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# Tonix Pharmaceuticals Announces Results of Retrospective Observational Database Study In Over 50,000 Long COVID Patients

*Over 40% of Long COVID Patients Had Fibromyalgia-Like Multi-Site Pain Symptoms*

*Rate of Opioid Use in Long COVID Patients with Multi-Site Pain is a Potential Health Concern*

CHATHAM, N.J., April 20, 2022 (GLOBE NEWSWIRE) -- Tonix Pharmaceuticals Holding Corp. (Nasdaq: TNXP), a clinical-stage biopharmaceutical company, announced today the results of a retrospective observational database study in over 50,000 patients diagnosed with Long COVID[1-2]. Long COVID is known officially as Post-Acute Sequelae of COVID-19 (PASC[3]). Tonix recently announced that the U.S. Food and Drug Administration (FDA) has cleared the Investigational New Drug (IND) application to support a Phase 2 clinical trial with TNX-102 SL[4] (cyclobenzaprine HCl tablets for sublingual administration) as a potential treatment for a subset of patients with Long COVID whose symptoms overlap with fibromyalgia, and expects to initiate this study in the second quarter. The goal of the retrospective database study was to assess the proportion of Long COVID patients who experience fibromyalgia-like multi-site pain and to measure their use of opiates.

In the study, over 40% of patients with symptoms of Long COVID had fibromyalgia-like multi-site pain [1,2]. In addition, the study reported on the rate of opioid use in Long COVID patients. Opioid use noted was in 36% of Long COVID patients with multi-site pain symptoms relative to 19% of Long COVID patients without multi-site pain. In patients with multisite pain, opiate use increased to 39% of patients when fatigue was present, and 50% of patients when insomnia was present.

“We undertook this retrospective analysis in part to determine the feasibility and representative nature of our upcoming Phase 2 study of TNX-102 SL in patients with Long COVID who present with fibromyalgia-like multi-site pain,” said Seth Lederman, M.D., Chief Executive Officer of Tonix Pharmaceuticals. “The finding that more than 40% of Long COVID patients in this sample have fibromyalgia-like multi-site pain symptoms suggests that we should be able to recruit a robust cohort of participants to test the effects of TNX-102 SL in treating this condition. Further, these findings suggest that the group of Long COVID patients with fibromyalgia-like multi-site pain represents a significant portion of this underserved population. Finally, the high level of opiate use reveals the urgency to provide effective non-opioid analgesia that is targeted toward widespread pain thought to be nociplastic in nature, meaning that augmented CNS pain and sensory processing, as well as altered pain modulation, play a role. The primary efficacy endpoint of the upcoming Phase 2 study will therefore be change from baseline in the weekly average of daily self-reported worst pain

intensity scores."

The study queried data from the TriNetX Dataworks USA Network. The network is a federated network of de-identified inpatient and outpatient electronic medical records from 48 U.S. healthcare organizations. From 75 million people in the network, approximately 1 million adults (18-65) had been diagnosed with acute COVID-19. Of these, approximately 260,000 followed up with a healthcare provider in the network within six months of having acute COVID-19. Of these, approximately 52,000 had Long COVID symptoms in the period between 3 and 6 months after acute COVID-19, which was the time-frame for the analysis for diagnostic codes consistent with multi-site pain, fatigue and insomnia.

*[1]Harris, H, et al. Tonix data on file. 2022*
*[2]TriNetX Analytics*
*[3]Feb. 24, 2021 - White House COVID-19 Response Team press briefing; Feb 25, 2021 - policy brief from the World Health Organization on long COVID.*
*[4]TNX-102 SL is an investigational new drug and has not been approved for any indication.*

**About Tonix Pharmaceuticals Holding Corp.**

Tonix is a clinical-stage biopharmaceutical company focused on discovering, licensing, acquiring and developing therapeutics and diagnostics to treat and prevent human disease and alleviate suffering. Tonix's portfolio is composed of immunology, rare disease, infectious disease, and central nervous system (CNS) product candidates. Tonix's immunology portfolio includes biologics to address organ transplant rejection, autoimmunity and cancer, including TNX-1500[1] which is a humanized monoclonal antibody targeting CD40-ligand being developed for the prevention of allograft and xenograft rejection and for the treatment of autoimmune diseases. A Phase 1 study of TNX-1500 is expected to be initiated in the second half of 2022. Tonix's rare disease portfolio includes TNX-2900[2] for the treatment of Prader-Willi syndrome. TNX-2900 has been granted Orphan-Drug Designation by the FDA. Tonix's infectious disease pipeline includes a vaccine in development to prevent smallpox and monkeypox called TNX-801[3], next-generation vaccines to prevent COVID-19, and an antiviral to treat COVID-19. Tonix's lead vaccine candidates for COVID-19 are TNX-1840 and TNX-1850[4], which are live virus vaccines based on Tonix's recombinant pox vaccine (RPV) platform. TNX-3500[5] (sangivamycin, *i.v.* solution) is a small molecule antiviral drug to treat acute COVID-19 and is in the pre-IND stage of development. TNX-102 SL, (cyclobenzaprine HCl sublingual tablets), is a small molecule drug being developed to treat Long COVID, a chronic post-acute COVID-19 condition. Tonix expects to initiate a Phase 2 study in Long COVID in the second quarter of 2022. The Company'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, is in mid-Phase 3 development for the management of fibromyalgia with a new Phase 3 study launched in the second quarter of 2022. Finally, TNX-1300[6] is a biologic designed to treat cocaine intoxication that is expected to start a Phase 2 trial in the second quarter of 2022.

*[1]TNX-1500 is an investigational new biologic at the pre-IND stage of development and has not been approved for any indication.*
*[2]TNX-2900 is an investigational new drug at the pre-IND stage of development and has not been approved for any indication.*

*[3]TNX-801 is a live horsepox virus vaccine for percutaneous administration in development to protect against smallpox and monkeypox. TNX-801 is an investigational new biologic and has not been approved for any indication.*

*[4]TNX-1840 and TNX-1850 are live horsepox virus vaccines for percutaneous administration, in development to protect against COVID-19. TNX-1840 and TNX-1850 are designed to express the SARS-CoV-2 spike protein from the omicron and BA.2 variants, respectively. TNX-1840 and TNX-1850 are investigational new biologics at the pre-IND stage of development and have not been approved for any indication.*

*[5]TNX-3500 is an investigational new drug at the pre-IND stage of development and has not been approved for any indication.*

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

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

**About TriNetX, LLC**

TriNetX is a global health research network that connects the world of drug discovery and development from pharmaceutical company to study site, and investigator to patient by sharing real-world data to make clinical and observational research easier and more efficient. TriNetX combines real time access to longitudinal clinical data with state-of-the-art analytics to optimize protocol design and feasibility, site selection, patient recruitment, and enable discoveries through the generation of real-world evidence. The TriNetX platform is HIPAA and GDPR compliant.

**Forward Looking Statements**

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

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