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Better Treatments, More Tomorrows

INVESTOR PRESENTATION / OCTOBER 2021

MOLECULIN.COM / NASDAQ: MBRX

DISCLAIMER

All statements contained herein other than statements of historical fact, including statements regarding our future results of operations and financial position, our business strategy and plans, and our objectives for future operations, are forward-looking statements. The words “believe,” “may,” “will,” “estimate,” “continue,” “anticipate,” “intend,” “expect,” and similar expressions are intended to identify forward looking statements. We have based these forward-looking statements largely on our current expectations and projections about future events and trends that we believe may affect our financial condition, results of operations, business strategy, short-term and long-term business operations and objectives, and financial needs. These statements are only predictions and involve known and unknown risks, uncertainties, and other factors, including those discussed under Item 1A. "Risk Factors" in our most recently filed Form 10-K filed with the Securities and Exchange Commission ("SEC") and updated from time to time in our Form 10-Q filings and in our other public filings with the SEC. Any forward-looking statements contained in this release speak only as of its date. Moreover, we operate in a very competitive and rapidly changing environment. New risks emerge from time to time. It is not possible for our management to predict all risks, nor can we assess the impact of all factors on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements we may make. In light of these risks, uncertainties and assumptions, the future events and trends discussed in this presentation may not occur and actual results could differ materially and adversely from those anticipated or implied in the forward looking statements. More detailed information about Moleculin is set forth in our filings with the Securities and Exchange Commission. Investors and security holders are urged to read these documents free of charge on the SEC’s web site at http://www.sec.gov.

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We are committed to solving the toughest challenges in highly resistant cancers and viruses. Through our extensive network of world-renowned research organizations, we aim to develop better treatments that can make a real impact in people's lives.

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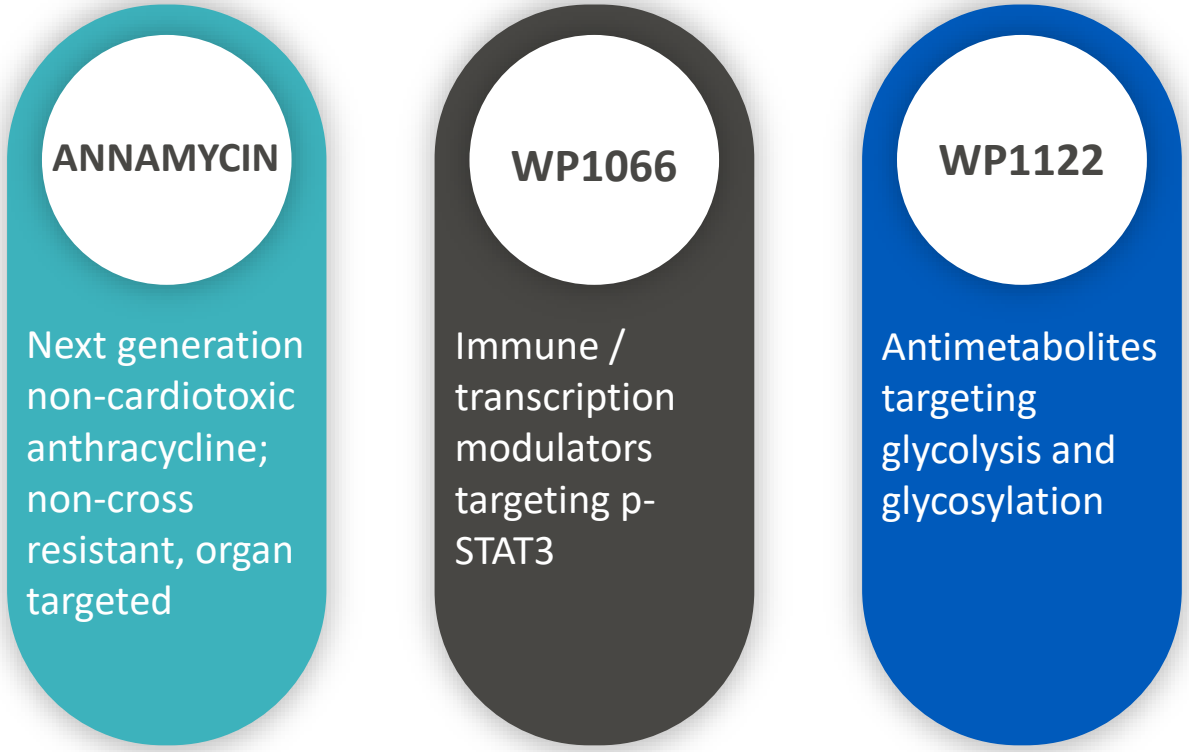
INVESTMENT HIGHLIGHTS

Advancing Three Core Technologies



CORE TECHNOLOGIES
originated and licensed from MD Anderson

DE-RISKED OPPORTUNITY
four clinical-stage programs in 5 indications

UP TO 7
clinical studies with data readouts over the next 18 months

STRONG BALANCE SHEET
with cash into 2024[1]

1: Based on Management's current expectations and planned increase in development activities

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INTERNALLY FUNDED DEVELOPMENT PIPELINE

Multiple Value Driving Milestones

PROGRAM	INDICATION	PRECLINICAL	PHASE 1	PHASE 2	HIGHLIGHTS
Annamycin	Acute Myeloid Leukemia			2021	Topline interim results from Phase 1/2 single agent study expected H2 2021 Initiation of Phase 2 combo (Ara-C) study targeted H2 2021
	Lung Sarcoma Mets			2022	Phase 1b/2 interim data demonstrated 80% clinical activity; Completion of Phase 1b portion targeted H1 2022
WP1066	GBM / IV Formulation		2022		IND targeted for 2022
WP1122	GBM/Pancreatic		2021		Filing of IND targeted 2021
	COVID-19			2021	Received MHRA authorization to commence Phase 1a trial and expect to commence Q4 2021

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EXTERNALLY FUNDED DEVELOPMENT PIPELINE

Multiple Value Driving Milestones

PROGRAM	INDICATION	PRECLINICAL	PHASE 1	PHASE 2	HIGHLIGHTS
Annamycin	STS Lung Mets		2021		Initiation of EU Phase 1/2 study targeted 2021
WP1220	CTCL				Initiation of Phase 2 study targeted 2022 – Seeking Partner
WP1066	Pediatric brain tumors, including DIPG			2021	Topline results from Phase 1 expected H2 2021 Initiation of Pivotal study targeted H1 2022
WP1066 + Radiation	GBM		2022		Initiation of Phase 1/2 study targeted 2022
WP1122, WP1096, WP1097	HIV, Hemorrhagic and Tropical viruses	2021			Publication of externally funded university research

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MANAGEMENT TEAM WITH PROVEN EXECUTIONAL EXPERTISE

Walter Klemp
Chairman, President &
Chief Executive Officer

soliton · ZENO · Inc. 500 · Drypers · Coopers & Lybrand

Don Picker, PhD
Chief Science Officer

SYNERGY PHARMACEUTICALS · TAPESTRY Life Science · CARBOPLATIN

Jonathan P. Foster, CPA, CGMA
Executive Vice President &
Chief Financial Officer

InfuSystem · LSG Sky Chefs · Drypers · Schlumberger · Deloitte.

Paul Waymack, MD, SCD
Senior Chief Medical Officer

UMDNJ · FDA · kitov PHARMA

Sandra Silberman, MD, PhD
Chief Medical Officer – New Products

AstraZeneca · Roche · Bristol-Myers Squibb · NOVARTIS · Pfizer

Robert Shepard, MD, FACP
Chief Medical Officer

DANA-FARBER CANCER INSTITUTE · UNIVERSITY OF VIRGINIA · HARVARD UNIVERSITY · Takeda · FDA · Tufts UNIVERSITY

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PREEMINENT SCIENCE ADVISORY BOARD

Waldemar Priebe, PhD

THE UNIVERSITY OF TEXAS MD Anderson Cancer Center

PANCREATIC

James Abbruzzese, MD

Dana-Farber Cancer Institute

Duke University School of Medicine

HEMATOLOGY

Elihu Estey, MD

FRED HUTCH CURES START HERE®

JOHNS HOPKINS SCHOOL of MEDICINE

Marty Tallman, MD

Memorial Sloan Kettering Cancer Center™

Jorge Cortes, MD

The NEW ENGLAND JOURNAL of MEDICINE

GEORGIA CANCER CENTER AUGUSTA UNIVERSITY

VIROLOGY

Richard Whitley, MD

NIH National Institute of Allergy and Infectious Diseases

Dominique Schols, PhD

KATHOLIEKE UNIVERSITEIT LEUVEN Rega Instituut

Hongbo Zhai, MD

UCSF

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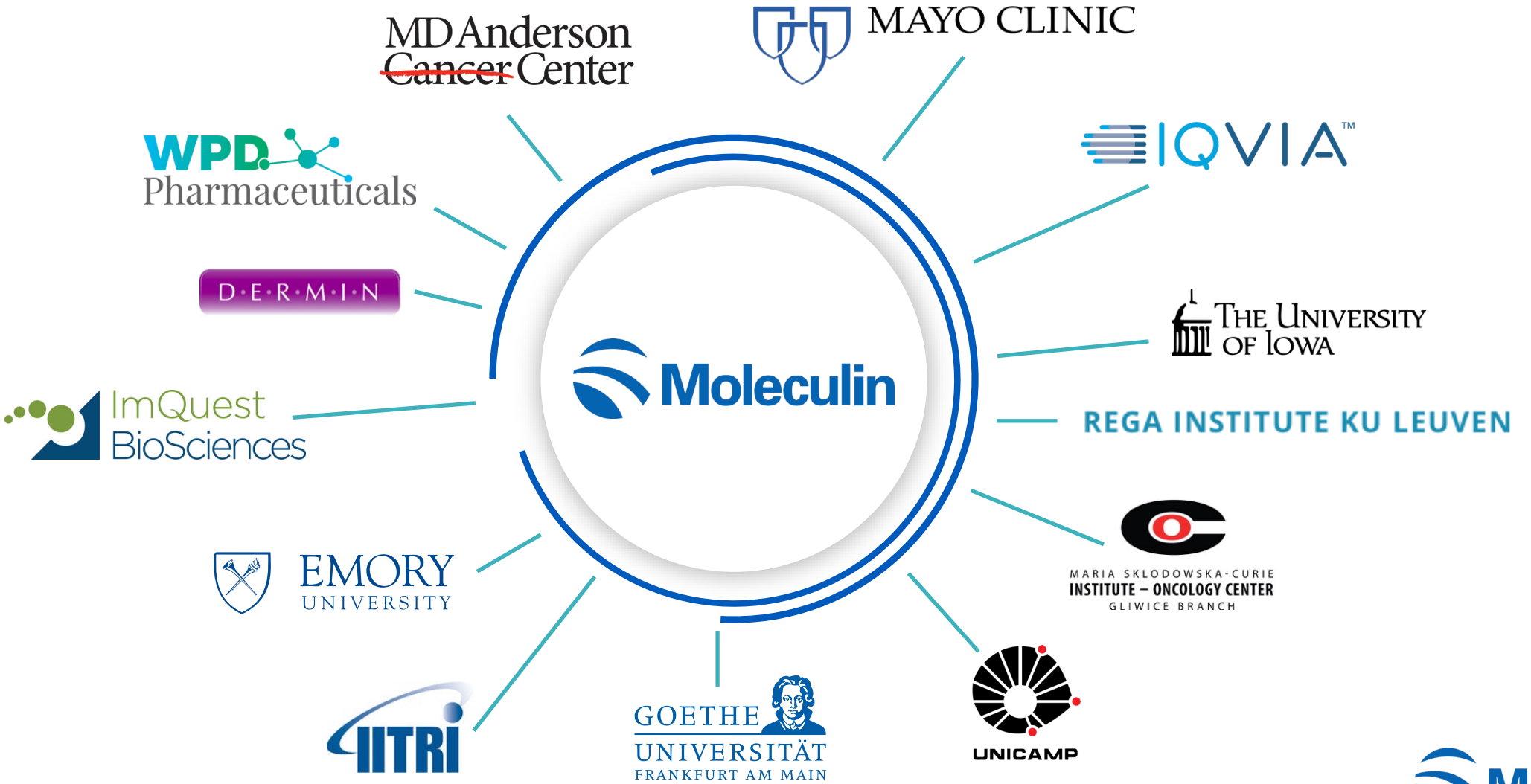
EXTENSIVE NETWORK OF RENOWNED PARTNERS AND COLLABORATORS



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OUR STRATEGY

- Translational development from bench to clinical proof
- Prioritize accelerated approval pathways
- Advance to clinical inflection point to partner
- Leverage collaborations to conserve resources
- Utilize external funding
- Lead with multiple shots on goal

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ANNAMYCIN

“Next generation” non-cardiotoxic anthracycline

Key Regulatory Highlights

- Orphan Drug Designation
- Fast Track Status

Target Indications:

Acute Myeloid Leukemia

- **~160,000** cases worldwide[1]
- **~19,940** new cases annually (U.S.)[1]
- **~11,180** deaths annually (U.S.)[1]

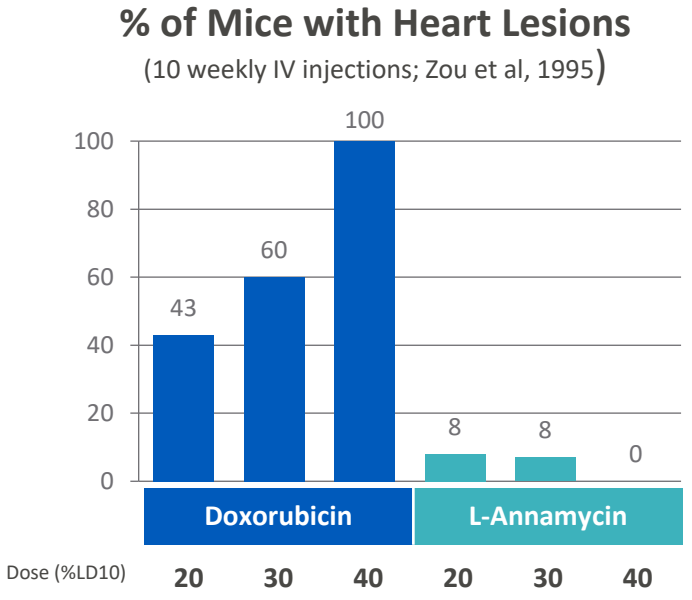
Soft Tissue Sarcoma Lung Mets

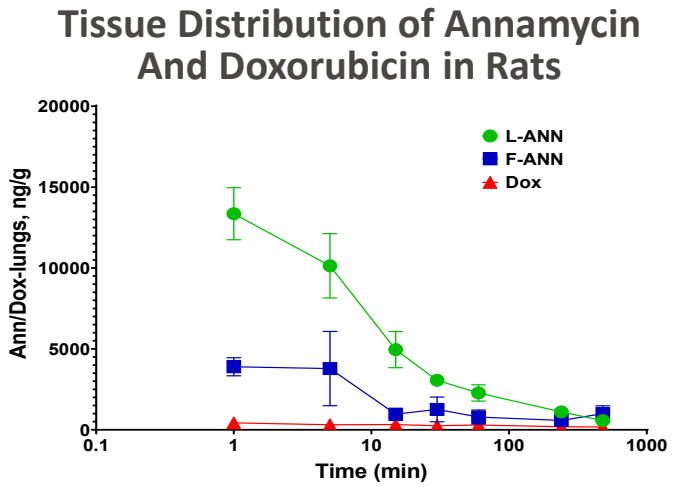
- **~130,000** cases worldwide[2]
- **20% to 50%** of sarcomas metastasize to the lungs[2]

1: Villatoro A, (2020) Leukemia Stem Cell Release From the Stem Cell Niche to Treat Acute Myeloid Leukemia. Front. Cell Dev. Biol. 8:607. doi: 10.3389/fcell.2020.00607; 2: Glabbeke M V, et al. Prognostic Factors for the Outcome of Chemotherapy in Advanced Soft Tissue Sarcoma: An Analysis of 2,185 Patients Treated With Anthracycline-Containing First-Line Regimens—A European Organization for Research and Treatment of Cancer Soft Tissue and Bone Sarcoma Group Study. Journal of Clinical Oncology, Vol 17, No 1 (January), 1999: pp 150-157

ANNAMYCIN: NEXT GENERATION ANTHRACYCLINE

- Novel non-cardiotoxic anthracycline[1]
- Demonstrated ability to overcome multidrug resistance
- >30x better accumulation in lungs than doxorubicin
- Potent topoisomerase-II poison with a wider therapeutic window than doxorubicin[2]
- Clinically evaluated stable liposomal formulation[3]





1: Trevino et al, 2004; 2: Based on preclinical and clinical data to date. See Company's most recent SEC filings; 3: L-ANN, Wetzler et al. 2013

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ONGOING PHASE 1/2 STUDY FOR TREATMENT OF AML

Poland multi-center, open-label, dose escalation study

Dose escalation from 120 mg to a max of 420 mg (currently at 240 mg)

Targeted number of Phase 1 subjects remaining to RP2D: ~15

Topline Phase 1 Results Expected H2 2021

Primary Endpoint: Establish safety and MTD/RP2D

Treatment regimen: infusions days 1, 2 & 3 with 21 days off

Expansion Phase 2 with 21 patients to demonstrate efficacy of RP2D

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ANNAMYCIN – AML CLINICAL BENEFIT TO DATE[2]

22	Patients[1] treated in both US and EU trials
12	Patients taken above the lifetime maximum anthracycline dose established by FDA
100%	Non-cardiotoxic
67%	Response rate in 240 mg cohort[1]

1: Patients receiving a full course of treatment; 2: Trial is ongoing, preliminary data

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ONGOING PHASE 1b/2 STUDY FOR TREATMENT OF STS LUNG METS

US Multi-center, open-label, dose escalation study

Targeted number of Phase 1b subjects: ~18

Treatment regimen: single dose every 21 days

Demonstrated 80% Clinical Activity in First 2 Cohorts of Phase 1b[1]

Dose escalation from 210 mg to a max of 450 mg (Currently enrolling 330 mg)

Primary Endpoint: Establish MTD/RP2D and safety

Phase 2 expansion (25 patients) will evaluate efficacy

1: Trial is ongoing, preliminary data

ANNAMYCIN – STS CLINICAL BENEFIT TO DATE[1]

6	Patients treated at 1st site opened
5	Patients taken above the lifetime maximum anthracycline dose established by FDA
100%	Non-cardiotoxic
80%	Stable disease or better (1 PR)

1: Trial is ongoing, preliminary data

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CLINICAL STUDIES

Acute Myeloid Leukemia

- **Single agent cohort advancing 2H2021**
- **Phase 1/2 combination therapy: targeted H2 2021** *Annamycin plus Ara-C*
- **New published mouse model data shows much higher efficacy in AML when combined with Ara-C**

Soft Tissue Sarcoma Lung Mets

- **U.S. Phase 1/2: initiated Q2 2021**
  - Multi-center (4 more sites opening)
  - Intra-patient dose escalation
  - Pacing to conclude 1H2022
- **EU Phase 1/2: targeted 2021**
  - Grant funded investigator-initiated weekly dosing

WP1066 AND WP1220

First-in-class p-STAT3 inhibitors

Key Regulatory Highlights

Orphan Drug Designation

Rare Pediatric Disease Designation

Target Indications:

Glioblastoma Multiforme (GBM)

- **>13,000** new cases annually (U.S.)[1]
- **>10,000** deaths annually (U.S.)[1]
- **~48%** of all primary malignant brain tumors[1]

Pediatric Brain Tumors

- **200-400** estimated annual incidence[2]
- **10%** of all childhood CNS tumors[2]
- **<10%** 2-year survival[2]
- **<1%** 5-year survival[2]

Cutaneous T-Cell Lymphoma (CTCL)

- **~16,000** cases worldwide[3]
- **~3,000** new cases annually (U.S.)[4]

1: https://braintumor.org/take-action/about-gbm/; 2: https://www.ncbi.nlm.nih.gov/books/NBK560640/; 3: Biomedtracker CTCL Disease Background and Treatment Nov 16, 2020; 4: https://www.clfoundation.org/cutaneous-t-cell-lymphoma

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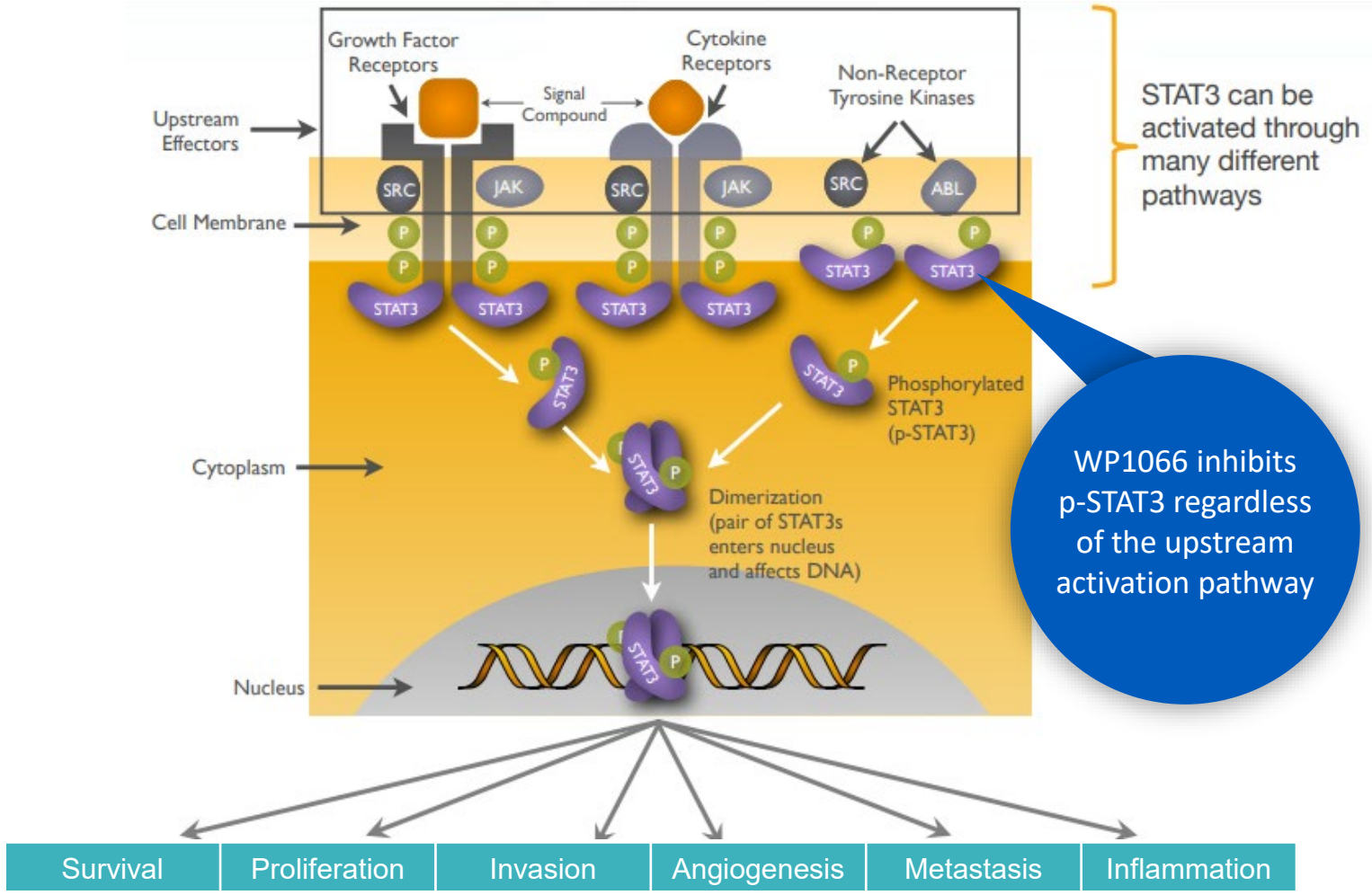
IMMUNE / TRANSCRIPTION MODULATORS

p-STAT3 inhibitor, a key cancer and viral signaling pathway

Also inhibits c-Myc and HIF-1α



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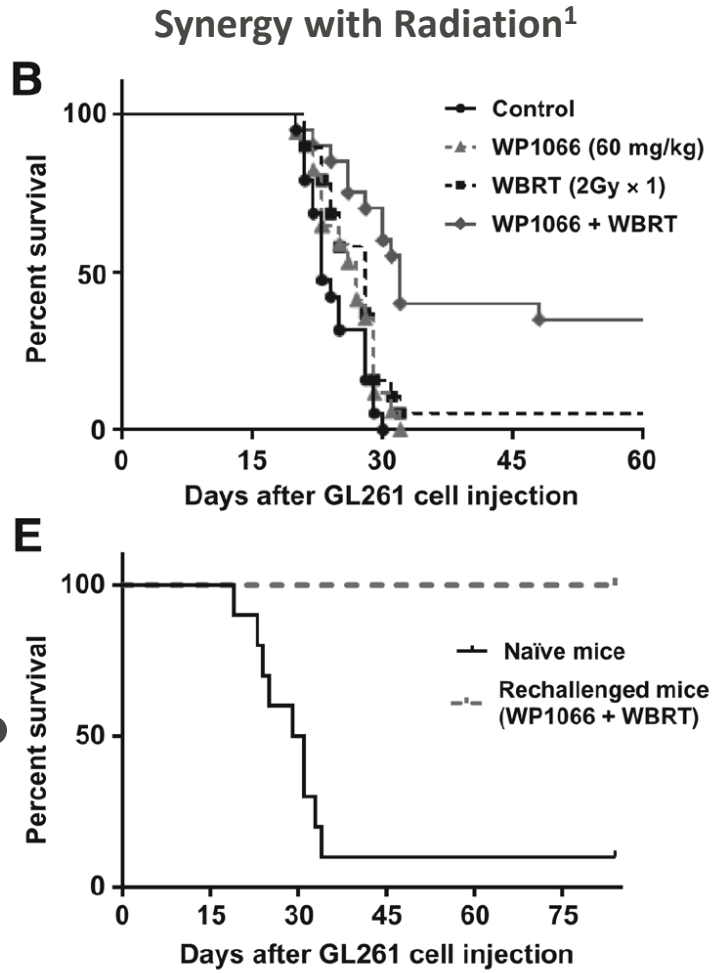
IMMUNE MODULATION AND SENSITIZING TO RADIATION THERAPY

Targeting launch of Phase 1/2 study in H1 2022

Study externally funded by: Ivy Foundation

WP1066 imparts immune memory protecting mice future tumor exposure



1: Ott. M. (2020) Radiation with STAT3 Blockade Triggers Dendritic Cell–T cell Interactions in the Glioma Microenvironment and Therapeutic Efficacy, Clin Cancer Res September 15 2020 (26) (18) 4983-4994

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WP1066

TREATMENT OF PEDIATRIC BRAIN TUMORS, INCLUDING DIFFUSE INTERSTITIAL PONTINE GLIOMA (DIPG)

Targeted Number of Subjects: 35

Escalating doses of 4, 6, 8, 12, and 16 mg/kg twice a day

First Drug to Ever Show Activity in DIPG

Study conducted at and funded by Emory University

Primary Endpoint: Establish safety and MTD

Targeting Launch Pivotal Phase 2 Study in H1 2022

Rare pediatric disease designation for DIPG and three other pediatric brain tumor types

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WP1220

TREATMENT OF CUTANEOUS T-CELL LYMPHOMA (CTCL)

Number of Subjects: 5

Dose: Topically applied bid

Favorable Safety and Efficacy Demonstrated in Phase 1

Duration: 3 months of treatment

Response rate of 45% and a clinical benefit rate of 100%

Preparing to Launch Phase 2 Study in 2022

Seeking strategic partner

ODD and potential for accelerated approval

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WP1122

Antimetabolites targeting glycolysis and glycosylation with applications across cancer and viral indications

Key Highlights

- Prodrug of glucose decoy enables drug-like properties
- Disruption of metabolisms – relevant to certain cancers and viruses

Target Indications:

Glioblastoma Multiforme (GBM)

- **>13,000** new cases annually (U.S.)[2]
- **>10,000** deaths annually (U.S.)[2]
- **~48%** of all primary malignant brain tumors[1]

COVID-19

- **>145** million cases globally[1]
- **>3** million deaths globally[1]

Pancreatic Cancer

- **~60,000** new cases annually (U.S.)[3]
- **~48,220** deaths annually (U.S.)[4]
- **11th** most commonly diagnosed cancer (U.S.)[3]

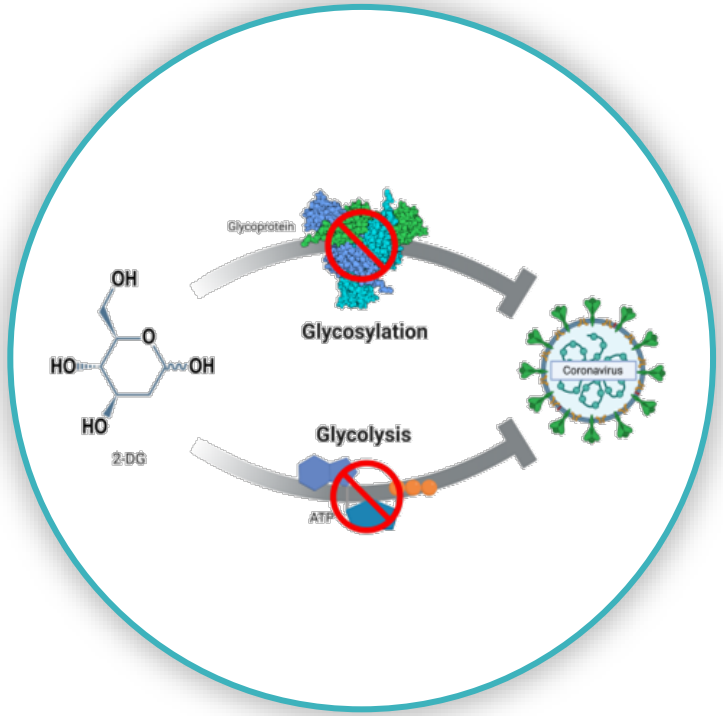
1: https://coronavirus.jhu.edu/map.html as of 4/25/21; 2: https://braintumor.org/take-action/about-gbm/; 2: https://www.ncbi.nlm.nih.gov/books/NBK560640/; https://www.pancan.org/facing-pancreatic-cancer/about-pancreatic-cancer/what-is-pancreatic-cancer/; 4: https://www.cancer.net/cancer-types/pancreatic-cancer/statistics

TREATMENT OF COVID-19

- Multiple independent University studies show antiviral activity of 2-DG against SARS-CoV-2
- 2-DG was just given Emergency Use Authorization for treating COVID-19 in India based on Phase 2 results[1]
- WP1122 is a prodrug of 2-DG that has substantially higher *in vitro* antiviral activity than 2-DG
- Received MHRA authorization to commence Phase 1a clinical trial

Next Steps:

- Initiation of Phase 1a/1b study targeted in Q4 2021
- Potential to launch Phase 2 pivotal study in H1 2022



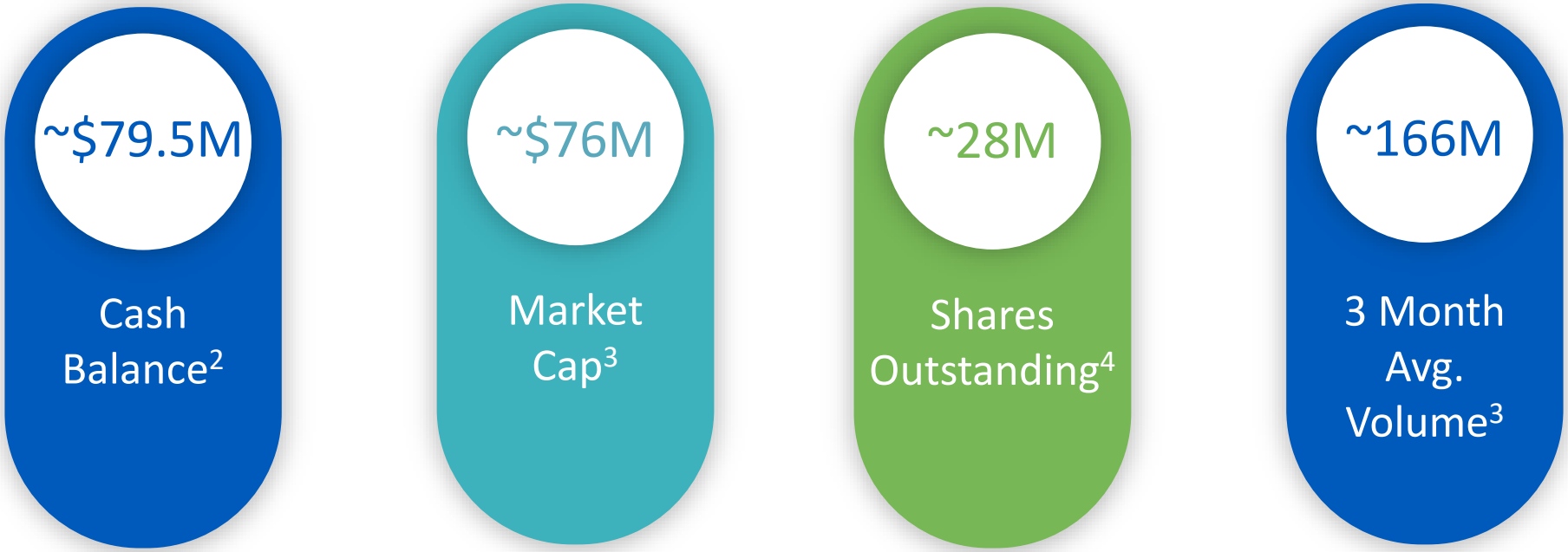
Inhibition by 2-DG of Glycosylation and Glycolysis are believed to play a role in limiting viral infectivity and replication

1: Based on public disclosures of trial conducted by an unrelated company in India

CORPORATE

FINANCIAL SNAPSHOT
NASDAQ: MBRX

Strong Cash Position Funds Operations into 2024[1]



1: Based on Management's current expectations and planned increase in development activities;
2: As of June 30, 2021; 3: As of October 20, 2021; 4: Common stock outstanding as of June 30, 2021

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TARGET VALUE-DRIVING MILESTONES

PROGRAM	INDICATION	2021 H2	2022 H1	2022 H2
Annamycin	AML	Phase 1/2 Interim Data	Phase 1/2 Interim Data	Phase 1/2 Topline Data
	AML Comb with Ara-C	Initiate Phase 1/2	Phase 1/2 Interim Data	Phase 1/2 Topline Data
	US STS	✓ Initiate Phase 1b/2 ✓ Phase 1b Topline Interim Data	Phase 1b Completed	Phase 2 Interim Data
	EU STS	Initiate Phase 1b/2		Phase 1b/2 Interim Data
WP1066/ WP1220	GBM Comb. with Radiation	Facilitate Phase 1/2	Initiate Phase 1/2 Phase 1 Interim Data	Phase 2 Interim Data
	DIPG	Phase 1 Topline Data	Initiate Pivotal Study	Pivotal Study Topline Data
WP1122	GBM/Pancreatic	File IND	Initiate Phase 2	
	COVID-19	Initiate Phase 1a	Phase 1a Topline Data Initiate Phase 2 Phase 2 Topline Data	EUA Potential

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INVESTMENT SUMMARY

Extensive pipeline with multiple blockbuster market opportunities

Lead program has potential to be first non-cardiotoxic anthracycline

Pipeline provides numerous value driving clinical and regulatory catalysts this year

Fully-integrated team with proven track record of success

Strategy designed to drive significant shareholder value

Cash runway to fund operations into 2024[1]

1: Based on Management's current expectations and planned increase in development activities

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Investor Relations
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mbrx@jtcir.com

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Thank you!

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