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Tonix Pharmaceuticals Announces Program to Develop TNX-102 SL for the Treatment of Long COVID Syndrome, also Known as Post-Acute Sequelae of COVID-19 (PASC)

Long COVID Symptoms of Pain, Sleep Disturbance, Fatigue and Brain Fog Overlap with Symptoms of Fibromyalgia, for which TNX-102 SL is in Mid-Phase 3 Development

Condition Afflicts More Than 30 Percent of Patients Post Infection with SARS-CoV-2,the Virus that Causes COVID-19

Pre-IND Meeting with FDA Scheduled for Q3 2021

CHATHAM, N.J., June 21, 2021 (GLOBE NEWSWIRE) -- Tonix Pharmaceuticals Holding Corp. (Nasdaq: TNXP) (Tonix or the Company), a clinical-stage biopharmaceutical company, today announced it plans to develop TNX-102 SL (cyclobenzaprine HCl sublingual tablets) as a potential treatment for Long COVID Syndrome (Long COVID) which is now known officially as Post-Acute Sequelae of COVID-19 (PASC[1]). Tonix plans to meet with the U.S. Food and Drug Administration (FDA) in the third quarter of 2021 to seek agreement on the design of a potential Phase 2 pivotal study and the overall clinical development plan to qualify TNX-102 SL as an indicated treatment for Long COVID.

Although most people recover from COVID-19 within weeks of the acute illness, a substantial portion develop a chronic syndrome called Long COVID, or PASC. These individuals experience a constellation of symptoms long past the time of recovery from acute COVID-19. Most Long COVID patients who have been studied appear to have cleared the SARS-CoV-2 virus from their systems. The symptoms of Long COVID can include fatigue, sleep disorders, pain, fevers, shortness of breath, cognitive impairment described as “brain fog”, gastrointestinal symptoms, anxiety, and depression. Long COVID can persist for months and can range in severity from mild to incapacitating. Several cohort studies have reported that persistence of symptoms following SARS-CoV-2 infection occurs in more than 30% of patients.[2] While typically associated with moderate or severe COVID-19, Long COVID can occur after mild COVID-19 or even after asymptomatic SARS-CoV-2 infection.

Seth Lederman, M.D., President and Chief Executive Officer of Tonix, stated, “We are excited to begin development of TNX-102 SL for the treatment of Long COVID because the program leverages what we have learned about the pharmacodynamic activity of TNX-102 SL from more than one thousand participants who have been or are enrolled in our

fibromyalgia trials to date. Long COVID has been compared to fibromyalgia because of the common symptoms of sleep disturbance, persistent pain, fatigue, and brain fog.[3] Additionally, Long COVID, like fibromyalgia, is experienced by women at a rate approximately four times that of men.[4] The 2003 SARS outbreak that was due to an earlier coronavirus outbreak was also described as causing a post-SARS syndrome similar to fibromyalgia.[5] Long COVID is a chronic disabling condition that is expected to result in a significant global economic burden.[6] In response to the urgent need for therapies that address PASC, Congress awarded $1.15 billion to the National Institutes of Health to study Long COVID last December.[7] While the vaccines available in the U.S. under Emergency Use Authorization have been shown to prevent acute COVID, their ability to prevent Long COVID is unknown. There is currently no approved drug for the treatment of PASC."

Gregory Sullivan, M.D., Chief Medical Officer of Tonix, commented, "We believe the core symptoms of Long COVID, including fatigue, sleep disturbances, and persistent pain, share an underlying pathogenesis with fibromyalgia. By improving sleep quality, we believe TNX-102 SL may improve the sleep disturbance of Long COVID and potentially also improve other symptoms of Long COVID. For example, TNX-102 SL showed activity in addressing persistent pain, sleep disturbance and fatigue in our fibromyalgia Phase 3 study. In our double-blind clinical studies for both fibromyalgia and posttraumatic stress disorder (PTSD), TNX-102 SL showed robust activity in improving sleep quality starting within the first two weeks of treatment."

Dr. Lederman added, "TNX-102 SL is in mid-Phase 3 development for the treatment of fibromyalgia, for which interim analysis results of the second potential pivotal study are expected in the third quarter of 2021, and topline results are expected in the first quarter of 2022. The proposed mechanism of TNX-102 SL is to improve sleep quality. Since disturbed sleep is linked to exacerbation and chronicity of a number of pain, neuropsychiatric and addictive disorders, we plan to conduct clinical trials to determine whether TNX-102 SL improves sleep in certain pain and neuropsychiatric disorders in addition to fibromyalgia. Tonix already has four active INDs for TNX-102 SL, including fibromyalgia, PTSD, agitation in Alzheimer's disease (AAD) and alcohol use disorder (AUD)."

[1]Feb. 24, 2021 - White House COVID-19 Response Team press briefing; Feb 25, 2021 - policy brief from the World Health Organization on long COVID

[2]Nalbandian, Ani, et al. "Post-acute COVID-19 syndrome." Nature Medicine (2021): 1-15.

[3]Clauw DJ, Häuser W, Cohen SP, Fitzcharles M-A. Considering the potential for an increase in chronic pain after the COVID-19 pandemic. Pain. 2020 Aug; 161(8): 1694–1697.

[4]Cox, D. "Why are women more prone to long Covid?"The Guardian. 13 Jun 2021 https://www.theguardian.com/society/2021/jun/13/why-are-women-more-prone-to-long-covid

[5]Moldofsky H, Patcai J. Chronic widespread musculoskeletal pain, fatigue, depression and disordered sleep in chronic post-SARS syndrome; a case-controlled study. BMC Neurol 2011;11:37.

[6]Briggs, Andrew, and Anna Vassall. "Count the cost of disability caused by COVID-19."

(2021): 502-505.

[7]The NIH provision of Title III Health and Human Services, Division M--Coronavirus Response and Relief Supplemental Appropriations Act, 2021, of H.R. 133, The Consolidated Appropriations Act of 2021. The bill was enacted into law on 27 December 2020, becoming Public Law 116-260.

About Long COVID or Post-Acute Sequelae of SARS-CoV-2 (PASC)

Long COVID is a protracted syndrome experienced by some people following SARS-CoV-2 infection, that can include a number of persistent symptoms including fatigue, pain, sleep disturbance, brain fog or difficulty concentrating, arthralgias, olfactory dysfunction, and headache. Patients with Long COVID are sometimes referred to as "long-haulers."

About TNX-102 SL

TNX-102 SL is a patented sublingual tablet formulation of cyclobenzaprine hydrochloride which provides rapid transmucosal absorption and reduced production of a long half-life active metabolite, norcyclobenzaprine, due to bypass of first-pass hepatic metabolism. As a multifunctional agent with potent binding and antagonist activities at the serotonin$_{2A}$, α_1-adrenergic, histaminergic-H_1, and muscarinic-M_1 receptors, TNX-102 SL is in clinical development as a daily bedtime treatment for fibromyalgia, PTSD, alcohol use disorder and agitation in Alzheimer's disease. The U.S. Patent and Trademark Office (USPTO) has issued United States Patent No. 9636408 in May 2017, Patent No. 9956188 in May 2018, Patent No. 10117936 in November 2018, Patent No. 10,357,465 in July 2019, and Patent No. 10736859 in August 2020. The Protectic™ protective eutectic and Angstro-Technology™ formulation claimed in these patents are important elements of Tonix's proprietary TNX-102 SL composition. These patents are expected to provide TNX-102 SL, upon NDA approval, with U.S. market exclusivity until 2034/2035.

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 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[1], is in mid-Phase 3 development for the management of fibromyalgia, with positive data from the Phase 3 RELIEF study reported in December 2020. The Company expects interim data from the second Phase 3 study, RALLY, in the third quarter of 2021 and topline data in the first quarter of 2022. Tonix's immunology portfolio includes vaccines to prevent infectious diseases and biologics to address immunosuppression, cancer, and autoimmune diseases. Tonix's lead vaccine candidate, TNX-1800[2], 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[2], 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]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 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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