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): July 26, 2023

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 July 26, 2023, Tonix Pharmaceuticals Holding Corp. (the "Company") announced that development of its TNX-4300 (estianeptine) product candidate will be prioritized over its TNX-601 ER product candidate. A copy of the press release which discusses this matter is furnished hereto as Exhibit 99.01, 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 99.02 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 and 99.02 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 July 26, 2023, the Company announced that the development of TNX-4300 (estianeptine), the single *(S)*-isomer of tianeptine, will be prioritized over TNX-601 ER. The Company intends to accelerate the completion of enrollment of patients into the Phase 2 UPLIFT trial of TNX-601 ER for the treatment of major depressive disorder ("MDD") in order to reallocate resources to the preclinical development of TNX-4300. Topline results for the UPLIFT trial are expected in the fourth quarter of 2023. TNX-4300 is in preclinical development for mood disorders, Alzheimer's disease and Parkinson's disease. The Company believes that the scientific and clinical advantages of TNX-4300 support the focus on this preclinical program as a potential treatment for mood disorders such as depression, and neurodegenerative conditions such as Alzheimer's disease.

The Company intends to accelerate completion of enrollment in the RESILIENT study of its TNX-102 SL product candidate for fibromyalgia. Results are expected in the fourth quarter of 2023.

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 July 26, 2023
99.02	Corporate Presentation by the Company for July 2023
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: July 26, 2023

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

Exhibit 99.01

Tonix Pharmaceuticals Announces Accelerating Completion of Enrollment in Phase 2 UPLIFT Study of TNX-601 ER (Racemic Tianeptine) for Major Depressive Disorder: Topline Data Now Expected in Fourth Quarter 2023

Reallocating Resources to Development of Single Isomer TNX-4300 (Estianeptine)

Estianeptine in Preclinical Development Has Demonstrated Key Activities Related to in vivo Novel Object Recognition and in vitro Neuroplasticity, Without the μ-Opioid Receptor Activity of Racemic and (R)-Tianeptine

New Findings Support Development of TNX-4300 as a First-in-Class Oral Therapy in Depression, Alzheimer's Disease and Other Psychiatric and Neurodegenerative Conditions with Memory Deficits

CHATHAM, N.J., July 26, 2023 – Tonix Pharmaceuticals Holding Corp. (Nasdaq: TNXP) (Tonix or the Company), a biopharmaceutical company, today announced that development of TNX-4300* (estianeptine), the single *(S)*-isomer of tianeptine will be prioritized over TNX-601 ER*, which is being studied in the Phase 2 UPLIFT[1] trial for the treatment of major depressive disorder (MDD). TNX-4300 is in preclinical development for mood disorders, Alzheimer's disease and Parkinson's disease. Recent findings have shown estianeptine possesses the ability to improve memory and cognition *in vivo* as measured in the rat Novel Object Recognition (NOR) test, and the ability to restore neuroplasticity to neurons in cell culture. The finding that estianeptine is responsible for improving memory and cognition *in vivo* suggests a role for peroxisome proliferator-activated receptor PPAR-β/δ activation in memory. For these reasons, Tonix intends to accelerate completion of enrollment for the Phase 2 UPLIFT[1] trial to reallocate resources to the preclinical development of TNX-4300 and now expects to report topline data from this study in the fourth quarter of 2023. Tonix is also accelerating completion of enrollment in the RESILIENT study of TNX-102 SL for the management of fibromyalgia so that approximately 450 patients will be enrolled, and topline results are expected in the fourth quarter of 2023.

Racemic tianeptine is an antidepressant that has been marketed outside the U.S. for more than 30 years. Tianeptine is also a racemic drug composed of a 1:1 mixture of two mirror-image isomers. Tonix recently reported that the *(S)*-isomer (estianeptine) is responsible for its positive effects on neuroplasticity in cell culture, while the *(R)*-isomer is responsible for racemic tianeptine's off-target activity on the μ-opioid receptor.[2,3] Tonix also recently reported that estianeptine activates PPAR-β/δ. These activities on molecular targets in neurons and glia in the brain are believed to relate to tianeptine's ability to restore connectivity between neurons that atrophy in conditions of stress or depression in animal models.[4] Tianeptine's mechanism is distinct from traditional antidepressants that alter the level or activity of serotonin, norepinephrine, and dopamine neurotransmitters, which are believed to indirectly induce neurons to make new connections.[5]

"The memory- and cognition-enhancing effects of racemic tianeptine and estianeptine seen in the NOR test are consistent with human clinical studies in which racemic tianeptine treatment improved cognition and memory in patients with Alzheimer's disease and depression[6] and in patients with bipolar disorder,[7]" said Seth Lederman, M.D., Chief Executive Officer of Tonix Pharmaceuticals. "We also recently reported that estianeptine induces neuroplasticity in cell culture.[2] Together these findings support the development of estianeptine in psychiatric and neurodegenerative diseases."

“Given the time and expense of developing new drugs, the scientific and clinical advantages of TNX-4300 lead us to focus our efforts on this preclinical program as a potential treatment for mood disorders like depression and neurodegenerative conditions like Alzheimer’s disease,” said Gregory Sullivan, M.D., Chief Medical Officer of Tonix Pharmaceuticals. “The finding that TNX-4300 possesses the desirable attributes of racemic tianeptine and at the same time lacks a measurable opioid liability supports the focus of our resources on this candidate. Multiple studies around the world have already shown that racemic tianeptine is effective in treating depression. However, our *in vivo* animal studies and *in vitro* lab studies have indicated that TNX-4300 is potentially a more active and safer drug.”

Dr. Sullivan continued, “TNX-601 ER, which contains racemic tianeptine, has informed the future development of TNX-4300 which contains the single isomer, estianeptine. We believe that estianeptine bypasses the synapse and activates intracellular PPAR-β/δ and PPAR-γ targets. The finding that estianeptine is responsible for tianeptine’s ability to improve memory and cognition in the NOR test implicates PPAR-β/δ activation specifically as a molecular target. This finding is consistent with the impaired memory of mice lacking the PPAR-β/δ gene.”[8]

Tonix has filed patents claiming single *(S)*-isomer estianeptine, the active ingredient in TNX-4300, which is devoid of activity on the μ-opioid receptor in tissue culture. Tonix has filed patent claims that describe crystalline salt forms of estianeptine that appear well suited to formulation. TNX-4300 is currently in preclinical development for depression, bipolar disorder, Alzheimer’s disease, and Parkinson’s disease. Key experiments were performed by scientists at Tonix’s Research and Development Center (RDC) in Frederick, Maryland.

*TNX-601 ER and TNX-4300 are investigational new drugs and are not approved for any indication. TNX-601 ER is being developed under an IND. TNX-4300 is at the pre-IND stage of development.

About Tianeptine

Racemic tianeptine sodium (amorphous) immediate release (dosed 3 times daily) was first marketed for depression in France in 1989 and has been available for decades in Europe, Russia, Asia, and Latin America for the treatment of depression. Tianeptine sodium has an established tolerability profile from decades of use in these jurisdictions. Currently no tianeptine-containing product is approved in the U.S. and no extended-release once-daily tianeptine product is approved in any jurisdiction. In animal models, tianeptine restores dendritic arborization of pyramidal neurons in the CA3 region of hippocampus and in the dentate gyrus region promotes new neuron formation and integration into hippocampal networks.[4] Tianeptine’s enhancement of neuroplasticity in animal models of stress is believed to be mediated by activation of PPAR isoforms PPAR-β/δ and PPAR-γ, which is mechanistically distinct from traditional monoaminergic antidepressants marketed in the U.S. and contributes to its potential for clinical indications beyond depression and stress disorders. Tianeptine and its MC5 metabolite are also weak μ-opioid receptor (MOR) agonists that present a potential abuse liability if illicitly misused in large quantities.[3,9] In cases where tianeptine has been abused, the dose has been approximately 8-80 times the therapeutic dose in depression on a daily basis.[9] In patients who were prescribed tianeptine for depression, the French Transparency Committee found an incidence of misuse of approximately 1 case per 1,000 patients treated[10] suggesting low abuse liability when used at the antidepressant dose in patients prescribed tianeptine for depression. Clinical trials have shown that cessation of a therapeutic course of tianeptine does not appear to result in dependence or withdrawal symptoms following 6-weeks[11-15], 3-months,[16] or 12-months[17] of treatment. Estianeptine is believed to mimic naturally occurring

polyunsaturated fatty acid ligands in low affinity interactions with PPAR-β/δ and PPAR-γ. Estianeptine's activation of nuclear PPAR-β/δ and PPAR-γ receptors appears to be a more direct mechanism to achieve the goal of restoring neuronal connectivity than the active ingredients of current pharmacologic therapies for depression. Tianeptine's proposed mechanism as a plastogen is consistent with its clinical effects in promoting cognition in depressed patients with Alzheimer's disease[5] and in patients with bipolar disorder.[6] The PPAR-β/δ target is validated by prior work on agonists treating animal models of neurodegenerative and autoimmune diseases of the central nervous system.[18] Alzheimer's disease has been proposed to be a form of diabetes that affects the CNS, sometimes termed type-III diabetes."[19] The PPAR superfamily plays key roles in metabolic processes, and activation of PPAR-β/δ in brain by tianeptine shows promise to prevent the cognitive dysfunction associated with CNS insulin resistance. Tianeptine's reported pro-cognitive and anxiolytic effects as well as its ability to attenuate the neuropathological effects of excessive stress responses suggest other potential uses including as a treatment for posttraumatic stress disorder (PTSD), as well as for preventing neurocognitive dysfunction associated with corticosteroid use.

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Tonix Pharmaceuticals Holding Corp.*

Tonix is a biopharmaceutical company focused on commercializing, developing, discovering and licensing therapeutics to treat and prevent human disease and alleviate suffering. Tonix markets Zembrace® SymTouch® (sumatriptan injection) 3 mg and Tosymra® (sumatriptan nasal spray) 10 mg. Zembrace SymTouch and Tosymra are each indicated for the treatment of acute migraine with or without aura in adults. Tonix's development portfolio is composed of central nervous system (CNS), rare disease, immunology and infectious disease product candidates. Tonix's CNS development 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, nearing complete enrollment in a potentially registration-enabling study with topline data expected in the fourth quarter of 2023. TNX-102 SL is also being developed to treat Long COVID, a chronic post-acute COVID-19 condition. Enrollment in a Phase 2 proof-of-concept study has been completed, and topline results are expected in the third quarter of 2023. TNX-601 ER (tianeptine hemioxalate extended-release tablets), a once-daily formulation being developed as a treatment for major depressive disorder (MDD), is nearing complete enrollment with topline results of a proof-of-concept study expected in the fourth quarter of 2023. TNX-4300 (estianeptine) is a small molecule oral therapeutic in preclinical development to treat MDD, Alzheimer's disease and Parkinson's disease. TNX-1900 (intranasal potentiated oxytocin), in development for chronic migraine, has completed enrollment with topline data expected in the fourth 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 third quarter of 2023. Tonix's rare disease development 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 development 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 rejection and for the treatment of autoimmune diseases. A Phase 1 study of TNX-1500 is expected to be initiated in the third quarter of 2023. Tonix's infectious disease pipeline includes TNX-801, a vaccine in development to prevent smallpox and mpox. TNX-801 also serves as the live virus vaccine platform or recombinant pox vaccine platform for other infectious diseases. The infectious disease development portfolio also includes TNX-3900 and TNX-4000, classes of broad-spectrum small molecule oral antivirals.

** Tonix's product development candidates are investigational new drugs or biologics and have not been approved for any indication.*

Tonix Medicines has contracted to acquire the Zembrace SymTouch and Tosymra registered trademarks. Intravail is a registered trademark of Aegis Therapeutics, LLC, a wholly owned subsidiary of Neurelis, Inc.

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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Zembrace® SymTouch® (sumatriptan Injection): IMPORTANT SAFETY INFORMATION

Zembrace SymTouch (Zembrace) can cause serious side effects, including heart attack and other heart problems, which may lead to death. Stop use and get emergency help if you have any signs of a heart attack:

- discomfort in the center of your chest that lasts for more than a few minutes or goes away and comes back
- severe tightness, pain, pressure, or heaviness in your chest, throat, neck, or jaw
- pain or discomfort in your arms, back, neck, jaw or stomach
- shortness of breath with or without chest discomfort
- breaking out in a cold sweat
- nausea or vomiting
- feeling lightheaded

Zembrace is not for people with risk factors for heart disease (high blood pressure or cholesterol, smoking, overweight, diabetes, family history of heart disease) unless a heart exam shows no problem.

Do not use Zembrace if you have:

- history of heart problems
- narrowing of blood vessels to your legs, arms, stomach, or kidney (peripheral vascular disease)
- uncontrolled high blood pressure
- hemiplegic or basilar migraines. If you are not sure if you have these, ask your provider.
- had a stroke, transient ischemic attacks (TIAs), or problems with blood circulation
- severe liver problems
- taken any of the following medicines in the last 24 hours: almotriptan, eletriptan, frovatriptan, naratriptan, rizatriptan, ergotamines, dihydroergotamine.
- are taking certain antidepressants, known as monoamine oxidase (MAO)-A inhibitors or it has been 2 weeks or less since you stopped taking a MAO-A inhibitor. Ask your provider for a list of these medicines if you are not sure.
- an allergy to sumatriptan or any of the components of Zembrace

Tell your provider about all of your medical conditions and medicines you take, including vitamins and supplements.

Zembrace can cause dizziness, weakness, or drowsiness. If so, do not drive a car, use machinery, or do anything where you need to be alert.

Zembrace may cause serious side effects including:

- changes in color or sensation in your fingers and toes
- sudden or severe stomach pain, stomach pain after meals, weight loss, nausea or vomiting, constipation or diarrhea, bloody diarrhea, fever
- cramping and pain in your legs or hips; feeling of heaviness or tightness in your leg muscles; burning or aching pain in your feet or toes while resting; numbness, tingling, or weakness in your legs; cold feeling or color changes in one or both legs or feet
- increased blood pressure including a sudden severe increase even if you have no history of high blood pressure
- medication overuse headaches from using migraine medicine for 10 or more days each month. If your headaches get worse, call your provider.
- serotonin syndrome, a rare but serious problem that can happen in people using Zembrace, especially when used with anti-depressant medicines called SSRIs or SNRIs. Call your provider right away if you have: mental changes such as seeing things that are not there (hallucinations), agitation, or coma; fast heartbeat; changes in blood pressure; high body temperature; tight muscles; or trouble walking.
- hives (itchy bumps); swelling of your tongue, mouth, or throat
- seizures even in people who have never had seizures before

The most common side effects of Zembrace include: pain and redness at injection site; tingling or numbness in your fingers or toes; dizziness; warm, hot, burning feeling to your face (flushing); discomfort or stiffness in your neck; feeling weak, drowsy, or tired.

Tell your provider if you have any side effect that bothers you or does not go away. These are not all the possible side effects of Zembrace. For more information, ask your provider.

This is the most important information to know about Zembrace but is not comprehensive. For more information, talk to your provider and read the Patient Information and Instructions for Use. You can also visit www.upsher-smith.com or call 1-888-650-3789.

You are encouraged to report adverse effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088.

INDICATION AND USAGE

Zembrace is a prescription medicine used to treat acute migraine headaches with or without aura in adults who have been diagnosed with migraine.

Zembrace is not used to prevent migraines. It is not known if it is safe and effective in children under 18 years of age.

Tosymra® (sumatriptan nasal spray): IMPORTANT SAFETY INFORMATION

Tosymra can cause serious side effects, including heart attack and other heart problems, which may lead to death. Stop Tosymra and get emergency medical help if you have any signs of heart attack:

- discomfort in the center of your chest that lasts for more than a few minutes or goes away and comes back
- severe tightness, pain, pressure, or heaviness in your chest, throat, neck, or jaw
- pain or discomfort in your arms, back, neck, jaw, or stomach
- shortness of breath with or without chest discomfort
- breaking out in a cold sweat
- nausea or vomiting
- feeling lightheaded

Tosymra is not for people with risk factors for heart disease (high blood pressure or cholesterol, smoking, overweight, diabetes, family history of heart disease) unless a heart exam is done and shows no problem.

Do not use Tosymra if you have:

- history of heart problems
- narrowing of blood vessels to your legs, arms, stomach, or kidney (peripheral vascular disease)
- uncontrolled high blood pressure
- severe liver problems

- hemiplegic or basilar migraines. If you are not sure if you have these, ask your healthcare provider.
- had a stroke, transient ischemic attacks (TIAs), or problems with blood circulation
- taken any of the following medicines in the last 24 hours: almotriptan, eletriptan, frovatriptan, naratriptan, rizatriptan, ergotamines, or dihydroergotamine. Ask your provider if you are not sure if your medicine is listed above.
- are taking certain antidepressants, known as monoamine oxidase (MAO)-A inhibitors or it has been 2 weeks or less since you stopped taking a MAO-A inhibitor. Ask your provider for a list of these medicines if you are not sure.
- an allergy to sumatriptan or any ingredient in Tosymra

Tell your provider about all of your medical conditions and medicines you take, including vitamins and supplements.

Tosymra can cause dizziness, weakness, or drowsiness. If so, do not drive a car, use machinery, or do anything where you need to be alert.

Tosymra may cause serious side effects including:

- changes in color or sensation in your fingers and toes
- sudden or severe stomach pain, stomach pain after meals, weight loss, nausea or vomiting, constipation or diarrhea, bloody diarrhea, fever
- cramping and pain in your legs or hips, feeling of heaviness or tightness in your leg muscles, burning or aching pain in your feet or toes while resting, numbness, tingling, or weakness in your legs, cold feeling or color changes in one or both legs or feet
- increased blood pressure including a sudden severe increase even if you have no history of high blood pressure
- medication overuse headaches from using migraine medicine for 10 or more days each month. **If your headaches get worse, call your provider**.
- serotonin syndrome, a rare but serious problem that can happen in people using Tosymra, especially when used with anti-depressant medicines called SSRIs or SNRIs. **Call your provider right away if you have**: mental changes such as seeing things that are not there (hallucinations), agitation, or coma; fast heartbeat; changes in blood pressure; high body temperature; tight muscles; or trouble walking.
- hives (itchy bumps); swelling of your tongue, mouth, or throat
- seizures even in people who have never had seizures before

The most common side effects of Tosymra include: tingling, dizziness, feeling warm or hot, burning feeling, feeling of heaviness, feeling of pressure, flushing, feeling of tightness, numbness, application site (nasal) reactions, abnormal taste, and throat irritation.

Tell your provider if you have any side effect that bothers you or does not go away. These are not all the possible side effects of Tosymra. For more information, ask your provider.

This is the most important information to know about Tosymra but is not comprehensive. For more information, talk to your provider and read the Patient Information and Instructions for Use. You can also visit www.upsher-smith.com or call 1-888-650-3789.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088.

INDICATION AND USAGE
Tosymra is a prescription medicine used to treat acute migraine headaches with or without aura in adults.

Tosymra is not used to treat other types of headaches such as hemiplegic or basilar migraines or cluster headaches.

Tosymra is not used to prevent migraines. It is not known if Tosymra is safe and effective in children under 18 years of age.

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; 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. 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, 2022, as filed with the Securities and Exchange Commission (the "SEC") on March 13, 2023, 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

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 approximately **$72 M in cash and cash equivalents** as of 3/31/23. Tonix has no debt.

TONIX PHARMACEUTICALS

Pipeline: Key Clinical Development Programs

Candidates*	Indication	Status/Next Milestone
TNX-102 SL[1]	Fibromyalgia (FM) Long COVID (PASC[2])	Mid-Phase 3 – completing enrollment Phase 2 enrollment complete
TNX-1300[3]	Cocaine Intoxication - *FDA Breakthrough Designation*	Mid-Phase 2, Targeted 3Q 2023 Start
TNX-1900[4]	Prevention of Chronic Migraine	Phase 2 - enrolling[5]
TNX-601 ER	Depression	Phase 2 – completing enrollment[6]
TNX-2900[7]	Prader-Willi Syndrome - *FDA Orphan Drug Designation*	Phase 2 ready
TNX-1500[8]	Organ Transplant Rejection/ Autoimmune Conditions	Phase 1, Targeted 3Q 2023 Start

**All of Tonix's product candidates are investigational new drugs or biologics and none has been approved for any indication.*
[1]TNX-102 SL (cyclobenzaprine HCl sublingual tablets) also has active INDs for Agitation in Alzheimer's Disease (AAD), Alcohol Use Disorder (AUD), and Posttraumatic Stress Disorder (PTSD). All indications are Phase 2 ready.
[2]Post-Acute Sequelae of COVID-19.
[3]TNX-1300 (double-mutant cocaine esterase) is licensed from Columbia University.
[4]Acquired from Trigemina; license agreement with Stanford University; Planned investigator-initiated Binge Eating Disorder (BED) study is expected start 2Q 2023.
[5]A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900
[6]Phase 1 trial for formulation development was completed outside of the U.S.; Other potential indications include PTSD and neurocognitive dysfunction from steroids
[7]Co-exclusive license agreement with French National Institute of Health and Medical Research (Inserm)
[8]anti-CD40L humanized monoclonal antibody – IND cleared

Late-Stage CNS Programs[1]

Four Studies Expecting Topline in the Next Three Quarters (by End of 1Q24)

CNS PORTFOLIO

Active Studies

- **23Q3 - Topline:**
  - TNX-102 SL for fibromyalgia-type Long COVID (enrollment complete) — P2 — Proof-of-Concept
- **23Q4 – Topline:**
  - TNX-1900 for migraine headache (enrollment complete) — P2 — Proof-of-Concept
  - TNX-601 ER for depression (completing enrollment) — P2 — Proof-of-Concept
  - **TNX-102 SL for fibromyalgia (completing enrollment) — P3 — Potential NDA enabling**

Entering Phase 2

- **In 3Q 2023:**
  - TNX-1300 for cocaine intoxication (FDA Breakthrough Therapy) — P2 — Potential Pivotal Study

[1]Not approved for any indication

TONIX PHARMACEUTICALS

Tonix Medicines is our Commercial Subsidiary

Marketed products for the treatment of acute migraine in adults with or without aura

Zembrace® SymTouch® (sumatriptan injection) 3 mg[1]

Tosymra® (sumatriptan nasal spray) 10 mg[2]

- Both are proprietary non-oral formulations of sumatriptan that bypass the gastrointestinal tract

Headed by President Jim Hunter

- Industry veteran – experience in CNS products
- Built Validus Pharmaceuticals

Consolidated Product Sales for the 12 months ended March 31st 2023

- Factory sales: $30.4M[3]
- Net sales: $16.4M[3]

Retail Product Sales for the 12 months ended December 31st 2022

- Retail sales: ~$23 M (Zembrace ~$19.6 M and Tosymra ~$3.5 M)[4]

Acquired from Upsher-Smith Laboratories which has managed care contracts covering ~200 M lives

- Contract includes a transition period during which Tonix expects to secure its own contracts

[1]Zembrace SymTouch [package insert]. Maple Grove, MN: Upsher-Smith Laboratories, LLC: February 2021 - For more information, talk to your provider and read the Patient Information and Instructions for Use. – Important Safety Information is provided in the appendix

[2]Tosymra [package insert]. Maple Grove, MN: Upsher-Smith Laboratories, LLC: Feb 2021 .For more information, talk to your provider and read the Patient Information and Instructions for Use. – Important Safety Information is provided in the appendix

[3]Audited abbreviated financial statements of assets acquired from Upsher-Smith Laboratories, LLC as filed in the 8-K/A dated July 18, 2023 https://ir.tonixpharma.com/sec-filings/all-sec-filings/content/0001387131-23-008497/0001387131-23-008497.pdf

[4]IQVIA, 2022 sales from the National Sales Perspectives (NSP) audit within the SMART database estimates Zembrace sales of ~$19.6 M and Tosymra sales of ~$3.5 M


TONIX
PHARMACEUTICALS
CNS:
KEY DEVELOPMENT
CANDIDATES
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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 serotonergic-5-HT2A, adrenergic-α1, histaminergic-H1, and muscarinic-M1 cholinergic 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
- Not scheduled with no recognized abuse potential

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) completing enrollment
  - ~450 enrolled

Next Steps: Topline results expected 4Q 2023

Fibromyalgia-Type Long COVID

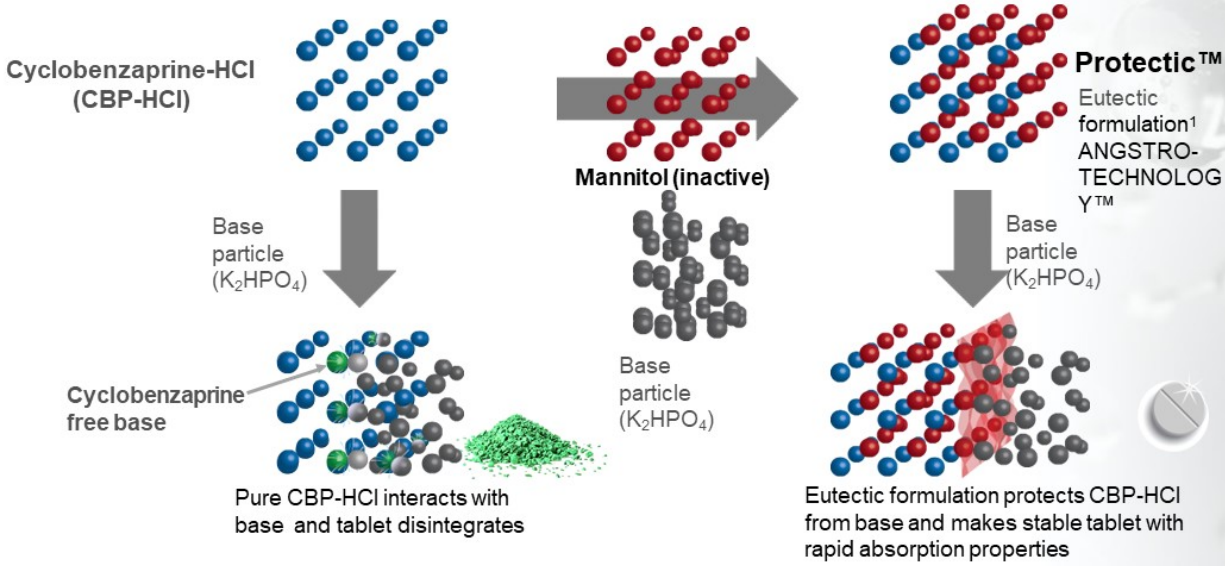
Status: Phase 2
- Phase 2 study (PREVAIL) has completed enrollment of 60 patients

Next Steps: Topline results expected 3Q 2023

TONIX PHARMACEUTICALS

TNX-102 SL (Sublingual Cyclobenzaprine HCl tablets*)

Proprietary cyclobenzaprine HCl eutectic mixture stabilizes sublingual tablet formulation

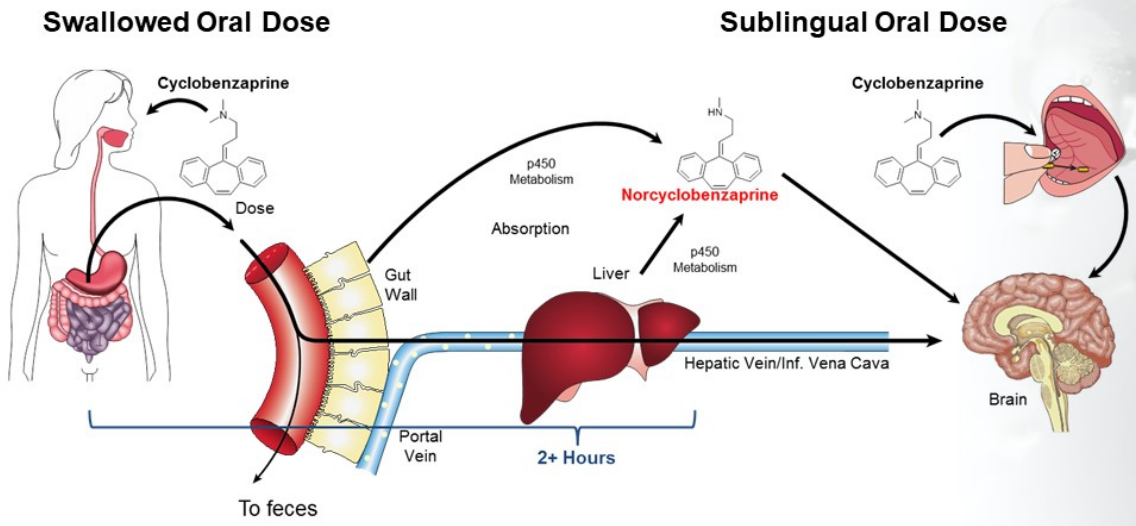


*U.S. Patent issued May 2, 2017

TONIX PHARMACEUTICALS

TNX-102 SL Sublingual Administration*

Transmucosal absorption avoids first pass hepatic metabolism



*U.S. Patent issued May 2, 2017

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[2]

Second Phase 3 study RALLY missed primary endpoint

Confirmatory Phase 3 study RESILIENT completing enrollment

Next Steps: Topline results expected 4Q 2023

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

[1]American Chronic Pain Association (www.theacpa.org, 2019)
[2]Lederman et al., (2023) *Arthritis Care & Research* "Efficacy and Safety of TNX-102 SL (Sublingual Cyclobenzaprine) for the Treatment of Fibromyalgia: Results From the RELIEF Trial", doi: 10.1002/acr.25142. Epub ahead of print. PMID: 37165930.

TONIX PHARMACEUTICALS

TNX-102 SL: Phase 3 RESILIENT Study Design

RESILIENT Study

CNS PORTFOLIO

General study characteristics:

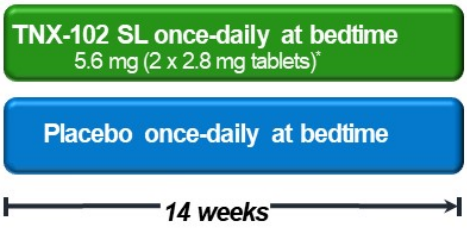
- Randomized, double-blind, placebo-controlled study in fibromyalgia
- U.S. sites only, enrolled approximately 450 patients

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

Key Secondary Endpoints:

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



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

ClinicalTrials.gov Identifier: NCT05273749
A Phase 3 Study to Evaluate the Efficacy and Safety of TNX-102 SL Taken Daily in Patients With Fibromyalgia (RESILIENT)

TONIX PHARMACEUTICALS

TNX-102 SL*: Fibromyalgia-Type 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]
- Symptoms of Long COVID, like multi-site pain, fatigue and insomnia, are the hallmarks of chronic pain syndromes like fibromyalgia and myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS)
- In August 2022, the HHS released the National Research Action Plan on Long COVID[4] which endorses the connection between Long COVID and ME/CFS

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 has completed enrollment of 60 patients

Next Steps: Topline results expected 3Q 2023

Patents Issued

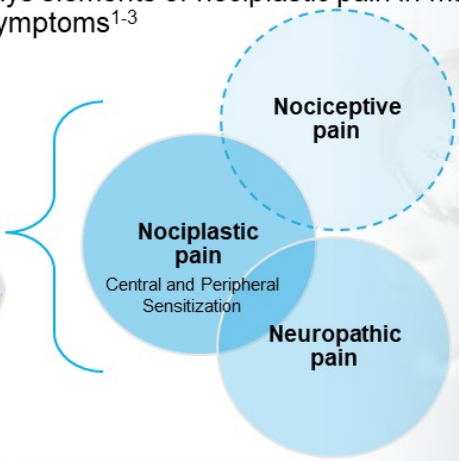
*TNX-102 SL has not been approved for any indication.

[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
[4]Department of Health and Human Services, Office of the Assistant Secretary for Health. 2022. National Research Action Plan on Long COVID.

TONIX PHARMACEUTICALS

Fibromyalgia-Type Long COVID

- Long COVID is a heterogeneous condition that displays elements of nociplastic pain in many individuals, who experience otherwise unexplained symptoms[1-3]



Symptoms (multi-site pain, fatigue, sleep disorders and cognitive dysfunction) overlap with the key symptoms of fibromyalgia

Nociplastic pain[4]: (*new term for "Central and Peripheral Sensitization"*) Pain that arises from altered nociception despite no clear evidence of tissue damage, or for disease or lesion of the somatosensory system causing the pain

[1]Bierle et al., 2021. *J Prim Care Community Health*. 12:21501327211030826
[2]Moghimi et al., 2021. *Curr Neurol Neurosci Rep*. 21(9):44
[3]Thaweethai T, et al. 2023. JAMA. 2023 329(22):1934-1946
[4]Trouvin et al., 2019. *Best Pract Res Clin Rheumatol*. 33(3):101415

TONIX PHARMACEUTICALS

TNX-102 SL: Phase 2 PREVAIL Study Design

PREVAIL Study

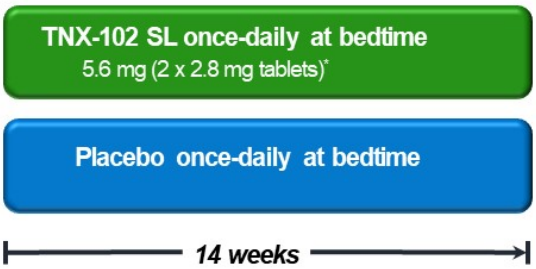
CNS PORTFOLIO

Study characteristics:

- Randomized, double-blind, placebo-controlled study of TNX-102 SL in fibromyalgia-type Long COVID
- U.S. sites only, completed enrollment of 63 patients

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



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

ClinicalTrials.gov Identifier: NCT05472090
"A Phase 2 Study to Evaluate the Efficacy and Safety of TNX-102 SL in Patients With Multi-Site Pain Associated With Post-Acute Sequelae of SARS-CoV-2 Infection (PREVAIL)"

TONIX PHARMACEUTICALS

TNX-601 ER*: Depression
Tianeptine Hemioxalate Extended-Release Tablets (39.4 mg)

PROFILE

- A novel, oral, extended-release once-daily tablet
- Treatment effect of tianeptine sodium immediate release *t.i.d.* in depression is well-established
- Tianeptine restores neuroplasticity in animal models
- PPAR-β/δ and PPAR-γ agonist[1]

Differentiators:

Relative to tianeptine IR available ex-US:

- Once daily dosing

Relative to traditional antidepressants:

- Unique mechanism of action – beyond neurotransmitter modulation
- Tianeptine sodium IR has similar efficacy but less weight gain or sexual side effects than traditional antidepressants
- Tianeptine's side effects are described in labeling in countries in which it is marketed[2]

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Major Depressive Disorder (MDD)

Additional Indications: PTSD, Neurocognitive Disorder From Corticosteroids, Alzheimer's Disease[3]

Status: Phase 2 MDD study UPLIFT completing enrollment

Next Steps:

Topline results expected 4Q 2023

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

[1]Sullivan G et al. Poster presentation at the American Society of Clinical Psychopharmacology, June 2023. https://bit.ly/42o3jnV
[2]Summary of product characteristics (SmPC), European Medicines Agency, Stablon®, www.servier.ci/sites/default/files/spc-pil/SPC_Stablon_1.pdf accessed 7-16-23.
[3]García-Alberca et al., 2022. *J Alzheimers Dis.* 88(2):707-720

TONIX PHARMACEUTICALS

TNX-601 ER - Phase 2 UPLIFT* Study Design

UPLIFT Study

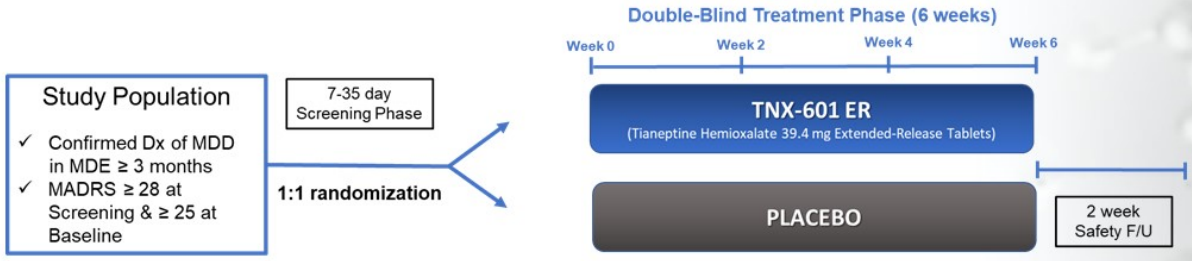
CNS PORTFOLIO

General study characteristics:

- Randomized, double-blind, placebo-controlled study in Major Depressive Disorder to evaluate monotherapy with TNX-601 ER versus placebo
- Parallel design with two arms – treatment with tianeptine hemioxalate 39.4 mg or placebo
- ~30 U.S. sites

Primary Endpoint:

- Mean change from baseline in the Montgomery-Åsberg Depression Rating Scale (MADRS) total score at Week 6



*ClinicalTrials.gov Identifier: NCT05686408

Abbreviations: Dx, diagnosis; ER, extended-release; F/U, follow-up; MDD, major depressive disorder; MDE, major depressive episode; N, number

TONIX PHARMACEUTICALS

Tianeptine is a Polyunsaturated Fatty Acid (PUFA) Analogue

PUFAs and PUFA-analogues

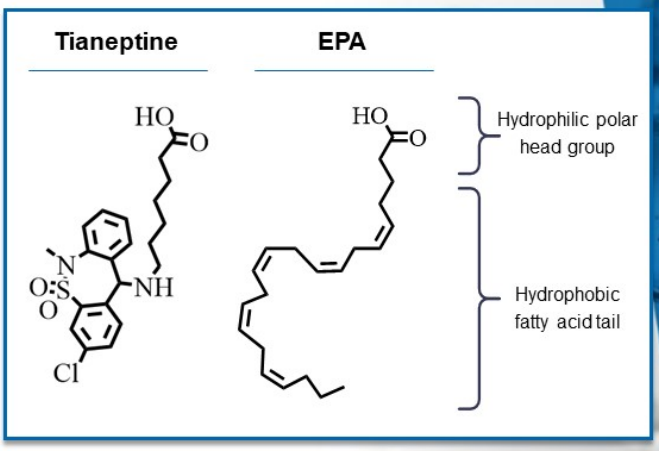
- Polar acidic "head" and hydrophobic fatty acid "tail"

Pharmacological modulation of PUFA signaling has therapeutic potential in multiple pathologies

- Act through the binding sites of endogenous FA metabolites on enzymes, transporters, and receptors
- Several PUFA analogues have been developed as drugs, including the ethyl ester of eicosapentaenoic acid (EPA)[1] which is branded as Vascepa® and Lovaza® (omega-3-acid ethyl esters)
- Docosahexaenoic acid (DHA) is a primary structural component of the brain

EPA and DHA have activity in treating MDD[3,4] and Alzheimer's disease[5]

- Activity shown in studies and meta-analyses, but insufficient randomized studies to be conclusive
- Pharmacology of EPA and DHA is not optimal[5]



EC_{50} for EPA is ~3 µM

[1]EPA = eicosa-5Z, 8Z, 11Z, 14Z, 17Z-pentaenoic acid.
[2]Wikipedia: https://en.wikipedia.org/wiki/Docosahexaenoic_acid
[3]Liao et al., 2019. *Transl Psychiatry*. 9(1):190
[4]Wani et al., 2015. *Integr Med Res*. 4(3):132-141
[5]Heath RJ, and Wood TR. 2021. *Int J Mol Sci*. 2021 22(21):11826

TONIX PHARMACEUTICALS

TNX-601 ER – Racemic Tianeptine – Composed of Two Isomers

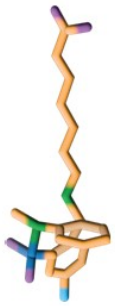
Racemic tianeptine:
- Approved in Europe and ex-US
- 1:1 mixture of 2 mirrorr-image isomers[1,2]
- Weak μ-opioid receptor agonism[2]
  - Risk of abuse or diversion for euphoric effects[3]

	Racemic-Tianeptine	*(S)*-Tianeptine TNX-4300	*(R)*-Tianeptine
Activates PPAR-β/δ	+	+	-
Neuroplasticity	+	+	-
Novel Object Test[5]	+	+	-
μ-Opioid Receptor	+	-	+
Forced Swim Test[6]	+	-	+
Activates PPAR-γ	+	+	+

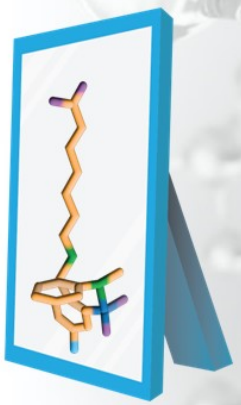
_(S)_-Tianeptine: PPAR-β/δ agonist, no opiate liability[4]
- New mechanism of action for treating depression

_(R)_-Tianeptine: opiate liability[4]
- Weak μ-opioid receptor agonism[4]

***(S)*-tianeptine**



***(R)*-tianeptine**



[1]Stablon. Summary of product characteristics. Les Laboratoires Servier Industrie; 2014.
[2]PubChem. Accessed November 10, 2022. https://pubchem.ncbi.nlm.nih.gov/compound/Tianeptine
[3]Drug Enforcement Administration. May 2019. Accessed November 11, 2022. https://www.deadiversion.usdoj.gov/drug_chem_info/tianeptine.pdf
[4]Sullivan G et al. Poster presentation at the American Society of Clinical Psychopharmacology, June 2023. https://bit.ly/42o3jnV
[5]Rat Novel Object Recognition Test
[6]Mouse Porsolt Forced Swim Test

TNX-4300*: Depression, Alzheimer's & Parkinson's diseases
Estianeptine (Single *(S)*-isomer of Tianeptine)

PROFILE

- Single isomer, oral treatment
- Proposed mechanism of action from lab studies indicates estianeptine is the active ingredient of TNX-601 ER[1]
  - PPAR-β/δ and PPAR-γ agonist
  - Free of μ-opioid receptor activity
- Estianeptine restores neuroplasticity in tissue culture

Differentiators:

Relative to racemic tianeptine IR or TNX-601 ER:

- Lack of opioid liability

Relative to traditional antidepressants:

- Unique mechanism of action – beyond neurotransmitter modulation
- Racemic tianeptine sodium IR has similar efficacy but fewer side effects than traditional antidepressants

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Major Depressive Disorder (MDD)

Additional Indications: PTSD, Neurocognitive Disorder From Corticosteroids, Alzheimer's Disease[2]

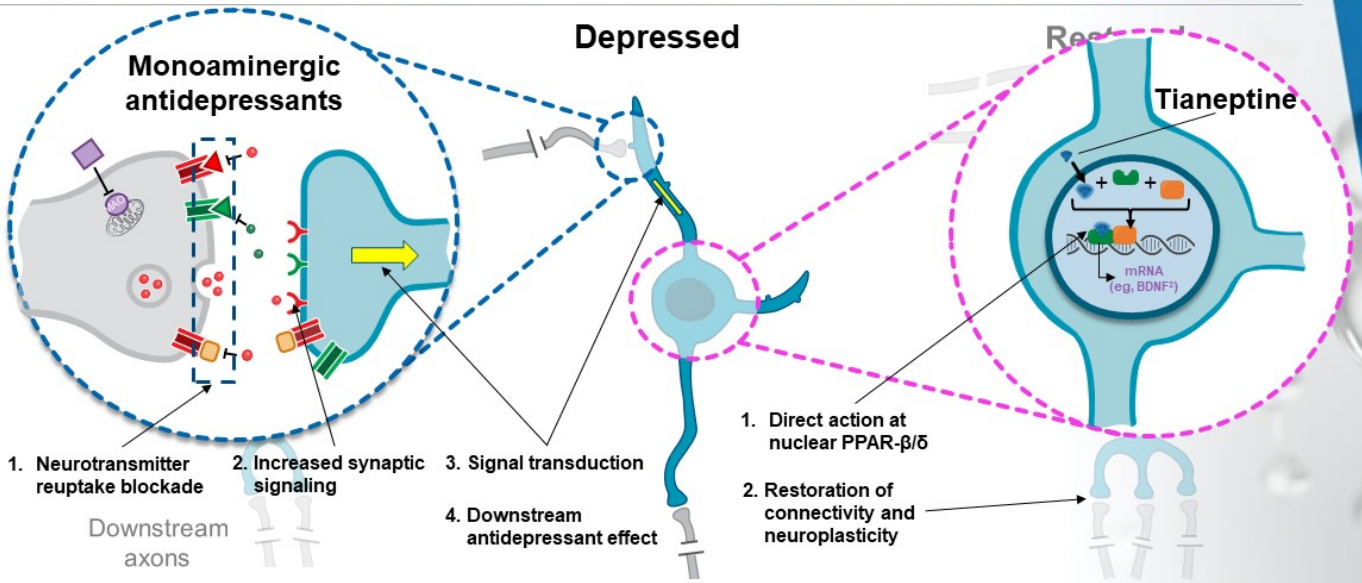
Status: Pre-clinical

Next Steps: Expect IND can be supported by pre-clinical and clinical data from TNX-601 (racemic tianeptine) development

*TNX-4300 is in the pre-IND stage of development and has not been approved for any indication

[1]Sullivan G et al. Poster presentation at the American Society of Clinical Psychopharmacology, June 2023. https://bit.ly/42o3jnV
[2]García-Alberca et al., 2022. *J Alzheimers Dis.* 88(2):707-720

While Monoaminergic Antidepressants Work at the Synapse, *(S)*-Tianeptine "Cuts in Line" to More Directly Affect Neuroplasticity[1]



Decreased connectivity and neuroplasticity

Restored connectivity and neuroplasticity

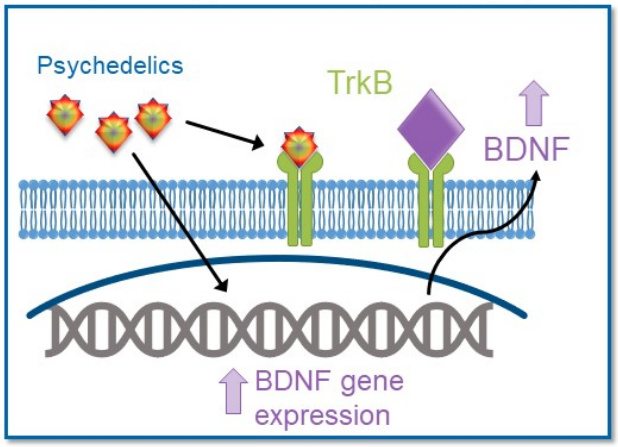
[1]Sullivan G et al. Poster presentation at the American Society of Clinical Psychopharmacology, June 2023. https://bit.ly/42o3jnV
[2]BDNF=brain-derived neurotrophic factor.

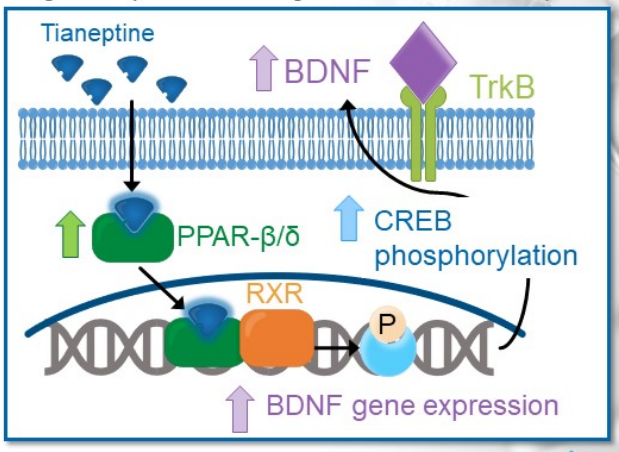
TONIX PHARMACEUTICALS

Tianeptine Shares a Neuroplasticity-Promoting Mechanism With Psychedelics

The neurotrophic growth factor BDNF plays a key role in the regulation of synaptic plasticity, and is diminished in populations suffering from anxiety and depression[1]

- Psychedelics may promote neuroplasticity both by directly binding to BDNF receptor TrkB, and by increasing BDNF gene expression[1,2]
- Tianeptine may promote neuroplasticity by upregulating BDNF gene expression through activation of PPAR-β/δ[3,4]





BDNF=brain-derived neurotrophic factor; CREB=cAMP response element binding protein; TrkB=tyrosine receptor kinase B

[1]de Vos CMH, et al. *Front Psychiatry*. 2021;12:724606
[2]Moliner R, et al. *Nat Neurosci*. 2023;26(6):1032-1041
[3]Ji MJ, et al. *Int J Neuropsychopharmacol*. 2015;19(1):pyv083
[4]Seo MK, et al. *Psychopharmacology (Berl)*. 2016;233(13):2617-2627

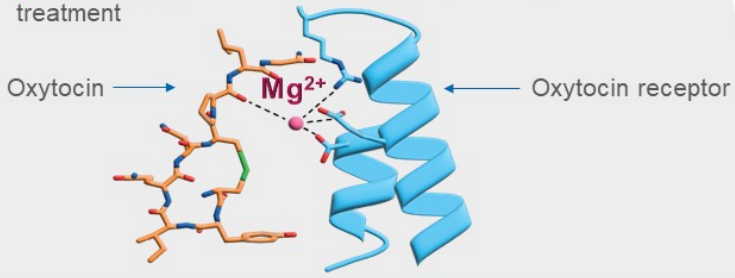
TONIX PHARMACEUTICALS

TNX-1900*: Prevention of Headache in Chronic Migraine
Intranasal Potentiated Oxytocin (OT) with Magnesium

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 study PREVENTION enrollment completed[4]

Next Steps: Topline results from PREVENTION expected 4Q 2023

Investigator initiated Phase 2 trials in adolescent obesity and social anxiety disorder are enrolling 3Q 2023

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

[1]Tzabazis et al., 2017. *Headache*. 57 Suppl 2:64-75
[2]Antoni et al., 1989. *Biochem J*. 257(2):611-4
[3]Meyerowitz et al., 2022. *Nat Struct Mol Biol*. (3):274-281
[4]A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900

TONIX PHARMACEUTICALS

TNX-1900: Phase 2 PREVENTION Study Design

PREVENTION Study

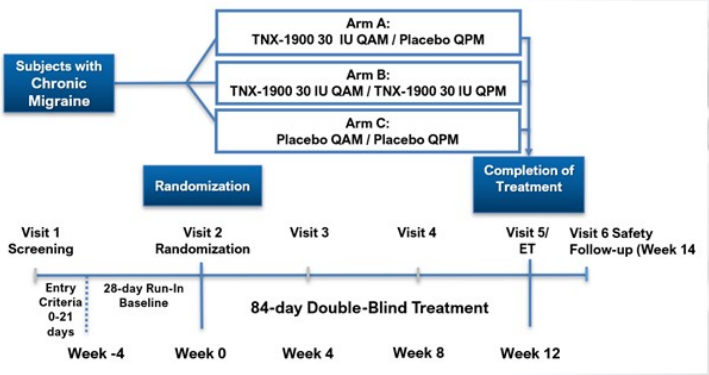
CNS PORTFOLIO

General study characteristics:

- Randomized, double-blind, placebo-controlled study (three arms– two treatment regimens and one placebo) in chronic migraine
- U.S. sites only
- Fully enrolled with 88 patients
- Topline results expected 4Q'23

Primary Endpoint:

- Mean change in the number of migraine headache days between the 28-day Run-In phase and the last 28-days of the Treatment phase (TNX-1900 vs. placebo)



ClinicalTrials.gov Identifier: NCT05679908
A Study to Evaluate the Efficacy and Safety of TNX-1900 in Patients With Chronic Migraine (PREVENTION)

TONIX PHARMACEUTICALS

TNX-1900 – Other Studies in Collaboration with Academic Investigators

Pharmacodynamic biomarker study related to headache[1]

- Testing TNX-1900 effects on capsaicin- or electrical stimulation-induced forehead dermal blood flow in healthy female human volunteers
- Forehead dermal blood flow is considered a trigeminovascular biomarker for antimigraine drugs.
  - Both a CGRP inhibitor and a triptan have been successfully tested in the model and have been found to inhibit the forehead dermal blood flow response to capsaicin in migraineurs and healthy volunteers, respectively.[2,3]
- Erasmus University Medical Center, Dr. Antoinette Maassen van den Brink, Principal Investigator (P.I.)

Pediatric Obesity[4]

- Phase 2 double-blind 'POWER' study testing TNX-1900 as a novel therapeutic agent to induce weight loss and improve indicators of cardiometabolic risk in adolescent patients with obesity
- Massachusetts General Hospital (MGH), Dr. Elizabeth Lawson, P.I.

Social Anxiety[5]

- Study effects of TNX-1900 on social safety learning in social anxiety disorder (SAD)
- Univ. of Washington, Dr. Angela Fang, Principal Investigator (P.I.)

[1]Tonix Press Release May 22, 2023: https://ir.tonixpharma.com/news-events/press-releases/detail/1391/tonix-pharmaceuticals-announces-clinical-proof-of-concept
[2]de Vries Lentsch S, et al. 2022 "CGRP-mediated trigeminovascular reactivity in migraine patients treated with erenumab." *J Neurol Neurosurg Psychiatry*. Aug;93(8):911-912.
[3]Ibrahimi K, et al. 2017 "A human trigeminovascular biomarker for antimigraine drugs: A randomized double-blind, placebo-controlled, crossover trial with sumatriptan." *Cephalalgia*. Jan;37(1):94-98.
[4]Tonix Press Release July 10 2023 – https://ir.tonixpharma.com/news-events/press-releases/detail/1404/tonix-pharmaceuticals-announces-initiation-of-enrollment-in
[5]Tonix Press Release July 17, 2023 – https://ir.tonixpharma.com/news-events/press-releases/detail/1405/tonix-pharmaceuticals-announces-agreement-and-initiation-of

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

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 trial 3Q 2023

- Single-blind, placebo (+ usual care) controlled, randomized, potentially pivotal study
- Expected to enroll approximately 60 emergency department patients at sites in the US

FDA Breakthrough Therapy Designation

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

[1]Havakuk et al., 2017. *J Am Coll Cardiol*. 70:101-113

ED = emergency department.

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

Patents Issued

DEVELOPMENT PROGRAM

Market Entry: Hyperphagia in Prader-Willi Syndrome

Additional Indications: Rare Hyperphagia Conditions

Status: Phase 2 ready

Next Steps: IND submission

FDA Orphan Drug Designation

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

[1]Miller et al., 2011. *Am J Med Genet A.* 155A(5):1040-1049
[2]Butler et al., 2017. *Genet Med.* 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 et al., 2021. *J Endocrinol Invest.* 44(10):2057-2070

TONIX PHARMACEUTICALS


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IMMUNOLOGY: KEY CANDIDATES
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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.

*TNX-1500 has not been approved for any indication. Patents filed.

Prevention of Allograft Rejection

Status: Phase 1 ready – IND cleared

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

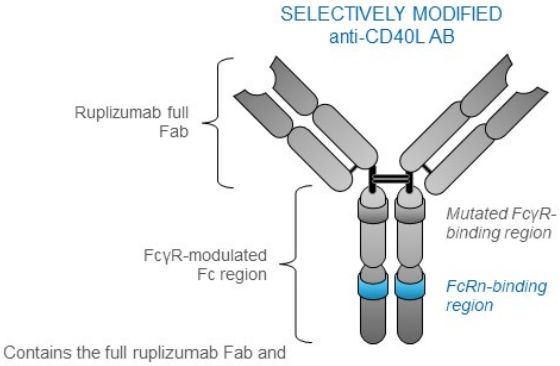
Next Steps: Initiate Phase 1 study 3Q 2023

Autoimmune Diseases

Status: Potential future indications include:

Sjögren's Syndrome, Systemic Lupus Erythematosus

- 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.

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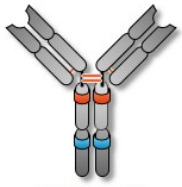
Third-Generation α-CD40L
Engineered to Decrease Risk of Thrombosis

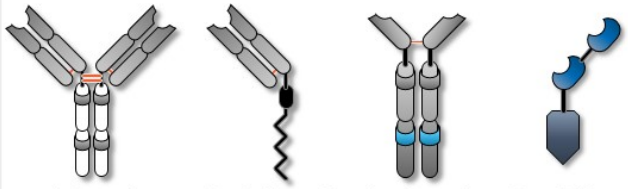
First-generation
anti-CD40L mAbs



Ruplizumab

Constant fragment (Fc) domain interacted with FcγRIIA (CD32A), which suggested a mechanism for the increased risk of thrombosis.[1,2]

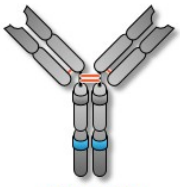
Second-generation
anti-CD40L proteins



Aglycosyl Ruplizumab | *Dapirolizumab* | *Letolizumab* | *Dazodalibep*

Second-generation anti-CD40L proteins exhibited dramatically reduced binding to FcγRIIA[3-6] but had other issues, including decreased efficacy, shortened half-life, or engendering of anti-drug antibodies (ADAs).[7-9]

Third-generation
anti-CD40L mAbs*



TNX-1500

TNX-1500 is engineered to target CD40L therapeutically while reducing FcγRIIA binding and thereby lowering the potential for thrombosis.[1-9]

*Sanofi's frexalimab (formerly SAR441344) and Eledon's tegoprubart (formerly AT-1501) also are Fc modified

[1]Inwald et al., 2003. *Circ Res.* 92(9):1041-1048
[2]Robles-Carrillo et al., 2010. *J Immunol.* 185(3):1577-1583
[3]Shock et al., 2015. *Arthritis Res Ther.* 17(1):234
[4]Xie et al., 2014. *J Immunol.* 192(9):4083-4092
[5]Ferrant et al., 2004. *Int Immunol.* 16(11):1583-1594
[6]Karnell et al., 2019. *Sci Transl Med.* 11(489):eaar6584
[7]ClinicalTrials.gov identifier: NCT02273960. Updated July 16, 2019. Accessed June 1, 2021. https://clinicaltrials.gov/ct2/show/results/NCT02273960?view=results
[8]Waters, 2018. *Biocentury.*
[9]Company data

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Other anti-CD40L Monoclonal Antibodies in Development

UCB (Co-developed with Biogen) – Systemic Lupus Erythematosus (SLE)
- Phase 3 Trial Currently Enrolling (NCT04294667)
  - Topline results expected 1H 2024[1]
- Dapirolizumab pegol (pegylated Fab)

Horizon (being acquired by Amgen) – Sjögren's Syndrome (SjS)
- Two Positive Phase 2 studies reported[2,3]
- Dazodalibep (tn03 fusion protein)

Sanofi – Sjögren's Syndrome (SjS), Multiple Sclerosis (MS), Systemic Lupus Erythematosus (SLE)
- Phase 2 Trial Currently Enrolling in SjS (NCT04572841) and SLE (NCT05039840)
- Active Phase 2 Trial in Relapsing MS (NCT04879628)
- Frexalimab, f.k.a.SAR441344 (Fc-modified)

Eledon – Amyotrophic Lateral Sclerosis (ALS) and Kidney Transplant
- Phase 2 Trial Completed in ALS (NCT04322149)
- Phase 1/2 Trial Currently Enrolling in Kidney Transplant (NCT05027906)
- Tegoprubart, f.k.a. AT-1501 (Fc-modified)

Lundbeck and AprilBio – Neurology
- Phase 1 Trial Currently Enrolling in Healthy Adults (NCT05136053)
- APB-A1 or Lu AG22515 (HAS fusion protein)

[1] https://www.ucb.com/our-science/pipeline
[2] https://ir.horizontherapeutics.com/news-releases/news-release-details/horizon-therapeutics-plc-announces-phase-2-trial-evaluating
[3] https://ir.horizontherapeutics.com/news-releases/news-release-details/horizon-therapeutics-plc-announces-phase-2-trial-evaluating-0


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INFECTIOUS DISEASE: KEY CANDIDATES
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TNX-801*

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

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

Mpox and Smallpox Vaccine

Status: Preclinical

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

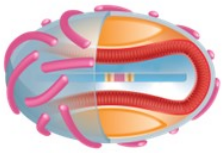
Next Steps: File IND

Vaccine for Future Emerging Infectious Diseases

Example: TNX-1850 for COVID-19

Status: Model System

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



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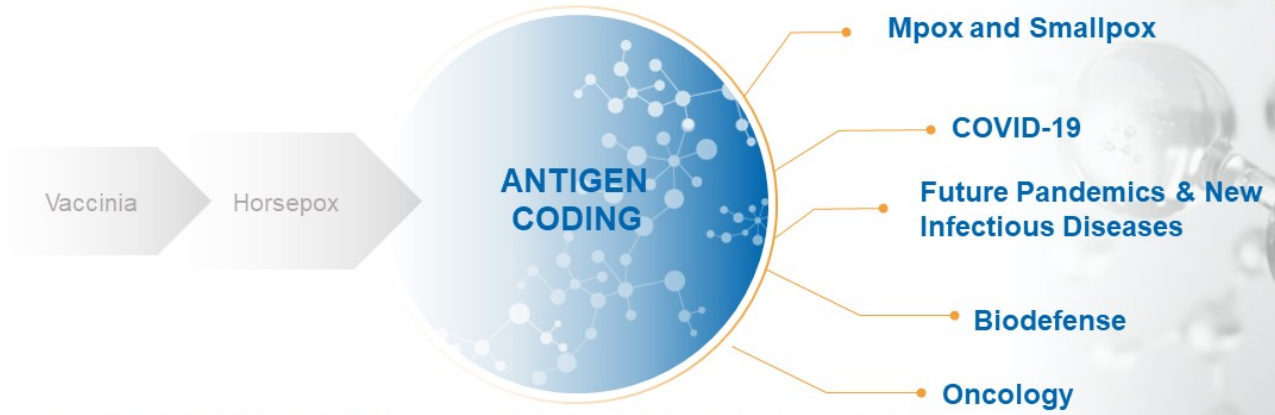
Live Virus Vaccine Platform: Recombinant Pox Vaccine (RPV)
Technology for Emerging Infectious Diseases and Oncolytics



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

INFECTIOUS DISEASE PORTFOLIO

[1]Shrick, 2017. *N Engl J Med* 377:1491-1492
[2]Esparza, 2020. *Vaccine*. 38(30): 4773–4779
[3]Brinkmann, 2020. *Genome Biol*. 21: 286

TONIX PHARMACEUTICALS

TONIX MEDICINES: MARKETED PRODUCTS

Two Marketed Proprietary Migraine Drugs
Autoinjector and Nasal Spray (Non-oral) Formulations of Sumatriptan

Zembrace® SymTouch® (sumatriptan injection) 3 mg[1]

Tosymra® (sumatriptan nasal spray) 10 mg[2]

- Each indicated for the treatment of acute migraine with or without aura in adults
- Sumatriptan remains the acute migraine 'gold standard' treatment for many patients and continues to represent the largest segment of the market in terms of unit sales[3]
- Each may provide migraine pain relief in as few as 10 minutes for some patients[1,2,4,5]
- Each bypasses GI tract – provides convenient administration
- Patents to 2036 (Zembrace) and 2031 (Tosymra)

Upsher-Smith Laboratories Providing Certain Commercial Operations

- Product acquisition closed on June 30, 2023
- To support the transition of the products, Upsher-Smith is providing certain commercial operations, regulatory and other transition services to Tonix Medicines for up to nine months after closing, in exchange for agreed upon service fees.

[1]Zembrace SymTouch [package insert]. Maple Grove, MN: Upsher-Smith Laboratories, LLC: February 2021 - For more information, talk to your provider and read the Patient Information and Instructions for Use. – Important Safety Information is provided in the appendix
[2]Tosymra [package insert]. Maple Grove, MN: Upsher-Smith Laboratories, LLC: Feb 2021 .For more information, talk to your provider and read the Patient Information and Instructions for Use. – Important Safety Information is provided in the appendix
[3]Upsher-Smith Laboratories, LLC; Data On File, 2023
[4]Mathew NT, et al. Dose ranging efficacy and safety of subcutaneous sumatriptan in the acute treatment of migraine. US Sumatriptan Research Group. Arch Neurol. 1992;49(12):1271-1276.
[5]Wendt J, et al. A randomized, double-blind, placebo-controlled trial of the efficacy and tolerability of a 4-mg dose of subcutaneous sumatriptan for the treatment of acute migraine attacks in adults. Clinical Therapeutics. 2006;28(4):517-526.
Tonix has contracted to acquire the Zembrace, SymTouch and Tosymra trademarks. Intravail is a registered trademark of Aegis Therapeutics, LLC, a wholly owned subsidiary of Neurelis, Inc.

Zembrace® SymTouch® (sumatriptan injection) 3 mg

Indication

- Indicated for the treatment of acute migraine with or without aura in adults

Design

- Only branded sumatriptan autoinjector professionally promoted in the United States
- Designed for ease of use and favorable tolerability with a low 3 mg dose[1-4]

Patents

- Patents to 2036

Clinical evidence

- Demonstrated onset of migraine pain relief in as few as 10 minutes (17% of patients vs. 5% for placebo)[2]
- Demonstrated migraine pain freedom for 46% of patients (vs 27% for placebo) at 2 hours in a single-attack, double-blind study (N=230)[3]

[1]Zembrace SymTouch [package insert]. Maple Grove, MN: Upsher-Smith Laboratories, LLC: February 2021.
[2]Mathew NT, et al. Dose ranging efficacy and safety of subcutaneous sumatriptan in the acute treatment of migraine. US Sumatriptan Research Group. Arch Neurol. 1992;49(12):1271-1276.
[3]Landy, S. et al. Efficacy and safety of DFN-11 (sumatriptan injection, 3 mg) in adults with episodic migraine: a multicenter, randomized, double-blind, placebo-controlled study. *J Headache Pain*. 19, 69 (2018).
[4]Brand-Schieber E, Munjal S, Kumar R, et al. Human factors validation study of 3 mg sumatriptan autoinjector, for migraine patients. Med Devices (Auckl). 2016;9:131-137.

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Tosymra® (sumatriptan nasal spray) 10 mg

Indication

- Indicated for the treatment of acute migraine with or without aura in adults

Design

- Novel intranasal sumatriptan product formulated with a permeation enhancer (Intravail® technology) that provides rapid and efficient absorption of sumatriptan[1,2]
- Pharmacokinetically equivalent to 4 mg subcutaneous (*s.c.*) sumatriptan[1]

Patents

- Patents to 2031

Clinical evidence

- Tosymra® delivers migraine pain relief in as little as 10 minutes with just one spray for some patients (13% vs. 5% for placebo)[1-3]

[1]Tosymra [package insert]. Maple Grove, MN: Upsher-Smith Laboratories, LLC: 2019.
[2]Mathew NT, et al. Dose ranging efficacy and safety of subcutaneous sumatriptan in the acute treatment of migraine. US Sumatriptan Research Group. Arch Neurol. 1992;49(12):1271-1276.
[3]Wendt J, et al. A randomized, double-blind, placebo-controlled trial of the efficacy and tolerability of a 4-mg dose of subcutaneous sumatriptan for the treatment of acute migraine attacks in adults. Clinical Therapeutics. 2006;28(4):517-526.
Intravail is a trademark of Aegis, a subsidiary of Neurelis

Potential for Zembrace and Tosymra in Evolving Migraine Market

Documented efficacy of Zembrace[1,2] and Tosymra[3-5] as abortive treatments for acute migraine

- Migraine pain relief possible in as few as 10 minutes for some patients and convenient administration
- Potential to address the unmet needs of patients using traditional or emerging oral acute migraine medications, particularly for rapid-onset treatment

Zembrace and Tosymra have potential as first-line or rescue medications

- Depending on patient need, prescribers may utilize to treat acute migraine either first-line or in the rescue position in a comprehensive migraine toolbox
- Fast onset of action, high pain-relief rates
- For certain patients who present to ERs, Zembrace and Tosymra also provide ER staff a straightforward treatment option

[1]Zembrace SymTouch [package insert]. Maple Grove, MN: Upsher-Smith Laboratories, LLC: 2019.
[2]Landy, S. et al. Efficacy and safety of DFN-11 (sumatriptan injection, 3 mg) in adults with episodic migraine: a multicenter, randomized, double-blind, placebo-controlled study. *J Headache Pain*. 19, 69 (2018).
[3]Tosymra [package insert]. Maple Grove, MN: Upsher-Smith Laboratories, LLC: Feb 2021.
[4]Mathew NT, et al. Dose ranging efficacy and safety of subcutaneous sumatriptan in the acute treatment of migraine. US Sumatriptan Research Group. Arch Neurol. 1992;49(12):1271-1276.
[5]Wendt J, et al. A randomized, double-blind, placebo-controlled trial of the efficacy and tolerability of a 4-mg dose of subcutaneous sumatriptan for the treatment of acute migraine attacks in adults. Clinical Therapeutics. 2006;28(4):517-526.
Intravail is a registered trademark of Aegis Therapeutics, LLC, a wholly owned subsidiary of Neurelis, Inc.

Administration of Zembrace and Tosymra Bypass the GI Tract

Bypassing the gastrointestinal (GI) tract is a potential advantage for treating acute migraine

- Potential to provide a treatment option for migraines complicated by severe nausea and vomiting

Need for acute non-oral treatments

- GI absorption may be inconsistent in migraineurs due to gastric stasis (also called "gastroparesis")[1-4]
- Nausea and vomiting are symptoms of migraine[5]

Existing intranasal products

- Imitrex® nasal spray (sumatriptan)
- Migranal® (dihydroergotamine) nasal spray – developed by Novartis, sold by Bausch Health

New intranasal products bring attention to this non-oral route

- Pfizer's Zavzpret® (zavegepant), FDA approved in March, 2023[1] is the first intranasal gepant
- Impel NeuroPharma's Trudhesa® (dihydroergotamine) FDA approved 2021[2]
  - Precision Olfactory Delivery (POD) technology targets vascular-rich upper nasal space

[1]Pfizer Press Release March 10, 2023. – https://www.pfizer.com/news/press-release/press-release-detail/pfizers-zavzprettm-zavegepant-migraine-nasal-spray
[2]Impel Press Release September 3, 2021 - https://impelpharma.com/2021/09/03/impel-neuropharma-announces-u-s-fda-approval-of-trudhesa-dihydroergotamine-mesylate-nasal-spray-for-the-acute-treatment-of-migraine/

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Strategic Fit

We expect commercial business of Zembrace and Tosymra will be under our control in 4Q: and projected fibromyalgia topline for TNX-102 SL is expected 1Q24

- With success in F307 trial, commercial business is expected to speed TNX-102 SL launch
- Commercial business has potential to expand
  - Potential for "Growth Equity" investors to fund subsequent product acquisitions
  - Debt can be part of financing strategy for subsequent acquisitions

Acquiring subsequent commercial products is easier than buying the first products

- Licenses, accounting, managed care relationships facilitate acquisitions

Commercial sales is an established business strategy

- Historically recession-proof
- Opportunities for new products as big pharma focuses on cell- and gene-therapies
- Room for innovation in evolving reimbursement market
  - Constant evolution in Managed care, Medicare/Medicaid, specialty pharmacies, etc.

Value to Tonix of Marketed Proprietary Migraine Drugs

Prepare for the launch of TNX-102 SL for fibromyalgia

- Commercial capabilities prior to expected launch of TNX-102 SL may speed market uptake
- Potential to facilitate launch of TNX-1900 for prevention of chronic migraine once approved
  - Overlap of prescribers and patients between acute migraine and chronic migraine indications

Grow commercial CNS sales capability

- Improve sales and margins of these migraine products
  - Targeting sampling to potential users
  - Decreasing certain costs
- Explore specialty pharmacy channel

Build a specialty pharma business

- Further product acquisitions
- Several CNS companies have launched ~~of~~ their own internally-developed products and needed to build commercial capabilities
  - *e.g.*, Cephalon, Acadia, Neurocrine, BioHaven, Intra-Cellular, Axsome


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PRECLINICAL
PIPELINE
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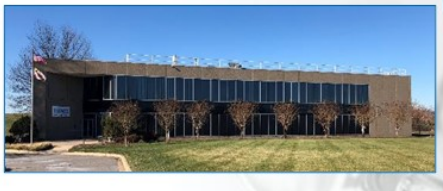
Internal Development & Manufacturing Capabilities

R&D Center (RDC) – Frederick, MD

- **Functions:**
  - Research advancing CNS and immunology drugs
  - 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

Pipeline: Key Pre-Clinical Programs

Candidates*	Indication	Status/Next Milestone
TNX-1610[1]	Attention Deficit Hyperactivity Disorder (ADHD)	Preclinical
TNX-1700[2]	Gastric and colorectal cancers	Preclinical
TNX-1850[3]	COVID-19 (horsepox-based live virus vaccine platform)	Preclinical
TNX-801[4]	Smallpox and mpox vaccine	Preclinical
TNX-3900	Filoviruses (broad spectrum antiviral)	Preclinical
TNX-4000	Filoviruses (broad spectrum antiviral)	Preclinical
TNX-4300	Depression (estianeptine)	Preclinical

[1]Acquired from TRImaran Pharma; license agreement with Wayne State University
[2]Recombinant trefoil factor 2 (rTFF2) based protein; licensed from Columbia University
[3]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.
[4]Live attenuated vaccine based on horsepox virus

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

IMMUNOLOGY PORTFOLIO

Potential New Cancer Treatment

- TNX-1700 (rTFF2-HSA) 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-PD1 or anti-PD-L1 monoclonal antibodies (mAbs)

Preclinical Evidence for Inhibiting Growth of Cancer Cells

- In an MC38 mouse model of colorectal cancer, mTNX-1700 (murine TNX-1700) alone inhibited tumor growth by 50%, and combination therapy with anti-PD1 inhibited tumor growth by 87%[1]
- In an advanced mouse model of gastric cancer, mTNX-1700 combination therapy with anti-PD1 inhibited tumor growth by 78%[2]
- Mechanistically, the combination therapy reduced intratumoral MDSCs, profoundly increased tumor-infiltrating CD8+ T cells, and significantly reduced spontaneous metastasis[2]

Patents Filed

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

Licensed from Columbia University

- Developing in partnership under sponsored research agreement

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

[1]Daugherty et al., AACR Poster. 2023. MDSC-targeted TFF2-MSA suppresses tumor growth and increases survival in anti-PD-1 treated MC38 and CT26.wt murine colorectal cancer models. https://bit.ly/45XbGK9
[2]Qian et al., AACR Poster. 2023. MDSC-targeted TFF2-MSA synergizes with PD-1 blockade therapy in diffuse-type gastric cancer. https://bit.ly/3qCQsku

TONIX PHARMACEUTICALS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TONIX TEAM, NETWORK AND FUTURE OUTLOOK
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Key Development Partners

Massachusetts General Hospital
Harvard Medical School

TNX-1500: ALLOGRAFT REJECTION

Columbia University

TNX-1300: COCAINE INTOXICATION
TNX-1700: GASTRIC AND COLORECTAL CANCERS

Stanford University
Université de Genève

TNX-1900: MIGRAINE & OTHER INDICATIONS

University of Alberta
SR Southern Research

TNX-801: SMALLPOX AND MONKEYPOX VACCINE
TNX-1850: COVID-19 VACCINE

Inserm Transfert
CHU de Toulouse
Aix Marseille université

TNX-2900: PRADER-WILLI SYNDROME

Kansas State University

TNX-3700: COVID-19 VACCINE (ZINC NANOPARTICLE mRNA TECHNOLOGY)
TNX-2300: BOVINE PARAINFLUEZNA VIRUS

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Milestones: Recently Completed and Upcoming

- ☑ 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 fibromyalgia-type Long COVID
- ☑ 1st Quarter 2023 Phase 2 PREVENTION study start of TNX-1900 for the treatment of migraine
- ☑ 1st Quarter 2023 Phase 2 UPLIFT study start of TNX-601 ER for major depressive disorder
- ☑ 2nd Quarter 2023 Acquisition of marketed migraine products

Expected Data

- ❑ 3rd Quarter 2023 Topline results of Phase 2 PREVAIL study of TNX-102 SL for fibromyalgia-type Long COVID
- ❑ 4th Quarter 2023 Topline results of Phase 2 PREVENTION study of TNX-1900 for chronic migraine
- ❑ 4th Quarter 2023 Topline results of Phase 3 RESILIENT study of TNX-102 SL for fibromyalgia
- ❑ 4th Quarter 2023 Topline results of Phase 2 UPLIFT study of TNX-601 ER for major depressive disorder

Expected Clinical Trial Initiations

- ❑ 3rd Quarter 2023 Phase 1 study start of TNX-1500 for prevention of allograft rejection
- ❑ 3rd Quarter 2023 Phase 2 study start of TNX-1300 for the treatment of cocaine intoxication

TONIX PHARMACEUTICALS

THANK YOU

Zembrace® IMPORTANT SAFETY INFORMATION (1 of 2)

Zembrace SymTouch (Zembrace) can cause serious side effects, including heart attack and other heart problems, which may lead to death. Stop use and get emergency help if you have any signs of a heart attack:

- Discomfort in the center of your chest that lasts for more than a few minutes or goes away and comes back; severe tightness, pain, pressure, or heaviness in your chest, throat, neck, or jaw; pain or discomfort in your arms, back, neck, jaw or stomach; shortness of breath with or without chest discomfort; breaking out in a cold sweat; nausea or vomiting; feeling lightheaded

Zembrace is not for people with risk factors for heart disease (high blood pressure or cholesterol, smoking, overweight, diabetes, family history of heart disease) unless a heart exam shows no problem.

Do not use Zembrace if you have:

- History of heart problems; narrowing of blood vessels to your legs, arms, stomach, or kidney (peripheral vascular disease); uncontrolled high blood pressure; hemiplegic or basilar migraines. If you are not sure if you have these, ask your provider.
- Had a stroke, transient ischemic attacks (TIAs), or problems with blood circulation; severe liver problems; taken any of the following medicines in the last 24 hours: almotriptan, eletriptan, frovatriptan, naratriptan, rizatriptan, ergotamines, dihydroergotamine; are taking certain antidepressants, known as monoamine oxidase (MAO)-A inhibitors or it has been 2 weeks or less since you stopped taking a MAO-A inhibitor. Ask your provider for a list of these medicines if you are not sure.
- An allergy to sumatriptan or any of the components of Zembrace

Tell your provider about all of your medical conditions and medicines you take, including vitamins and supplements.

Zembrace can cause dizziness, weakness, or drowsiness. If so, do not drive a car, use machinery, or do anything where you need to be alert.

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Zembrace® IMPORTANT SAFETY INFORMATION (2 of 2)

Zembrace may cause serious side effects including:

- Changes in color or sensation in your fingers and toes; sudden or severe stomach pain, stomach pain after meals, weight loss, nausea or vomiting, constipation or diarrhea, bloody diarrhea, fever; cramping and pain in your legs or hips; feeling of heaviness or tightness in your leg muscles; burning or aching pain in your feet or toes while resting; numbness, tingling, or weakness in your legs; cold feeling or color changes in one or both legs or feet; increased blood pressure including a sudden severe increase even if you have no history of high blood pressure; medication overuse headaches from using migraine medicine for 10 or more days each month. If your headaches get worse, call your provider.
- Serotonin syndrome, a rare but serious problem that can happen in people using Zembrace, especially when used with anti-depressant medicines called SSRIs or SNRIs. Call your provider right away if you have: mental changes such as seeing things that are not there (hallucinations), agitation, or coma; fast heartbeat; changes in blood pressure; high body temperature; tight muscles; or trouble walking.
- Hives (itchy bumps); swelling of your tongue, mouth, or throat
- Seizures even in people who have never had seizures before

The most common side effects of Zembrace include: pain and redness at injection site; tingling or numbness in your fingers or toes; dizziness; warm, hot, burning feeling to your face (flushing); discomfort or stiffness in your neck; feeling weak, drowsy, or tired.

Tell your provider if you have any side effect that bothers you or does not go away. These are not all the possible side effects of Zembrace. For more information, ask your provider.

This is the most important information to know about Zembrace but is not comprehensive. For more information, talk to your provider and read the Patient Information and Instructions for Use. You can also visit www.upsher-smith.com or call 1-888-650-3789. For full Prescribing Information, visit: https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=6e5b104f-2b9e-416e-92fb-ef1bdaea867d

You are encouraged to report adverse effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088.

Zembrace is a prescription medicine used to treat acute migraine headaches with or without aura in adults who have been diagnosed with migraine.

Zembrace is not used to prevent migraines. It is not known if it is safe and effective in children under 18 years of age.

Tosymra® IMPORTANT SAFETY INFORMATION (1 of 2)

Tosymra® can cause serious side effects, including heart attack and other heart problems, which may lead to death. Stop Tosymra and get emergency medical help if you have any signs of heart attack:

- Discomfort in the center of your chest that lasts for more than a few minutes or goes away and comes back; severe tightness, pain, pressure, or heaviness in your chest, throat, neck, or jaw; pain or discomfort in your arms, back, neck, jaw, or stomach; shortness of breath with or without chest discomfort; breaking out in a cold sweat; nausea or vomiting; feeling lightheaded

Tosymra is not for people with risk factors for heart disease (high blood pressure or cholesterol, smoking, overweight, diabetes, family history of heart disease) unless a heart exam is done and shows no problem.

Do not use Tosymra if you have:

- History of heart problems; narrowing of blood vessels to your legs, arms, stomach, or kidney (peripheral vascular disease); uncontrolled high blood pressure; severe liver problems; hemiplegic or basilar migraines. If you are not sure if you have these, ask your healthcare provider.
- Had a stroke, transient ischemic attacks (TIAs), or problems with blood circulation; taken any of the following medicines in the last 24 hours: almotriptan, eletriptan, frovatriptan, naratriptan, rizatriptan, ergotamines, or dihydroergotamine. Ask your provider if you are not sure if your medicine is listed above
- are taking certain antidepressants, known as monoamine oxidase (MAO)-A inhibitors or it has been 2 weeks or less since you stopped taking a MAO-A inhibitor. Ask your provider for a list of these medicines if you are not sure
- An allergy to sumatriptan or any ingredient in Tosymra

Tell your provider about all of your medical conditions and medicines you take, including vitamins and supplements. Tosymra can cause dizziness, weakness, or drowsiness. If so, do not drive a car, use machinery, or do anything where you need to be alert.

Tosymra® IMPORTANT SAFETY INFORMATION (2 of 2)

Tosymra may cause serious side effects including:

- Changes in color or sensation in your fingers and toes; sudden or severe stomach pain, stomach pain after meals, weight loss, nausea or vomiting, constipation or diarrhea, bloody diarrhea, fever; cramping and pain in your legs or hips, feeling of heaviness or tightness in your leg muscles, burning or aching pain in your feet or toes while resting, numbness, tingling, or weakness in your legs, cold feeling or color changes in one or both legs or feet; increased blood pressure including a sudden severe increase even if you have no history of high blood pressure; medication overuse headaches from using migraine medicine for 10 or more days each month. **If your headaches get worse, call your provider**.
- Serotonin syndrome, a rare but serious problem that can happen in people using Tosymra, especially when used with anti-depressant medicines called SSRIs or SNRIs. **Call your provider right away if you have**: mental changes such as seeing things that are not there (hallucinations), agitation, or coma; fast heartbeat; changes in blood pressure; high body temperature; tight muscles; or trouble walking.
- Seizures even in people who have never had seizures before

The most common side effects of Tosymra include: tingling, dizziness, feeling warm or hot, burning feeling, feeling of heaviness, feeling of pressure, flushing, feeling of tightness, numbness, application site (nasal) reactions, abnormal taste, and throat irritation.

Tell your provider if you have any side effect that bothers you or does not go away. These are not all the possible side effects of Tosymra. For more information, ask your provider.

This is the most important information to know about Tosymra but is not comprehensive. For more information, talk to your provider and read the Patient Information and Instructions for Use. You can also visit www.upsher-smith.com or call 1-888-650-3789. For full Prescribing Information, visit: https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=015a5cf9-f246-48bc-b91e-cd730a53d8aa

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088.

Tosymra is a prescription medicine used to treat acute migraine headaches with or without aura in adults.

Tosymra is not used to treat other types of headaches such as hemiplegic or basilar migraines or cluster headaches.

Tosymra is not used to prevent migraines. It is not known if Tosymra is safe and effective in children under 18 years of age.

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