



# **Corporate Presentation**

**April 2024**

[www.matinasbiopharma.com](http://www.matinasbiopharma.com)  
NYSE American: MTNB



# Forward Looking Statements

This presentation contains "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995, including those relating to the Company's product development, clinical and regulatory timelines, market opportunity, cash flow and other statements that are predictive in nature, that depend upon or refer to future events or conditions. All statements other than statements of historical fact are statements that could be forward-looking statements. Forward-looking statements include words such as "expects," "anticipates," "intends," "plans," "could," "believes," "estimates" and similar expressions. These statements involve known and unknown risks, uncertainties and other factors which may cause actual results to be materially different from any future results expressed or implied by the forward-looking statements. Forward-looking statements are subject to a number of risks and uncertainties, including, but not limited to, our ability to obtain additional capital to meet our liquidity needs on acceptable terms, or at all, including the additional capital which will be necessary to complete the clinical trials of our product candidates; our ability to successfully complete research and further development and commercialization of our product candidates; the uncertainties inherent in clinical testing; the timing, cost and uncertainty of obtaining regulatory approvals; our ability to protect the Company's intellectual property; the loss of any executive officers or key personnel or consultants; competition; changes in the regulatory landscape or the imposition of regulations that affect the Company's products; and the other factors listed under "Risk Factors" in our filings with the SEC, including Forms 10-K, 10-Q and 8-K. Investors are cautioned not to place undue reliance on such forward-looking statements. Except as may be required by law, the Company does not undertake any obligation to release publicly any revisions to such forward-looking statements to reflect events or circumstances after the date hereof or to reflect the occurrence of unanticipated events. Matinas BioPharma's product candidates are all in a development stage and are not available for sale or use.

# Investment Thesis: LNC Delivery Unlocks Therapeutic Value

## Lipid Nanocrystals (LNCs)



- Intracellular delivery
- Oral administration
- Less toxicity
- Targeting beyond the liver

**MAT2203**

Clinical Validation  
of LNC Capabilities

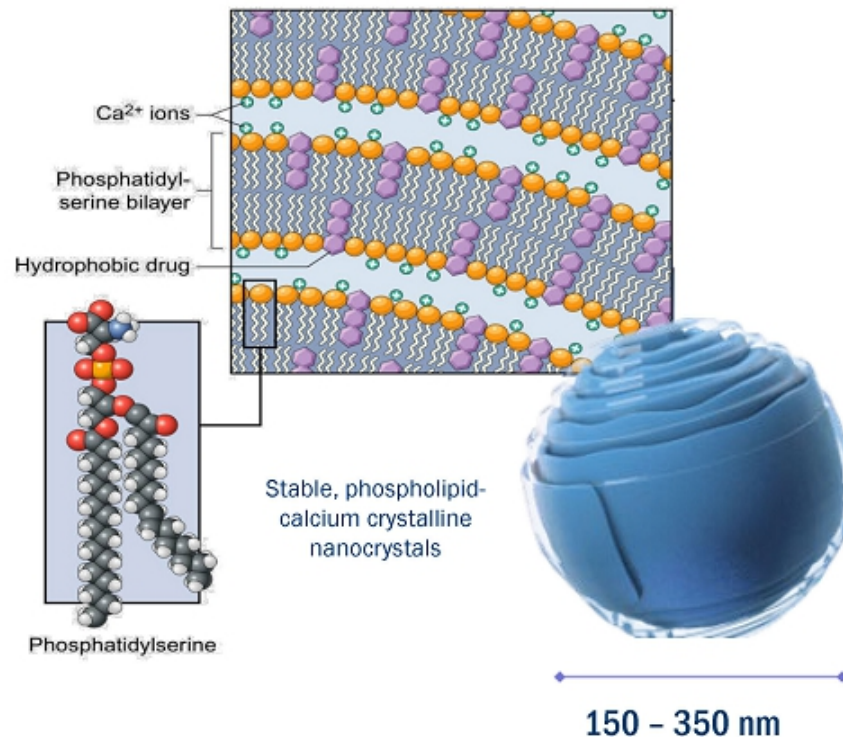
**Pipeline Products  
and Opportunities**

- Oral Amphotericin B - without nephrotoxicity
- Phase 3-ready
  - ORALTO** – Treatment of Invasive Aspergillosis in ~216 patients with limited or no treatment options
- Provides effective longer-term fungicidal stepdown therapy for Invasive Fungal Infections
- **12** years of exclusivity\*

\*QIDP and Orphan designations

- Expand LNC cargo capabilities:
  - small molecule chemotherapeutics
  - oral delivery of small oligonucleotides  
ASOs, siRNA, RNAi
- Future focus on inflammation and oncology

# Lipid Nanocrystals (LNCs): A Clinically Validated Intracellular Delivery Platform



## Delivery of small molecules and small oligonucleotides

- Successful oral delivery of therapeutics in infectious disease, inflammation, and oncology

## Extra-hepatic targeting

- Selective delivery to targeted tissues facilitated by phosphatidylserine
- Validated Blood-Brain-Barrier penetration with MAT2203 in cryptococcal meningitis

## Oral delivery

- Unique structure protects cargo in GI tract
- Particle size obviates first-pass hepatic metabolism

## Safe & stable

- Deliver high-target tissue concentrations of drug with low plasma levels and no absorption by non-target tissues
- No evidence of immunogenicity or cytotoxicity



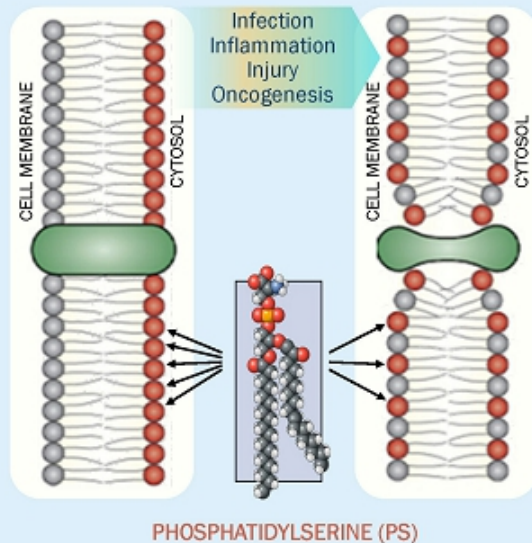
# Phosphatidylserine Enables Cellular Targeting and Intracellular Delivery

## Targeting

### Stressed Cells Externalize PS

Normally, **PS** is confined to the inner layer (facing cytosol)

With cellular stress or injury, **PS** moves from the inner layer to the outer layer of the cell membrane



With a wide variety of potential target cells

### PROFESSIONAL PHAGOCYTES

- Macrophages/monocytes
- Neutrophils
- Dendritic cells

### NON-PROFESSIONAL PHAGOCYTES

- Fibroblasts, epithelial cells, endothelial cells

### INJURED/STRESSED CELLS

- Infection
- Inflammation
- Other physiologic stressors

### TUMOR CELLS

### OTHER IMMUNE CELLS

- T-cells

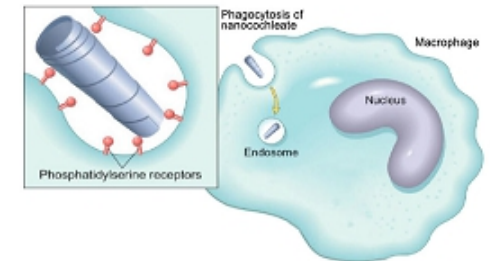
### EXTRACELLULAR PATHOGENS

## Delivery

PS-containing LNCs deliver their cargo to the interior of cells by both phagocytosis and fusion

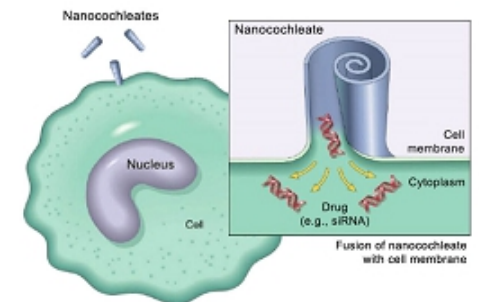
### PHAGOCYTOSIS


**PS** on the outer layer of injured cells is an "eat-me" signal enabling recognition and uptake by professional phagocytes



### FUSION

**PS** on the outer cell membrane facilitates direct LNC-to-membrane fusion and rapid direct cytosolic delivery





# **MAT2203**

## **Oral Amphotericin B**

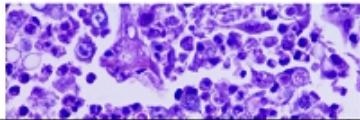
### **Clinical Validation of LNC Delivery**

# The Growing Threat of Invasive Fungal Infections (IFIs)

WIRED

## The Battle Against the Fungal Apocalypse Is Just Beginning

Fungal infections are rising worldwide and climate change may be to blame. Medicine isn't ready.



Nature Reviews Microbiology 2022

## Tackling the emerging threat of antifungal resistance to human health

Matthew C. Fisher<sup>1,2</sup>, Ana Alastruey-Igual<sup>3,4</sup>, Judith Berman<sup>5</sup>, Thana Brankic<sup>6</sup>, Elaine M. Bignell<sup>7</sup>, Paul Bowyer<sup>8</sup>, Michael Brosley<sup>9</sup>, Roger Brüggemann<sup>10</sup>, Gary Garber<sup>11</sup>, Oliver A. Cornely<sup>12</sup>, Sarah J. Currie<sup>13</sup>, Thomas S. Harrison<sup>14</sup>, Ed Kuiper<sup>15</sup>, Johanna Rhodes<sup>16</sup>, Donald C. Sheppard<sup>17</sup>, Adilia Worms<sup>18</sup>, P. Lewis White<sup>19</sup>, Jianping Xu<sup>20</sup>, Bas Zwaan<sup>21</sup> and Paul E. Verweij<sup>22,23,24</sup>

**Abstract** Invasive fungal infections pose an important threat to public health and are an under-recognized component of antimicrobial resistance, an emerging crisis worldwide. Across a period of profound global environmental change and expanding at-risk populations, human-infecting pathogenic fungi are evolving resistance to all licensed systemic antifungal drugs. In this Review, we highlight the main mechanisms of antifungal resistance and explore the similarities and differences between bacterial and fungal resistance to antimicrobial control. We discuss the research and innovation topics that are needed for risk reduction strategies, aimed at minimizing the emergence of resistance in pathogenic fungi. These topics include links between the environment and One Health, surveillance, diagnostics, routes of transmission, novel therapeutics and methods to mitigate hotspots for fungal adaptation. We emphasize the global efforts required to steward our existing antifungal armamentarium, and to direct the research and development of future therapies and interventions.

New York Times



Wall Street Journal

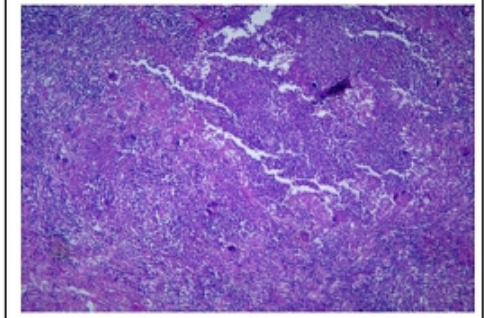
## Dangerous Fungi Are Spreading Across U.S. as Temperatures Rise

Some fungi such as the type that causes Valley Fever might be adapting to endure more heat stress

By Dominique Mosbergen

Feb. 2, 2023 10:05 am ET

Save 408 Listen (5 min)



WHO fungal priority pathogens list to guide research, development and public health action



Wall Street Journal

## Deadly Fungal Infections Confound Doctors—'It's Going to Get Worse'

Once a freak occurrence, fungi resistant to standard drugs now threaten millions of vulnerable Americans

By Dominique Mosbergen

June 22, 2021 9:43 am ET

Scientific American



## Deadly Fungi Are the Newest Emerging Microbe Threat All Over the World

These pathogens already kill 1.6 million people every year, and we have few defenses against them.

By Megan McManus



NBC Nightly News





## MAT2203: Unlocking the Full Potential of Amphotericin B

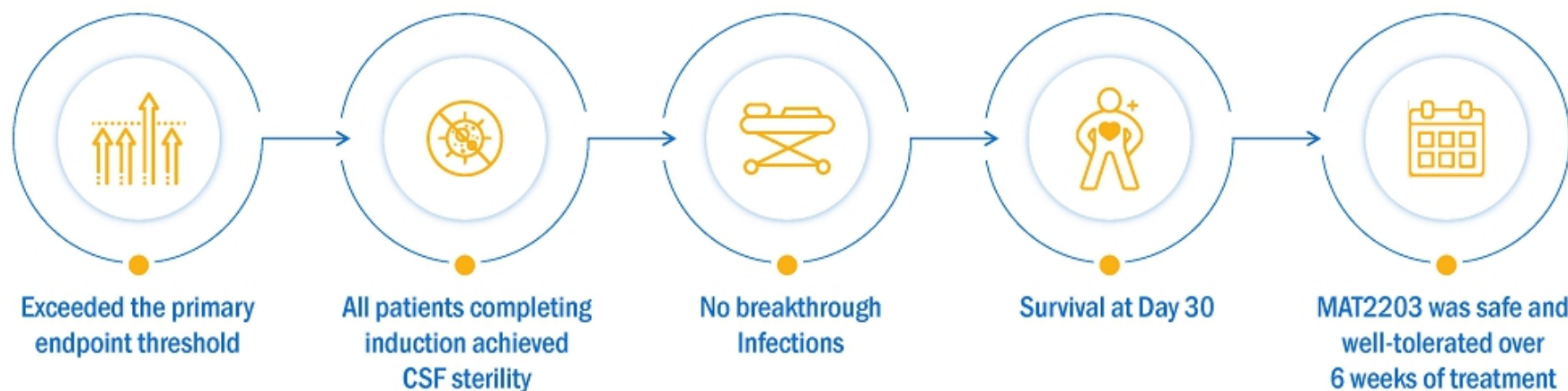
Innate Amphotericin B Characteristics	IV Amphotericin B Limitations	Unlocked Potential
✓ POTENT – broad-spectrum fungicidal	✗ Only available through IV administration	✓ Available systemically and orally (crosses BBB following oral administration)
✓ Minimal drug-drug interactions	✗ Significant toxicity and side effects	✓ Well-tolerated and safe
✓ Low propensity for resistance	✗ High systemic exposure distributed throughout the body	✓ Delivered directly into infected tissues
✓ Active against susceptible and emerging drug-resistant fungal infections	✗ Must be administered in hospital, increasing costs	✓ Cost-effective with potential for significant health economic benefits

**MAT2203 is a promising potential therapeutic option**  
for the treatment of MULTIPLE serious and life-threatening fungal infections



# EnACT: Phase 2 Clinical Validation of Safety and Efficacy

## EnACT Clinical Data in Cryptococcal Meningitis Validates the Use of the LNC Platform to Enable Oral Administration and Overcome Toxicity



- EFA for MAT2203 was 0.42 (95% CI 0.29 to 0.55)  
(primary endpoint threshold was 0.20)

- 97% for patients receiving MAT2203
- 76% for patients receiving SOC

- Over 10 weeks, patients showed no breakthrough infections post-MAT2203 treatment

- 98% for patients receiving MAT2203
- 88% for patients receiving IV AMPB (SOC)

- Repeat dosing showed no renal toxicity or electrolyte abnormalities
- No discontinuations due to AEs nor MAT2203-related SAEs

## Results of EnACT Published in Highly-Regarded Peer-Reviewed Journal

*Clinical Infectious Diseases*

MAJOR ARTICLE

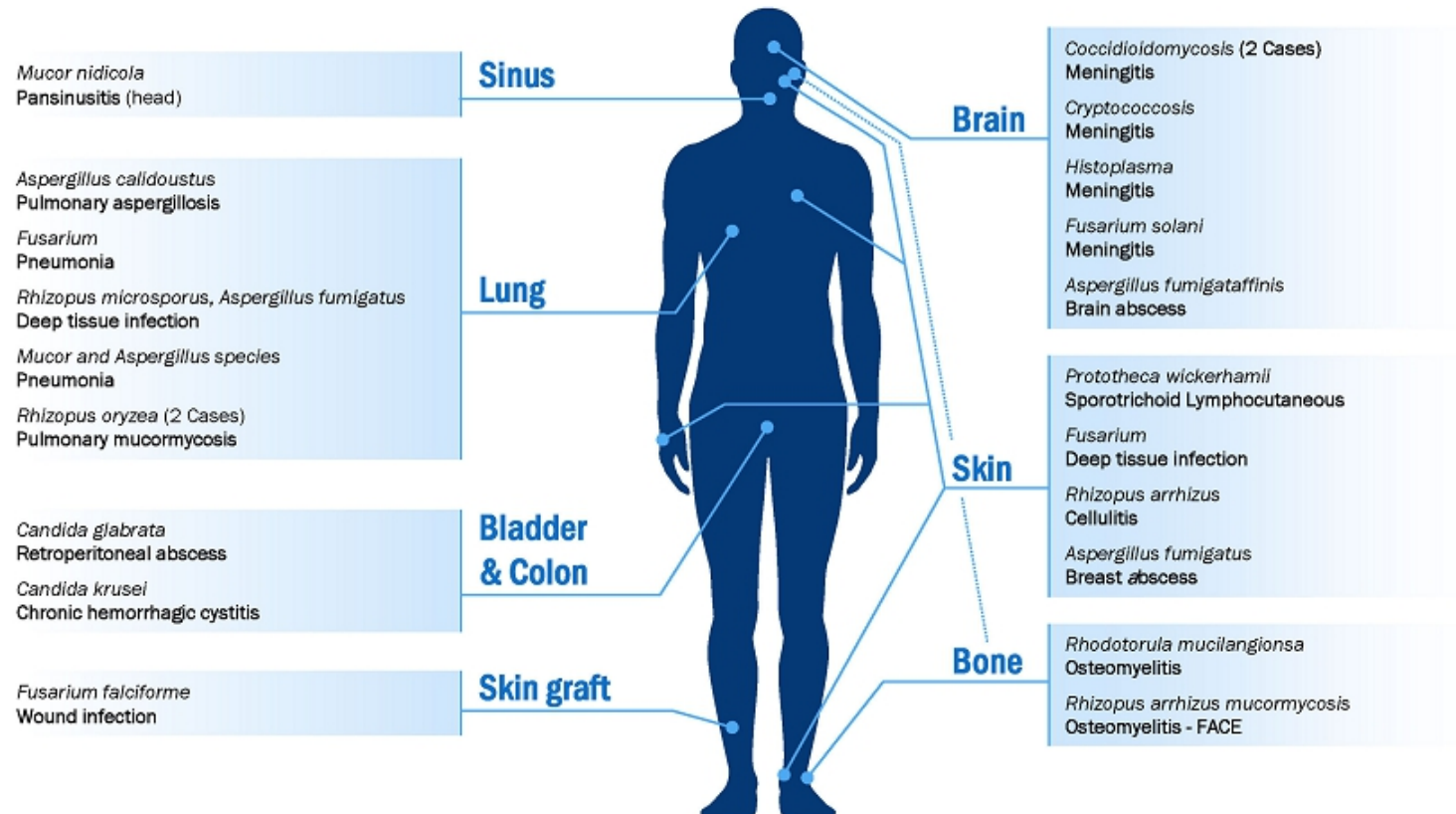


# Oral Lipid Nanocrystal Amphotericin B for Cryptococcal Meningitis: A Randomized Clinical Trial

David R. Boulware,<sup>1,a,\*</sup> Mucunguzi Atukunda,<sup>2,a</sup> Enoch Kagimu,<sup>2</sup> Abdu K. Musubire,<sup>2</sup> Andrew Akampurira,<sup>2</sup> Lillian Tugume,<sup>2</sup> Kenneth Ssebambulidde,<sup>2,3</sup> John Kasibante,<sup>2</sup> Laura Nsangi,<sup>2</sup> Timothy Mugabi,<sup>2</sup> Jane Gakuru,<sup>2</sup> Sarah Kimuda,<sup>2</sup> Derrick Kasozi,<sup>2</sup> Suzan Namombwe,<sup>2</sup> Isaac Turyasingura,<sup>2</sup> Morris K. Rutakingirwa,<sup>2</sup> Edward Mpoza,<sup>2</sup> Enos Kigozi,<sup>4</sup> Conrad Muzoora,<sup>4</sup> Jayne Ellis,<sup>2</sup> Caleb P. Skipper,<sup>1</sup> Theresa Matkovits,<sup>5</sup> Peter R. Williamson,<sup>3</sup> Darlisha A. Williams,<sup>1</sup> Ann Fieberg,<sup>6</sup> Kathy H. Hullsiek,<sup>6</sup> Mahsa Abassi,<sup>1</sup> Biyue Dai,<sup>6</sup> and David B. Meza<sup>1,2</sup>

<sup>1</sup>Department of Medicine, University of Minnesota, Minneapolis, Minnesota, USA; <sup>2</sup>Infectious Diseases Institute, Makerere University, Kampala, Uganda; <sup>3</sup>Laboratory of Clinical Immunology and Microbiology, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland, USA; <sup>4</sup>Department of Medicine, Mbarara University of Science and Technology, Mbarara, Uganda; <sup>5</sup>Matinas Biopharma Nanotechnologies, Bedminster, New Jersey, USA; and <sup>6</sup>Division of Biostatistics, School of Public Health, University of Minnesota, Minneapolis, Minnesota, USA

# MAT2203 Expanded Access Program – Targeted Treatment of IFIs Throughout the Body



## MAT2203 Expanded Access/Compassionate Use Program

### Demonstrated Efficacy in Treatment of Patients with Limited Treatment Options

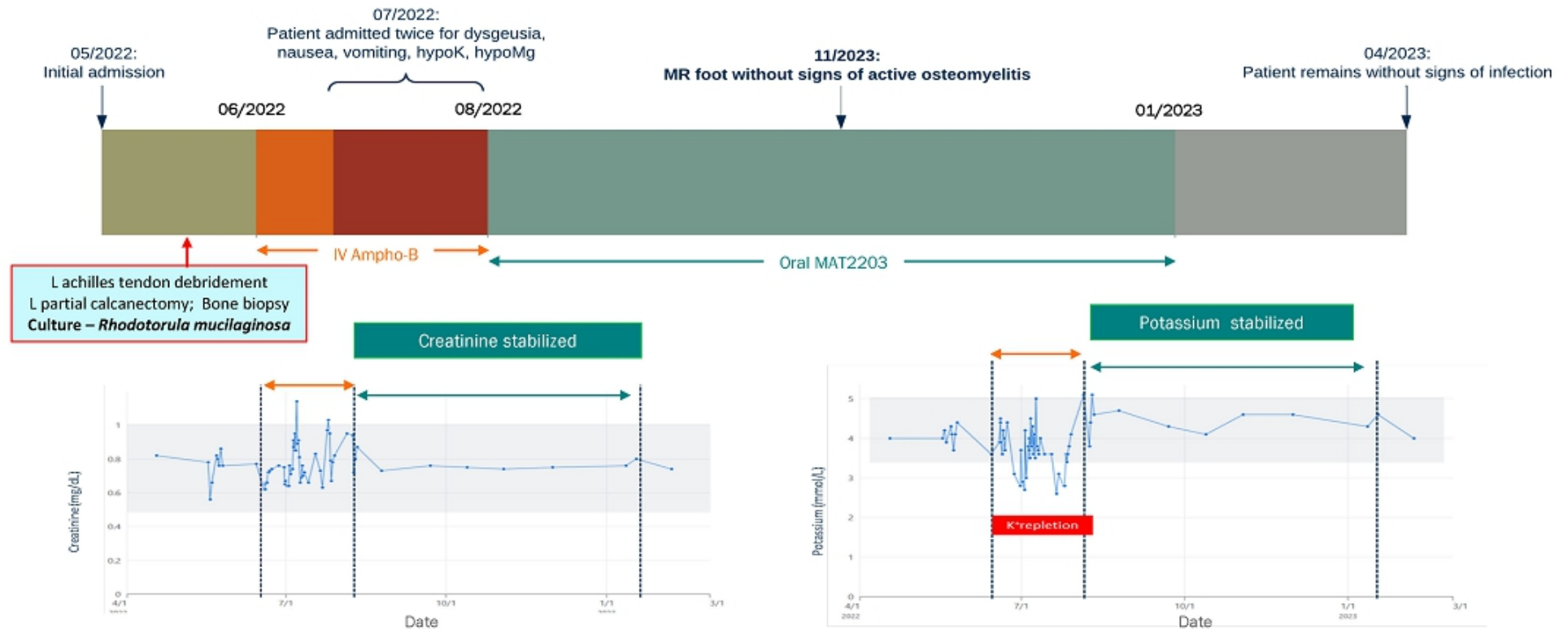
- 20 patients with no other treatment options have enrolled to receive or have completed treatment with MAT2203
  - **Notable Healthcare Institutions:** NIH, University of Michigan, Johns Hopkins, City of Hope, Nationwide Children's Hospital, Vanderbilt University Medical Center, Memorial Sloan Kettering, University of California, San Diego School of Medicine, Children's Hospital of Philadelphia
- Patients were not responding/resistant to, or unable to receive, azole therapy
- Patients were switched to treatment with IV Amphotericin B with clinical response but unable to tolerate treatment due to renal toxicity
  - All patients hospitalized to monitor/manage renal safety and most received IV electrolyte supplementation
- Following oral MAT2203 initiation, patients were discharged to continue treatment at home
- Renal toxicity reversed and renal function returned to baseline after switching to MAT2203
- All patients who received at least two weeks or more of treatment had positive clinical outcomes with significant success stories of full recovery in majority of patients



# Compassionate Use - Recovery from IV Amphotericin B Kidney Toxicity with MAT2203

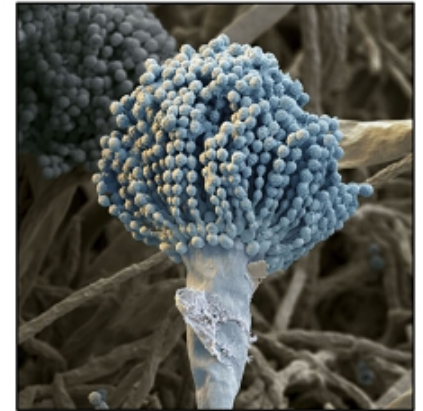


A 38 y/o female with systemic lupus erythematosus on chronic hydroxychloroquine and prednisone presented with a progressively enlarging wound on her left foot.



# High Unmet Medical Need in Invasive Aspergillosis (IA) with Limited Treatment Options

- **IA** is a serious, life-threatening fungal infection that occurs primarily in severely immunocompromised patients with hematologic malignancies and transplant recipients
  - ~15,000 new cases per year in the U.S.
  - WHO, CDC, and FDA all consider it a critical priority and a global public health concern
- IDSA Guidelines recommend treatment with mold-active azoles as first-line treatment for 6-12 weeks
  - Azole use requires fungal expertise to manage toxicities and significant DDIs that can limit duration of use
  - Resistance to azoles is increasing globally
  - Breakthrough **IA** now being reported in patients receiving antifungal prophylaxis (azoles)
    - Failures attributed to non-compliance, poor absorption, DDIs, or infection with drug-resistant *Aspergillus* species
- Unmet medical need highest in **IA** patients who cannot take azoles
  - ~3,000-5,000 cases per year in the U.S.
  - Include patients with resistance, intolerance, DDIs, breakthrough infections
  - No other good long-term oral options
  - Rare disease/orphan commercial opportunity



Bazaz R et al.  
*Pharmaceutical Journal* 2019

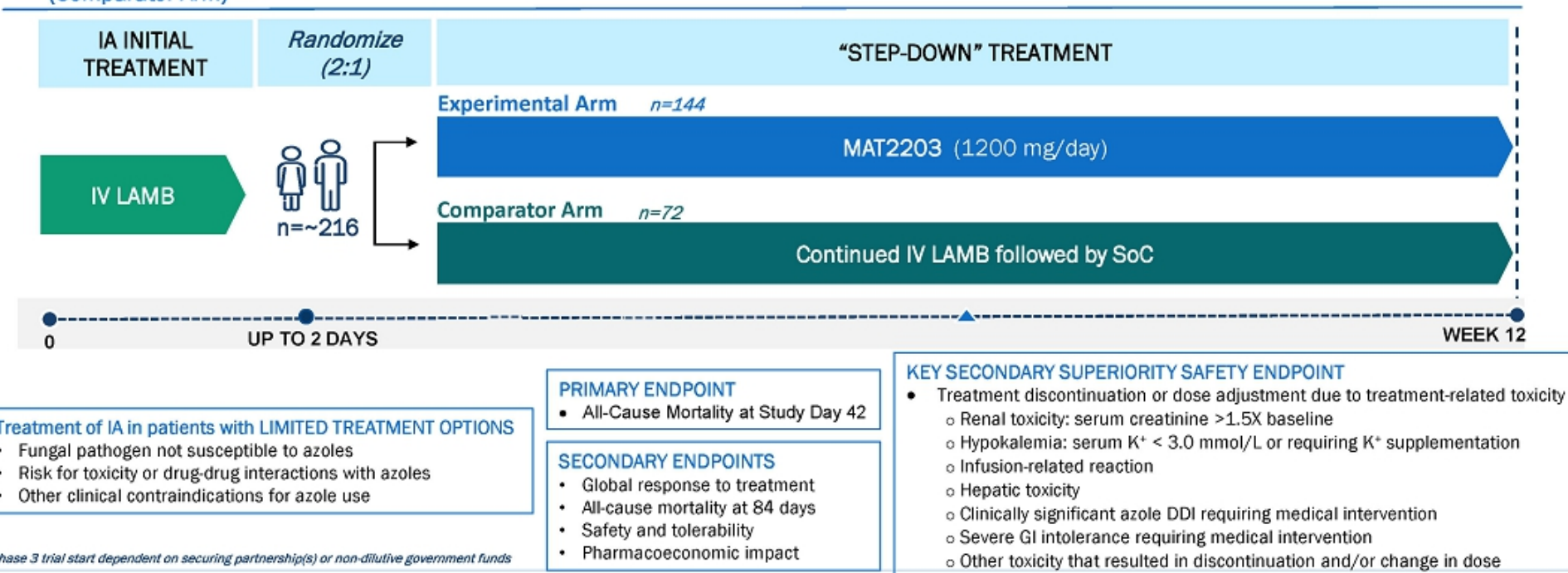
## MAT2203 Regulatory and Development Strategy

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- Near-term development strategy refined to narrow initial target indication: treatment of invasive aspergillosis in patients with limited treatment options (azole-intolerant, azole-resistant, or not effectively managed with an azole)
  - Potential registration through leveraging LPAD pathway
  - Other regulatory designations protected and maintained (QIDP, ODD, Fast-Track, potential for Breakthrough Therapy)
- In February 2024, reached agreement with FDA on a single Phase 3 Registration Trial in support of an NDA for the treatment of invasive aspergillosis in patients with limited treatment options (the “ORALTO” Trial)
- Preparations underway with global CRO in preparation for Phase 3 study implementation
- Development and commercial partnership discussions ongoing

# FDA-Agreed Phase 3 Study Design in Invasive Aspergillosis (IA) (the “ORALTO” Trial)

- To demonstrate that initial treatment with IV LAMB followed by step-down to oral MAT2203 is comparable to (noninferior) SoC treatment in adult patients with Invasive Aspergillosis (IA) who are unable to receive treatment with a mold-active azole and have limited alternative treatment options
- Patients will be randomized 2:1 to receive either oral MAT2203 (Experimental Arm) or continued IV LAMB followed by Standard of Care (Comparator Arm)



\* Phase 3 trial start dependent on securing partnership(s) or non-dilutive government funds



## MAT2203 Value Proposition

AMPHOTERICIN B + ORAL ADMINISTRATION + LACK OF NEPHROTOXICITY = Safe, long-term oral step-down Tx with a potent fungicidal agent

### LIFE CYCLE MANAGEMENT




VALUE →

### Near-Term Development Strategy:

Focused strategy on Phase 3 registration trial in Invasive Aspergillosis in patients with limited or no treatment options under the Limited Population Pathway for Antifungal Drugs (LPAD)\*

\* Evaluated at time of NDA filing



# LNCs Beyond Infection

Efficient and Safe Delivery of Small  
Oligonucleotides and Chemotherapeutics  
in Inflammation and Oncology

# Unlocking the Full Potential of the LNC Platform

## Proven Delivery of Cargo

### Oral Formulations of Anti-Infectives

- MAT2203
- Remdesivir

### Oral Delivery of Small Oligonucleotides

- siRNA
- ASO

### Oral Formulations of Chemotherapeutics

- Docetaxel

## Potential Therapeutic Applications

### INFECTION

- Anti-infectives
- Antivirals

### INFLAMMATION

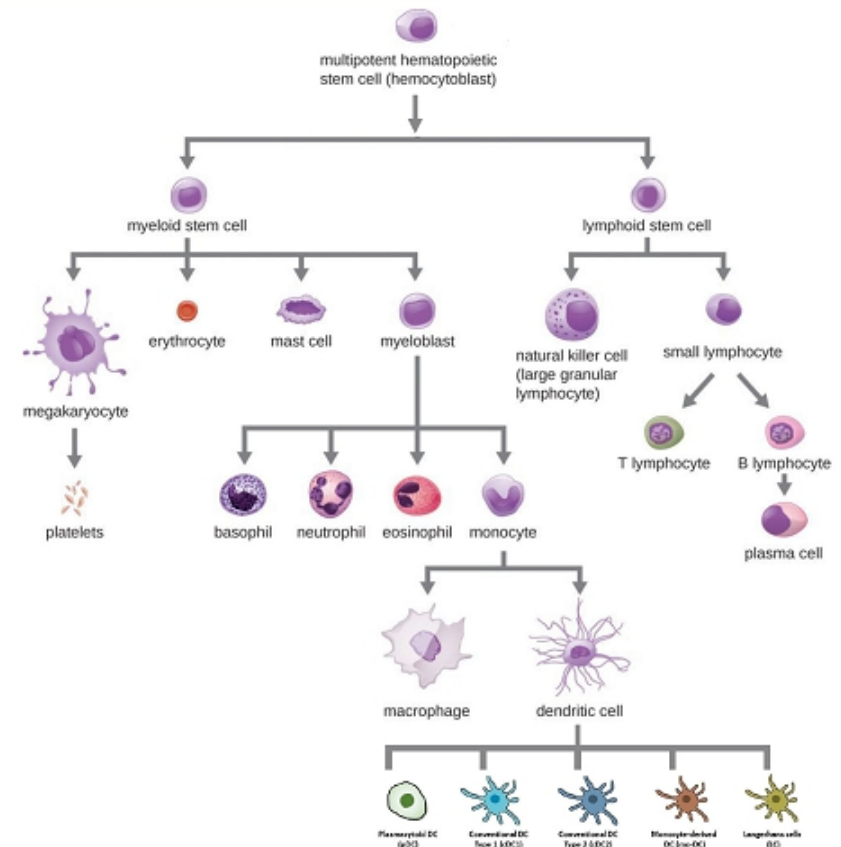
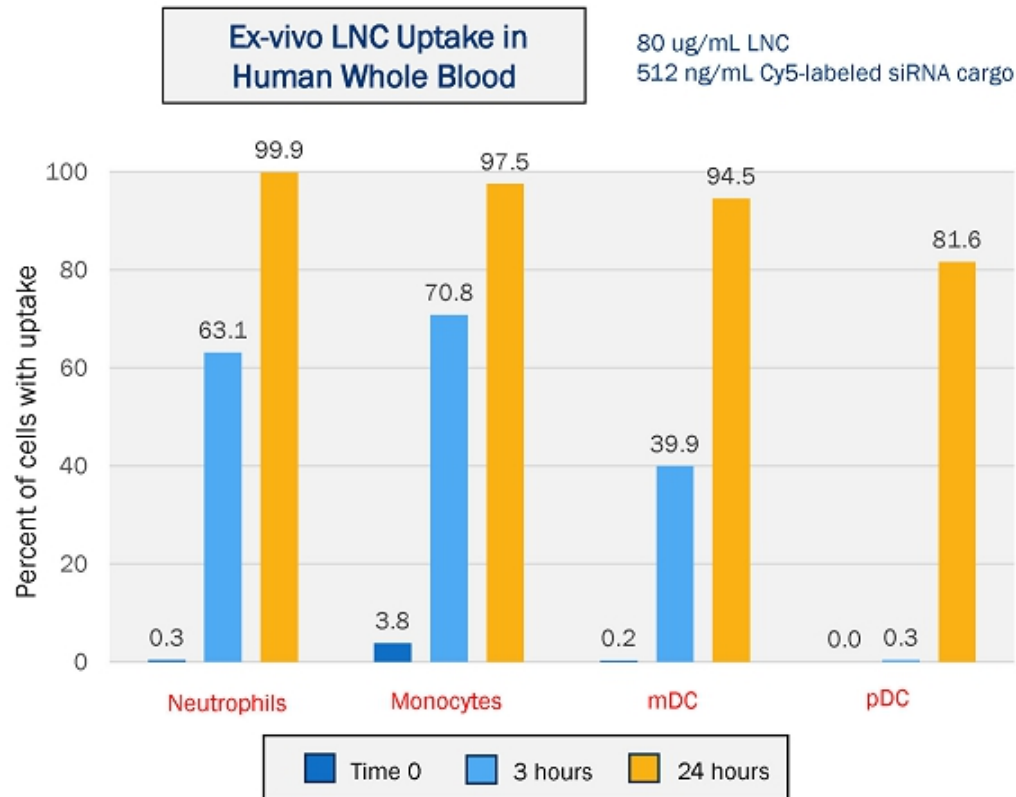
- Autoimmune diseases
- Neuro-inflammatory diseases
- Acute/chronic Inflammatory diseases

### ONCOLOGY

- Hematologic & solid tumor malignancies

Matinas is working internally and with third parties to broaden its portfolio of LNC-based therapeutics

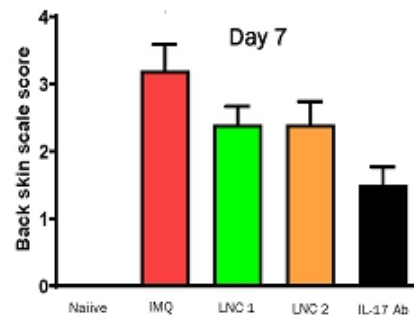
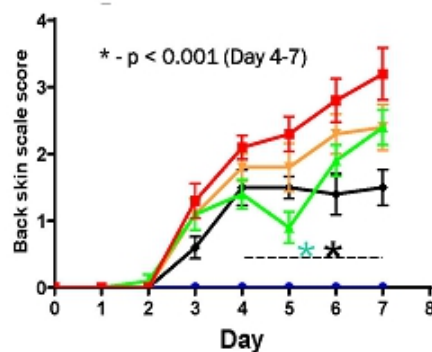
# LNCs are Avidly Taken up by Innate Immune Cells - *Multiple Opportunities in Inflammation*



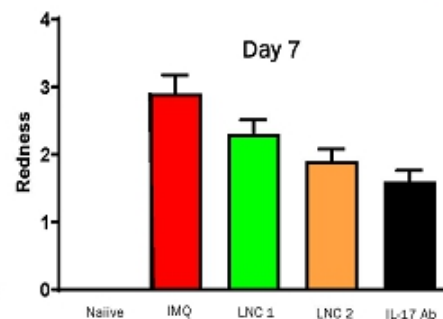
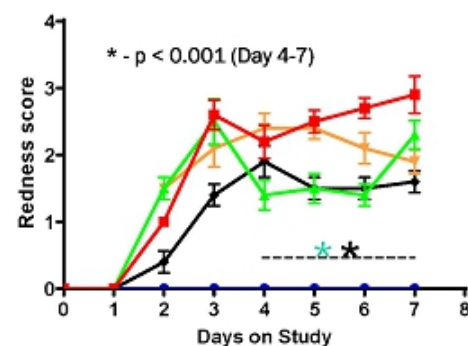


# Effect of Oral LNC IL-17A RNAi in a Murine Imiquimod (IMQ) Psoriasis Model

## Scaling



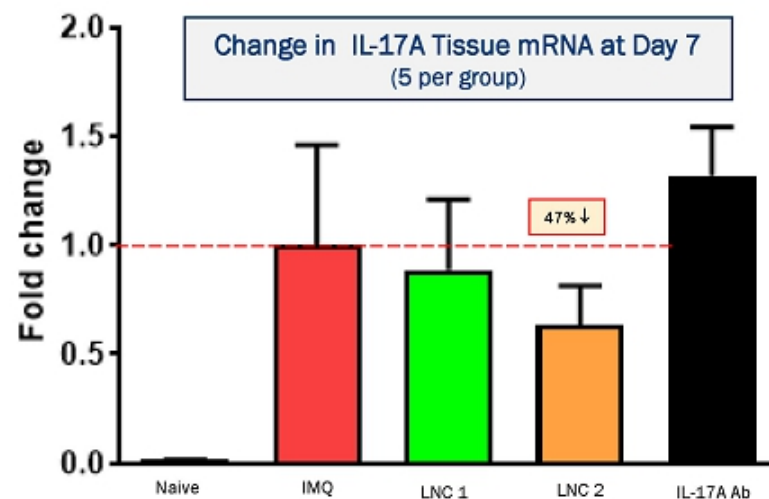
## Redness



BalbC mice  
(n = 50)

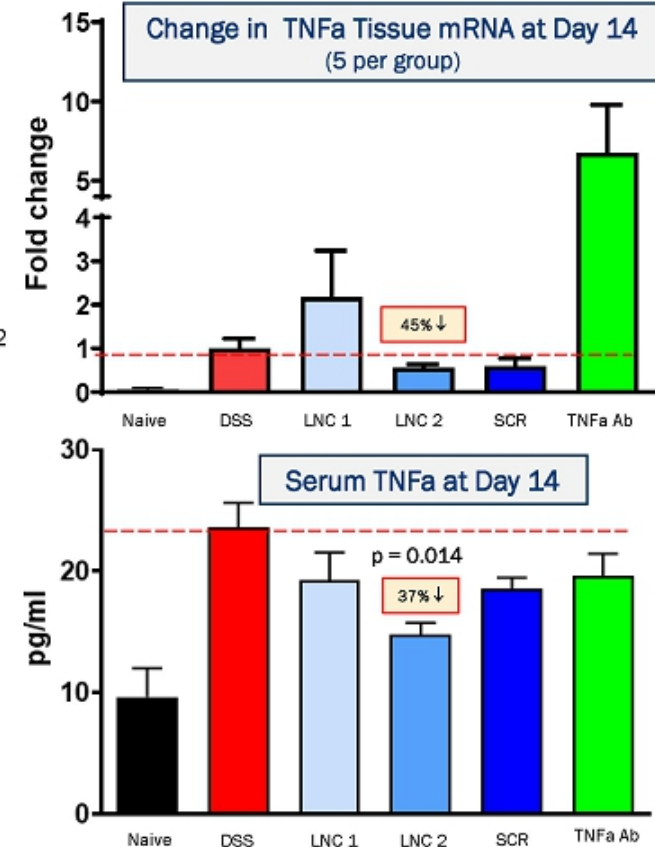
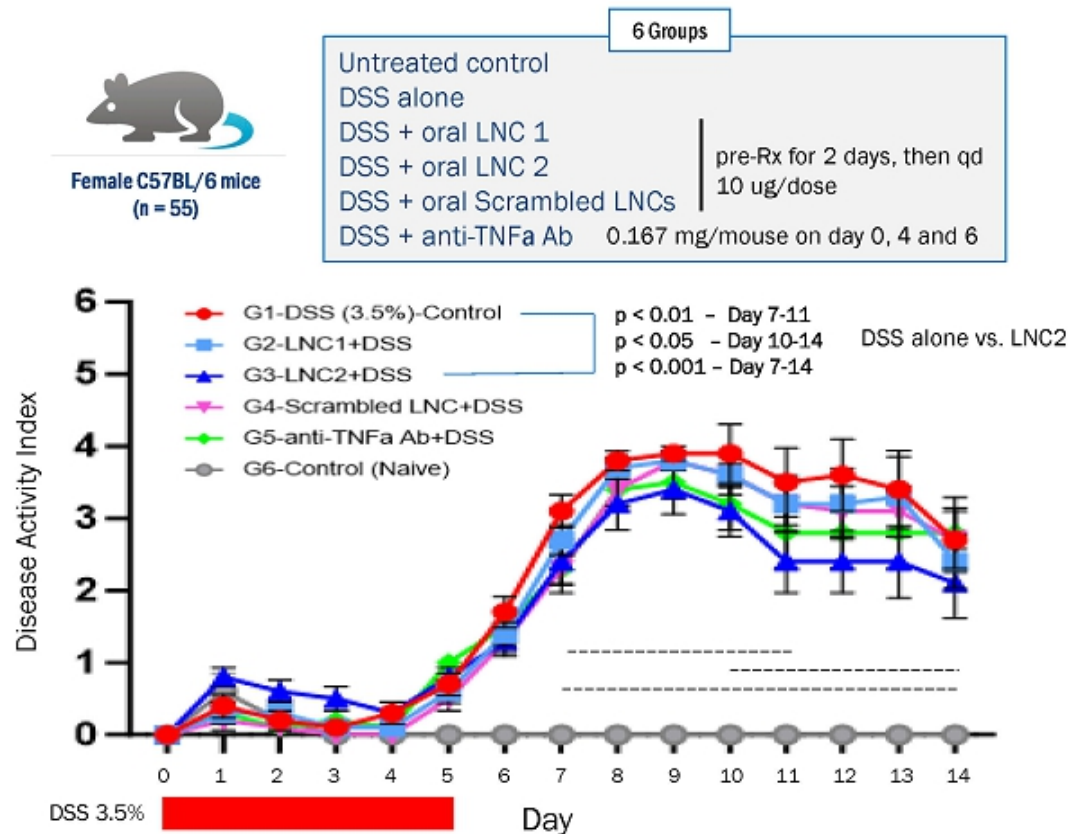
5 Groups

Naïve  
IMQ only  
LNC1 | 10 µg/mouse daily (oral gavage)  
LNC2 | 10 µg/mouse daily (oral gavage)  
IL-17A murine Ab 1 mg/kg i.p. qod

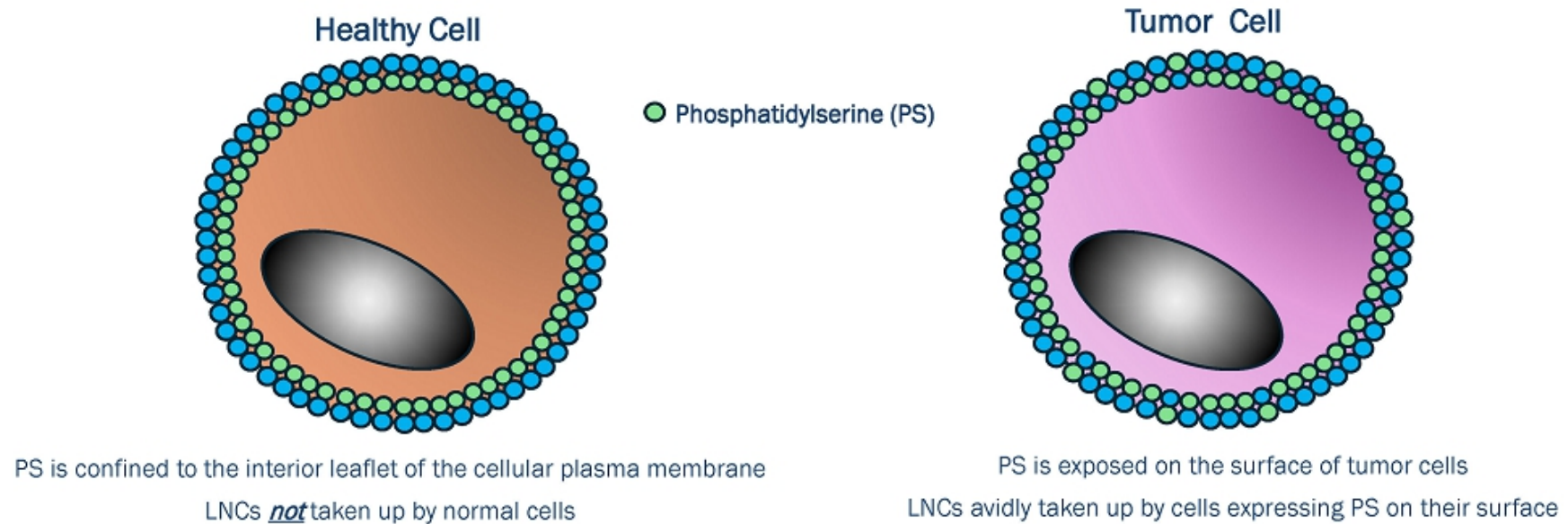


Changes in serum cytokine levels not expected in this model

# Effect of Oral LNC-TNF $\alpha$ RNAi in a Murine DSS Acute Colitis Model



# LNCs Target PS on Tumor Cells - *Multiple Opportunities in Oncology*



Targeted delivery  
provides strong  
opportunities

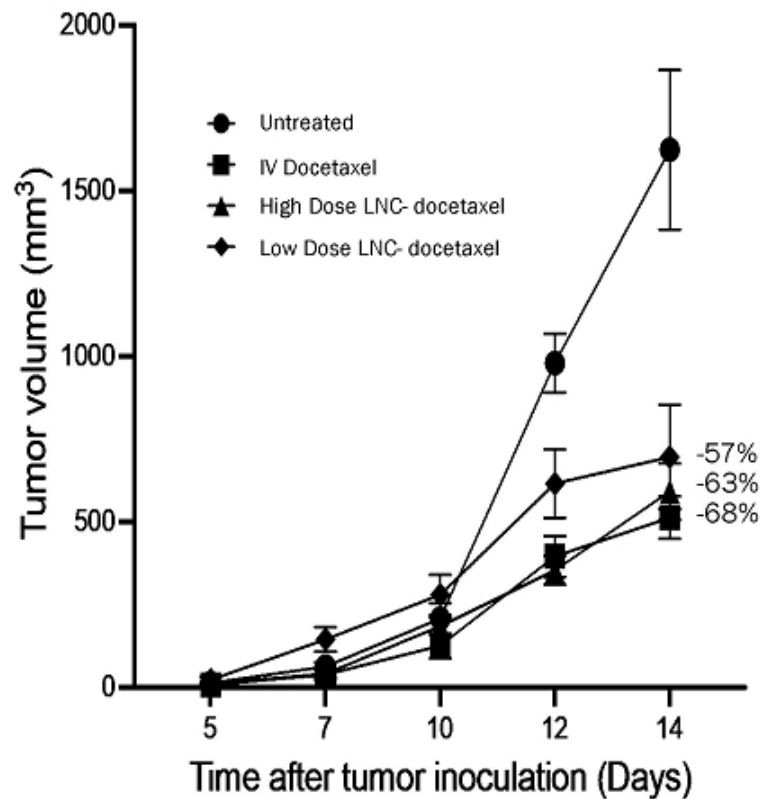
Improved Therapeutic Index

Anti-tumor small oligos

Improved safety & tolerability  
Enhanced efficacy

New therapeutic options

# *In vivo* Therapeutic Efficacy of Oral Docetaxel LNCs in a Murine Syngeneic Melanoma Model



Female C57BL/6 mice  
(n = 40)



Implant  
cells



Untreated control (with tumors)  
Docetaxel 0.15 mg/mouse iv on day 5 and day 10  
Oral LNC-docetaxel - high dose - 0.5 mg/day 5-13  
Oral LNC-docetaxel - low dose - 0.17 mg/day 5-13

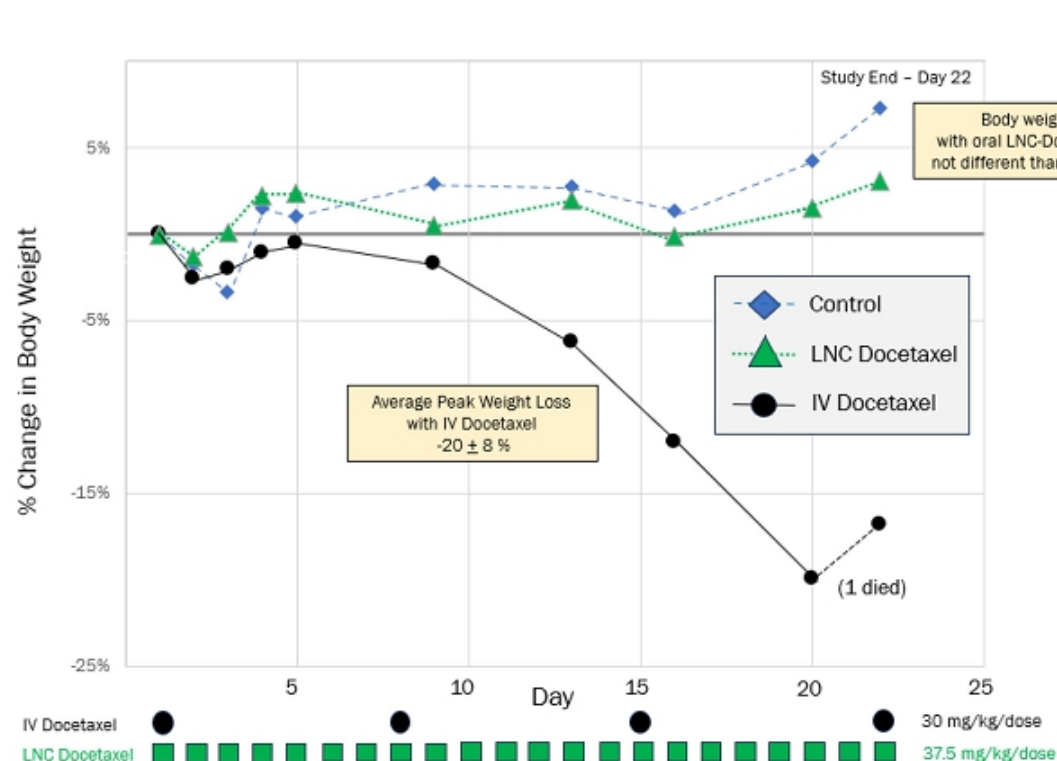


Reductions in tumor volume and tumor weight  
comparable to that seen with IV docetaxel

No significant effect of daily oral docetaxel treatment  
on body weight or hematologic parameters



# Oral LNC Docetaxel Markedly Reduces Toxicity



Healthy C57BL/6 mice (n = 24)

Oral saline (control)

Docetaxel 0.6 mg/mouse iv q week x 3

Oral LNC-docetaxel 0.75 mg/mouse daily through day 22

## KEY TAKEAWAYS

- Through Day 22, the total amount of docetaxel administered with oral LNC-docetaxel was more than 8x greater than with IV-docetaxel.
- Mice treated with oral LNC-docetaxel maintained their body weight; statistically no different than controls.
- All mice treated with IV-docetaxel lost a significant amount of weight (toxicity)—an average peak loss of 20%.
- The daily administered oral LNC-docetaxel dose was 50% higher (total administered drug 3.5x greater) than the LNC-docetaxel dose administered in the previous melanoma study.

# Recent Key Advances Highlight Broader Applicability of LNC Platform Capabilities

## Oncology

- Successful *in vivo* oral delivery of LNC-docetaxel in a melanoma tumor model
  - Reductions in tumor weight and volume comparable to IV docetaxel
  - No adverse effects on body weight or hematologic parameters
- Corroboration of safety in an additional *in vivo* study with higher dose/longer docetaxel Rx in healthy mice
  - Daily oral dose 50% higher than prior study
  - Total drug administered 3.5x higher than prior study
  - No weight loss – compared with 20% peak weight loss with IV docetaxel

## Inflammation

- Successful *in vivo* oral LNC delivery of 2 different RNAi oligonucleotides targeting inflammatory cytokines
- Documented biological activity and therapeutic impact in two different disease models.

### Psoriasis (IL-17A)

- Reduction in tissue IL-17A mRNA levels (skin)
- Statistically significant improvement in clinical scoring of skin lesions
- Reductions in tissue TNFα mRNA levels (colon)

### Colitis (TNFα)

- Statistically significant reductions in serum TNFα levels
- Statistically significant improvement in disease activity scores

### *Key LNC Capabilities*

- *Oral delivery*
- *Delivery of active therapeutics to diseased tissues outside the liver*
- *Low blood levels of active drug, with potential for improved safety*

## Expanding LNC Intellectual Property Portfolio

### Increasing Patent Portfolio to Increase Protection and Exclusivity



MAT2203 potentially entitled to **12+ years of marketing exclusivity**  
(QIDP & Orphan designations)



Owned and Licensed  
Global Platform IP with  
potential **protection**  
out to **2044**



Recent patent  
applications **based on**  
**formulation work with**  
**small oligonucleotides**  
and in oncology

**Strong IP & Regulatory Designations**

# Experienced Leadership Team

## EXECUTIVE TEAM



**Jerome D. Jabbour, J.D.**  
Chief Executive Officer



**Thomas Hoover, MBA**  
Chief Business Officer



**Theresa Matkovits, Ph.D.**  
Chief Development Officer



**James Ferguson, M.D.**  
Chief Medical Officer



**Keith Kucinski, CPA, MBA**  
Chief Financial Officer



**Hui Liu, Ph.D., MBA**  
Chief Technology Officer



## BOARD OF DIRECTORS

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Director



**James Scibetta**  
Director



**Kathryn Corzo**  
Director



**Natasha Giordano**  
Director



**Matthew Wikler, M.D., MBA**  
Director



**Jerome D. Jabbour, J.D.**  
CEO





# Investment Thesis

## Financial Summary



Runway through Q3 2024



\$13.8M<sup>1</sup> in Cash,  
Cash Equivalents and  
Marketable Securities

<sup>1</sup> as of 012/31/23



Non-Dilutive  
Financing Options

## Near-Term Milestones – Setup for Strong Start to 2024



**Q1** - Successful Agreement with FDA for a Single Phase 3 Registration Trial to Support an NDA for MAT2203 for the Treatment of Invasive Aspergillosis (the “ORALTO” Trial)

**Q1** - LNC-docetaxel Maximum Tolerated Dose Longer Term Safety Study vs. IV-docetaxel

**Q2** - Potential MAT2203 Domestic/Regional/Global Partnership

**Q2** - Additional *in vivo* Oral Delivery of Small Oligonucleotides Targeting Inflammation

**Q2** - *In vivo* Evaluation of Additional Chemo-toxic Agents Delivered with LNCs

**Q2** - Evaluation of LNC-docetaxel in Additional Tumor Models

**Q4** - Commencement and First Patient Enrolled in ORALTO Phase 3 Trial

## Solid Value “Foundation”

**MAT2203 (Infection)**

- Clinically Validated
- Clear Registration Pathway
- Highest unmet need



## Substantial UPSIDE

LNC ORAL Delivery of Small  
Oligonucleotides in Inflammation

LNCs to Improve Therapeutic Index of  
Chemotherapeutic Agents in Oncology

Toward

Establishing Internal and External Pipelines