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): December 1, 2022

TONIX PHARMACEUTICALS HOLDING CORP.

(Exact name of registrant as specified in its charter)

Nevada	**001-36019**	**26-1434750**
(State or Other Jurisdiction of Incorporation)	**(Commission File Number)**	**(IRS Employer Identification No.)**

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

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

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

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

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

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

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

Emerging growth company ☐

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

Item 7.01 Regulation FD Disclosure.

On December 1, 2022, Tonix Pharmaceuticals Holding Corp. (the "Company") announced data from the Company's TNX-801 (live horsepox virus vaccine) candidate for smallpox and monkeypox in an oral presentation delivered by Seth Lederman, M.D., Chief Executive Officer of the Company, at the World Antiviral Congress 2022, held November 28, 2022 to December 1, 2022 (the "Presentation"). A copy of the press release which discusses this matter is furnished hereto as Exhibit 99.01, and incorporated herein by reference. The Presentation, which may contain nonpublic information, is filed as Exhibit 99.02 hereto and incorporated herein by reference.

The Company updated its investor presentation, which is used to conduct meetings with investors, stockholders and analysts and at investor conferences, and which the Company intends to place on its website, which may contain nonpublic information. A copy of the presentation is filed as Exhibit 99.03 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 December 1, 2022, the Company announced data from its TNX-801 (live horsepox virus vaccine) smallpox and monkeypox vaccine development program. The Presentation, entitled, "*Live Virus Smallpox and Monkeypox Vaccine*" describes the history of live virus vaccines and rationale for the development of the Company's Recombinant Pox Virus (RPV) platform, including TNX-801 to protect against monkeypox and smallpox. Molecular analysis of DNA sequences from archaic smallpox vaccines suggests that TNX-801 is closer than modern smallpox vaccinia vaccines to the vaccine discovered and disseminated by Dr. Edward Jenner.

Forward- Looking Statements

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

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

Item 9.01 Financial Statements and Exhibits.

(d)

Exhibit No.	Description.
99.01	Press release of the Company, dated December 1, 2022
99.02	Live Virus Smallpox and Monkeypox Vaccine
99.03	Corporate Presentation by the Company for December 2022
104	Cover Page Interactive Data File (embedded within the Inline XBRL document)

SIGNATURE

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

TONIX PHARMACEUTICALS HOLDING CORP.

Date: December 1, 2022

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

Exhibit 99.01

Tonix Pharmaceuticals Presents Development Update on Potential Smallpox and Monkeypox Vaccine TNX-801 in an Oral Presentation at the World Vaccine and Immunotherapy Congress

TNX-801 is Based on the Sequence of a Natural Isolate of Horsepox and is Believed Closer in Structure to Edward Jenner's 1798 Vaccine than Modern Vaccinia Virus Vaccines Against Smallpox

Live-Virus Vaccine Platform Leverages Tonix's Expanding Internal Development and Manufacturing Capabilities for Biologics

CHATHAM, N.J., December 1, 2022 – Tonix Pharmaceuticals Holding Corp. (Nasdaq: TNXP), a clinical-stage biopharmaceutical company, today announced that Seth Lederman, M.D., Chief Executive Officer of Tonix Pharmaceuticals, presented data from the Company's TNX-801 (live horsepox virus vaccine) smallpox and monkeypox vaccine development program in an oral presentation at the World Vaccine and Immunotherapy Congress 2022, being held in San Diego, Calif., November 28 - December 1, 2022. A copy of the Company's presentation is available under the Scientific Presentations tab of the Tonix website at www.tonixpharma.com

"TNX-801 is a live virus vaccine that we believe is closer to the smallpox vaccines used in the U.S. and Europe before 1900 than the modern vaccinia smallpox vaccines. TNX-801 has reduced virulence in animals, and we believe it has the potential for widespread use to protect against monkeypox," said Seth Lederman, M.D., President and Chief Executive Officer. "Recent global outbreaks of monkeypox have highlighted the need to be prepared with a vaccine that provides durable immunity and blocks forward transmission. Tonix's live virus vaccine technology is designed to achieve these outcomes."

The oral presentation titled, "*Live Virus Smallpox and Monkeypox Vaccine*," describes the history of live virus vaccines and rationale for the development of the Company's Recombinant Pox Virus (RPV) platform, including TNX-801 to protect against monkeypox and smallpox. The presentation describes the origins of immunization, beginning with the first live virus vaccine invented by Dr. Edward Jenner in 1798. The inoculation procedure was called "vaccination" and the inoculum material was initially obtained from lesions on cows affected by a mild disease known as cowpox. However, Dr. Jenner suspected that cowpox originated from horses [8],which led to immunization using material directly obtained from horses. This procedure was sometimes called "equination". Equination and vaccination were practiced side-by-side in Europe[13,14]. Today, molecular analysis of DNA sequences from archaic smallpox vaccines suggests that TNX-801 is closer than modern smallpox vaccinia vaccines to the vaccine discovered and disseminated by Dr. Edward Jenner[6-8].

As presented at the Canadian Society for Virology in June 2022, non-human primates vaccinated with TNX-801 were fully protected with sterilizing immunity from a challenge with intra-tracheal monkeypox.

In July 2022, the Company announced a collaboration with the Kenya Medical Research Institute (KEMRI) to seek regulatory approval for conducting a Phase 1 clinical study in Kenya to develop TNX-801 as a vaccine to protect against monkeypox and smallpox. The study is expected to start in the first half of 2023.

About TNX-801 and TNX-1850

TNX-801 is a live virus vaccine based on synthesized horsepox[2,3]. Tonix is developing TNX-801 for percutaneous administration as a vaccine to protect against monkeypox and smallpox. Tonix has previously reported positive data from a monkeypox challenge study in non-human primates[4]. Tonix is also developing TNX-1850 (horsepox-based live virus vaccines) for the prevention of COVID-19. TNX-1850 is designed to express the spike protein from the BA.2 variants of SARS-CoV-2. Tonix has previously reported positive data from a SARS-CoV-2 challenge study in non-human primates in which animals were vaccinated with TNX-1800, a horsepox-based vaccine expressing spike protein from the Wuhan strain[5]. Tonix's TNX-801 was synthesized[2] based on the sequence of the 1976 natural isolate Mongolian horsepox clone MNR-763. Molecular analysis of DNA sequences suggests that TNX-801 is closer than modern smallpox vaccines to the vaccine discovered and disseminated by Dr. Edward Jenner in 1798 [6-8]. For example, recent studies[9,10] have shown approximately 99.7% colinear identity between TNX-801 and the circa 1860 U.S. smallpox vaccine VK05.[11] The small plaque size in culture of TNX-801 appears identical to the U.S. Centers for Disease Control publication of the natural isolate[12]. Relative to vaccinia, horsepox has substantially decreased virulence in mice[2]. Dr. Edward Jenner invented vaccination in 1798 and the procedure was called "vaccination" because 'cow' is 'vacca' in Latin and the inoculum material was initially obtained from lesions on the udders of cows affected by a mild disease known as cowpox. However, Dr. Jenner suspected that cowpox originated from horses [8]. Subsequently, Dr. Jenner and others immunized against smallpox using material directly obtained from horses. The use of vaccines from horses was sometimes called 'equination' from the Latin 'equus' which means 'horse'[13]. Equination and vaccination were practiced side-by-side in Europe[13,14].

About the Recombinant Pox Virus (RPV) Platform

Horsepox virus and vaccines based on its use as a vector are live replicating viruses that elicit strong immune responses. Live replicating orthopoxviruses, like vaccinia or horsepox, can be engineered to express foreign genes and have been exploited 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) manufacturable at scale, and (7) ability to provide direct antigen presentation. Relative to vaccinia, horsepox has substantially decreased virulence in mice[2]. 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. Tonix's TNX-801 and RPV vaccine candidates are administered percutaneously using a two-pronged, or "bifurcated" needle. 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 (WHO) 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.

About Monkeypox and Smallpox

Monkeypox[15] and smallpox[16] are diseases in humans called by the monkeypox and smallpox (or variola) viruses, respectively. Monkeypox and variola are closely related orthopox viruses. Vaccination against smallpox with live virus vaccines based on horsepox or vaccinia protects against monkeypox. After routine smallpox vaccination was stopped in about 1970, monkeypox has become a growing problem in Africa. Recently approximately 300 cases have been identified outside of Africa.[17] Smallpox is considered eradicated, but there are concerns about malicious reintroduction.

About Tonix Pharmaceuticals Holding Corp.[1]

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

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

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

[3] *Tulman ER, et al. (2006) J Virol. 80(18):9244-58.PMID:16940536*

[4] *Noyce, RS, et al. Synthetic Chimeric Horsepox Virus (scHPXV) Vaccination Protects Macaques from Monkeypox* Presented as a poster at the American Society of Microbiology BioThreats Conference – January 29, 2020, Arlington, VA. (https://content.equisolve.net/tonixpharma/media/10929ac27f4fb5f5204f5cf41d59a121.pdf)*

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[5] *Tonix Press Release March 16, 202a https://ir.tonixpharma.com/news-events/press-releases/detail/1255/tonix-pharmaceuticals-reports-positive-covid-19-vaccine*

[6] *Schrick L et al. N Engl J Med. (2017) 377:1491.*

[7] *Qin et al. J. Virol. 89:1809 (2015).*

[8] *Jenner E. "An Inquiry Into the Causes and Effects of the Variolae Vaccinae: A Disease Discovered in Some of the Western Counties of England, Particularly Gloucestershire, and Known by the Name of the Cow Pox." London: Sampson Low, 1798.*

[9] *Brinkmann A et al, Genome Biology (2020) 21:286 https://doi.org/10.1186/s13059-020-02202-0*

[10] *Duggan A et al. Genome Biology (2020) 21:175 https://doi.org/10.1186/s13059-020-02079-z*

[11] *Tonix press release. Dec 4, 2020 https://ir.tonixpharma.com/news-events/press-releases/detail/1236/vaccine-genome-researchers-report-99-7-colinear-identity*

[12] *Trindale GS et al. Viruses (2016) (12). Pii: E328. PMID:27973399*

[13] *Esparza E, et al Vaccine. (2017) 35(52):7222-7230.*

[14] *Esparza J et al. Vaccine. (2020); 38(30):4773-4779.*

[15] *www.cdc.gov/poxvirus/monkeypox/about.html*

[16] *www.cdc.gov/smallpox/research/*

[17] *Mandavilli, A. The New York Times. May 26, 2020. "Who is protected against monkeypox"*

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

Forward Looking Statements

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

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)
ICR Westwicke
peter.vozzo@westwicke.com
(443) 213-0505

Exhibit 99.02

Cautionary Note on Forward-Looking Statements

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

TONIX PHARMACEUTICALS 2

Live Virus Vaccines: Development Rationale

- **Control of smallpox, measles, mumps, rubella, chickenpox and other viral conditions**
  - Prevent forward transmission
- **Effective in eliciting durable or long-term immunity**
- **Economical to manufacture at scale**
  - Low dose because replication amplifies dose *in vivo*
  - Single shot administration
- **Standard cold chain required for shipping and storage**
- **Live virus vaccines are the oldest vaccine technology**
  - Starting with Edward Jenner's smallpox vaccine, the first vaccine, eradicated smallpox

First Live Virus vaccine: Edward Jenner's *Inquiry*[1] (1796) – 1/2

"There is a disease to which the **Horse** from his state of domestication is frequently subject. The Farriers have termed it *the Grease*. It is an inflammation and swelling in the heel, from which issues matter[2] possessing properties of a very peculiar kind, which seems capable of generating a disease in the Human Body (after it has undergone the modification[3] I shall presently speak of), which bears so strong a resemblance to the Small Pox, that I think it highly probable it may be the source of that disease."

[1]Jenner, E. "An Inquiry Into the Causes and Effects of the *Variolae Vaccinae*, a Disease Discovered in Some of the Western Counties of England, Particularly Gloucestershire, and Known by the Name of the Cow Pox (p 2-3.)
[2]Vaccine virus
[3]Passage in cows

First Live Virus vaccine:
Edward Jenner's *Inquiry*[1] (1796) – 2/2

"In this Dairy Country a great number of Cows are kept, and the office of milking is performed indiscriminately by Men and Maid Servants. One of the former having been appointed to apply dressings to the heels of a **Horse** affected with *the Grease*, and not paying due attention to cleanliness, incautiously bears his part in milking the Cows, with some particles of the infectious matter adhering to his fingers. When this is the case, it commonly happens that a disease is communicated to the Cows, and from the Cows to the Dairy-maids, which spreads through the farm until most of the cattle and domestics feel its unpleasant consequences. The disease has obtained the name of the *Cow Pox*."

[1]Jenner, E. "An Inquiry Into the Causes and Effects of the *Variolae Vaccinae*, a Disease Discovered in Some of the Western Counties of England, Particularly Gloucestershire, and Known by the Name of the Cow Pox (p 3.)

Loy's "*Account of some experiments*[1] (1801)

"This fact induces me to suspect, that two kinds of Grease exist, differing from each other in the power of giving disease to the human or brute animal: and there is another circumstance which renders this supposition probable. The **horses** that communicated the infection to their dressers, were affected with a general, as well as a topical, disease. The animals, at the commencement of their disease, were evidently in a feverish state, from which they were relived as soon as the complaint appeared at their heels, and an eruption upon their skin. The **horse**, too, from whom the infectious matter was procured for inoculation, had a considerable indisposition, previous to the disease at his heels, which was attended, as in the others, with an eruption over the greatest part of his body: but those that did not communicate the diseases at all, had a local affection only."

[1]Loy JG. An account of some experiments on the origin of the cow-pox: Whitby; 1801. (p 20-21.)

Equination[1]: Use of Smallpox Vaccines from Horse Lesions

- **Both Jenner and Loy used vaccine from horses; subsequently "Equination" was used in Europe in parallel with "vaccination"**
  - Jenner believed that his "cowpox" or "vaccinia" came from horses with "Grease"
- **Producers of "vaccinia" may have supplemented or refreshed stocks with horsepox periodically"**
  - Methods of propagating vaccine in the 19th Century were not based on understanding of microbiology
- **Horsepox isolated from a sick horse in Mongolia in 1976**
  - Like many other poxviruses, natural host is likely rodents (mice or voles)
  - No cases reported in >30 years, some believe it to be extinct; eliminated through improved animal husbandry

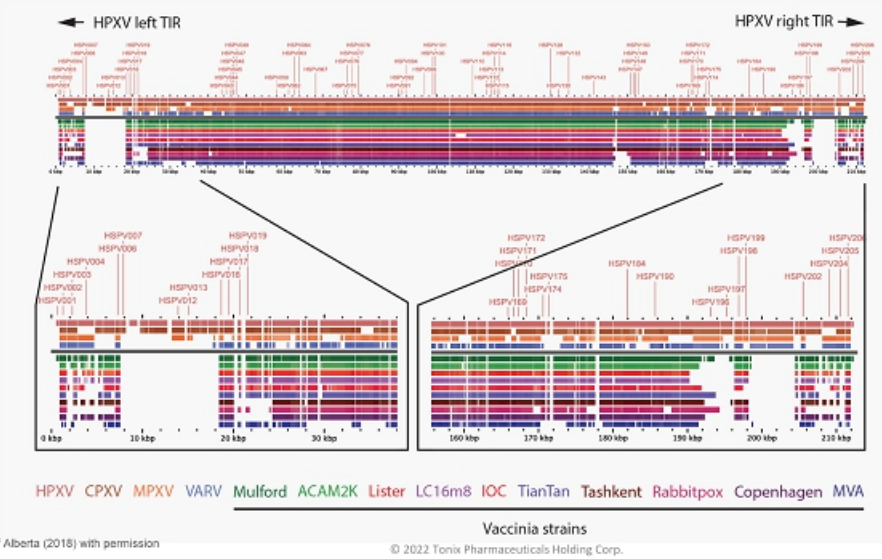
[1]Esparza J, Schrick L, Damaso CR, Nitsche A. Equination (inoculation of horsepox): An early alternative to vaccination (inoculation of cowpox) and the potential role of horsepox virus in the origin of the smallpox vaccine. *Vaccine*. 2017 Dec 19;35(52):7222-7230. doi: 10.1016/j.vaccine.2017.11.003. Epub 2017 Nov 11. Review. PMID:29137821

Horsepox: Development Rationale

- **Horsepox clone sequenced in 2006 shares a common ancestor with vaccinia and could be considered a strain of vaccinia**
  - Similar to cowpox with "intact" inverted terminal repeats (ITRs) – could be considered a primordial strain of vaccinia
- **U.S. vaccine from Mulford 1902 was found to be 99.7% similar to horsepox in core viral sequence[1,2]**
  - TNX-1800 has 99.7% colinear identity with circa 1860 smallpox vaccine[2,3]
  - Strong evidence linking a horsepox-like virus as progenitor to modern vaccinia
  - Effectiveness of older vaccines support belief that horsepox will e protective against smallpox
- **Genetic analysis of early vaccines indicates that "horsepox" is closely related to Edward Jenner's vaccinia from 1796**
  - Modern "vaccinia" evolved during the 220 years it was propagated by primitive methods – for over 120 years before "viruses" were identified
  - Prevents forward transmission
  - Edward Jenner's "cowpox"/"vaccinia" smallpox vaccine eradicated smallpox

[1]Schrick, L. et al An Early American Smallpox Vaccine Based on Horsepox *N Engl J Med* 2017; 377:1491
[2]Tulman ER, et al. Genome of horsepox virus. *J Virol*; 2006 80(18):9244-58.PMID:16940536
[3]Brinkmann A et al, *Genome Biology* 2020; 21:286 https://doi.org/10.1186/s13059-020-02202-0

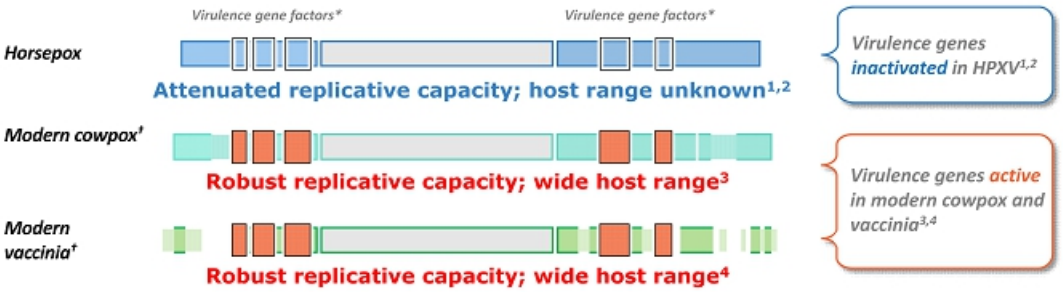
Horsepox Compared to Cowpox and Vaccinia Strains[1]
Consistent with Near "Primordial" Strain Status



[1]Evans, D. U. of Alberta (2018) with permission

TONIX PHARMACEUTICALS

Certain Gene Factors Have the Potential to Enhance Virulence of Vaccinia and Cowpox Relative to Horsepox



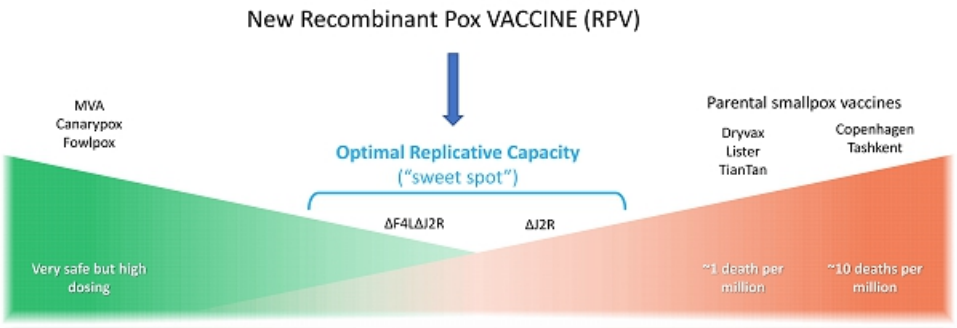
Replicative capacity equates to the "fitness" or competitive advantage of the virus

*This is a conceptual view to illustrate whether these genes are active or not and does not indicate the actual number, size, or location of the genes
†Stripes indicate regions among different vaccinia strains that are present in some but absent in others

[1]Schrick L, et al. *N Engl J Med.* 2017;377(15):1491-1492.
[2]Dabrowski PW, et al. *PLoS One.* 2013;8(12):e78953.
[3]Tulman ER, et al. *J Virol.* 2006;80(18):9244-9258.
[4]Qin L, et al. *J Virol.* 2015;89(3):1809-1824.

TONIX PHARMACEUTICALS

Historical Safety Spectrum Of Pox-based Vectors
Optimizing Live Virus Vaccines



Nonreplicating
Poor Transgene immunogenicity

Intermediate Replicative Capacity
Ability to elicit robust immunological responses to Transgene

Robust Replication
Risk for adverse vaccination events

Commercial Applications of Licensed Recombinant Poxvirus-Based Vaccines

Agriculture[1,2]

- Newcastle disease virus (NDV) TROVAC (**recombinant fowlpox**)
- Avian influenza (AIV) TROVAC (**recombinant fowlpox**) (H5N9 and H5N1)

Cats[3]

- **Recombinant canarypox** rabies vaccine (ALVAC-RG) and feline leukemia (ALVAC-FeLV)

Dogs[4]

- RECOMBITEK® C4 **recombinant canarypox** vector expressing the HA and F glycoproteins of canine distemper virus; modified live adenovirus type 2, parainfluenza virus, and parvovirus

[1]Taylor J, et al. *Avian Dis.* 1998;40(1):173-180.
[2]The Poultry Site. March 14, 2005. Accessed July 9, 2021. https://www.thepoultrysite.com/news/2005/03/merial-launches-new-h5n1-avian-influenza-vaccine-provides-new-hope-for-avian-flu-epidemic
[3]Boehringer Ingelheim. Accessed July 9, 2021. https://www.boehringer-ingelheim.com/animal-health/companion-animals-products/purevax
[4]Larson LJ, et al. *Vet Ther.* 2007;8(2):101-106.

Approved Recombinant Poxvirus-Based Commercial Products[1-3]

Product	Application / disease	Location	Poxvirus vector	Host restricted?	Doses released to environment
TROVAC-AIV H5N1 *Boehringer Ingelheim*	Agriculture/avian influenza	Mexico, Central America	TROVAC-AIV H5N1	**No** ***Replication competent***	**2 billion** (as of 2006)
Purevax FeLV *Boehringer Ingelheim*	Companion animals (cats)/FeLV	US, others	ALVAC-FeLV Gag/Pol	Yes *Replication incompetent*	Unknown
Purevax Rabies *Boehringer Ingelheim*	Companion animals (cats)/rabies	US, others	ALVAC-RG	Yes *Replication incompetent*	Unknown
Recombitek *Boehringer Ingelheim*	Companion animals (dogs)/canine distemper	US, others	ALVAC-HA, F	Yes *Replication incompetent*	Unknown
Raboral V-RG **Rabisin** *Boehringer Ingelheim*	Wildlife control of rabies	US, Europe, Israel	Vaccinia Copenhagen RG	**No** ***Replication competent***	**250 million doses** *5 million doses/year*

[1]Boehringer Ingelheim. Accessed July 15, 2021. https://www.boehringer-ingelheim.com/animal-health/products
[2]Bublot M, Pritchard N, Swayne DE, et al. Development and use of fowlpox vectored vaccines for avian influenza. *Ann N Y Acad Sci*. 2006;1081:193-201.
[3]Maki J, Guiot AL, Aubert M, et al. Oral vaccination of wildlife using a vaccinia-rabies-glycoprotein recombinant virus vaccine (RABORAL V-RG®): a global review. *Vet Res*. 2017;48(1):57.

TONIX PHARMACEUTICALS

Environmental Distribution: Vaccinia Released Aerially as Rabies Vaccine

- **RABORAL V-RG® is an oral vaccine based on vaccinia–rabies-glycoprotein recombinant virus used to prevent the spread of rabies among wildlife populations[1-3,*]**
  - RABORAL has been in continuous use since 1987
  - Approximately **250 million doses** in the form of animal baits have been aerially distributed across Europe, Israel, Canada, and the US at a rate of about 5 million baits per year
  - Species targeted include skunks, racoons, foxes, and coyotes
  - Jordona Kirby, the rabies field coordinator for the USDA's National Rabies Management Program was interviewed about dropping Raboral out of low-flying planes and helicopters to control rabies in the East Coast of the US[4]

*A registered trademark of Boehringer Ingelheim Animal Health
[1]Raboral V-RG®. Accessed July 9, 2021. https://www.raboral.com/about-rabies/raboral-v-rg
[2]Kieny MP, et al. *Nature*. 1984;312(5990):163-166.
[3]Maki J, et al. *Vet Res*. 2017;48(1):57.
[4]Science Friday : NPR Sept 30, 2022 NPR's program "Science Friday" at 30:02 in the podcast www.npr.org/podcasts/583350334/science-friday

TONIX PHARMACEUTICALS

TNX-801 (Live HPXV for Percutaneous Administration)

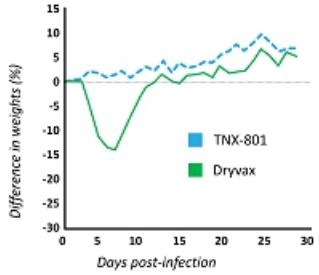
- **Vaccine based on sequence of isolated horsepox (HPXV) clone[1]**
  - Synthesized[2] since 1976 isolate was not available outside of the U.S. Centers for Disease Control and Prevention (CDC)
  - No new gene elements
  - Coding sequence identical to HPXV
- **Small plaque size in culture**
  - Appears identical to CDC publication of 1976 horsepox isolate[3]
- **Substantially decreased virulence in mice[2] and efficacy in NHPs to protect against monkeypox[4]**
  - Non-human primate study showing protection from monkeypox presented at 2020 ASM Biothreats conference

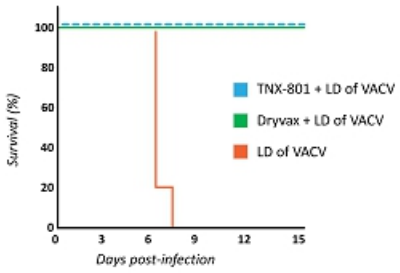
[1]Tulman ER, et al. Genome of horsepox virus. *J Virol.* 2006 80(18):9244-58.PMID:16940536
[2]Noyce RS, et al.. Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments. *PLoS One.* 2018 Jan 19;13(1):e0188453
[3]Trindade GS, et al. Serro 2 Virus Highlights the Fundamental Genomic and Biological Features of a Natural Vaccinia Virus Infecting Humans. *Viruses* 2016 Dec 10;8(12). pii: E328. PMID:27973399 PMCID: PMC5192389 DOI: 10.3390/v8120328
[4]Noyce, RS, et al. Synthetic Chimeric Horsepox Virus (scHPXV) Vaccination Protects Macaques from Monkeypox" Presented as a poster at the American Society of Microbiology BioThreats Conference - January 29, 2020, Arlington, VA. (https://content.equisolve.net/tonixpharma/media/10929ac27f4fb5f5204f5cf41d59a121.pdf)

TONIX PHARMACEUTICALS

Vaccination with TNX-801 (rHPXV) Improves Upon the Tolerability Profile of Modern Vaccines in Animals

- **In a study that compared the efficacy and safety of TNX-801 to Dryvax[1]:**
  - Mice (5 per group) infected with Dryvax lost up to 15% of their body weight because of illness induced by the vaccine, but mice infected with TNX-801 did not experience any weight loss or illness
  - TNX-801 protected equally well as Dryvax from a lethal dose (LD) of vaccinia (VACV)
  - TNX-801 may be safer than current vaccines without sacrificing efficacy

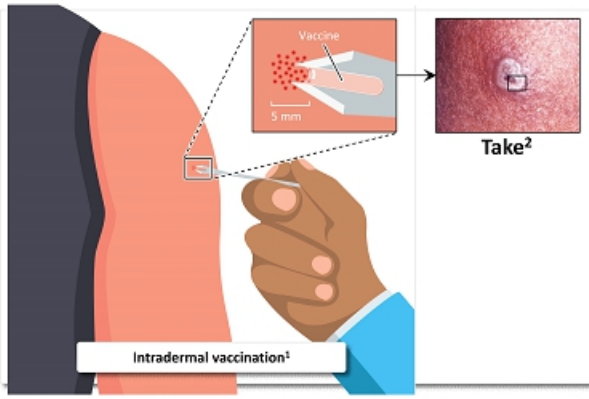




[1]Noyce RS, et al.. Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments. *PLoS One.* 2018 Jan 19;13(1):e0188453.

TONIX PHARMACEUTICALS

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



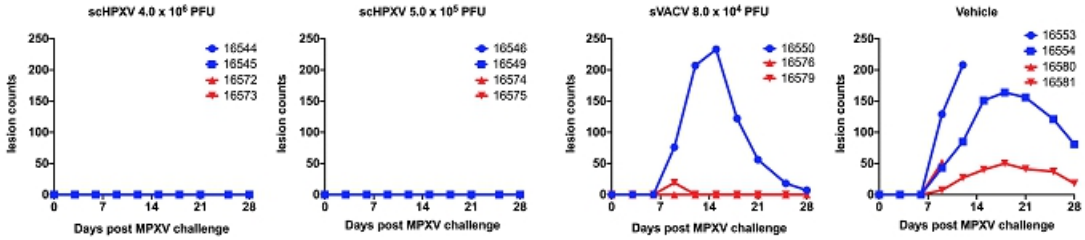
- **Biomarker of protection**
  - Smallpox was eradicated using this marker
  - Revaccination indicated for recipients without "take"
- **Measure of T cell immunity**
  - No need for blood draws or complex laboratory studies
  - No other functional T cell assay is approved or in clinical use for vaccination

*Example of major cutaneous reaction, or "take," resulting from a replication-competent live-virus vaccine with intradermal delivery, indicating successful vaccination[1,2]

[1]Fulginiti VA, et al. *Clin Infect Dis.* 2003;37(2):241-250.
[2]Centers for Disease Control and Prevention. Accessed April 15, 2020. https://phil.cdc.gov/Details.aspx?pid=3276

No Overt Clinical Signs Observed in TNX-801 Vaccinated Macaques After Monkeypox (MPVX) Challenge[1]

No monkeypox lesions observed after monkeypox (MPVX) challenge in any of the eight animals vaccinated with TNX-801



Legend: Cynomolgus macaques (4 per group), were vaccinated via scarification using a bifurcated needle. Two different doses of TNX-801 (scHPXV) vaccine were tested (panel a. and b.); one dose of TNX-1200 (sVACV)(panel c.); or vehicle (panel d). After monkeypox (MPXV) challenge, no lesions were seen in any of the 8 animals vaccinated with TNX-801 (panel a and b.). One animal in the TNX-1200 arm died from unrelated causes, and two of three remaining animals showed lesions by Day 69 (panel c.). All four vehicle vaccinated animals developed lesions (panel d.) Clinical signs of systemic monkeypox infections were seen in all 4 vehicle-vaccinated animals (panel d.) by Day 69, but TNX-801 and TNX-1200 vaccinated animals were protected. In Panels a-d, blue symbols are male animals and red are female.

Methods: 4 of 4 animals in the $4x10^8$ PFU dose, and 3 of 4 animals in the $5x10^5$ PFU dose groups exhibited a "take" at Day 7 after a single vaccination. A take is a biomarker of protective immunity. In the TNX-1200 (sVACV) arm only 1 of 4 animals exhibited a take after a single vaccination. The animals that did not present a take were revaccinated on Day 14: the one TNX-801 animal was revaccinated with $5x10^5$ PFU TNX-801 and the 3 TNX-1200 animals were revaccinated with $2.4x10^5$ PFU TNX-1200. All but one of the TNX-1200 animals subsequently produced a take. Tolerability was comparable for TNX-801 and TNX-1200.

[1]Noyce, RS, et al. Synthetic Chimeric Horsepox Virus (scHPXV) Vaccination Protects Macaques from Monkeypox* Presented as a poster at the American Society of Microbiology BioThreats Conference - January 29, 2020, Arlington, VA. (https://content.equisolve.net/tonixpharma/media/10929ac27f4fb5f5204ff5cf41d59a121.pdf)

Monkeypox Outside of Africa

- **First case reported May 7th, more than 25,000 cases observed outside of Africa[1]**
  - West African strain found outside of Africa, low mortality in Africa (<1%)
  - Mortality in Africa believed to be 3-6%; strain prevalent in Congo has higher mortality (~10%)
  - Skin to skin transmission
  - In latest outbreak most cases outside Africa were linked to linked to a events in Spain and Belgium
  - Last outbreak outside of Africa was 2003 when infected prairie dogs led to 70 cases in the US
- **Resurgence believed due to cessation of routine smallpox vaccination**
  - Smallpox vaccination with live virus vaccinia protects against monkeypox[2]
- **US Stockpile includes Jynneos®[3], 2-dose regimen of non-replicating MVA vaccinia strain that protects NHPs from monkeypox[4]**
  - US has ordered more Jynneos – CDC considering ring vaccination and vaccinating first responders, but Jynneos requires two dose regimen
  - ACAM2000®[3] - live replicating 1-dose regimen also recommended but not FDA approved

[1] *The Economist* May 25th 2022, "Monkeypox is not covid mk2, but it needs to be nipped in the bud: The illness can be dangerous for children, pregnant women and the immunocompromised":
URL: Monkeypox is not covid mk2, but it needs to be nipped in the bud | The Economist
[2] https://www.cdc.gov/smallpox/pdfs/revaccination-memo.pdf
[3] Jynneos is a trademark of Bavarian Nordic and ACAM2000 is trademark of Emergent BioSolutions
[4] Rao, AK. et al. May 27, 2022. US CDC MMWR 71 "Use of JYNNEOS (Smallpox and Monkeypox Vaccine, Live, Nonreplicating) for Preexposure Vaccination of Persons at Risk for Occupational Exposure to Orthopoxviruses: Recommendations of the Advisory Committee on Immunization Practices — United States, 2022"
www.cdc.gov/mmwr/volumes/71/wr/mm7122e1.htm?s_cid=mm7122e1_w

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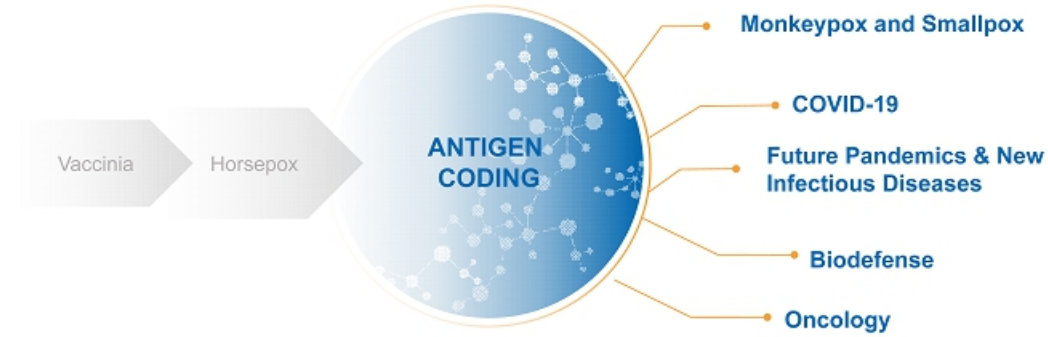
Live Virus Vaccine Platform: Recombinant Pox Vaccine (RPV)
Technology for Emerging Infectious Diseases and Oncolytics



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

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

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

TONIX PHARMACEUTICALS

Live Virus RPV Platform
Internal Development & Manufacturing Capabilities

Infectious Disease R&D Center (RDC) – Frederick, MD
- Function: Accelerated development of vaccines and antiviral drugs against COVID-19, its variants and other infectious diseases
- Description: ~48,000 square feet, BSL-2 with some areas designated BSL-3
- Status: Operational

Advanced Development Center (ADC) – North Dartmouth, MA
- Function: Development and clinical scale manufacturing of biologics
- Description: ~45,000 square feet, BSL-2
- Status: Operational

Commercial Manufacturing Center (CMC) – Hamilton, MT
- Function: Phase 3 and Commercial scale manufacturing of biologics
- Description: ~44 acre green field site, planned BSL-2
- Status: Planning for site enabling work

Architectural Rendering

Investigators and Collaborators

Tonix
- Seth Lederman
- Siobhan Fogarty
- Sina Bavari
- Scott Goebel
- Bruce Daugherty
- Helen Stillwell[1]

Univ. of Alberta
- Ryan Noyce
- David Evans

Univ. of Maryland – Institute of Human Virology
- José Esparza

Southern Research
- Fusataka Koide
- Landon Westfall[2]
- Karen Gilbert[3]

LINQ Pharma Consulting
- Onesmo Mpanju

Current Addresses

[1]University of Pennsylvania
[2]ITRI
[3]National Toxicology Program (NTP) at National Institute of Environmental Health Sciences (NIEHS), NIH; Artic Slope Regional Corp.


THANK YOU
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Exhibit 99.03

Cautionary Note on Forward-Looking Statements

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

TONIX PHARMACEUTICALS

Who We Are

OUR MISSION

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

OUR VISION

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

TONIX PHARMACEUTICALS

Investment Highlights

DIVERSE PIPELINE

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

IN-HOUSE CAPABILITIES

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

STRATEGIC PARTNERSHIPS

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

FINANCIAL POSITION

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

TONIX PHARMACEUTICALS

Pipeline: Key Programs

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

*All of Tonix's product candidates are investigational new drugs or biologics and have not been approved for any indication.
[1]TNX-102 SL (cyclobenzaprine HCl sublingual tablets) is also in development for Agitation in Alzheimer's Disease (AAD) and Alcohol Use Disorder (AUD). Both indications are Phase 2 ready.
[2]Post-Acute Sequelae of COVID-19.
[3]TNX-1300 (double-mutant cocaine esterase) was licensed from Columbia University.
[4]Acquired from Trigeminus; license agreement with Stanford University; IND cleared for the prevention of migraine indication; Planned Binge Eating Disorder study is expected to be investigator initiated.
[5]A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900; Phase 2 for the prevention of migraine headache expected to start 1Q 2023
[6]TNX-601 ER is in the pre-IND stage in the U.S.; a Phase 1 trial for formulation development was completed outside of the U.S. Phase 2 expected to start 1Q 2023
[7]Acquired from TRImaran Pharma; license agreement with Wayne State University
[8]Co-exclusive license agreement with French National Institute of Health and Medical Research (Inserm)
[9]anti-CD40L humanized monoclonal antibody
[10]Recombinant trefoil factor 2 (rTFF2) based protein; licensed from Columbia University
[11]Live attenuated vaccine based on horsepox virus
[12]Live attenuated vaccine based on horsepox virus vector, expressed SARS-CoV-2 spike protein. TNX-1850 is based on the BA.2 variant spike protein.
[13]Live attenuated vaccine based on bovine parainfluenza (BPI) virus
[14]Fully human monoclonal antibody generated from COVID-19 convalescent patients.
[15]COVID vaccine based on mRNA in zinc nanoparticle (ZNP) formulation with CD40L molecular trigger

TONIX PHARMACEUTICALS

TONIX PHARMACEUTICALS

CNS: KEY CANDIDATES

TNX-102 SL*

Cyclobenzaprine (Protectic®) Pipeline in a Product

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

Potent binding and antagonist activities at the serotonin-5-HT2A, α1-adrenergic, histaminergic-H1, and muscarinic-M1 receptors to facilitate restorative sleep

Innovative and proprietary PROTECTIC® Rapid drug exposure following nighttime administration

Differentiators:

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

Relative to Standard of Care
- Potential for better tolerability while maintaining efficacy

Patents Issued

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

Fibromyalgia

Status: Mid-Phase 3
- One positive Phase 3 study (RELIEF) completed
- Second Phase 3 study (RALLY) missed primary endpoint
- Confirmatory Phase 3 study (RESILIENT) is currently enrolling

Next Steps: Interim analysis results expected 2Q 2023

Long COVID

Status: Phase 2
- Phase 2 study (PREVAIL) is currently enrolling

Next Steps: Interim analysis results expected 2Q 2023

Posttraumatic Stress Disorder (PTSD)

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

Next Steps: Initiate Phase 2 trial 1Q 2023

TONIX PHARMACEUTICALS

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

CNS PORTFOLIO

PROFILE

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

- Afflicts an estimated 6-12 million adults in the U.S., approximately 90% of whom are women[1]
- Symptoms include chronic widespread pain, nonrestorative sleep, fatigue, and cognitive dysfunction
- Patients struggle with daily activities, have impaired quality of life, and frequently are disabled
- Physicians and patients report common dissatisfaction with currently marketed products

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

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Fibromyalgia

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

Status: One Positive Phase 3 study RELIEF completed

Second Phase 3 study RALLY missed primary endpoint

Confirmatory Phase 3 study RESILIENT is currently enrolling

Next Steps: Interim analysis results expected 2Q 2023

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

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

TONIX PHARMACEUTICALS

Phase 3 RESILIENT Study Design

General study characteristics:

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

Primary Endpoint:

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

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

Placebo once-daily at bedtime

14 weeks

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

CNS PORTFOLIO

TONIX PHARMACEUTICALS

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

PROFILE

- Occurs in approximately 13% of recovered COVID-19 patients[1]
- As many as 40% of Long COVID patients experience multi-site pain, a hallmark of fibromyalgia[2,3]

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Fibromyalgia-Type Long COVID (PASC)

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

Status: Phase 2 study PREVAIL is currently enrolling

Next Steps: Interim analysis results expected 2Q 2023

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

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

CNS PORTFOLIO

TONIX PHARMACEUTICALS

Phase 2 PREVAIL Study Design

General study characteristics:

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

Primary Endpoint:

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

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

CNS PORTFOLIO

TONIX PHARMACEUTICALS

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

PROFILE

PTSD is a serious chronic psychiatric illness

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

Affects approximately 12 million Americans adults[1,2]

Large unmet clinical need and limited effective therapies available

- Advances in pharmacological treatments beyond the currently approved SSRIs (e.g., Zoloft® (sertraline), Paxil® (paroxetine)) are needed[3]

DEVELOPMENT PROGRAM

Market Entry: PTSD

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

Status: One Phase 2 study (AtEase) completed

Two Phase 3 studies (HONOR, RECOVERY) conducted

Next Steps: 1Q 2023 Initiate Phase 2 Trial

Patents Issued

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

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

CNS PORTFOLIO

TONIX PHARMACEUTICALS

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

CNS PORTFOLIO

PROFILE

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

CocE is a recombinant protein that degrades cocaine in the bloodstream

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

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

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Cocaine Intoxication

Status: Mid-Phase 2

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

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

FDA Breakthrough Therapy Designation

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

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

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

TONIX PHARMACEUTICALS

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

CNS PORTFOLIO

PROFILE

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

Differentiators:
Relative to Tianeptine IR:

- Once daily dosing

Relative to traditional anti-depressants:

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

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Major Depressive Disorder

Additional Indications: PTSD, Neurocognitive Disorder From Corticosteroids

Status: Phase 2 ready

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

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

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

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

TONIX PHARMACEUTICALS

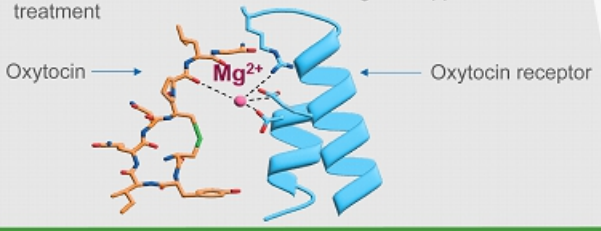
TNX-1900*: Migraine
Intranasal Potentiated Oxytocin (OT) with Magnesium

CNS PORTFOLIO

PROFILE

- Intranasal OT has potential utility in treating migraine[1]
- Magnesium is known to potentiate the binding of OT to its receptor[2,3]
- One billion individuals worldwide suffer from migraines

Differentiator: Novel non-CGRP antagonist approach to treatment



Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Chronic Migraine

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

Status: Phase 2 ready[4]

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

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

[1]Tzabazis A, et al. Oxytocin and Migraine Headache. Headache. 2017 May;57 Suppl 2:64-75. doi: 10.1111/head.13082. PMID: 28485846.
[2]Antoni FA, Chadio SE. Essential role of magnesium in oxytocin-receptor affinity and ligand specificity. Biochem J. 1989 Jan 15;257(2):611-4. doi: 10.1042/bj2570611. PMID: 2538090; PMCID: PMC1135623.
[3]Meyerowitz, J.G., et al. The oxytocin signaling complex reveals a molecular switch for cation dependence. *Nat Struct Mol Biol* (2022). (https://doi.org/10.1038/s41594-022-00728-4)
[4]A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900

TONIX PHARMACEUTICALS

TONIX PHARMACEUTICALS

RARE DISEASE: KEY CANDIDATES

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

RARE DISEASE PORTFOLIO

PROFILE

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

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

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

Dangers of PWS Hyperphagia:

Unhealthy behaviors around food[1-4] → Consequences such as obesity, type 2 diabetes, cardiovascular disease[1-5] → Caretaker Burden[1-4]:

DEVELOPMENT PROGRAM

Market Entry: Hyperphagia in Prader-Willi Syndrome

Additional Indications: Rare Hyperphagia Conditions

Status: Pre-IND

Next Steps: IND preparation

Patents Issued

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

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

TONIX PHARMACEUTICALS

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IMMUNOLOGY: KEY CANDIDATES

TNX-1500*

Next Generation α-CD40 Ligand (CD40L) Antibody

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

Differentiators: Expected to deliver efficacy without compromising safety

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

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

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

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

Prevention of Allograft Rejection

Status: Preclinical

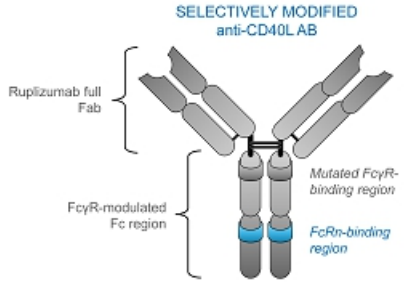
- Collaborations ongoing with Mass General Hospital on heart and kidney transplantation in non-human primates

Next Steps: Initiate Phase 1 study 1H 2023

Autoimmune Disease

Status: Potential future indication

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



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

TONIX PHARMACEUTICALS

TNX-1700*: Gastric and Colorectal Cancers
Recombinant Trefoil Factor 2 (rTFF2) Fusion Protein

IMMUNOLOGY PORTFOLIO

Potential New Cancer Treatment

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

Preclinical Evidence for Inhibiting Growth of Cancer Cells

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

Licensed from Columbia University

- Developing in partnership under sponsored research agreement

Patents Filed

DEVELOPMENT PROGRAM

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

Status: Preclinical

Next Steps: Animal studies ongoing

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

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

TONIX PHARMACEUTICALS

TNX-801 & TNX-1850*

Recombinant Pox Vaccine (RPV) Platform Using Live Virus Technology

Differentiators:

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

*TNX-801 and TNX-1850 are in the pre-IND stage of development and has not been approved for any indication. Patents filed.

[1]Noyce RS, et al. Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments. PLoS One. 2018 Jan 19;13(1):e0188453.
[2]Brennan, Z. Endpoints March 2, 2022 (https://endpts.com/weaker-omicron-variant-is-great-news-for-the-world-but-bad-news-for-covid-related-clinical-trials/)

Monkeypox and Smallpox Vaccine

Status: Preclinical

- TNX-801 is a cloned version of horsepox[1] (without any insert) purified from cell culture

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

COVID-19 Vaccine

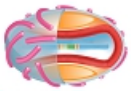
Status: Preclinical

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

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

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

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



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Additional Infectious Disease Therapeutics in Development

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

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

TNX-3600*: Fully Human Monoclonal Antibody Platform

Market Entry: COVID-19 Therapeutic
Status: Preclinical
Next Steps: Study inhibition of SARS CoV-2 variants in tissue culture; initiate animal studies

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

Market Entry: Booster for COVID-19 Vaccines
Status: Preclinical
Next Steps: Research at KSU on CoV-2 spike based vaccine in tissue culture and animals; initiate animal studies

INFECTIOUS DISEASE PORTFOLIO

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

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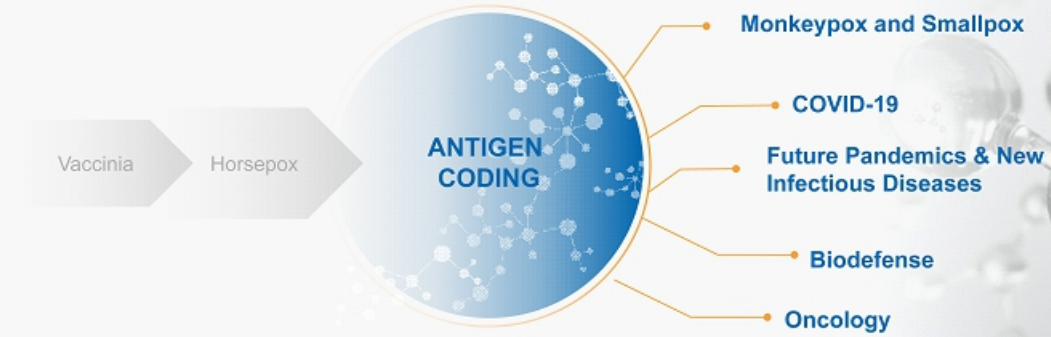
Live Virus Vaccine Platform: Recombinant Pox Vaccine (RPV) Technology for Emerging Infectious Diseases and Oncolytics



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

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

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

INFECTIOUS DISEASE PORTFOLIO

TONIX PHARMACEUTICALS

Internal Development & Manufacturing Capabilities

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

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

Advanced Development Center (ADC) – North Dartmouth, MA

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

Commercial Manufacturing Center (CMC) – Hamilton, MT

- **Function**: Phase 3 and Commercial scale manufacturing of biologics
- **Description:** ~44-acre green field site, planned BSL-2
- **Status:** Planning for site enabling work in 2022

Architectural Rendering

INFECTIOUS DISEASE PORTFOLIO

TONIX PHARMACEUTICALS

Management Team

Seth Lederman, MD
Co-Founder, CEO & Chairman

Gregory Sullivan, MD
Chief Medical Officer

Bradley Saenger, CPA
Chief Financial Officer

Jessica Morris
Chief Operating Officer

Milestones: Recently Completed and Upcoming*

- ☑ 1st Quarter 2022 Topline data from Phase 3 RALLY study of TNX-102 SL for the management of fibromyalgia
- ☑ 2nd Quarter 2022 Phase 3 RESILIENT study start of TNX-102 SL for the management of fibromyalgia
- ☑ 3rd Quarter 2022 Phase 2 PREVAIL study start of TNX-102 SL for the treatment of Long COVID

Expected Data

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

Expected Clinical Trial Initiations

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

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


THANK YOU
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