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Tonix Pharmaceuticals Receives Rare Pediatric Disease Designation from the FDA for TNX-2900 for the Treatment of Prader-Willi Syndrome

TNX-2900 is a proprietary magnesium-potentiated formulation of intranasal oxytocin, a naturally occurring hormone that reduces appetite and eating

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

CHATHAM, N.J., March 25, 2024 (GLOBE NEWSWIRE) -- Tonix Pharmaceuticals Holding Corp. (Nasdaq: TNXP) (Tonix or the Company), a biopharmaceutical company with marketed products and a pipeline of development candidates, today announced the U.S. Food and Drug Administration (FDA) has granted Rare Pediatric Disease Designation to TNX-2900* (intranasal potentiated oxytocin), a proprietary magnesium ($Mg2^{+}$)-potentiated formulation of intranasal oxytocin, to treat Prader-Willi syndrome (PWS) in children and adolescents. TNX-2900 was previously granted Orphan Drug designation by the FDA in 2022 for the treatment of PWS and the investigational new drug (IND) application was cleared by the FDA in 2023. The Company may be eligible to receive a transferable Priority Review Voucher if TNX-2900 for PWS is approved for marketing. Recently, vouchers have sold for approximately $100 million.

“The Rare Pediatric Disease Designation is an important regulatory milestone in the development of TNX-2900. With PWS being the most common genetic cause of life-threatening childhood obesity, we are excited that the FDA has recognized this significant unmet need in children and adolescents, particularly for PWS hyperphagia, which currently has no approved treatments[1,2],” said Seth Lederman, M.D., Chief Executive Officer of Tonix Pharmaceuticals. “As PWS is a genetic disorder associated with abnormalities of the oxytocin system, Tonix believes TNX-2900’s unique formulation has the potential to improve intranasal oxytocin’s therapeutic action by addressing limitations in efficacy observed at high-dose intranasal oxytocin that is not $Mg2^{+}$-potentiated[3,4].”

The FDA defines a rare pediatric disease as a serious or life-threating disease that primarily affects individuals aged from birth to 18 years and affects under 200,000 people in the United States.

About FDA’s Rare Pediatric Disease Priority Voucher Program

The FDA’s Rare Pediatric Disease Priority Voucher Program is intended to encourage the

development of new drugs to treat certain rare pediatric diseases. Under the FDA's Rare Pediatric Disease Designation and Voucher Program, if TNX-2900 is approved for marketing, Tonix may qualify for a priority review voucher that can be redeemed to receive priority review of a subsequent marketing application for a different product. Priority review vouchers may also be sold or transferred to another sponsor. The new sponsor can redeem the voucher to receive priority review for a different product, which reduces the review time of NDAs from 10 months to six months. There is no limit on the number of times a priority review voucher can be transferred. A 2020 U.S. Government Accounting Office analysis [5] of the voucher program found that in the ten years since launch of the program in 2009, the price of buying priority review vouchers ranged from $67 million to $350 million. More recently, priority review vouchers were acquired by Novo Nordisk for $110 million in June of 2022, and by Novartis for $100 million from Marinus in July of 2022.[6] Bluebird Bio sold vouchers for $102 million, $95 million and $103 million in November 2022, January 2023, and October 2023, respectively.[7-9] In June of 2023, Novartis bought a priority review voucher from Pharming for $21 million, a price that had been negotiated as part of a purchase agreement when Pharming acquired the asset from Novartis.[5]

About Prader-Willi Syndrome (PWS)

PWS is recognized as the most common genetic cause of life-threatening childhood obesity and affects males and females with equal frequency and all races and ethnicities. PWS results from the absence of expression of a group of genes on the paternally acquired chromosome 15. The hallmarks of PWS are lack of suckling in newborns and, in children and adolescents, severe hyperphagia – an overriding physiological drive to eat, leading to severe obesity and other complications associated with significant mortality. A systematic review of the morbidity and mortality as a consequence of hyperphagia in PWS found that the average age of death in PWS was 22.1 years.[10] There is no approved medication to treat poor feeding in newborns or hyperphagia in children and adolescents with PWS. Given the serious or life-threatening manifestations of these conditions, there is a critical need for effective treatments to decrease morbidity and mortality, improve quality of life, and increase life expectancy in people with PWS. Oxytocin has potent effects in correcting behavioral characteristics of the *Magel2* knock-out mouse model for PWS and autism.[11-13] Six clinical trials have investigated intranasal oxytocin as a treatment in pediatric patients with PWS. Four studies showed evidence for improvement in PWS-related behaviors/symptoms[14-17]; three clinical studies reported evidence for improvement in hyperphagia[14,15,17]; and one clinical study showed an improvement in sucking in infants[16].

About TNX-2900 and Tonix's Potentiated Oxytocin Platform

TNX-2900 is based on Tonix's patented intranasal Mg^{2+}-potentiated oxytocin formulation intended for use by children and adolescents. This formulation is believed to enhance the potency of oxytocin as well as increase specificity for oxytocin receptors relative to vasopressin receptors, potentially reducing unwanted side effects from activating vasopressin receptors. Tonix is also developing a different intranasal formulation, designated TNX-1900 for adolescent obesity, binge eating disorder, bone health in autism, and social anxiety disorder. Oxytocin is a naturally occurring human hormone that acts as a neurotransmitter in the brain. Oxytocin is believed to be more than 600 million years old and is present in vertebrates including mammals, birds, reptiles, amphibians, and fish.[18] It was

initially approved by the U.S. Food and Drug Administration as Pitocin®**, an intravenous infusion or intramuscular injection drug, for use in pregnant women to induce labor and control postpartum bleeding or hemorrhage. An intranasal formulation of oxytocin is marketed in some European countries to assist in breast milk production as Syntocinon®*** (oxytocin nasal 40 units/ml).

Tonix Pharmaceuticals Holding Corp.*

Tonix is a biopharmaceutical company focused on developing, licensing and commercializing therapeutics to treat and prevent human disease and alleviate suffering. Tonix's development portfolio is focused on central nervous system (CNS) disorders. Tonix's priority is to submit a New Drug Application (NDA) to the FDA in the second half of 2024 for Tonmya, a product candidate for which two positive Phase 3 studies have been completed for the management of fibromyalgia. TNX-102 SL is also being developed to treat acute stress reaction as well as fibromyalgia-type Long COVID. Tonix's CNS portfolio includes TNX-1300 (cocaine esterase) a biologic designed to treat cocaine intoxication with Breakthrough Therapy designation. Tonix's immunology development portfolio consists of 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 rejection and for the treatment of autoimmune diseases. Tonix also has product candidates in development in the areas of rare disease and infectious disease. Tonix Medicines, our commercial subsidiary, markets Zembrace® SymTouch® (sumatriptan injection) 3 mg and Tosymra® (sumatriptan nasal spray) 10 mg for the treatment of acute migraine with or without aura in adults.

*Tonix's product development candidates are investigational new drugs or biologics and have not been approved for any indication. Tonmya™ is conditionally accepted by the U.S. Food and Drug Administration as the tradename for TNX-102 SL for the management of fibromyalgia.

**Pitocin® is a trademark of Par Pharmaceutical, Inc.*

****Syntocinon® is a trademark of BGP Products Operations GmbH*

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Zembrace SymTouch and Tosymra are registered trademarks of Tonix Medicines. All other marks are property of their respective owners.

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; risks related to the failure to successfully market any of our products; 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, 2022, as filed with the Securities and Exchange Commission (the “SEC”) on March 13, 2023, 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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