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Certain statements in this presentation regarding strategic plans, expectations and objectives for future operations or results are "forward-looking statements" as defined by the Private Securities Litigation Reform Act of 1995. These statements may be identified by the use of forward-looking words such as "anticipate," "believe," "forecast," "estimate" and "intend," among others. These forward-looking statements are based on Tonix's current expectations and actual results could differ materially. There are a number of factors that could cause actual events to differ materially from those indicated by such forward-looking statements. These factors include, but are not limited to, the risks related to failure to obtain FDA clearances or approvals and noncompliance with FDA regulations; delays and uncertainties caused by the global COVID-19 pandemic; risks related to the timing and progress of clinical development of our product candidates; our need for additional financing; uncertainties of patent protection and litigation; uncertainties of government or third party payor reimbursement; limited research and development efforts and dependence upon third parties; and substantial competition. As with any pharmaceutical under development, there are significant risks in the development, regulatory approval and commercialization of new products. The forward-looking statements in this presentation are made as of the date of this presentation, even if subsequently made available by Tonix on its website or otherwise. Tonix does not undertake an obligation to update or revise any forward-looking statement, except as required by law. Investors should read the risk factors set forth in the Annual Report on Form 10-K for the year ended December 31, 2020, as filed with the Securities and Exchange Commission (the "SEC") on March 15, 2021, 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



WHAT WE DO



ADVANCING THE SCIENCE AND UNDERSTANDING OF DISEASES by developing **innovative therapies** that improve **population health** by focusing on **unmet needs** in patient care



OUR STRATEGY

Using our integrated development engine, we advance innovative programs across multiple therapeutic areas into the clinic while maximizing asset potential

PIPELINE

COVID, BIODEFENSE & IMMUNOLOGY PORTFOLIO



CANDIDATES	PORTFOLIO & INDICATION	NEXT MILESTONE
	COVID	
TNX-1800	COVID-19 Vaccine ¹	Phase 1 start - 1H 2022
TNX-102 SL	Long COVID-19 (Post-Acute Sequelae of COVID-19 or PASC) ²	Clinical - Pre-IND
TNX-2100	SARS-CoV-2 Diagnostic for T-Cell Immunity ³	First-in-human study - Q4 2021
TNX-3500	COVID-19 Antiviral ⁴	Preclinical
	BioDefense	
TNX-801 ⁵	Smallpox and monkeypox preventing vaccine	Preclinical
TNX-701	Radioprotection	Preclinical
	Immunology & Oncology	
TNX-1500 ⁶	Organ Transplant Rejection/ Autoimmune Conditions	Preclinical
TNX-1700 ⁷	Gastric and pancreatic cancers	Preclinical

^{*}All of Tonix's product candidates are investigational new drugs or biologics and have not been approved for any indication.



¹Live attenuated vaccine based on horsepox virus vector.

²Pre-IND meeting with the FDA completed and based on final meeting minutes, Company plans to file IND to support Phase 2 study in subset of patients whose symptoms overlap with fibromyalgia

³In vivo diagnostic: SARS-CoV-2 peptide epitope mixtures for intradermal administration to measure delayed-type hypersensitivity to SARS-CoV-2.

⁴Sangivamycin for injection.

⁵Live attenuated vaccine based on horsepox virus

⁶anti-CD40L humanized monoclonal antibody

⁷Recombinant trefoil factor 2 (rTFF2) based protein; licensed from Columbia University

PIPELINE CNS PORTFOLIO



Candidates	INDICATION	STATUS
	CNS	
TNX-102 SL ¹	Fibromyalgia (FM) Posttraumatic Stress Disorder (PTSD) Long COVID (PASC²)	Phase 3 Ongoing Phase 2 Clinical – Pre-IND ³
TNX-1300 ⁴	Cocaine Intoxication / Overdose	Phase 2
TNX-1900 ⁵	Migraine and Craniofacial Pain	Clinical – pre-IND ⁶
TNX-2900 ⁷	Prader-Willi Syndrome	Clinical – pre-IND
TNX-601 CR	Depression, PTSD, Neurocognitive Dysfunction from Steroids	Clinical – pre-IND ⁸
TNX-1600 ⁹	Depression, PTSD and ADHD	Preclinical

^{*}All of Tonix's product candidates are investigational new drugs or biologics and have not been approved for any indication.



¹TNX-102 SL (cyclobenzaprine HCl sublingual tablets) is an investigational new drug and has not been approved for any indication. Long COVID/PASC program is also included in the COVID-19 Portfolio. Additional indications of Agitation in Alzheimer's Disease (AAD) and Alcohol Use Disorder (AUD) are Phase 2 ready.

²Post-Acute Sequelae of COVID-19.

³Pre-IND (Investigational New Drug) meeting with the FDA completed and based on final minutes Company plans to file IND to support Phase 2 study in patients whose symptoms overlap with fibromyalgia ⁴TNX-1300 (double-mutant cocaine esterase) is an investigational new biologic and has not been approved for any indication; licensed from Columbia University.

⁵Acquired from Trigemina; license agreement with Stanford University

⁶A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900; Phase 2 expected to start 1H'22

⁷Co-exclustive license agreement with French National Institute of Health and Medical Research (Inserm)

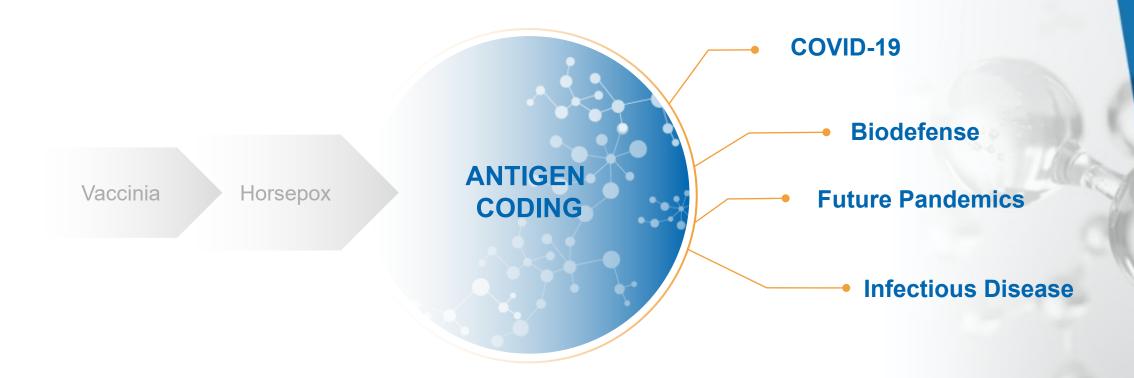
⁸TNX-601 CR is in the pre-IND stage in the U.S.; a Phase 1 trial for formulation development was completed outside of the U.S.; Phase 2 expected to start 1H 2022

⁹Acquired from TRImaran Pharma; license agreement with Wayne State University¹⁰anti-CD40L humanized monoclonal antibody



RECOMBINANT POX VACCINE (RPV) PLATFORM:

NEW VACCINE TECHNOLOGY FOR EMERGING DISEASES



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



RPV PLATFORM PROFILE



POTENTIALLY LONGER DURABILITY DUE TO POX-ENGINEERED ARCHITECTURE

• Enables broad CD8 T-cell response, resulting in strong immune response



PROGRAMMABLE VECTOR DESIGN FOR USE IN DIFFERENT DISEASE MODELS

- Responsive to new variants
- Wide range of clinical applications: pandemic, biodefense, infectious disease, smallpox, oncology



VIRUS-BASED SCIENCE IS WELL ESTABLISHED

- Streamlined development
- Ability to vertically integrate development and manufacturing
- Highly concentrated non-cold-chain products



TNX-1800 COVID-19 VACCINE RPV PLATFORM DEVELOPMENT PROGRAM

ESTABLISHES RPV PLATFORM

- Encodes a protein from SARS-CoV-2, the cause of COVID-19
- Provides a novel, variant-reflexive alternative to mRNA products

ANIMAL TESTING WITH SOUTHERN RESEARCH INSTITUTE

- Non-human primate immune response: positive results reported in Q4 2020
- Non-human primate CoV-2 challenge testing: positive data reported in Q1 2021

MANUFACTURING AGREEMENT WITH FUJIFILM DIOSYNTH

- Development for GMP manufacturing for human trials
- GMP clinical supply expected to be ready for human trials in 1H 2022

DEVELOPMENT PROGRAM

Market Entry: COVID-19 Vaccine

Additional Indications: Future Pandemic, Infectious Disease, Smallpox, Cancer

Status: Preclinical

Next Steps: 1H 2022 Initiate Phase 1 Study



RPV PLATFORM: WHAT MAKES TNX-1800 DIFFERENT FROM MRNA VACCINES

CRITERIA	mRNA VACCINES	TNX-1800*
Number of shots	Two	One
Duration	8 months	Years / decades
Boosters	Recommended	Likely not required
Protection from variants	Variants	Expected
Forward transmission	Unknown for variants like delta	Likely prevents
Biomarker	None	Yes – "Take"
Manufacturing	Complex	Conventional
Glass-sparing packaging	No	Yes
Shipping and storage	Cold chain	Standard refrigeration
Protection from smallpox	No	Yes

^{*} Characterizations of TNX-1800 show in table represent expectations.



US TRENDS IN COVID-19 VACCINE BOOSTER DEVELOPMENT





CURRENT US GOVERNMENT STANCE IS BOOSTERS MAY BE NEEDED POST- PFIZER OR MODERNA VACCINATION¹

- CDC, FDA, White House, COVID-19 Response Team stated that immunity wanes and booster vaccines should be considered
- FDA has authorized a single booster shot of the Pfizer-BioNTech COVID-19 vaccine for those 65 and older as well as high-risk individuals
- J&J vaccine duration under review



BOOSTER DEVELOPMENT ACTIVITY

- Pfizer applied for FDA approval of potential boosters based on a Phase 3 clinical trial in which participants were given a booster between 4.8 and 8 months after completing the two-dose primary regimen²
- J&J and Moderna also developing boosters³⁻⁴



IMPORTANCE OF TESTING PROTECTIVE IMMUNITY

- Personalized approach to determine need for vaccine boosters
- More cost effective
- Reduces risk with unnecessary vaccination
- One-size-fits-all booster strategy is expensive and unlikely unsustainable



¹www.cdc.gov/media/releases/2021/s0818-covid-19-booster-shots.html

²www.investors.pfizer.com/investor-news/press-release-details/2021/Pfizer-and-BioNTech-Initiate-Rolling-Submission-of-Supplemental-Biologics-License-Application-to-U.S.-FDA-for-Booster-Dose-of-COMIRNATY-in-Individuals-16-and-Older/default.aspx

³www.jnj.com/johnson-johnson-announces-data-to-support-boosting-its-single-shot-covid-19-vaccine

⁴investors.modernatx.com/news-releases/news-release-details/moderna-announces-submission-initial-data-us-fda-its-covid-19 © 2021 Tonix Pharmaceuticals Holding Corp.

RPV PLATFORM & COVID-19 VACCINE

INTERNAL DEVELOPMENT & MANUFACTURING CAPABILITIES

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

- <u>Function</u>: Accelerated development of vaccines and antiviral drugs against COVID-19, its variants and other infectious diseases
- <u>Description</u>: ~48,000 square feet, BSL-2, currently operated by Southern Research
- Status: Acquisition expected to close in the fourth quarter of 2021

Advanced Development Center (ADC) - New Bedford, MA

- <u>Function</u>: Development and clinical scale manufacturing of live-virus vaccines to support Phase 1 and Phase 2 trials
- <u>Description</u>: ~45,000 square feet, under construction, planned BSL-2
- Status: Expected to be operational in first half 2022

Commercial Manufacturing Center (CMC) – Hamilton, MT

- Function: Commercial scale manufacturing of live-virus vaccines
- <u>Description</u>: ~44 acre green field site, planned BSL-2
- Status: Planning for initiation of construction in 2022





Architectural Rendering



Architectural Rendering



ASSESSING ANTI-SARS-COV-2 PROTECTIVE IMMUNITY





TWO TYPES OF IMMUNITY

- <u>Antibodies</u> can be measured in a blood test, but anti-SARS-CoV-2 antibodies are not predictive of protection
- <u>T cell</u> can be measured in a blood test, but requires sophisticated lab, unknown if predictive



NEUTRALIZING ANTIBODIES – APPEAR TO CORRELATE WITH PROTECTION¹

- Not part of standard antibody tests
- Requires culture of antibodies with live SARS-CoV-2; possibly "pseudo-type" assays



FUNCTIONAL T CELL IMMUNITY

• *in vivo* – classic skin test – correlation with protection under investigation^{2,3}



²Barrios, Y et al. Clinical Immunol. (2021) 226:108730



³Barrios, Y et al. Vaccines (2021) 9:575

TNX-2100*: COVID-19 DIAGNOSTIC TO CONFIRM T-CELL IMMUNITY





MEASURES THE PRESENCE AND STRENGTH OF FUNCTIONAL IN VIVO T-CELL IMMUNITY

- Designed to elicit delayed-type hypersensitivity in individuals who have been exposed to SARS-CoV-2 or successfully vaccinated
- SARS-CoV-2 epitope peptide mixtures for intradermal administration (Skin Test)



POTENTIALLY SCALABLE FOR WIDESPREAD USE

- Many tests[†] for T-cell immunity to SARS-CoV-2 require specialized laboratories and are not amendable to standardization
- Adaptive Biotech's T Detect™ COVID-19 test received FDA EUA based on genetic analysis of T-cell receptors



DEVELOPMENT PLANS

- Q4 2021: Plan to initiate first-in-human clinical testing pending clearance of IND
- Patents filed

TONIX
PHARMACEUTICALS

TNX-3500*: COVID-19 ANTIVIRAL TREATMENT SANGIVAMYCIN

PROFILE

New variants heighten need for therapeutics

NIH Treatment Guidelines for COVID-19 are mixed on use of remdesivir

Potential monotherapy antiviral¹

 65 times more potent than remdesivir in inhibiting SARS-CoV-2 in cell culture infectivity studies (dose to achieve IC₉₀)²

Potential combination therapy with remdesivir

- TNX-3500 antiviral effect is additive when combined with remdesivir and reduces the amount of each drug necessary for an IC₉₀
- Combination therapies for other viruses have reduced the emergence of drug resistant viral strains

DEVELOPMENT PROGRAM

Market Entry: COVID-19 Antiviral

Additional Indications: MERS, Ebola, Lassa, Oncology

Status: Preclinical

Next Steps: Q3 2021 Initiate Animal Studies

MERS = Middle East Respiratory Syndrome; NIH = National Institutes of Health; PK = pharmacokinetics.

- *TNX-3500 is in the pre-IND stage of development and has not been approved for any indication.
- 1. Bennett RP et al. *Viruses*. 2020;13(1):52. doi: 10.3390/v13010052.
- 2. Data on file, live virus BSL-4 testing conducted by NIAID in collaboration with OyaGen.



TNX-102 SL: LONG COVID (PASC)

CYCLOBENZAPRINE PROTECTIC® SUBLINGUAL TABLETS

PROFILE

Long COVID or Post-acute Sequelae of COVID-19 (PASC) – What is it?

- Symptoms can include fatigue, sleep disorders, pain, fevers, shortness of breath, cognitive impairment described as "brain fog", gastrointestinal symptoms, anxiety, and depression
- Can persist for months and can range in severity from mild to incapacitating
- Occurs in 30% of patients
- Typically associated with moderate or severe COVID-19, Long COVID can occur after mild COVID-19 or even after asymptomatic SARS-CoV-2 infection

To address the urgent need for PASC therapies, Congress awarded the National Institutes of Health \$1.15 billion to study Long COVID.

DEVELOPMENT PROGRAM

Market Entry: Long COVID (PASC)

Status: Clinical – pre-IND; FDA minutes from pre-IND meeting received in Q3 2021

Next Steps: Submit IND for treating subset of Long COVID patients whose symptoms overlap with fibromyalgia in Q1 2022

Patents Issued



TNX-1500

NEXT GENERATION CD40 LIGAND ANTIBODY

THE CD40-CD40L PATHWAY IS A PIVOTAL IMMUNE SYSTEM MODULATOR AND IS A WELL-ESTABLISHED AND PROMISING TREATMENT TARGET TO MORE SAFELY PREVENT ALLOGRAFT REJECTION¹

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

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

Third Generation: Re-engineered to better modulate the binding of FcγR while preserving FcRn function

Expected to deliver efficacy without compromising safety

Status: Preclinical; collaborations ongoing with Mass General Hospital on heart and kidney transplantation in non-human primates

Next Steps: 2H 2022 Initiate Phase 1 Study

Ruplizumab full Fab FcyR-modulated Fc region SELECTIVELY MODIFIED ANTI-CD40L AB Mutated FcyR-binding region FcRn-binding region

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

Patents Filed





TNX-102 SL: FIBROMYALGIA CYCLOBENZAPRINE PROTECTIC® SUBLINGUAL TABLETS



PROFILE

A unique formulation of cyclobenzaprine designed to optimize delivery and absorption

Innovative and proprietary PROTECTIC® Rapid drug exposure following nighttime administration

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

Clinical trial program designed to examine treatment of core Fibromyalgia symptoms

DEVELOPMENT PROGRAM

Market Entry: Fibromyalgia

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

Status: One Positive Phase 3 study (RELIEF) Completed

Next Steps: Second Phase 3 Study Ongoing; topline data expected Q4 2021

Patents Issued



TNX-102 SL: FIBROMYALGIA

CYCLOBENZAPRINE PROTECTIC® SUBLINGUAL TABLETS PROGRAM UPDATE





Phase 3 Study, RALLY (F306)

- July 2021: Tonix stopped enrollment in the RALLY study following an unblinded, pre planned interim analysis by the Independent Data Monitoring Committee (IDMC).
- Based on interim analysis results of the first 50% (n=337) enrolled participants, the IDMC recommended stopping the trial as TNX-102 SL is unlikely to demonstrate a statistically significant improvement in the primary endpoint.
- Tonix will currently allow enrolled participants (n= 514) to complete the treatment period.
- 4th quarter 2021: topline results expected, following completion of study for currently enrolled participants

Following analysis of results from the full RALLY study, Tonix will determine next steps for fibromyalgia program.



TNX 102-SL Development Beyond Fibromyalgia

 Development efforts continue in PTSD, Agitation in Alzheimer's, Alcohol Use Disorder, Long COVID



TNX-601 CR: PSYCHIATRY TIANEPTINE OXALATE AND NALOXONE



A novel, oral, controlled release once-daily tablet

Mechanistically different from traditional MAOI treatments for depression

Indirectly modulates the glutamatergic system

Bypasses interaction with NMDA, AMPA, or kainate receptors

Naloxone added to deter parenteral abuse

Treatment effect of tianeptine in depression is well-established

DEVELOPMENT PROGRAM

Market Entry: Major Depressive Disorder

Additional Indications: PTSD, Neurocognitive Disorder From Corticosteroids

Status: Clinical – pre-IND

Next Steps: 1H 2022 Initiate Phase 2

Trial





TNX-1900: MIGRAINE INTRANASAL POTENTIATED OXYTOCIN (OT) WITH MAGNESIUM

PROFILE

Intranasal OT has potential utility in treating migraine¹

- Intranasal OT reaches the trigeminal ganglion
- Preclinical evidence of OT blocking CGRP release and suppressing pain
- Association of low OT levels during and preceding migraine episodes
- Novel non-CGRP antagonist approach to treatment

Magnesium is known to potentiate the binding of OT to its receptor²

One billion individuals worldwide suffer from migraines

DEVELOPMENT PROGRAM

Market Entry: Chronic Migraine

Additional Indications: Neuropathic Pain

Status: Clinical – pre-IND³

Next Steps: 1H 2022 Initiate Phase 2

Trial

- 1. Tzabazis et al., 2017.
- 2. Antoni and Chadio, 1989.
- 3. A Phase 2 trial under an investigator-initiated IND has been completed in the U.S. using TNX-1900 $\,$

CGRP = calcitonin gene-related peptide.





TNX-2900: PRADER-WILLI SYNDROME INTRANASAL POTENTIATED OXYTOCIN (OT) WITH MAGNESIUM

PROFILE

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

Orphan disease occurring in 1 in 15,000 births

Symptoms include lack of suckling as infants, poor muscle strength, and constant hunger (hyperphagia)

- In animal models, OT has improved suckling and suppressed hunger
 - Tonix's patented potentiated OT formulation is believed to increase specificity for OT receptors relative to vasopressin receptors

DEVELOPMENT PROGRAM

Market Entry: Prader-Willi Syndrome

Additional Indications: Rare, Orphan Hyperphagia Conditions

Status: pre-IND

Next Steps: Submit applications to the FDA for Orphan Drug and Fast Track designations for TNX-2900



TNX-1300: COCAINE INTOXICATION COCAINE ESTERASE (CoCe)

PROFILE

Cocaine is the main cause for drug-related ED visits¹

Cocaine use can cause irreversible structural damage to the heart and accelerate cardiovascular disease²

In one survey of 94 long-term cocaine users,
 71% had some form of cardiovascular disease³

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

DEVELOPMENT PROGRAM

Market Entry: Cocaine Intoxication

Additional Indications: Cocaine Overdose

Status: Phase 2 Open Label

Next Steps: Q4 2021 Initiate Trial

FDA Breakthrough Therapy Designation

Patents Issued

- 1. Havakuk O et al. J Am Coll Cardiol. 2017:70:101-113.
- 2. Phillips K et al. Am J Cardiovasc Drugs. 2009;9:177-196.
- 3. Maceira AM et al. J Cardiovasc Magn Reson. 2014;16:26.
- 4. Richards JR. *Am J Cardiol*. 2018;121:393. ED = emergency department.

KEY DEVELOPMENT PARTNERS





TNX-1500: ALLOGRAFT REJECTION





TNX-1900: MIGRAINE & OTHER INDICATIONS







TNX-2900: PRADER-WILLI SYNDROME



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





TNX-1800: COVID-19 VACCINE





MILESTONES: RECENTLY COMPLETED AND UPCOMING*

4th Quarter 2020 Positive topline data from TNX-102 SL Phase 3 F304/RELIEF study in fibromyalgia reported

✓ 1st Quarter 2021 Non-human primate positive efficacy data from TNX-1800 in COVID-19 models reported

✓3rd Quarter 2021 Interim analysis of TNX-102 SL Phase 3 F306/RALLY study in fibromyalgia reported

Data

☐ 4th Quarter 2021 Topline data from TNX-102 SL Phase 3 F306/RALLY study in fibromyalgia expected

Clinical Trial Initiations – Three New Trials This Year

- ☐ 4th Quarter 2021 Phase 2 OL safety study of TNX-1300 in ED setting for cocaine intoxication expected
- ☐ 4th Quarter 2021 Phase 2 study of TNX-102 SL for the treatment of PTSD in Kenya expected
- ☐ 4th Quarter 2021 First-in-human clinical study of TNX-2100 for SARS-CoV-2 skin test expected
- ☐ 1st Half 2022 Phase 1 safety study of TNX-1800 for COVID-19 expected
- ☐ 1st Half 2022 Phase 2 study of TNX-1900 for the treatment of migraine expected
- ☐ 1st Half 2022 Phase 2 study of TNX-601 CR for the treatment of major depressive disorder expected
- ☐ 2nd Half 2022 Phase 1 study of TNX-1500 for prevention of allograft rejection expected

MANAGEMENT TEAM



Seth Lederman, MDCo-Founder, CEO & Chairman









Gregory Sullivan, MDChief Medical Officer



New York State **Psychiatric Institute**



Bradley Saenger, CPAChief Financial Officer











Jessica Morris
Chief Operating Officer









