with T cell response

Protection against forward transmission

- Highly contagious nature of CoV-2 is a major problem driving pandemic

No biomarker of protection

- No test to establish protection from vaccination

Current and future variants

- Unknown effectiveness of existing vaccines

Potential for need to have annual vaccinations

- High capacity and low costs become critical

TNX-1800[1]: a COVID-19 Vaccine Candidate

- **Utilizes Tonix's proprietary horsepox virus as a vector**
  - Encodes a protein from SARS-CoV-2, the cause of COVID-19
  - Developed in collaboration with University of Alberta, Canada
- **Animal testing with Southern Research Institute**
  - Non-human primate immune response positive results reported in 4th quarter 2020
  - Non-human primate CoV-2 challenge testing positive data reported in 1st quarter 2021
    - TNX-1800 vaccinated animals had undetectable CoV-2 by PCR in oropharyngeal swabs and tracheal lavage
- **Manufacturing agreement with FUJIFILM Diosynth**
  - Development for Good Manufacturing Practice (GMP) manufacturing for human trials
  - GMP[2] clinical supply expected to be ready for a Phase 1 human trial in 2nd half of 2021[3]

[1]TNX-1800 (horsepox/Cov-2 spike live vaccine) is at the pre-IND stage of development
[2] Good Manufacturing Practice = GMP
[3] We cannot predict whether the global COVID-19 pandemic will impact the timing of these milestones

TNX-2100[1]: Potential Skin Test to Measure SARS-CoV-2 Exposure and T Cell Immunity

TNX-2100 (SARS-CoV-2 epitope peptide mixtures for intradermal administration)

- Designed to elicit delayed-type hypersensitivity (DTH) in individuals who have been exposed to SARS-CoV-2 or who have been successfully vaccinated
- Potential to measure the presence and strength of functional *in vivo* T cell immunity

Potentially scalable test for widespread use

- Adaptive Biotech's T Detect™ COVID received FDA EUA – based on genetic analysis of T cell receptors
- Other tests[2] for T cell immunity to SARS-CoV-2 require specialized laboratories and are not amenable to standardization

Development plans

- 2nd quarter 2021: Plan to submit IND based on FDA feedback
- 2nd half 2021: Plan to initiate clinical testing pending approval of IND

[1]TNX-2100 is in the pre-IND stage of development and has not been approved for any indication.
[2]Intracellular cytokine staining (ICS) measured by flow cytometry after in vitro stimulation of purified peripheral blood mononuclear cells

TNX-1900 (Intranasal Potentiated Oxytocin) for the Treatment of Migraine

Intranasal oxytocin(OT) has potential utility in treating migraine[1]

- Intranasal (*i.n.*) OT reaches the trigeminal ganglion
- Preclinical evidence of OT blocking CGRP release and suppressing pain transmission
- CGRP antagonists and antibodies approved for the treatment of migraine
- Association of low oxytocin levels during and preceding migraine episodes

TNX-1900 is an intranasal formulation of magnesium and OT

- Magnesium is known to potentiate the binding of oxytocin to its receptor[2]

Submission of IND application in 2nd quarter 2021 and initiation of Phase 2 study for treatment of chronic migraine anticipated in 3rd quarter 2021

1. Tzabazis et al., 22017
2. Antoni and Chadio, 1989

TNX-2900 (*i.n.* Potentiated OT) for the Treatment of Prader-Willi Syndrome

Prader-Willi syndrome is the most common genetic cause of life-threatening childhood obesity[1]

- Results in lack of suckling in infants and, in children and adults, severe hyperphagia, an overriding physiological drive to eat, leading to severe obesity and other complications associated with significant mortality
- No approved treatment for either the suckling deficit in babies or the obesity and hyperphagia in older children associated with Prader-Willi syndrome.
- Orphan disease occurring in approximately one in 15,000 births

Intranasal OT has been shown to improve suckling in newborn animals but also suppresses feeding behaviors in adult animal models

- Tonix's patented potentiated oxytocin formulation is believed to increase specificity for OT receptors relative to vasopressin receptors

Tonix intends to submit applications to the FDA for Orphan Drug and Fast Track designations for TNX-2900

[1]Foundation for Prader-Willi Research (fpwr.org).

TNX-1300: Cocaine Esterase (CocE)

CocE is the most potent known catalyst for cocaine degradation

- Natural bacterial CocE is unstable at body temperature

Thermostable bacterial CocE (active for ~6 hours at body temperature)

- Targeted mutations stabilize CocE
- Natural bacterial CocE is unstable at body temperature

Phase 2 open-label safety study of TNX-1300 in emergency department setting for cocaine intoxication)

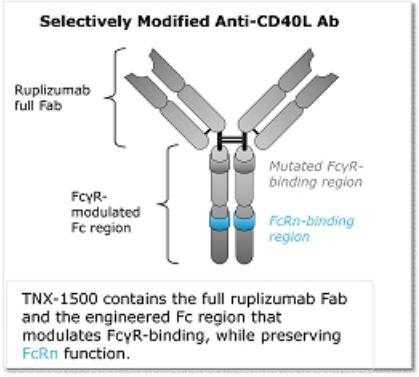
- Initiation of enrollment anticipated 2nd quarter 2021

TNX 1500, a New CD40 Ligand (CD40L) Antibody, for the Prevention of Allograft Rejection

The CD40-CD40L pathway is a pivotal immune system modulator and is a well-established and very promising treatment target to more safely prevent allograft rejection[1]

- **First Generation:** Development *halted due to thromboembolic complications (TE) – blood clots*. TE complications traced to Fc gamma receptor
- **Second Generation:** Eliminated the Fc gamma receptor (TE complication) but *potency and half life reduced which limited utility*
- **TNX-1500 Third Generation**: Re-engineered based on greater understanding of the Fc gamma receptor. Modulated the binding of FcγR while preserving FcRn function
  - Expected to deliver efficacy without compromising safety

Tonix expects to have GMP product ready in the 3rd quarter of 2021 for TNX-1500



TNX-1500 contains the full ruplizumab Fab and the engineered Fc region that modulates FcγR-binding, while preserving FcRn function.

1. Camilleri B, et al. *Exp Clin Transplant.* 2016;14(5):471-483.

Financial Overview

NASDAQ: TNXP	
Cash and cash equivalents, December 31, 2020	Approximately $77 million
Gross proceeds from registered direct equity offerings in 1Q2021	Approximately $110 million
Shares outstanding as of March 15, 2021	Approximately 324 million

Milestones – Recently Completed and Upcoming[1]

✓ 4th Quarter 2020	Non-human primate immune response positive results reported
✓ 4th Quarter 2020	Positive topline data from TNX-102 SL Phase 3 F304/RELIEF study in fibromyalgia reported
✓ 1st Quarter 2021	Non-human primate positive efficacy data from TNX-1800 in COVID-19 models reported
❑ **2ND Quarter 2021**	**Initiation of Phase 2 open-label safety study of TNX-1300 in ED setting for cocaine intoxication**
❑ **2nd Quarter 2021**	**Submission of IND application for TNX-2100 for SARS-CoV-2 skin test**
❑ **2nd Quarter 2021**	**Submission of IND application for TNX-1900 for the treatment of migraine**
❑ **3rd Quarter 2021**	**Initiation of Phase 2 study of TNX-1900 for the treatment of migraine**
❑ **3rd Quarter 2021**	**Interim analysis of TNX-102 SL Phase 3 F306/RALLY study in fibromyalgia expected**
❑ **4th Quarter 2021**	**Topline data from TNX-102 SL Phase 3 F306/RALLY study in fibromyalgia expected**
❑ **2nd Half 2021**	**Initiation of Phase 1 safety study of TNX-1800 for COVID-19 expected**
❑ **2nd Half 2021**	**Initiation of clinical trials for TNX-2100 SARS-CoV-2 skin test expected**

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

Management Team

Seth Lederman, MD
President & CEO

TARGENT · Fusilev (levoleucovorin) for injection · vela

Gregory Sullivan, MD
Chief Medical Officer

Bradley Saenger, CPA
Chief Financial Officer

Shire · VERTEX · Sirtex · pwc

Jessica Morris
Chief Operating Officer

Deutsche Bank · svb Silicon Valley Bank · American Capital

TONIX PHARMACEUTICALS

Thank You!