Aptose Corporate Presentation

September 12, 2022

APTOSE BIOSCIENCES

PRECISION ONCOLOGY FOR THERAPIES OF TOMORROW

NASDAQ: **APTO**
TSX: **APS**

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Aptose Biosciences Investor Highlights (NASDAQ: APTO)

Clinical-stage Biotech Company Developing **Oral Kinase Inhibitors** to treat Life-threatening **Hematologic Malignancies**

HM43239 | Lead Agent | Primary Value Driver | Treatment of Acute Myeloid Leukemia (AML) | Orphan Drug Status

- **Well tolerated**, once daily, oral agent designed to **target driver kinases of AML** (SYK, JAK1/2, $FLT3^{WT/MUT}$, $cKIT^{MUT}$)
- **Clinically de-risked**, as **single agent** achieves **CRs across diverse AML populations in Ph 1/2 Trial**
  - **Targets more genetically-defined AML populations** than SYK inhibitors, IRAK4 inhibitors, and Menin inhibitors
  - **Targets broader spectrum** of kinases and patients **than gilteritinib** FLT3 inhibitor → **Fast Track** for FLT3+ AML
  - **Plasma half life** sustains inhibition of phospho-FLT3/-STAT and **inhibits FLT3 mutations** to **overcome drug resistance**
- **Response rates** may support **single agent Phase 2 accelerated approvals** in multiple AML populations of unmet need
- **Potential to become preferred agent | combination therapy | late-stage R/R and early lines of therapy | >$1bn market**

Luxeptinib | Phase 1a/b for AML & B-cell Cancers | G3 New Formulation ≈18-fold Improvement | Program Advancing

Meaningful Near-term Upside | Value-driving Clinical Milestones Through 2022 and 2023 | Cash Runway into 2024

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Aptose Leadership Team:
Deep Expertise in Kinase Inhibitors and Orphan Hematologic Diseases

William G. Rice, PhD

Chairman, President & Chief Executive Officer

Rafael Bejar, MD, PhD

Sr. VP & Chief Medical Officer

Fletcher Payne

Sr. VP & Chief Financial Officer

Philippe Ledru

Sr. VP & Chief Commercial Officer

Brian J. Druker, MD

Chair, Scientific Advisory Board

- Pioneer in the field of precision medicine, Key Role in the development of Gleevec - the first targeted kinase inhibitor for cancer
- Member, National Academy of Medicine, National Academy of Sciences & American Academy of Arts & Sciences
- Winner of Karnofsky Award, Lasker Award, Japan Prize in Healthcare and Medical Technology, Tang Prize in Biopharmaceutical Science, Sjöberg Prize
- Leader of Inter-institutional Beat AML Initiative

Michael Andreeff, MD, PhD

Scientific Advisory Board

- Renowned hematology specialist, Expert in AML and other hematologic malignancies
- Expert in drug resistance and drug mechanisms
- Professor of Medicine, Paul and Mary Haas Chair in Genetics
- Chief, Section of Molecular Hematology and Therapy, MD Anderson Cancer Center

Daniel Von Hoff, MD, FACP

Scientific Advisory Board

- Former President of AACR, Board Member of ASCO, Former Presidential Cancer Advisory Board
- Physician in Chief, Tgen, Medical Director of Research for McKesson Specialty Health
- Chief Scientific Officer for US Oncology Research, Professor of Medicine, Mayo Clinic Scottsdale

Aptose Clinical Stage Pipeline of Differentiated Oral Kinase Inhibitors

HM43239 oral myeloid kinase inhibitor clinically validated for R/R AML patients

Clinically Safe & Effective	**25-44% ORR** in Phase 1/2 Trial with **CRs in multiple genetically-defined AML target populations**
Near-term Value Creation	Expansion Trials begin 2022 as passage into Registrational Studies planned for 2023
Orphan and **Fast Track**	Designations earned with impressive clinical responses across AML populations
Clinical Need	Across R/R and front line, fit and unfit, induction and maintenance therapies
Commercial Opportunity	Single agent and combination therapy commercial opportunity in excess of $1B

Luxeptinib (CG-806) oral dual lymphoid and myeloid kinase inhibitor

High Value Targets	B-cell cancers, AML/MDS and inflammation: BTK, FLT3, LCK, LYN, Others
Activity in Ill Patients	Difficult to treat R/R B-cell lymphoma/CLL and R/R AML patients
Commercial Opportunity	Single agent and combination therapy commercial opportunity in excess of $1B
Improved Formulation	G3 formulation being explored to reduce drug substance and increase plasma exposure

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HM43239 “239”

Oral, Daily, Kinase Inhibitor for Genetically-Defined AML Populations

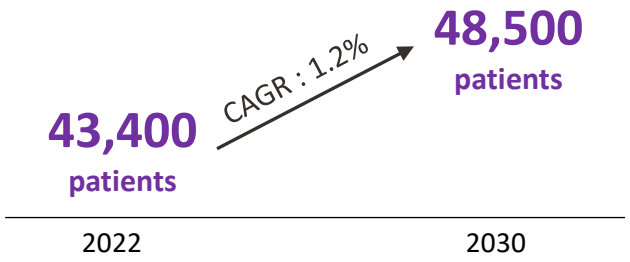
AML Orphan Disease
Unmet Medical Need Remains High

AML Disease

- Deadly and heterogeneous cancer
- 5-year survival rate 27% at diagnosis
- Less than half of newly diagnosed pts achieve CR with high dose chemo
- Median life expectancy < 6mo after relapse on approved therapies

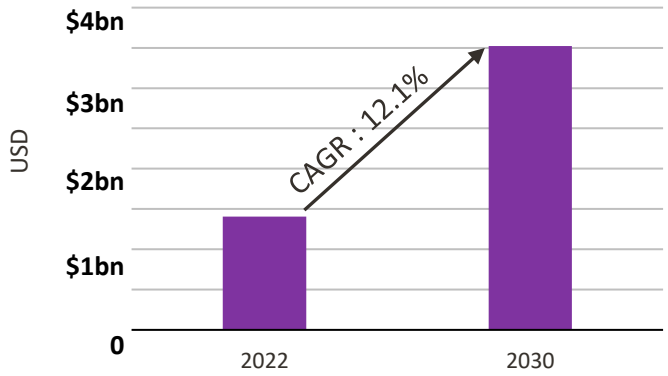
Growth in AML Incidence Consistent with Aging of Populations

(AML Incidence – US, EU5 & Japan)



Newly Approved Drugs Drive Market Growth

(US, EU5 & Japan Sales 2025-2030)



Need for *more effective & better tolerated targeted agents* drives FDA's interest for accelerated approvals (Fast track)

DURABILITY
- Strong drugs to achieve lasting remissions yet gentle enough to extend meaningful/quality life

SAFETY
- Well tolerated for post-remission maintenance therapy and avoid overlapping toxicities for drug combination therapy

BREADTH
- Ability to better treat diverse genetically-defined populations and overcome resistance to current agents

1. SEER Database 2021, GLOBOCAN – IACR 2020, Ganjoho Cancer Statistics in Japan 2021. 2. Datamonitor – AML Report Q2 2022

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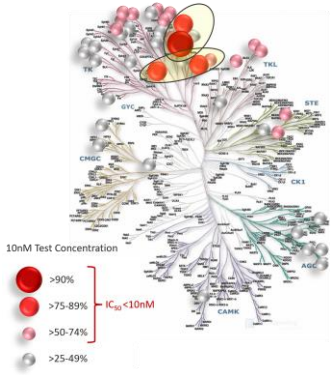
HM43239 Effective and Well Tolerated Targeted Agent
Proven Broad Clinical Activity in AML Patients to Treat Significant Unmet Needs



Validated AML Targets

SYK, JAK1/2, FLT3$^{WT/MUT}$, cKIT^{MUT}

Single Agent CRs

CRs and No DLT at 3 dose levels

HM43239
AML Kinase Inhibitor

Broad Therapeutic Window

No drug-related SAE, QTc toxicities, or CK increases

Broad Market Potential

R/R, 1L, Maint./MRD+/Combination

Accelerated Paths to Market
Multiple Potential Populations

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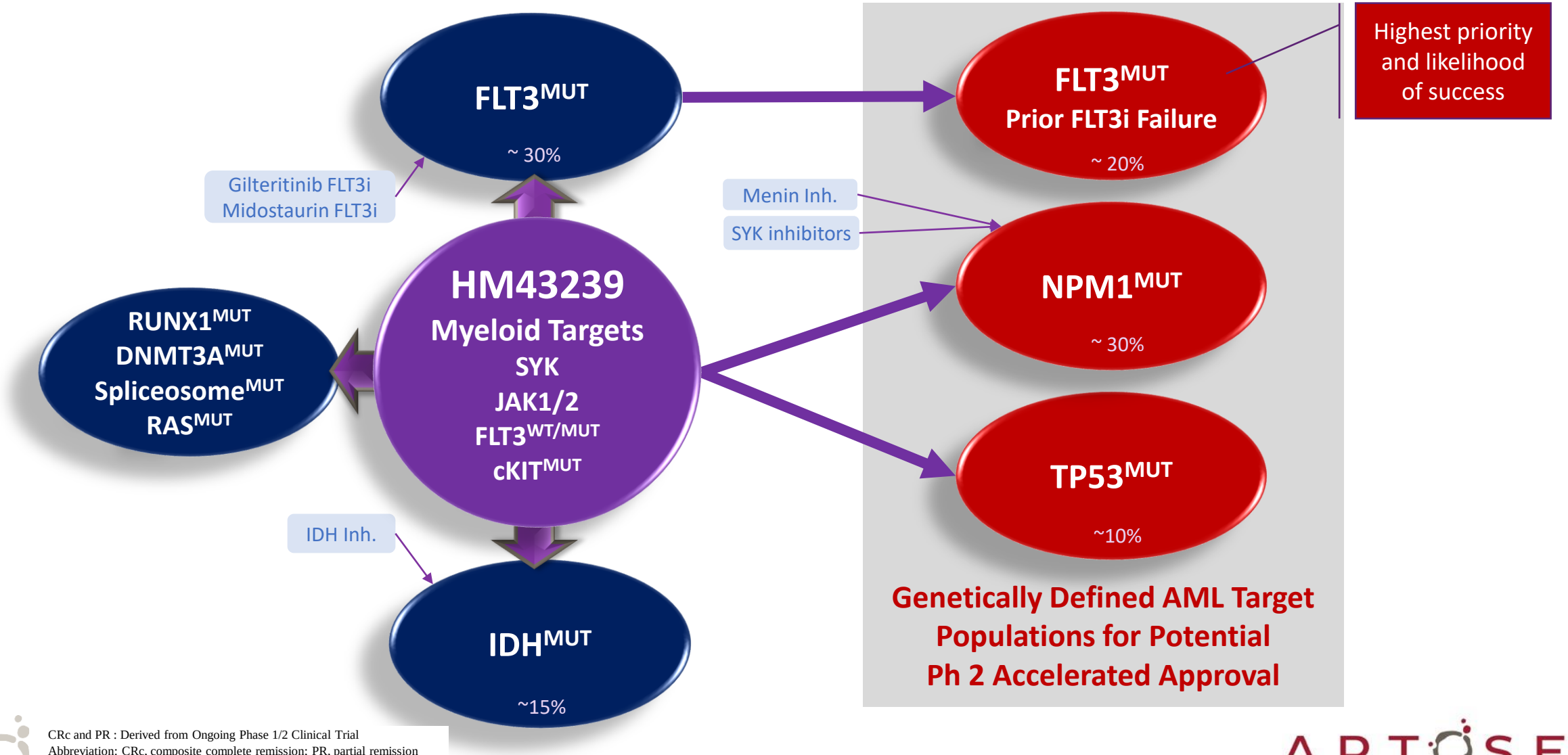
HM43239: Broad Spectrum Activity May Lead to Accelerated Approval in Multiple AML Target Populations



CRc and PR : Derived from Ongoing Phase 1/2 Clinical Trial
Abbreviation: CRc, composite complete remission; PR, partial remission

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HM43239 Emerging Clinical Data

Potential Superior AML Therapy

HM43239 Phase 1/2 Study in R/R AML: Ongoing Dose Escalation & Dose Exploration

PART A : DOSE ESCALATION (18 Pts Dosed)			PART B : DOSE EXPLORATION (39 Pts Dosed)	
Cohort 6	200 mg QD	Ongoing		
Cohort 5	160 mg QD	Completed	160 mg QD	14 Treated → 20 Planned
Cohort 4	120 mg QD	Completed	120 mg QD	16 Treated → 20 Planned
Cohort 3	80 mg QD	Completed	80 mg QD	20 Treated
Cohort 2	40 mg QD	Completed	40 mg QD	5+ Planned
Cohort 1	20 mg QD	Completed		

CRc DLT

CRc DLT

CRc DLT

Favorable safety profile:

- No drug related SAE or death and no observed relation between delta-QTc throughout the trial
- No DLT through 160 mg dose level
- Plasma $t_{1/2}$ estimated at 40hrs
- Patients fasted in this trial

Dose Exploration continues across several cohorts

- Currently enrolling patients at 120 mg and 160 mg dose levels and plan to explore 40 mg dose level

Data as of July 27, 2022

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HM43239 Safety and Efficacy Data
Broad Therapeutic Window as a Single Agent in R/R AML Patients

- **Safety Profile Favorable to Date**
  - No drug related SAE, drug related deaths, or drug related discontinuations
  - No drug related AE of QT prolongation – No observed relation between ΔQTc and dose
  - No DLT through 160 mg level – One DLT of muscle weakness at 200 mg (not rhabdomyolysis)
  - No observed muscle destruction – No AE of elevated creatine phosphokinase (CPK)
  - Avoids many of the typical toxicities observed with other tyrosine kinase inhibitors
- **Identified a Broad Therapeutic Window**
  - **Achieved efficacy (CRs) across three separate dose levels** (80 mg, 120 mg, 160 mg)
  - **Achieved safety across all three dose levels that delivered efficacy**
  - Demonstrated **broad therapeutic range** across safe dose levels
  - Safety profile supports **combination therapy with other agents**

Data as of July 14, 2022

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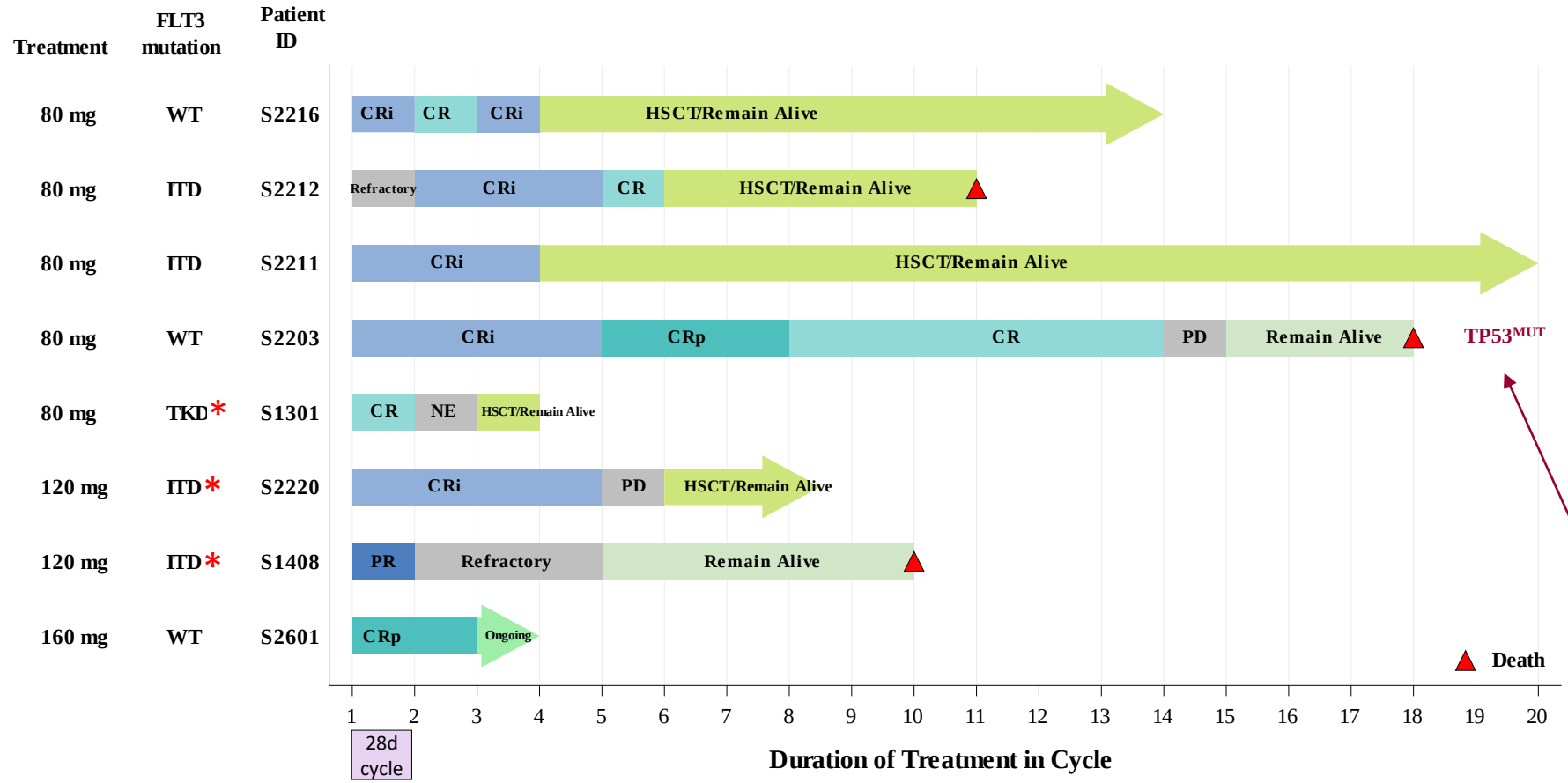
HM43239: Swimmer Plot of R/R AML Patients Who Achieved Clinical Response Reported to Date in Phase 1/2 Study



RESPONDERS

FLT3^{WT} and FLT3^{MUT}, including prior FLT3i failures

Across three dose levels

Most bridged to potentially life-saving transplant

TP53^{MUT} breadth, durability & continuous dosing without myelosuppression

Abbreviation: CR, complete response; CRh, complete response with partial hematologic recovery; CRi, complete response with incomplete hematologic recovery; CRp, complete response with incomplete platelet recovery; HSCT, hematopoietic stem cell transplantation; NE, not evaluable; PD, progressive disease; PR, partial remission.
ITD, internal tandem duplication; TKD tyrosine kinase domain
Note: 'Ongoing' means treatment is still ongoing; 'Remain Alive' indicates patients' status in follow-up after treatment termination; The right arrow at the end of horizontal bar indicates patients are still on study, whereas without the right arrow indicates patients discontinued from study.
Note: The bone marrow aspiration/biopsy date was used as response date. Each response assessed at a regular visit is considered to have started 1 cycle before the assessment; however the start of the response is considered the integer part of (study day/28) if the response occurred at the End of Treatment visit.

***Indicates patients who received prior FLT3 inhibitors, including gilteritinib and/or midostaurin.**

Data as of July 14, 2022

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HM43239 Diversity of Adverse Mutations in R/R AML Patients Who Achieved a Clinical Response Reported to Date in Phase 1/2 Study

Important Adverse Mutations	FLT3 Status	Dosage	Best Response	HSCT
IDH2 SRSF2	Wild Type	80 mg	CR	Yes
TP53	Wild Type	80 mg	CR	Ineligible
NRAS BCOR U2AF1 SETBP1	Wild Type	160 mg	CRp	In Process
NPM1 DNMT3A	ITD	80 mg	CR	Yes
NRAS RUNX1	ITD	80 mg	CRi	Yes
RUNX1 SF3B1 RB1	TKD Prior FLT3i	80 mg	CR	Yes
MLL-PTD RUNX1	ITD Prior FLT3i	120 mg	CRi	Yes
KRAS NPM1 DNMT3A PTPN11	ITD Prior FLT3i	120 mg	PR	Ineligible

Most Responders Bridged to Potentially Life-Saving Transplant

Responses Across Spectrum of Genetically-defined Populations With Highly Adverse Mutations

$FLT3^{MUT}$ (ITD, TKD) Responders Who Failed Prior FLT3i
Potential for Accelerated Approval

$NPM1^{MUT}$ Responders
Potential for Accelerated Approval

$TP53^{MUT}$ Responder
Potential for Accelerated Approval

Abbreviation: CR, complete response; CRi, complete response with incomplete hematologic recovery; CRp, complete response with incomplete platelet recovery; HSCT, hematopoietic stem cell transplantation; NE, not evaluable; PD, progressive disease; PR, partial remission.
Note: 'Ongoing' means treatment is still ongoing; 'Remain Alive' indicates patients' status in follow-up after treatment termination; The right arrow at the end of horizontal bar indicates patients are still on study, whereas without the right arrow indicates patients discontinued from study.
Note: Each response assessed at a regular visit is considered to have started 1 cycle before the assessment; however the start of the response is considered the integer part of (study day/28) if the response occurred at the End of Treatment visit.

*Indicates patients who received prior FLT3 inhibitors, including gilteritinib and/or midostaurin.

Data as of July 14, 2022

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HM43239 Overall Response Rate (CRc + PR)
7 CRc and 1 PR to Date in Phase 1 as a Single Agent in R/R AML Patients

Mutation Status	All Patients		
	N = 45 Patients	Number Responders	Response Rate
FLT3+	20	4CRc | 1PR	25%
FLT3+/prior FLT3i	**7**	**3**	**42.9% (CRc + PR) 28.6% (CRc only)**
FLT3-WT	25	3	12%
TP53+	**4**	**1**	**25%**
NPM1+	**7**	**2**	**28.6% (CRc + PR) 14.3% (CRc only)**

Overall Response Rate for ”All Patients” Receiving ≥ 80mg HM43239

- Findings represent a snapshot in time: The reported safety, tolerability, PK, PD and efficacy findings reported herein represent the data available and may change as additional patients are assessed and more data are collected.
- Most CRc patients went to HSCT and cannot be evaluated for transfusion independence assessment.

Abbreviation: CR, complete remission; CRc, composite complete remission; CRp, complete remission with incomplete platelet recovery; CRi, complete remission with incomplete hematological recovery; PR, partial remission.
Note: efficacy evaluable patients include all patients with at least 80% drug compliance during Cycle 1 or who had reported a DLT during Cycle 1, and who reported relevant data for efficacy interpretation such as bone marrow assessment, CBC counts, reason for treatment termination.
[1] Overall response includes CRc and PR.
[2] CRc includes CR, CRh, CRp and CRi.
[3] The reported prior FLT3 inhibitors include gilteritinib, midostaurin and soranfenib.

Data as of July 14, 2022

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HM43239 Global Dose Expansion Trial Planned to Support Phase 2 Registrational Trials for Accelerated Approval and Drug Combination Trials for Broad Commercialization

Escalation/Exploration Trial
239 Single Agent Ongoing

- **Dose Escalation**
  - 20mg to 200mg
- **Dose Exploration**
  - 40, 80, 120, 160mg
  - Up to 20 pts/dose

CRc & Safe
160mg
120mg
80mg

Expansion Trials Begin 4Q 2022
239 and Ven+239

HM43239 Single Agent

- **FLT3-Mutated Cohort:**
  - **Enrich Prior FLT3i**
  - FLT3i naïve
- **FLT3-Unmutated Cohort:**
  - **Enrich TP53^{MUT}/ Complex Karyotype**
  - Other

12-16 pts to justify

Combination of HM43239 + Venetoclax

- **FLT3-Mutated Cohort**
- **FLT3-Unmutated Cohort**

Single Agent Registrational Trials Planned if Data from Expansion Trial Support

- **Registrational Phase 2 study – Single Agent FLT3^{MUT} R/R AML with prior FLT3i therapy**
- Registrational Phase 2 study – Single Agent NPM1^{MUT} R/R AML
- Registrational Phase 2 study – Single Agent TP53^{MUT} R/R AML, Complex Karyotype, Other

Accelerated Approval and Marketing

Drug Combination Trials to Support Usage of 239 with Other Agents in AML Populations

Combo Phase 2-3 Randomized Study
1L unfit AML: HMA/VEN vs. 239/HMA/VEN + maint
1L fit AML, FLT3-WT: Chemo vs. 239/Chemo + maint

Combo Phase 2 Randomized Study
R/R AML in 2L, FLT3 mutant – 239 vs. 239/VEN vs. GILT

- **Single agent Expansion studies** designed to collect data on a small number of patients in "high need" groups and segue into Ph 2 Registrational Trial(s)
- **Combination Expansion studies** designed to illustrate safety and efficacy of 239 with venetoclax and segue into Phase 2-3 randomized studies and demonstrate 239 can be the preferred agent for combination therapy

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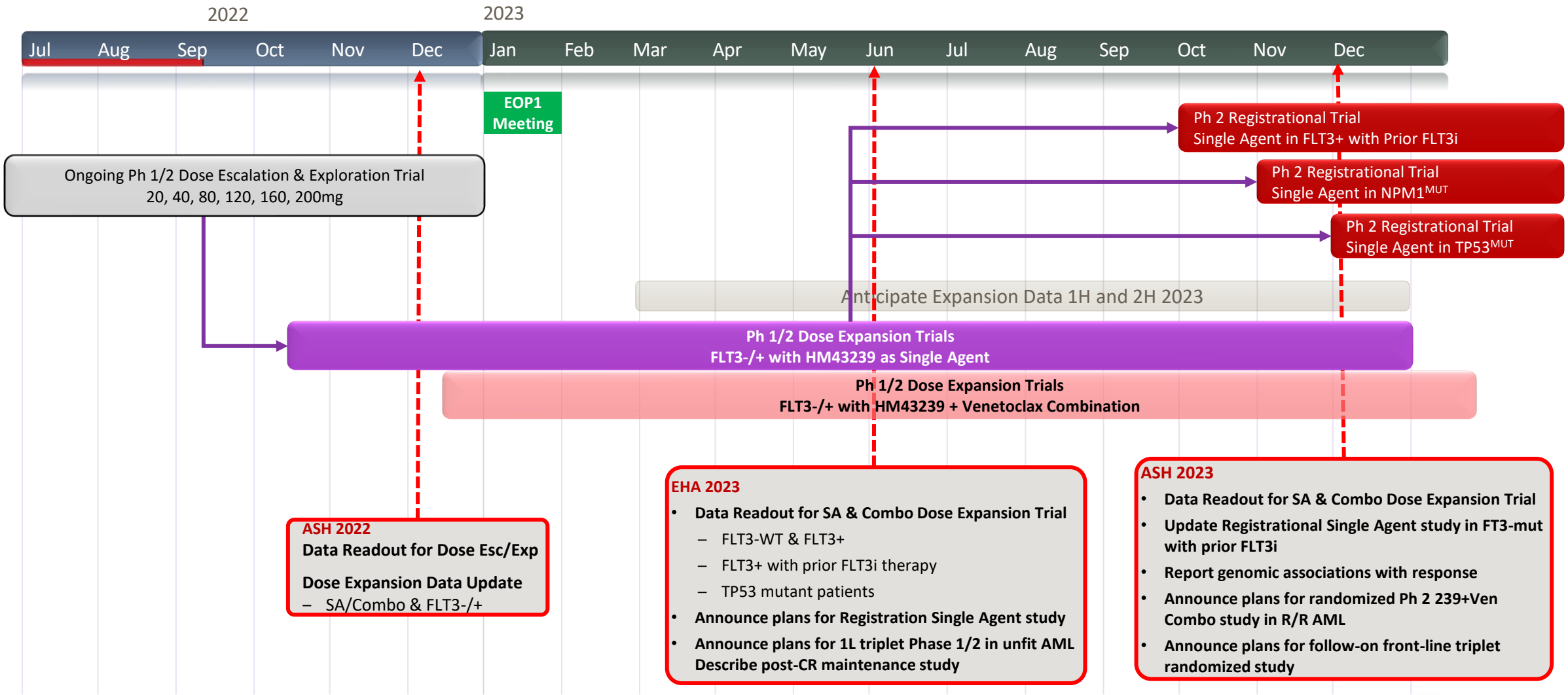
HM43239 Planned Clinical Development Timeline, Clinical Data Release and Potential Value Driving Milestones



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Clinical Development Plan Sets the Stage for Broad Commercial Success

HM43239: Positioned for Accelerated Approval & Traditional Development
Broad Commercial Opportunities >$1 billion in Multiple AML Target Populations

Safe, Broad Spectrum AML Drug

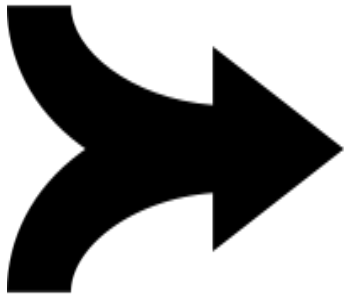
HM43239
Myeloid Targets
SYK
FLT3$^{WT/MUT}$
JAK1/2
cKIT^{MUT}

FLT3-Mutated / Prior FLT3i
NPM1-Mutated
TP53-Mutated

Genetically-defined target populations for potential
Single Agent Phase 2 Accelerated Approval Path

MUTATED POPULATIONS

FLT3
IDH
RUNX1
DNMT3A
Sliceosome
RAS



Broad Commercial Potential in Excess of $1B

Genetically-defined target populations for potential
to expand market through combos and IIT programs

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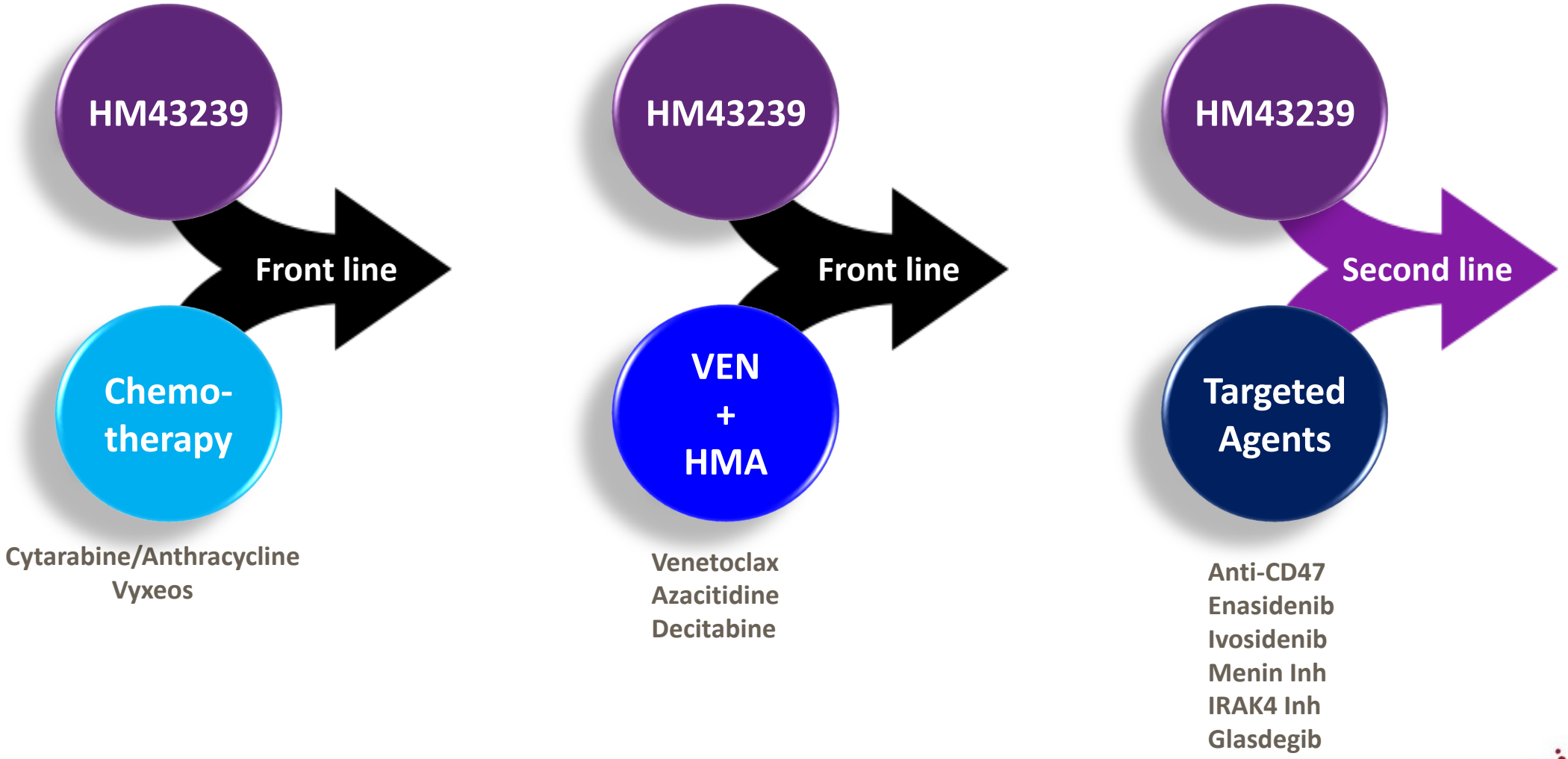
HM43239 Effective and Well Tolerated Targeted Agent
Potential to Serve as Preferred Agent of Choice for Combination Therapy



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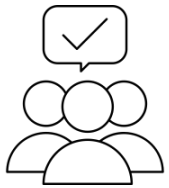
HM43239 Clinically Validated, Once Daily, Oral Kinase Inhibitor
Safety and Efficacy Engender Confidence of Clinical Investigators and KOLs

Targets Constellation of Driver Kinases in AML

- Potent inhibitor of myeloid kinases **SYK**, **JAK1/2, FLT3$^{WT/MUT}$** and **mutant forms of c-KIT** associated with transformation and resistance
- Potential to treat genetically defined AML patients across multiple lines of therapy & populations
- Safety & efficacy foretell significant market potential for R/R, 1L, FLT3-/+, Fit/Unfit AML populations



Clinical Validation Supports Path of Rapid Development for Breadth of AML Patients

- **FLT3-Mutated Patients**
  - CRc in patients who **failed prior FLT3 inhibitors**
    CRc in patients with ITD and TKD mutated FLT3
  - **FDA Fast Track** received for FLT3^{MUT} R/R AML
- **Other Genetically-defined Patients**
  - CRc in patients with specific mutations: **NPM1**, **MLL**, **TP53**, Others
- **Broad Therapeutic Window**
  - Well tolerated across three active & safe doses
- **Preferred Agent Profile for Combination Therapy**

Program Goals Supporting Rapid Development

- ***Genetically-defined Populations*** for Potential **Single Agent Phase 2 Accelerated Approval**
- ***Single Agent* Expansion Trial (239)** planned 2H2022
- ***Combo* Expansion Trial (*239+Ven*)** planned 2H2022
- **Registrational Ph2 study(ies)** planned based on data from the Expansion Trials
- **Broad commercialization goals**

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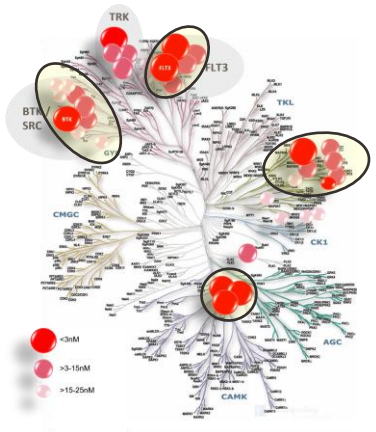
Luxeptinib

Oral Lymphoid & Myeloid Kinase Inhibitor

Luxeptinib Potent and Well Tolerated Kinase Inhibitor
Proven Broad Clinical Activity in AML Patients to Treat Significant Unmet Needs

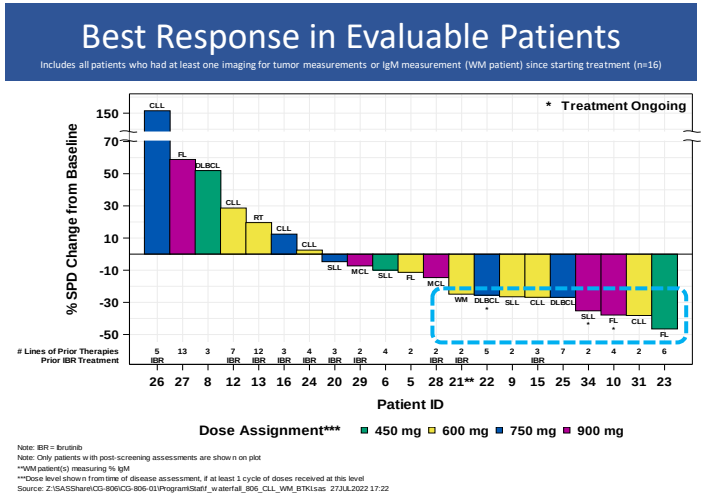


- Targets **WT/MUT BTK and FLT3**
- **Avoids** targets that drive **toxicity**
- To date **65 R/R patients dosed**
- Current dosing **BID G1 formulation**
- **Limited absorption hampered effectiveness**

Phase 1a/b
R/R B-cell Leukemias/Lymphomas
36 Patients dosed

Antitumor Activity in Diverse B-cell Cancers

- Multiple patients experienced meaningful tumor shrinkage
- Complete metabolic responses and extended time on Tx



Phase 1a/b
R/R AML and MDS
29 Patients dosed

MRD-negative CR in FLT3+ AML Patient

- Observed MRD- CR at 450mg BID dose level
- Heavily pretreated AML patient, failed by prior treatments with chemotherapy / FLT3i / 2 HSCT
- Atypically high plasma exposure levels

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Luxeptinib Path Forward with Generation 3 (G3) Formulation

- **G3 Self Emulsifying Formulation Developed**
  - Designed for more rapid absorption (early Tmax), more efficient absorption (use lower doses), longer retention (longer $t_{1/2}$), greater accumulation (higher steady state levels)
- **G3 as a Single Dose has been Tested for PK Profile (72 hr) in AML & B-cell Cancer Patients**
  - **15 Patients** dosed to date and enrolled 3 months **ahead of forecast**
- **PK Modeling Shows Approx. 18-fold Improvement in Bioavailability and Earlier Tmax**
  - Modeling **predicts steady state** with **50mg G3 Q12h is equivalent to 900mg G1 Q12h**
  - Modeling supports exploration of multiple dose levels using continuous dosing of G3
- **Plan to Test G3 with Continuous Dosing – 3x3 Dose Escalation Study with AML Patients**
  - Protocol amendment submission to FDA planned 4Q2022 for treatment of R/R AML patients with G3 Q12h
  - Expect 9-15 patients will determine if G3 is safe and achieves desired exposures to deliver clinical responses

Aptose Biosciences (APTO)
Key Financial Highlights Q2/2022

Q2 Financials:

- **Cash balance** at June 2022 was **$62.4M**
- **Cash burn** during Q2 was **$7.1M**
- **Cash runway** into Q1 of **2024**
- The company is pre-revenue
- The net loss for the second quarter was $10.6M,
  - Which is down from $13.5M in the same quarter last-year
- The net loss YTD was $22.1M
  - Which is down from $29.7M in YTD last-year
- Net loss per share Q2 ($0.11) and YTD ($0.24)

Upcoming Investor Conferences:

- NYC: HCW 9/13, Cantor 9/28: Piper 11/29; & Others
- Oppenheimer Oncology Summit at MD Anderson
- ASH Early December

Capitalization:

- Market capitalization is approximately $70 million
- Recent market capitalization high was $294M 6/2021
  - Before the acquisition of HM43239
  - 239 acquired for $12.5M, ($5M cash and $7.5M stock)
  - $407.5M future milestone plus royalties
- Common stock outstanding 92 million as of June 2022
- **Clean Cap Table** : No debt, Warrants or Preferred Stock

Trading Statistics:

- The 52-week trading range: high of $3.13 & low of $0.73

ATM Program:

- Piper & Canaccord as Co-Agents

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Recap Aptose Biosciences Investor Highlights (NASDAQ: APTO)

Developing Oral Kinase Inhibitors to treat Life-threatening **Hematologic Malignancies / AML**

HM43239 | Lead Agent & Value Driver | Orphan Drug Status | Fast Track FLT3+ Status | Treatment of AML

- Once daily, oral tablet **targets driver kinases of AML**
- **Safely** achieves **broad spectrum single agent CRs** in Ph 1/2 Trial
  - **Targets more genetically-defined AML populations** than SYK, IRAK4, and Menin inhibitors
  - **Targets broader spectrum** of kinases and patients **than gilteritinib** FLT3 inhibitor
- **Response rates** may support **Phase 2 accelerated approvals** in multiple AML populations
- **Potential as preferred agent | single agent and combination therapy | R/R and 1L therapy | >$1bn market**

Luxeptinib | New G3 Formulation Delivers ≈18-fold Improvement | Planned Continuous Dosing in AML

Meaningful Near-term Upside | Value-driving Clinical Milestones Through 2022 and 2023 | Cash Runway into 2024

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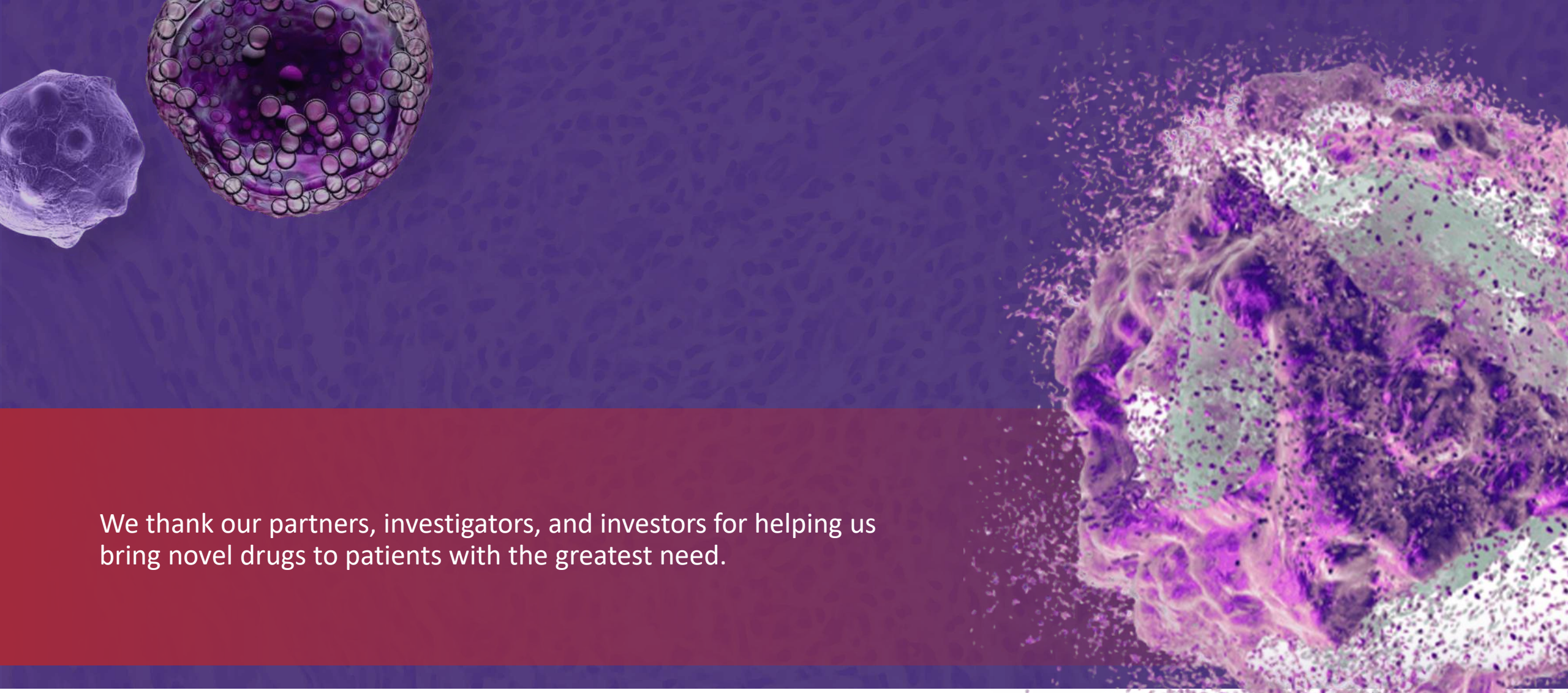

We thank our partners, investigators, and investors for helping us bring novel drugs to patients with the greatest need.

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PRECISION ONCOLOGY FOR THERAPIES OF TOMORROW