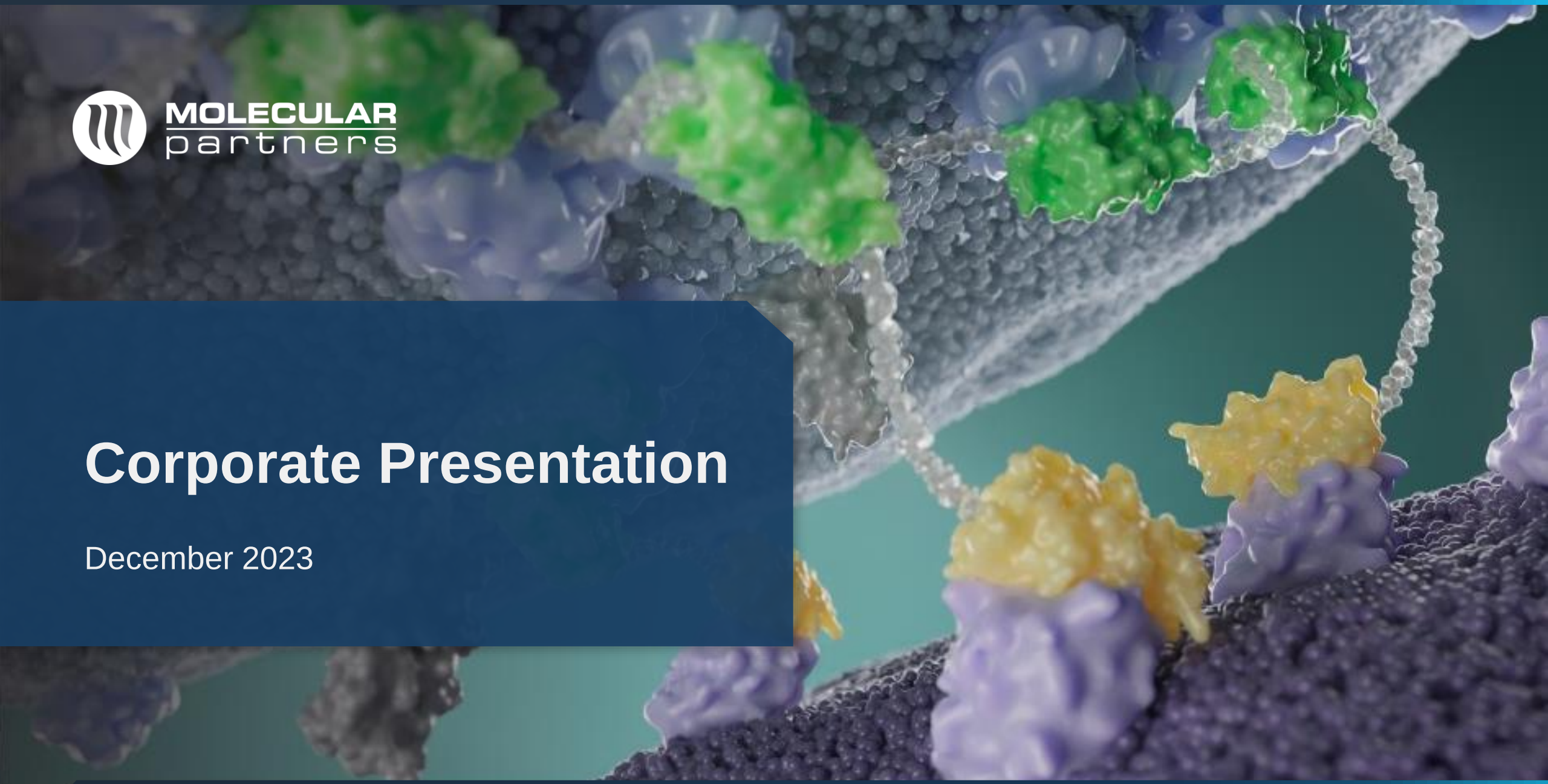


Corporate Presentation

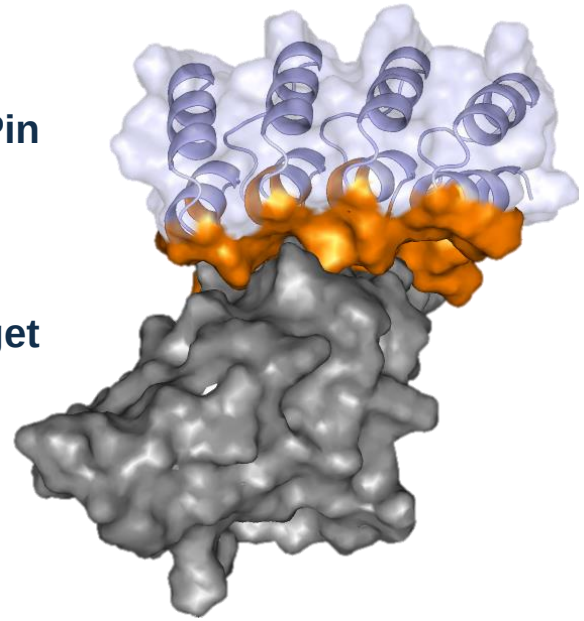
December 2023

Disclaimer

This presentation contains forward looking statements. Any statements contained in this press release that do not describe historical facts may constitute forward-looking statements as that term is defined in the Private Securities Litigation Reform Act of 1995, as amended, including, without limitation, implied and express statements regarding the clinical development of Molecular Partners' current or future product candidates, expectations regarding timing for reporting data from ongoing clinical trials or the initiation of future clinical trials, the potential therapeutic and clinical benefits of Molecular Partners' product candidates, the selection and development of future antiviral or other programs, and Molecular Partners' expected business and financial outlook, including expenses and cash utilization for 2023 and its expectation of its current cash runway. These statements may be identified by words such as "believe", "expect", "may", "plan", "potential", "will", "would" and similar expressions, and are based on Molecular Partners' current beliefs and expectations. These statements involve risks and uncertainties that could cause actual results to differ materially from those reflected in such statements. Some of the key factors that could cause actual results to differ from Molecular Partners' expectations include its plans to develop and potentially commercialize its product candidates; Molecular Partners' reliance on third party partners and collaborators over which it may not always have full control; Molecular Partners' ongoing and planned clinical trials and preclinical studies for its product candidates, including the timing of such trials and studies; the risk that the results of preclinical studies and clinical trials may not be predictive of future results in connection with future clinical trials; the timing of and Molecular Partners' ability to obtain and maintain regulatory approvals for its product candidates; the extent of clinical trials potentially required for Molecular Partners' product candidates; the clinical utility and ability to achieve market acceptance of Molecular Partners' product candidates; the impact of any health pandemic, macroeconomic factors and other global events on Molecular Partners' preclinical studies, clinical trials or operations, or the operations of third parties on which it relies; Molecular Partners' plans and development of any new indications for its product candidates; Molecular Partners' commercialization, marketing and manufacturing capabilities and strategy; Molecular Partners' intellectual property position; Molecular Partners' ability to identify and in-license additional product candidates; and other risks and uncertainties that are described in the Risk Factors section of Molecular Partners' Annual Report on Form 20-F for the fiscal year ended December 31, 2022, filed with Securities and Exchange Commission (SEC) on March 9, 2023 and other filings Molecular Partners makes with the SEC. These documents are available on the Investors page of Molecular Partners' website at www.molecularpartners.com.

Any forward-looking statements speak only as of the date of this press release and are based on information available to Molecular Partners as of the date of this release, and Molecular Partners assumes no obligation to, and does not intend to, update any forward-looking statements, whether as a result of new information, future events or otherwise.

The DARPin Modality and Molecular Partners' Strategy



What we invented

- New class of therapeutics: Designed Ankyrin Repeat Proteins **(DARPins)**
- DARPins to **close the gap between small molecules and antibodies**
- 7 clinical-stage compounds, **>2500 patients treated**

How we apply it

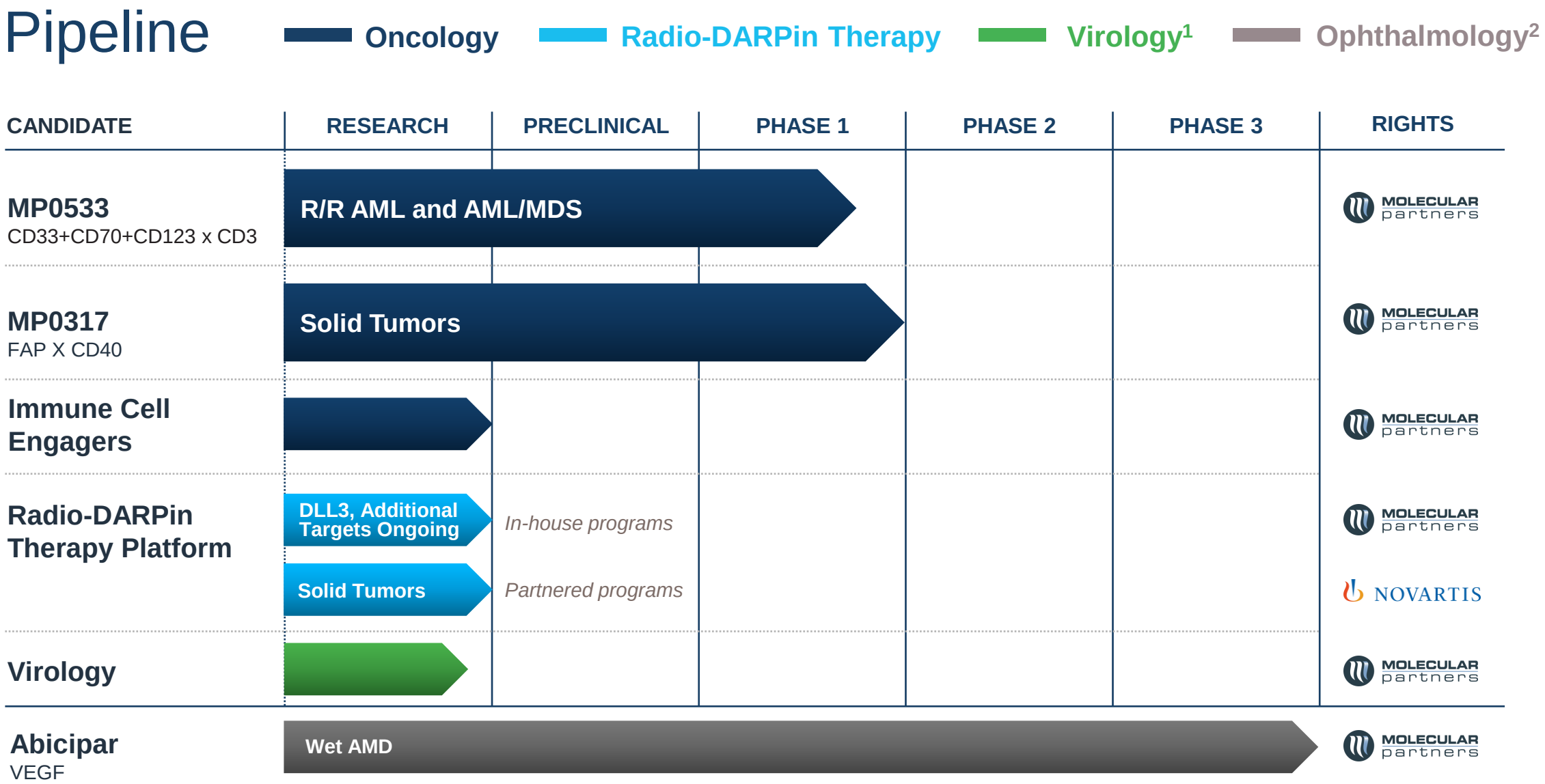
- **Unique DARPin solutions** for a defined medical problems not addressable by antibody designs
- Demonstrate **true patient value** with **early clinical readouts**
- Combine our **capabilities with world-class partners** to deliver innovative therapeutics

H2 2023 Highlights

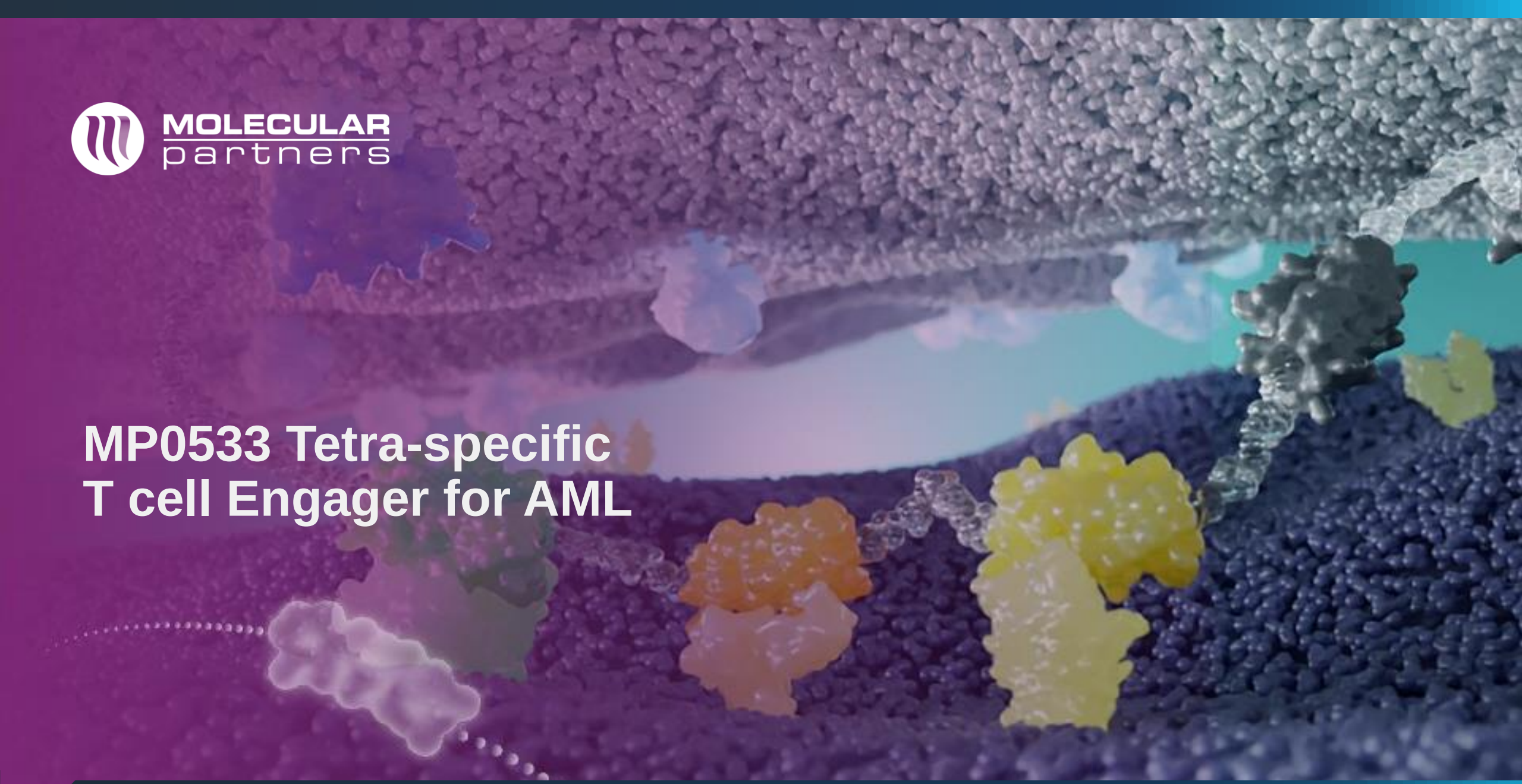
MP0533	• Novel tetra-specific T cell engager for relapsed/refractory (R/R) AML and high-risk myelodysplastic syndrome (MDS/AML) patients • Phase 1 dose-escalation study well on track; **dose regimen (DR) 5 fully enrolled** • **Encouraging initial clinical data presented at ASH 2023:** acceptable safety profile in DR 1-4, two responders reported in DR 3-4
MP0317	• Bi-specific targeting FAP and CD40 for tumor-localized immune activation • Phase 1 study in R/R solid tumors; dose-escalation fully enrolled • Tumor-localized CD40 activation leading to **remodeling of tumor microenvironment** in patients presented at **SITC 2023; favorable safety profile** up to highest dose
Radio-DARPin Therapy Platform	• RDT platform successfully optimized to **reduce kidney accumulation and increase tumor uptake;** progress presented at **EANM 2023** • Selected tumor-associated protein DLL3 as a first in-house target, additional targets ongoing • Novartis collaboration progressing further
Operations	• Strong financial position with CHF ~207 M in cash (incl. short term deposits) as of Sept. 30, 2023 • **Capitalized well into 2026**

AML, acute myeloid leukemia; ASH, American Society of Hematology; FAP, fibroblast activation protein; SITC, Society for Immunotherapy of Cancer; DLL3, Delta-like ligand 3; MDS, myelodysplastic syndrome; EANM, European Association of Nuclear Medicine; RDT, Radio-DARPin Therapy; R/R, relapsed/refractory.

Pipeline



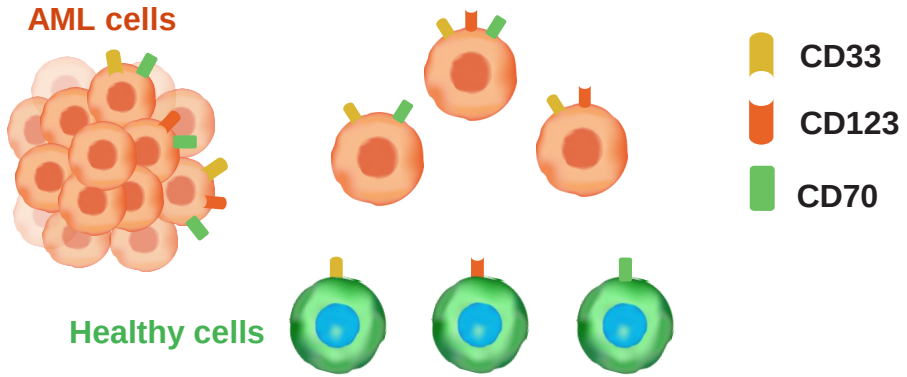
1) Ensovibep: Molecular Partners was informed by Novartis that the Emergency Use Authorization (EUA) application from the U.S. Food and Drug Administration (FDA) for ensovibep was withdrawn effective January 25, 2023. As previously disclosed, ensovibep is not presently in clinical development.
2) The Company continues to evaluate potential business opportunities for abicipar outside of Molecular Partners.



MP0533 Tetra-specific T cell Engager for AML

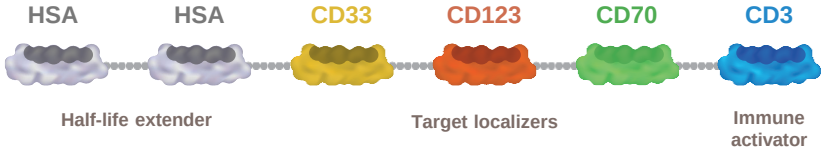
MP0533: Avidity-Driven Selectivity for Cancer Cells in AML

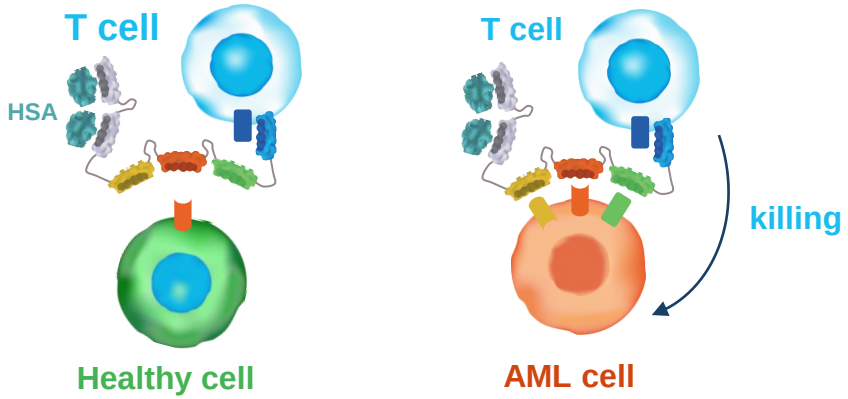
Problem: AML tumor-associated antigens are expressed on healthy cells



- **AML remains a deadly disease** and persistence of **leukemic stem cells (LSCs)** drives relapse
- **AML cell population is heterogeneous**: individual AML blasts and LSCs lack a clean target. AML cells can be differentiated from healthy cells (e.g. HSCs) by their **co-expression of specific targets** (e.g. CD33, CD123, CD70)

Solution: MP0533 – Avidity-driven selectivity and killing by T cells

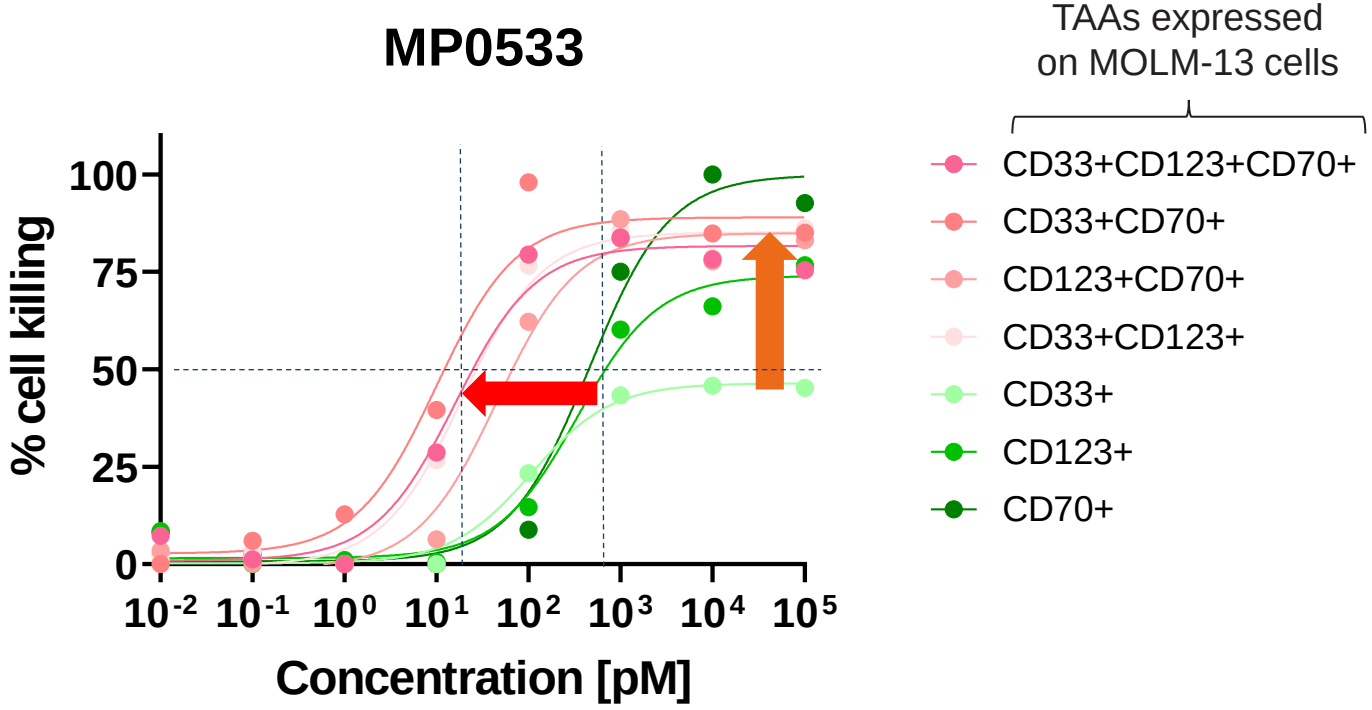


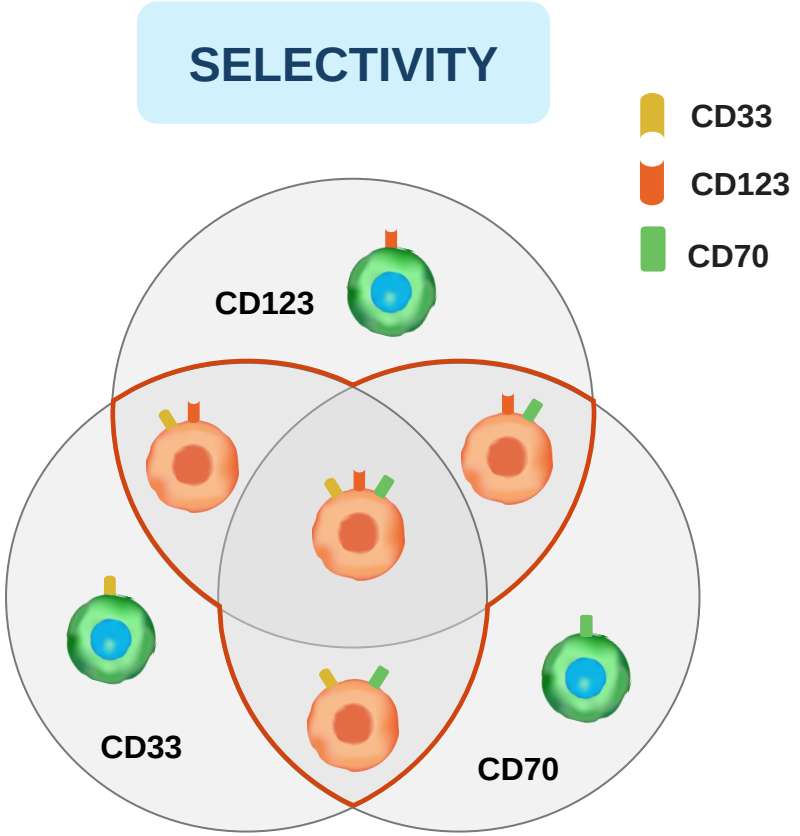


- MP0533 is designed to induce **T cell-mediated killing preferentially when two or three target antigens (CD33, CD123, CD70) are co-expressed**
- MP0533 is hypothesized to preserve healthy cells hence **opening a therapeutic window**
- MP0533 has the potential to kill all AML cells (blasts and LSCs) despite heterogeneity, ensuring **long term disease control**

AML, acute myeloid leukemia; HSC, hematopoietic stem cell; HSA, human serum albumin.

MP0533 Induces Specific Killing of AML Cells Expressing Two or Three TAAs





TAA, tumor-associated antigen.

MP0533 Shows Preferential Killing of CD34+ LSCs over HSC

Larger therapeutic window as compared to CD123-CD3 DART and CD33-CD3 BiTE

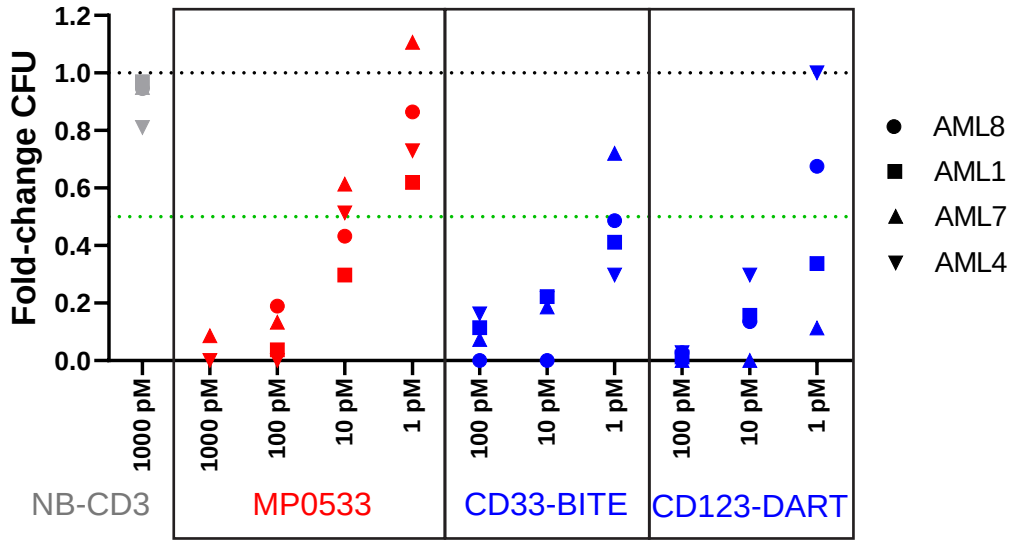
Sorted CD34+ LSC or HSC
+ Healthy donor T cells (E:T = 1:1)

MP0533 or controls

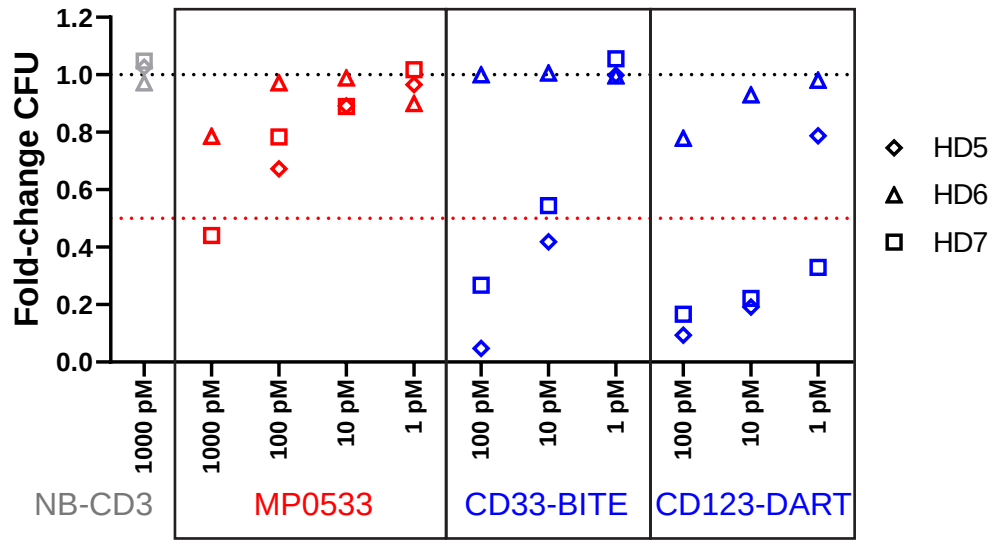
14 days colony forming assay

Counting of Colony Forming Units (CFU)

Allogeneic killing of **AML CD34+ LSC**



Allogeneic killing of **healthy donor CD34+ HSC**



EFFICACY

SAFETY

Bianchi et al, ASH 2022 oral presentation

*NB = Non-Binding to TAAs

LSC, leukemic stem cell; HSC, hematopoietic stem cell; TAA, tumor-associated antigen; BiTE, Bispecific T cell Engager; DART, Dual-Affinity Re-Targeting

MP0533 Phase 1 Dose-escalation Trial in R/R AML patients

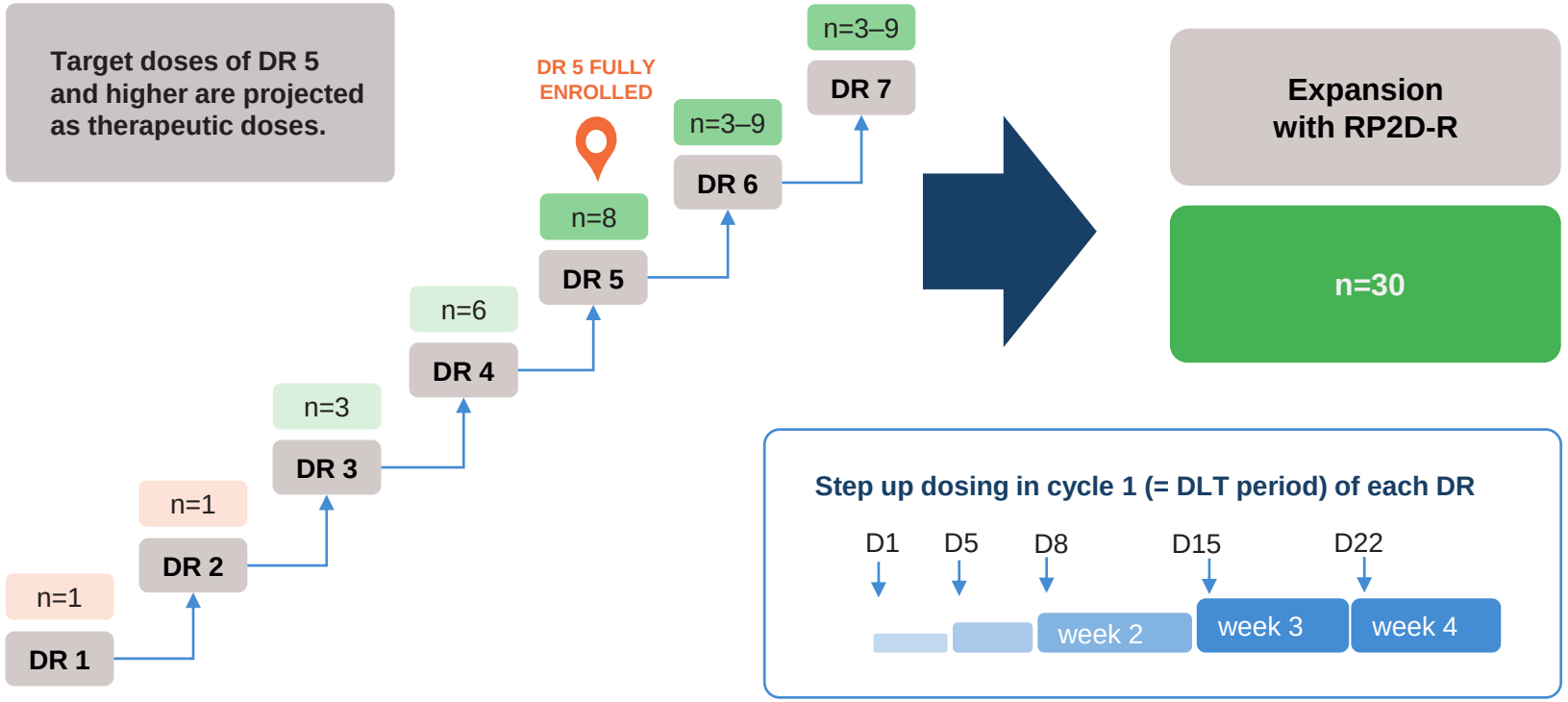
STUDY DESIGN

- FIH, multicenter, single-arm, open-label, Phase 1/2a study of MP0533 monotherapy (NCT05673057)
- Objectives: Safety/tolerability, PK/PD, and preliminary activity
- Eligible patients: Adults with R/R AML or MDS/AML
- Centers: 8 sites open across Europe

*Data cut-off: 24 Oct 2023

PHASE 1
DR ESCALATION OF MP0533 MONOTHERAPY

PHASE 2A
POC OF MP0533 MONOTHERAPY



Study currently dosing patients in DR 5, plans to present data at expected therapeutic doses in H1 2024

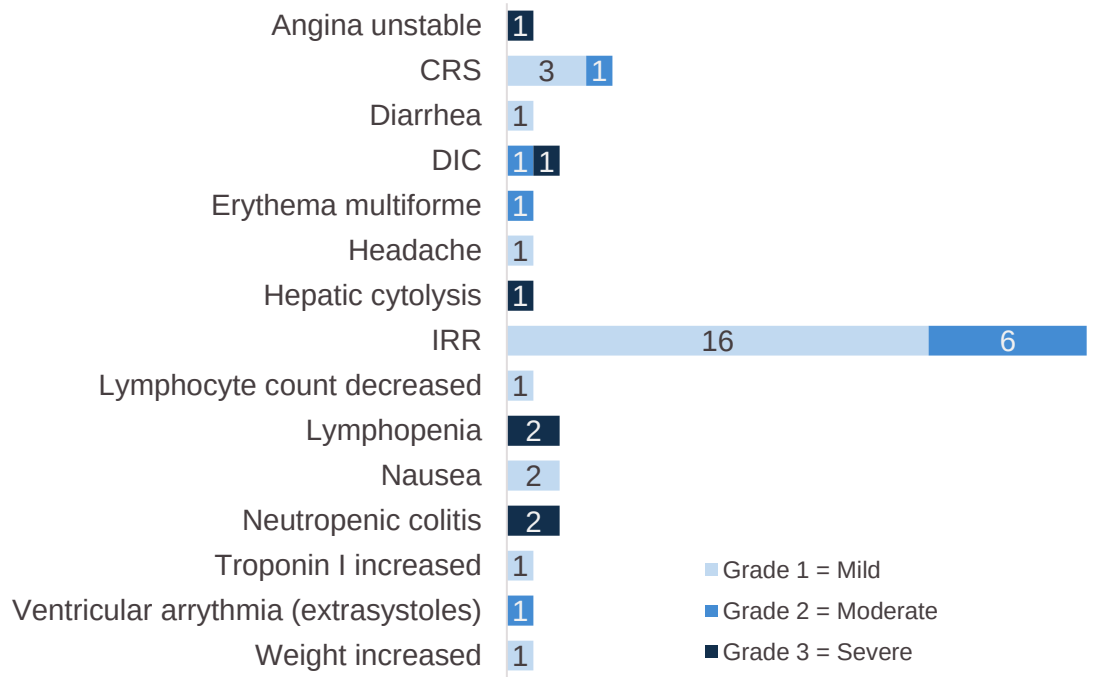
Pabst et al, ASH 2023 poster presentation

AML, acute myeloid leukemia; MDS, myelodysplastic syndrome; CT, chemotherapy; DLT, dose-limiting toxicity; HMA, hypomethylating agent; HSCT, hematopoietic stem cell transplantation; N, number of patients; PK, pharmacokinetics; PD, pharmacodynamic; R/R, relapsed/refractory; DR, dose regimen; ASH, American Society of Hematology.

MP0533 - Patient Characteristics and Safety Profile

PATIENT CHARACTERISTICS	DR COHORTS 1–4 (N=11)
Sex, n (%)	
Female / male	5 (45) / 6 (55)
Age	
Mean / Median (range)	66 / 75 (26–81)
ECOG PS, n (%)	
0 / 1 / 2	4 (36) / 5 (46) / 2 (18)
Hematologic malignancy, n (%)	
AML / MDS/AML	9 (82) / 2 (18)
ELN risk category, n (%)	
Intermediate / adverse	1 (9) / 10 (91)*
No. of prior systemic treatment lines, n (%)	
1 / 2 / 3	4 (36) / 5 (46) / 2 (18)
*TP53 mutated: 3 (27%)	Data cut-off: 24 Oct 2023

MP0533-RELATED TEAEs



Acceptable safety profile for MP0533 reported for DR 1-4 (11 patients):

- Overall, AE profile consistent with AML and elderly/heavily pretreated patients with many comorbidities
- No DLTs in any of the MP0533 DRs to-date
- IRR and CRS are most frequent TEAEs reported (Grade 1-2)

Pabst et al, ASH 2023 poster presentation

AE, adverse event; CRS, cytokine release syndrome; DIC, disseminated intravascular coagulation; ELN, European LeukemiaNet; IRR, infusion-related reaction; TEAE, treatment-emerging AE.

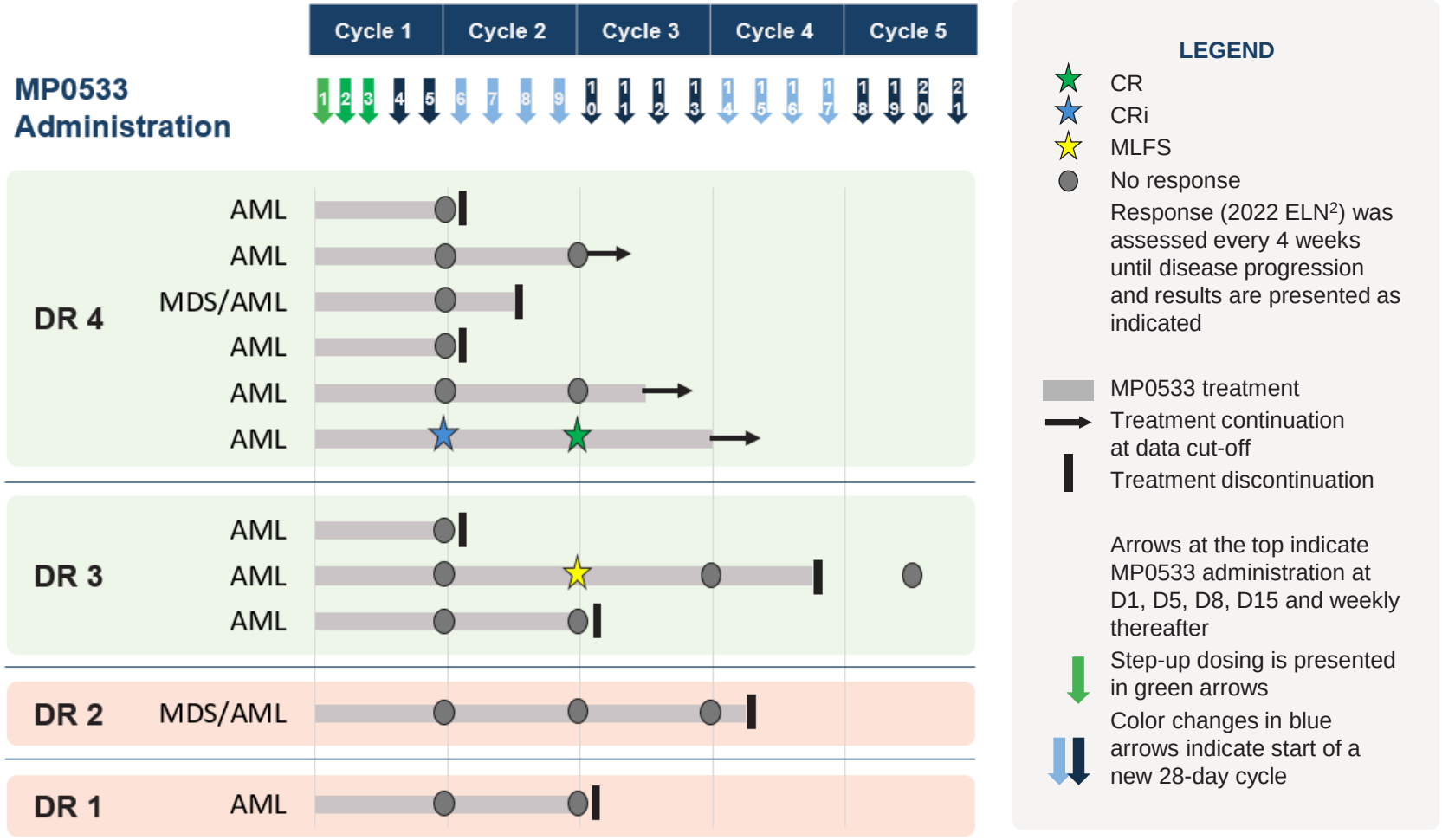
MP0533 Treatment and Clinical Responses

Encouraging preliminary clinical data with two responders reported in DR 3-4:

- CR in 1 patient at DR 4
- MLFS in 1 patient at DR 3

Dosing in DR 5 currently ongoing

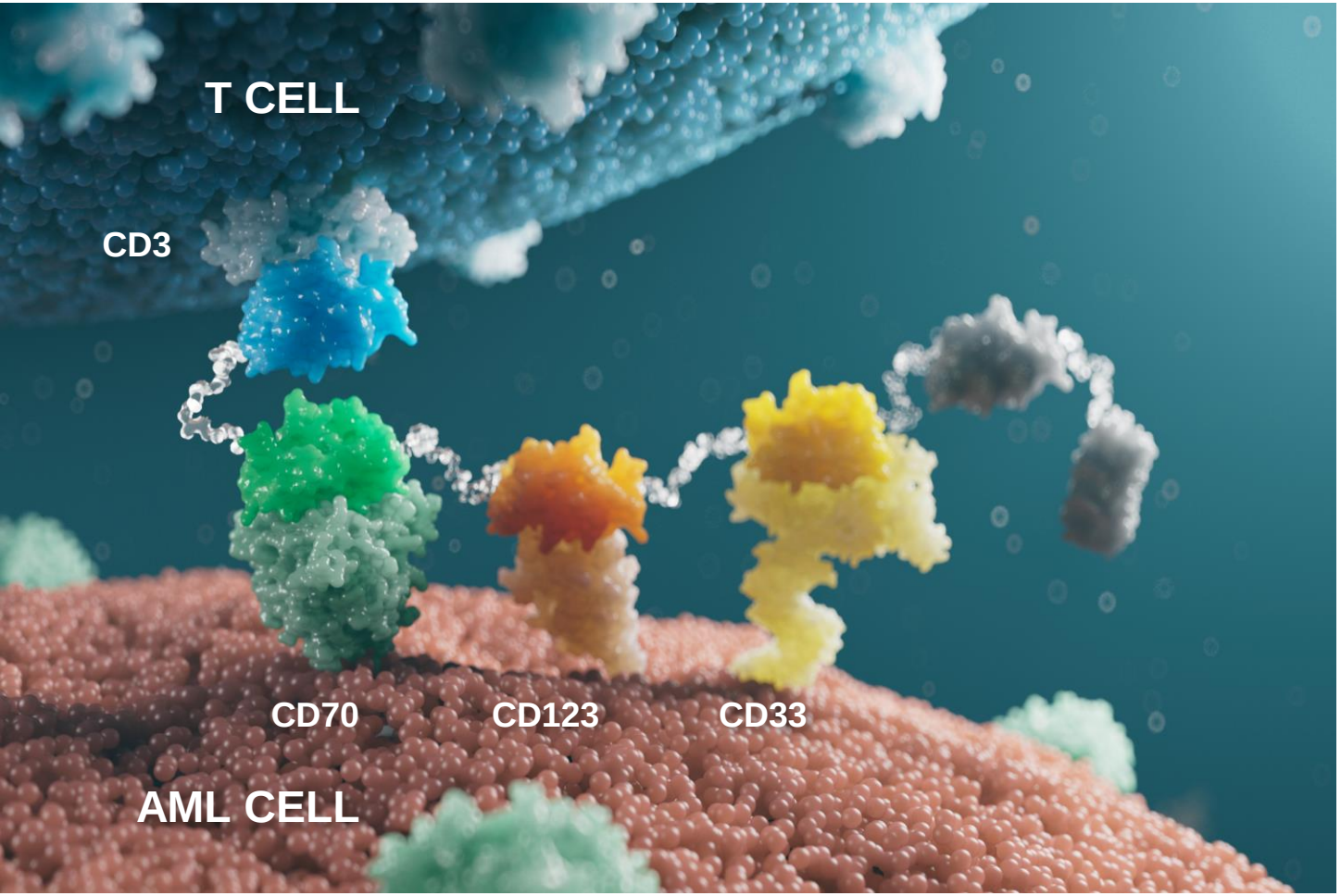
- DR 5 and above are projected as therapeutically active doses



Data cut-off: 24 Oct 2023

CR, complete response; CRi, CR with incomplete hematologic recovery; ELN, European LeukemiaNet; MLFS, morphologic leukemia-free state.

MP0533 Summary and Conclusions



Initial Phase 1/2a results support an acceptable safety profile for MP0533 monotherapy in patients with R/R AML or MDS/AML

- No DLTs observed; CRS and IRRs reported were of Grade 1/2

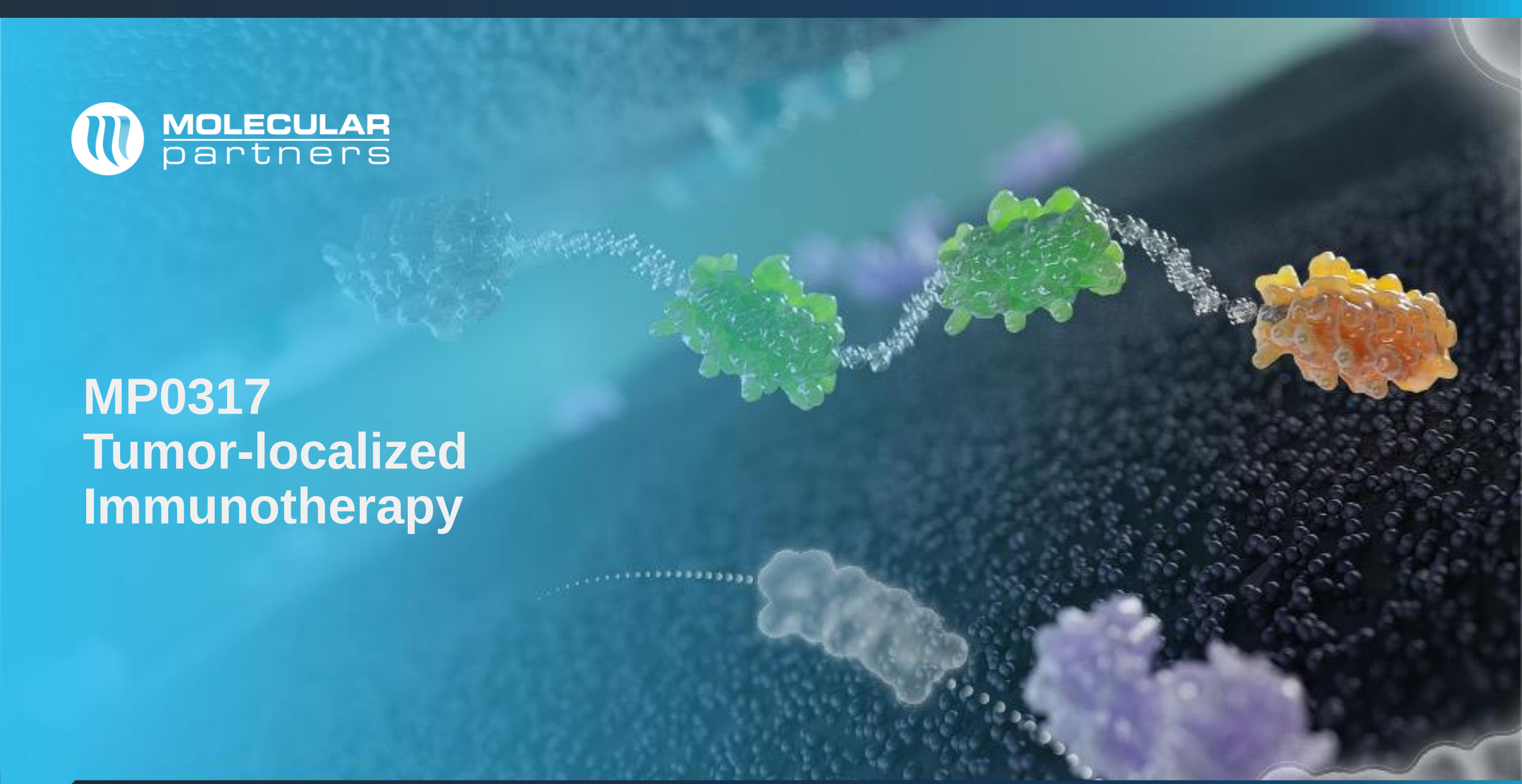
Preliminary response data are encouraging:

- CR in 1 patient at DR 4
- MLFS in 1 patient at DR 3

The study is ongoing and continues dosing patients into DR 5

Additional data from therapeutically active doses (DR 5 and above) to be presented in H1 2024

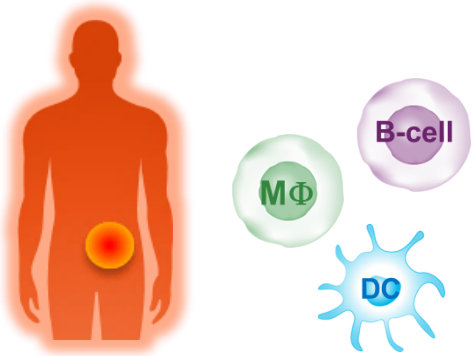
AML, acute myeloid leukemia; CR, complete response; CRS, cytokine release syndrome; DLT, dose-limiting toxicity; IRR, infusion-related reaction; MDS, myelodysplastic syndrome; MLFS, morphologic leukemia-free state; R/R, relapsed/refractory.



MP0317
Tumor-localized Immunotherapy

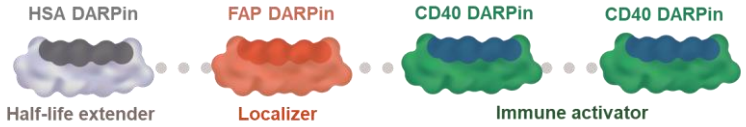
MP0317: Unlocking CD40 Activity Through Local Activation

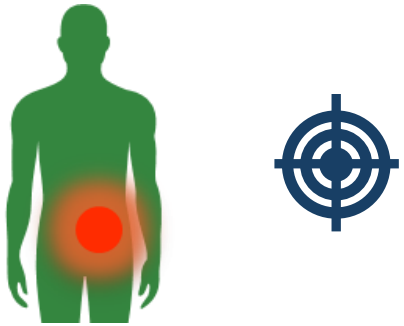
Problem: Toxicity of CD40 Antibodies Has So Far Limited Their Activity



- **CD40 agonists** can activate **B cells, DCs and MΦ** to enhance the efficacy of IO drugs, especially in “cold tumors”
- **Systemic activation of CD40 via mAbs** has been hampered by **significant toxicities,** therefore **limiting their potential of reaching a therapeutically active dose**

Solution: MP0317 – FAP-dependent tumor-localized CD40 activation



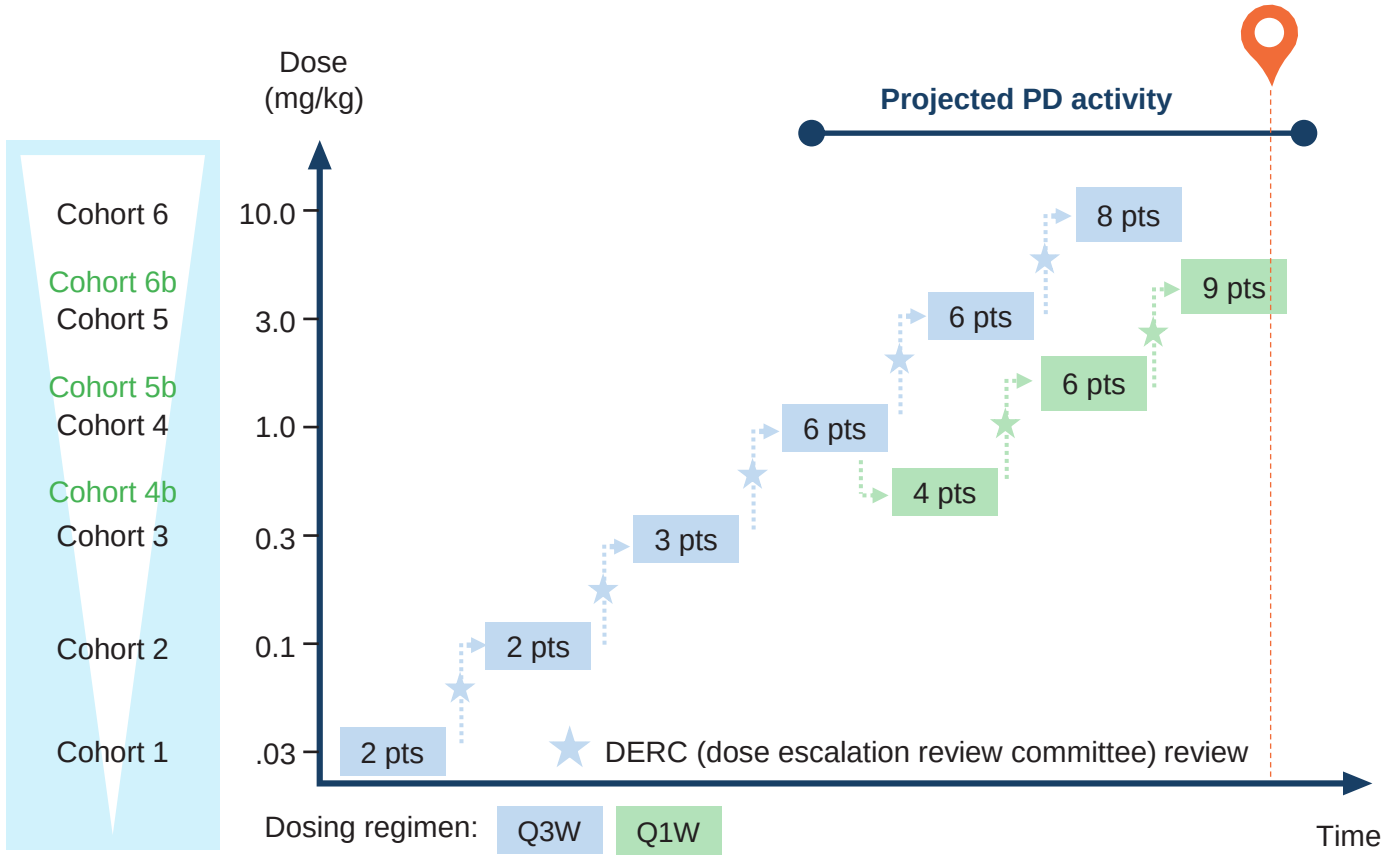


- **FAP is a validated tumor target** overexpressed in at least 28 different cancer types and its expression is not downregulated during disease progression
- **MP0317** is designed to bind tumor-localized FAP and induce CD40-mediated **activation of immune cells in the tumor**, thereby overcoming systemic toxicity and allowing a **wider therapeutic dosing range**

DC, dendritic cell; FAP, fibroblast activation protein; HSA, human serum albumin; MΦ, macrophage; mAb, monoclonal antibody; IO: immuno-oncology.

MP0317 Phase 1 Study Design and Status

First-in-human, multicenter, dose-escalation study in adults with advanced solid tumors



Primary Study Objectives

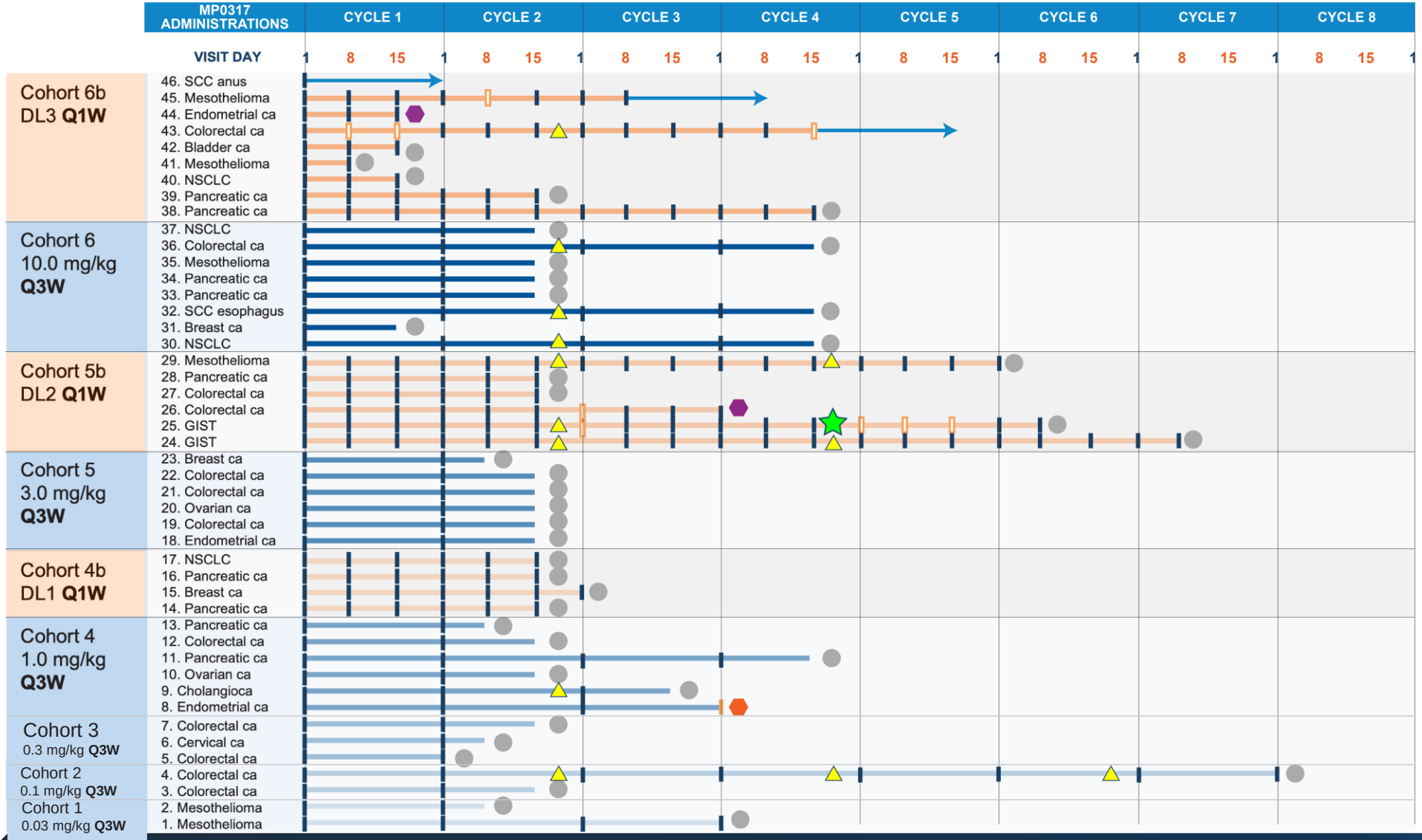
- MP0317 safety and tolerability
- Recommended dose for expansion and combination

Updated Data Presented at SITC 2023

- **Enrollment completed** at highest planned doses in dose escalation part
- **Favorable safety profile** up to highest planned dose; one DLT observed
- Tumor-localized CD40 pathway and immune cell activation, leading to **remodeling of TME**

The study is registered at ClinicalTrials.gov (NCT05098405).
PD, pharmacodynamic; Q1W, weekly dosing; Q3W, every-3-weeks dosing; DLT, dose-limiting toxicity; TME, tumor microenvironment

MP0317 Study Status and Patient Characteristics



Baseline Characteristics (n=46)

- **Age (y), median (range):** 63 (35 –79)
- **Sex (%):** Female 24 (52) Male 22 (48)
- **Prior regimens, median (range) :** 4 (1–13)

RESPONSE / STATUS

- STABLE DISEASE
- PROGRESSIVE DISEASE
- PARTIAL RESPONSE (UNCONFIRMED)
- WITHDRAWAL DUE TO IRR G2
- PATIENT WITHDRAWAL
- ONGOING TREATMENT

ADMINISTRATION

- FULL DOSE
- INCOMPLETE DOSE
- SKIPPED DOSE

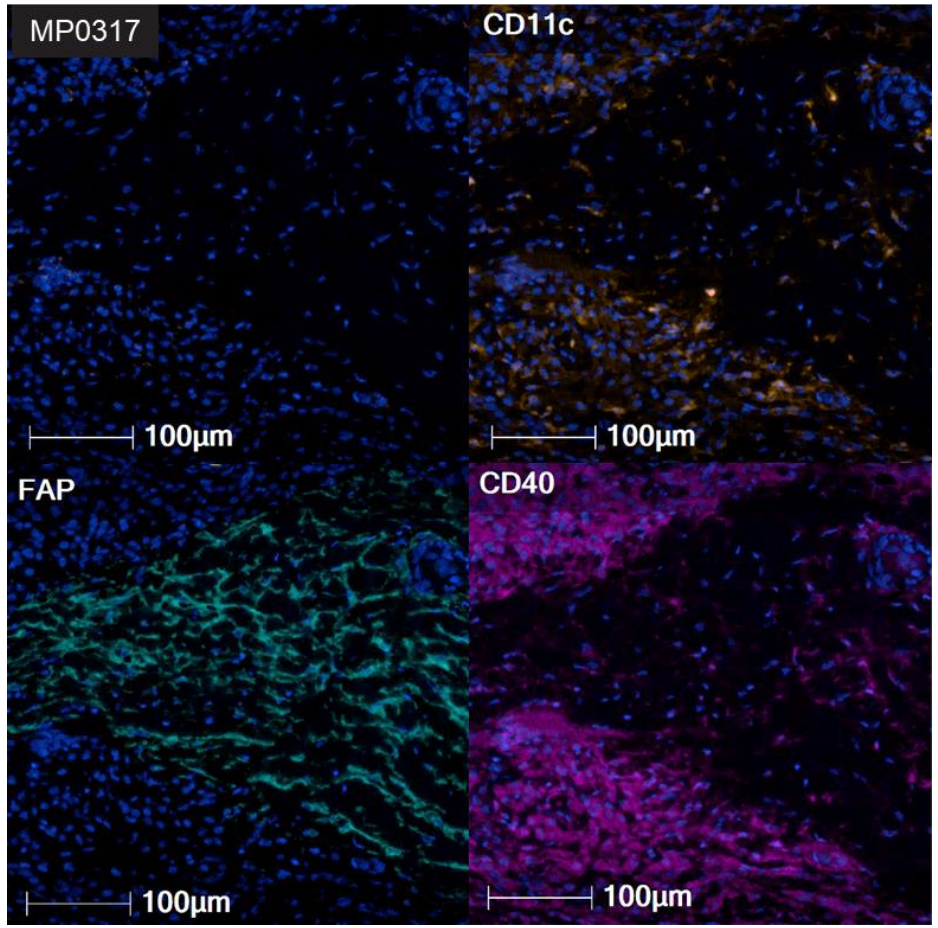
MOLECULAR partners

Gomez-Roca et al, SITC 2023 poster presentation

Data cut-off: 10 Oct 2023. N, number of patients; SCC, squamous cell carcinoma; NSCLC, non-small cell lung cancer; Ca, cancer; GIST, gastrointestinal stromal tumor.

MP0317 Co-localizes with FAP and CD40 in Tumors – Concomitant Increase in Intra-tumoral DCs Observed

PRIOR TO TREATMENT

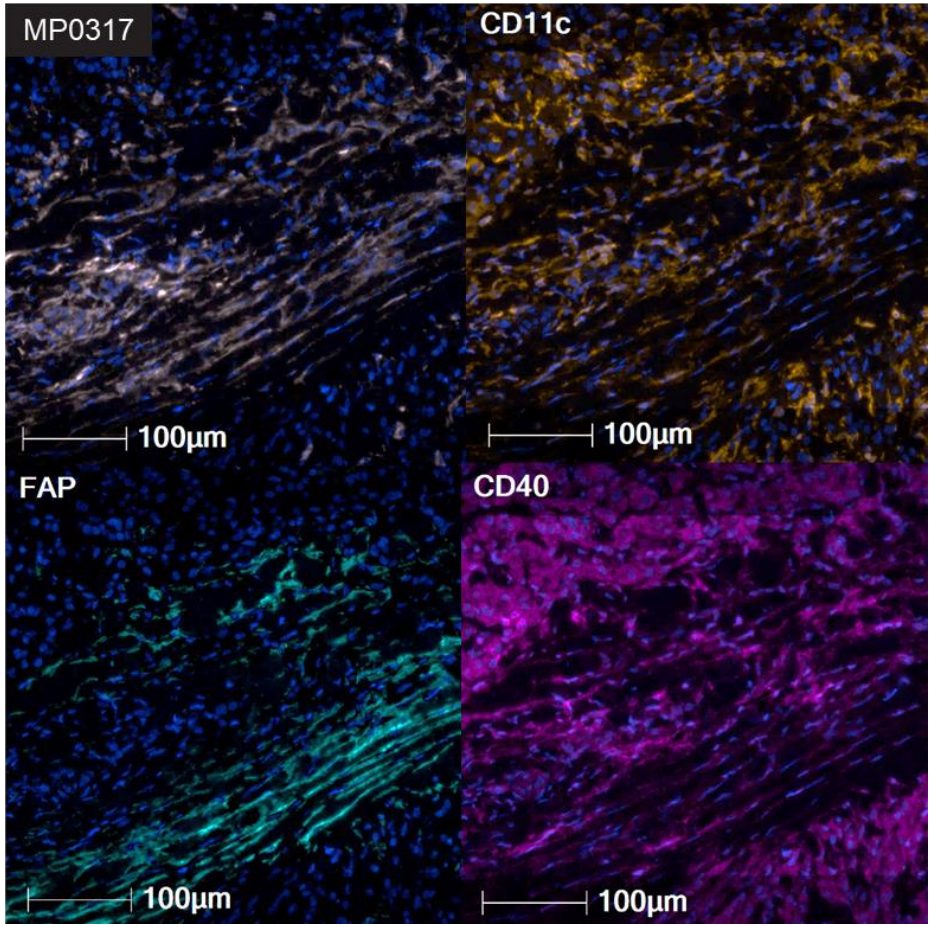


Minimal DC presence in FAP-positive tumor area

DC infiltration

MP0317

CYCLE 2 DAY 8

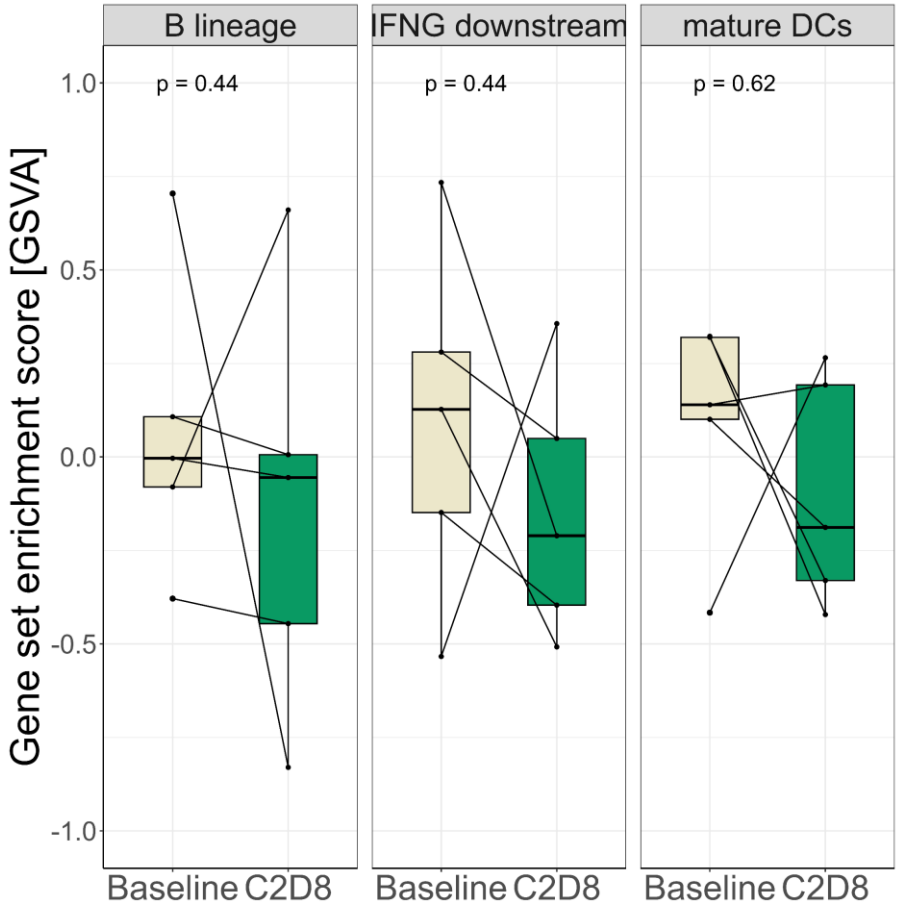


High DC infiltration in FAP-positive tumor area in MP0317 presence

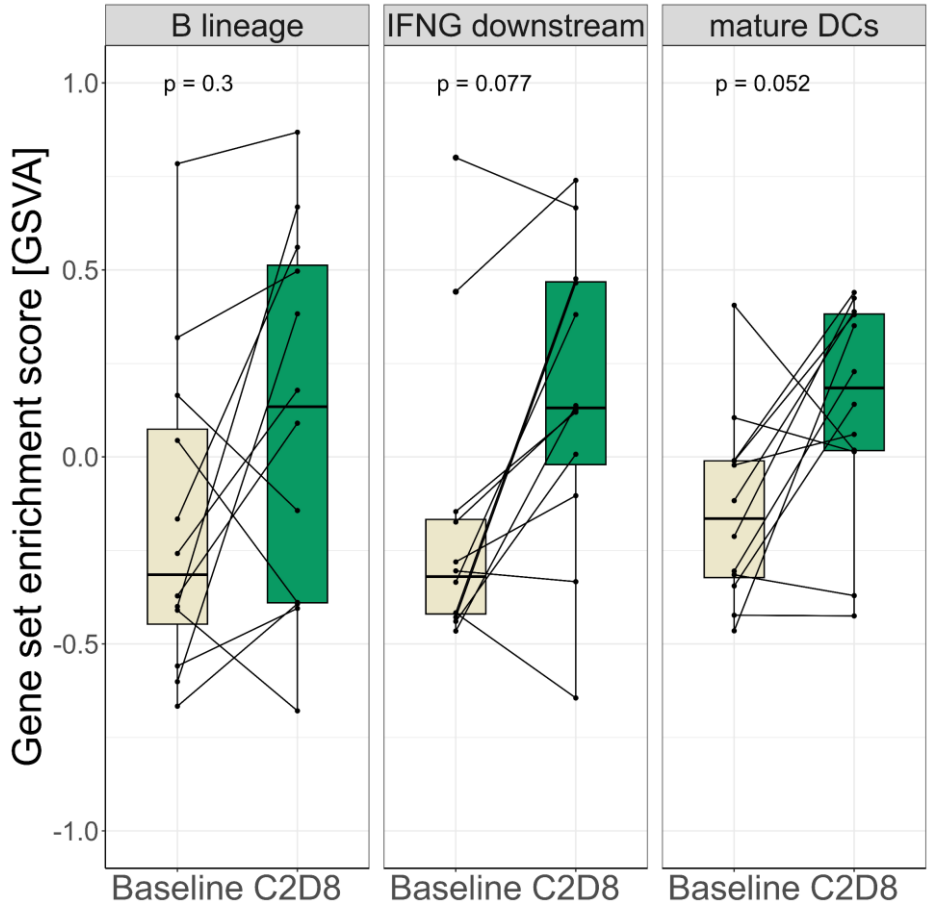
Tumor biopsy of a patient with GIST in Cohort 5b (Q1W); biopsy location: peritoneum.
DC, dendritic cell; FAP, fibroblast activation protein; GIST, gastrointestinal stromal tumor.

Increased immune cell infiltration, DC maturation and IFNγ production observed in tumors post MP0317 treatment

MP0317 low* doses or not detected in tumor (n=5)

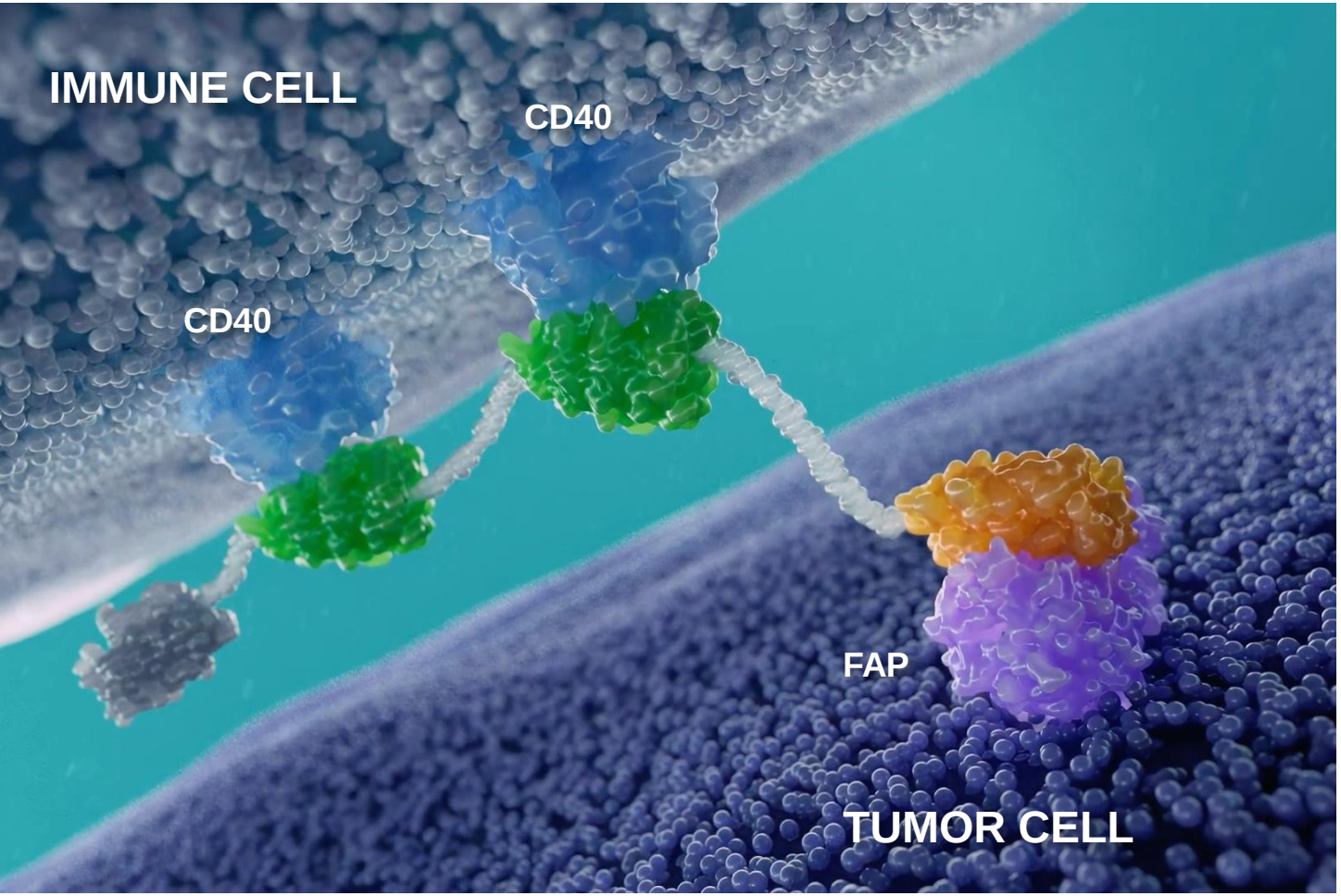


MP0317 higher doses and detected in tumor (n=12)**



Treated patients up to Cohort 6 with evaluable paired biopsies for transcriptomics (n=17).
*Low doses=≤0.1mg/kg; **Higher doses=≥0.3mg/kg. Statistical analysis was done using a signed rank Wilcoxon test.
Gomez-Roca et al, SITC 2023 poster presentation

MP0317 Summary and Conclusion



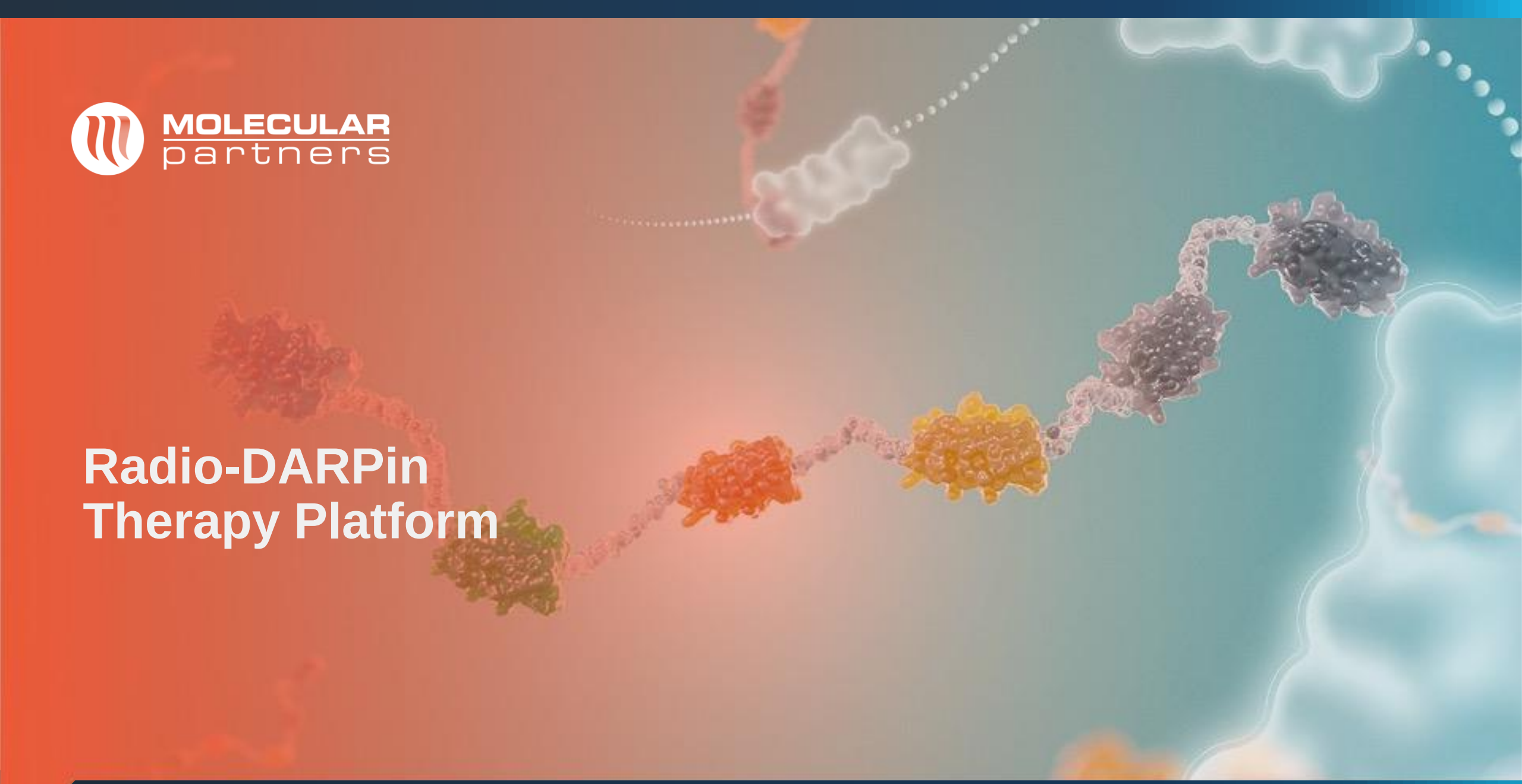
Positive results of ongoing Phase 1 provide clinical confirmation of proposed MP0317 MoA in patients with advanced solid tumors:

- Enrollment completed; 46 patients dosed
- **Favorable safety profile** up to highest planned dose
- **Tumor-localized CD40 activation**, leading to remodeling of the tumor microenvironment

Full Phase 1 proof-of-mechanism and safety data in H1 2024

Data support continued clinical evaluation of MP0317, including combination studies with potential partners

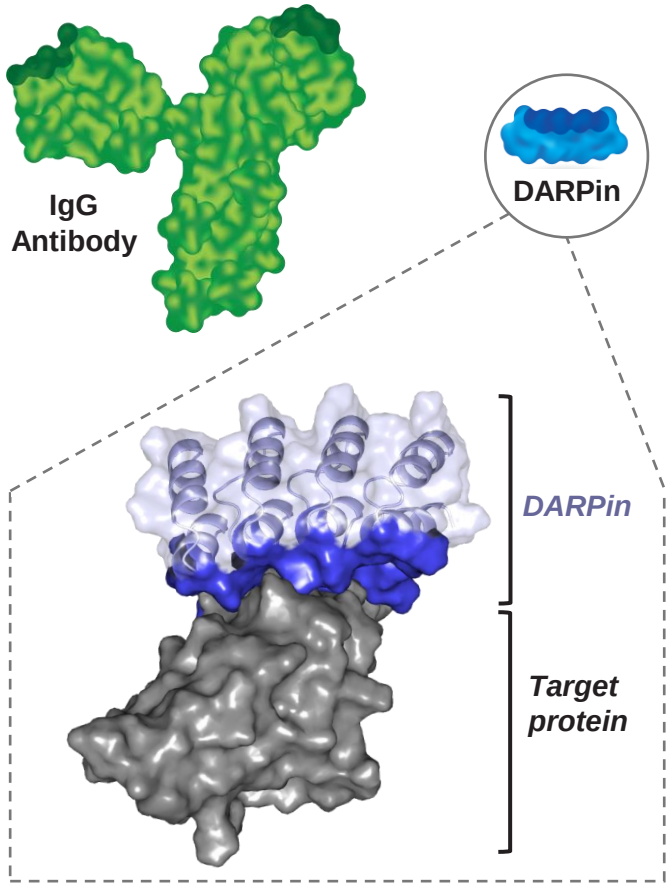
FAP, fibroblast activation protein; MoA, mechanism of action.



Radio-DARPin Therapy Platform

Radio-DARPin Therapeutics: Opportunity in Nuclear Oncology

The DARPin Modality



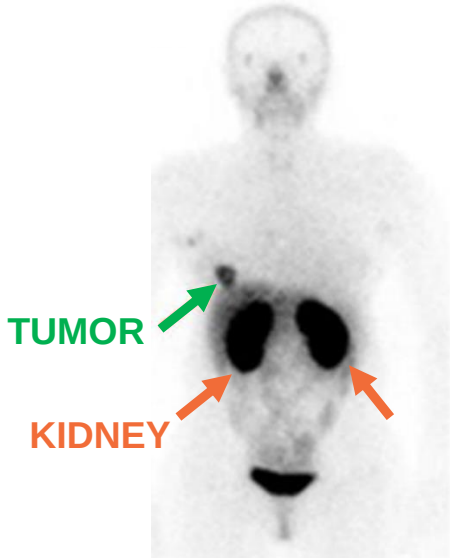
Ideal Platform Properties

Radio-DARPin Therapeutics

- Small size (15 kDa)
- Short systemic half-life
- High affinity
- High specificity
- Simple and robust architecture
- High-yield microbial expression
- **Broad target range**

The Challenge

Polypeptides < 60 kDa are reabsorbed by the kidney



→ Accumulation of therapeutic radionuclides will cause **kidney toxicity**

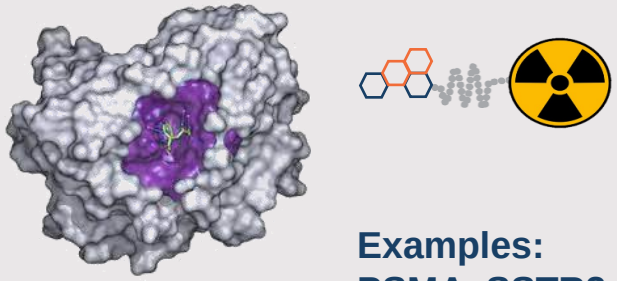
Rothenberger *et al.*, *Nature Biotech*, 2022
Fischer *et al.*, *JCO Precis Oncol*, 2022

Bragina *et al.*, *J Nuc Med*, 2021

DARPins to Expand the ‘Ligandable’ Target Space

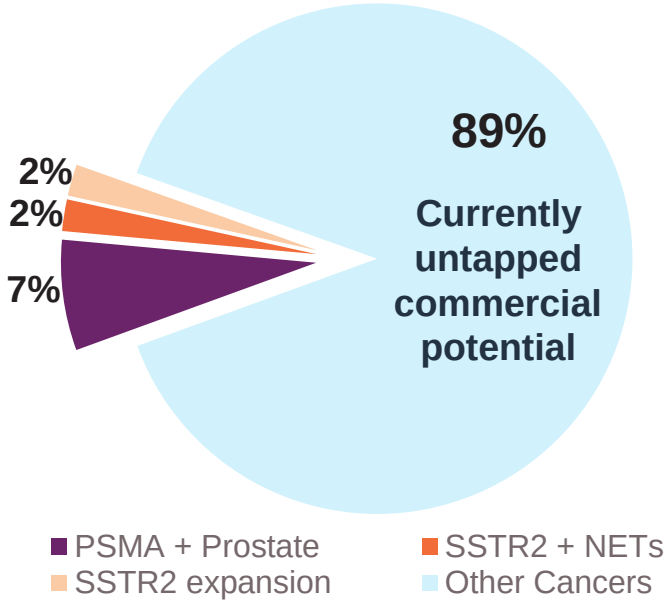
RLTs are Suitable for

Targets where a small molecule ligand with high affinity and specificity can be generated



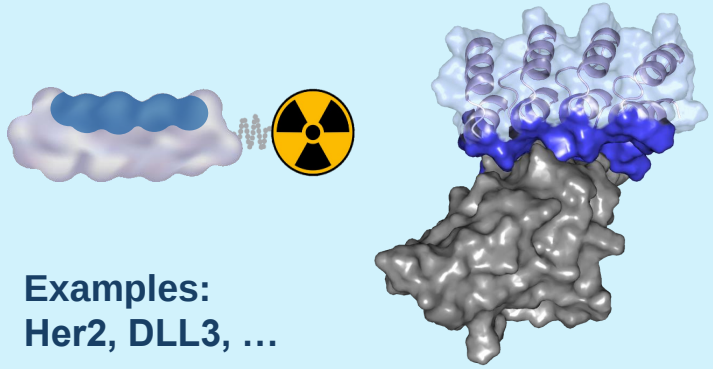
Examples:
PSMA, SSTR2, ...

TARGET SPACE*



Focus with RDTs on

Targets that are challenging for peptides or small molecules to reach desired specificity and affinity



Examples:
Her2, DLL3, …

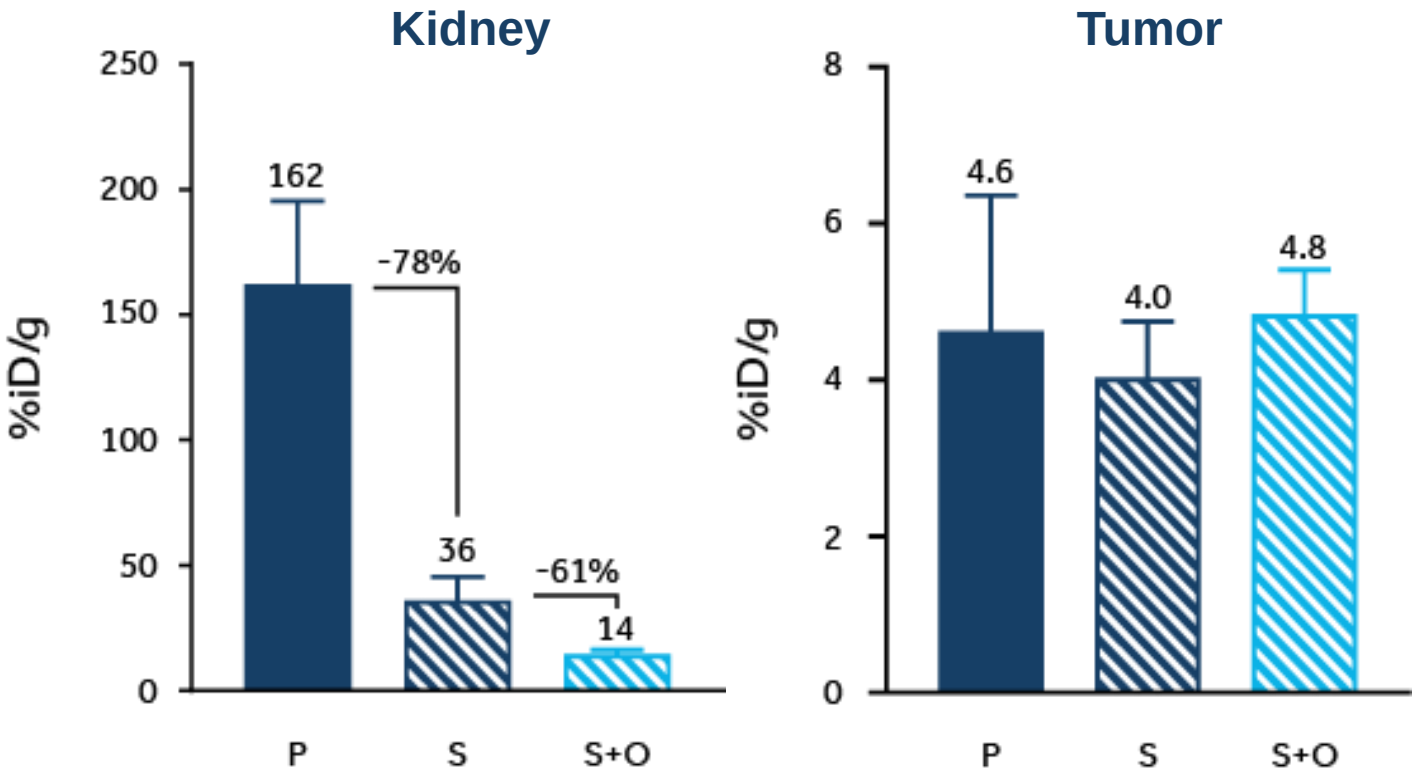
Target Properties for Radiopharmaceuticals

- Expressed on the cell surface and accessible for binding
- Expression limited to tumors (or high differential expression between tumors and healthy tissues)
- Relevant for target patients and indications with unmet need

* Source: Guggenheim Securities Report 2023

PSMA: PSB 1Z8L; CD33: PDB 5IHB.
DLL3, delta-like ligand 3; Her2, human epidermal growth factor receptor 2; PSMA, prostate-specific membrane antigen; RDT, radio-DARPin therapy; RLT, radio-ligand therapy; SSTR2, somatostatin receptor 2.

Surface Engineered Radio-DARPins Show Dramatically Reduced Kidney Update

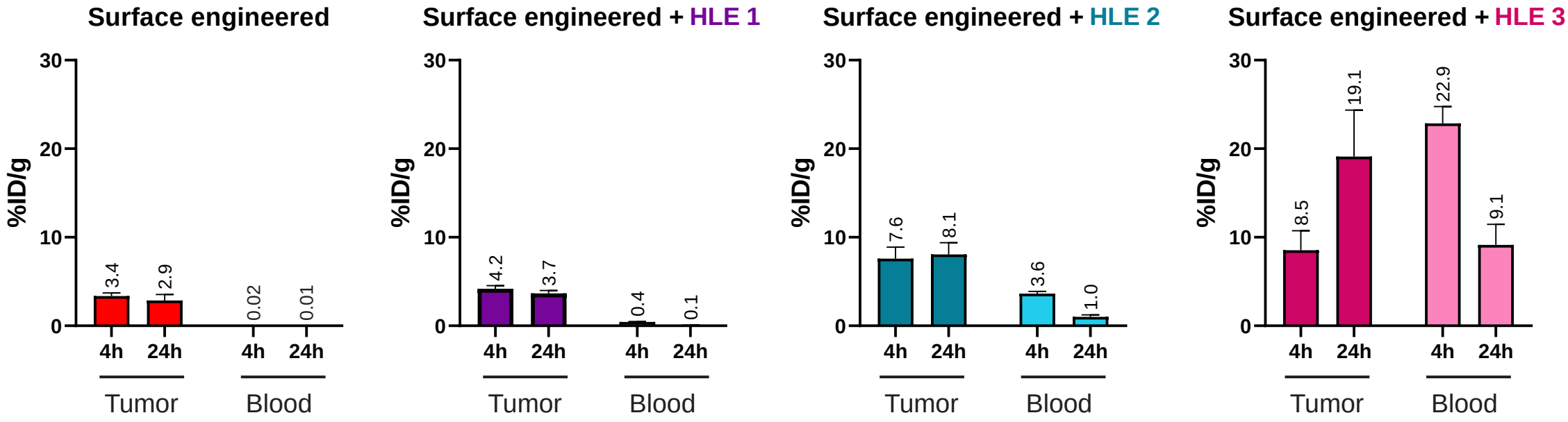


After 4 hour timepoint	T/K*
P: Parental	1/35
S: Surface Engineered	1/9
S+O: Surf. Eng. + Orthogonal + O**	1/3

*tumor to kidney ratio

**Orthogonal = MP proprietary kidney blocking or saturating agent

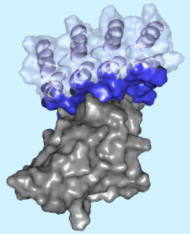
Systemic Half-life Extension (HLE) Increases Tumor Uptake



- Serum albumin binding results in increased blood levels that correlate with higher tumor uptake
- **HLE toolbox with different "strengths" allows RDT properties tailored to specific needs and payloads**

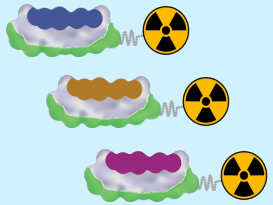
Building a Growing Pipeline of Radio-DARPin Therapeutics

ESTABLISHED DARPin GENERATION



- DARPins against 50+ targets generated
- Binders available in ~ 4 months*
- Strong clinical validation

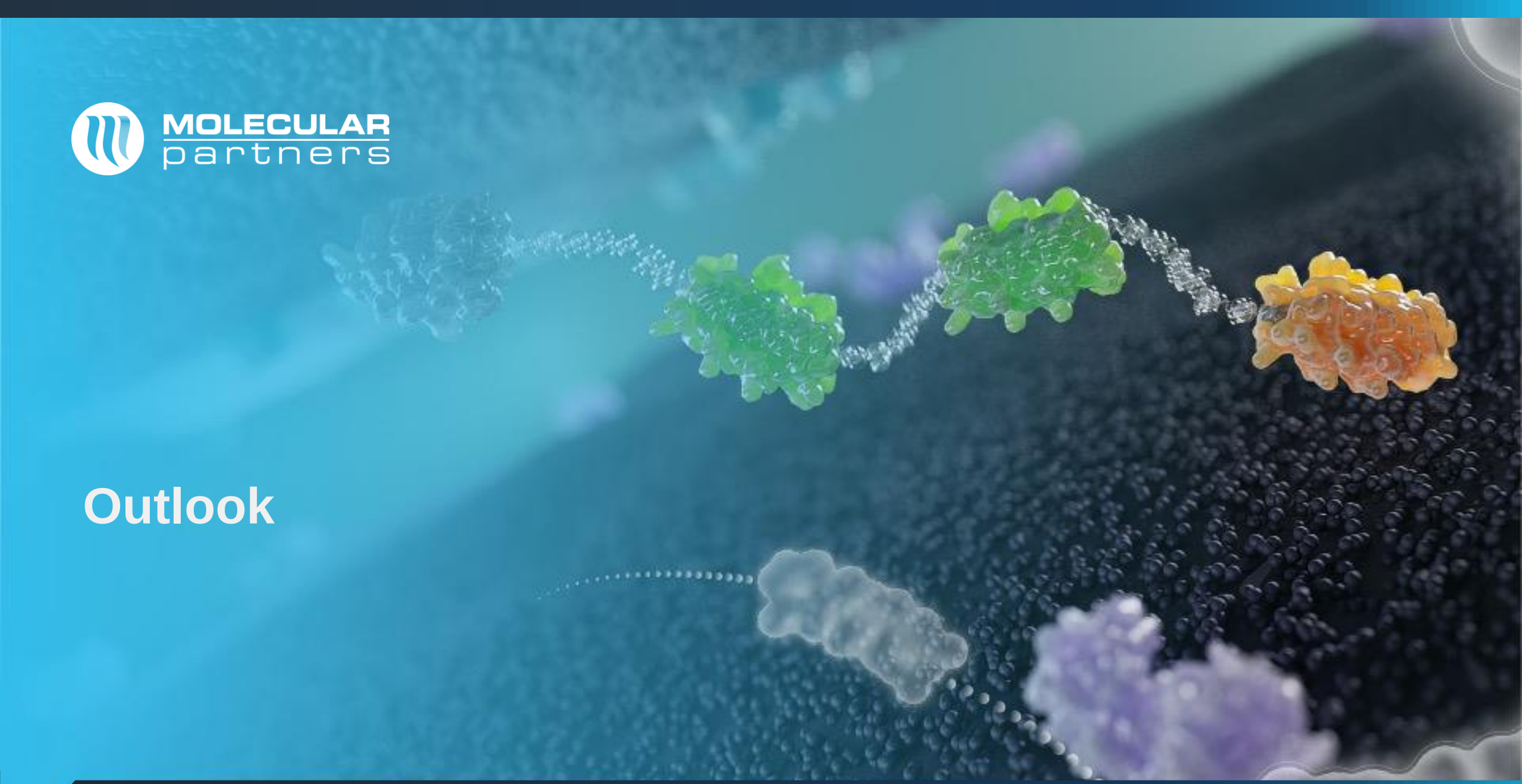
OPTIMIZED RDT PLATFORM



- Low kidney accumulation
- Optimized systemic half-life
- High and durable tumor uptake

RIGHTS	CURRENT PIPELINE	OPPORTUNITY
NOVARTIS **Exclusive for two target antigens**		• **$20m upfront** • **$560m in potential milestones** • **Up to double digit royalties**
MOLECULAR partners **Five in-house programs**	**DLL3**	**> 10 targets planned**

** Starting from high-quality biotinylated target protein available for selections (without affinity maturation/engineering)*



Outlook

Outlook and Upcoming Milestones

MP0533	• **Initial Phase 1 results in R/R AML reported at ASH 2023 confirm activity** • Data from expected therapeutically active doses planned in H1 2024 • Clinical expansion in Europe and preparation of potential US IND application
MP0317	• Full Phase 1 proof-of-mechanism and safety data in H1 2024 • **Partnering for clinical development** in combination settings
Radio-DARPin Therapy Platform	• Build on reduced kidney accumulation, **focus on tumor accumulation** • Evaluation and nomination of additional targets ongoing • Establish clinical and supply collaborations with radionuclide companies
Next Opportunities for DARPins	• **Leverage DARPin platform** for next-generation immune cell engagers • Presentation of first project building on **SWITCH concept** anticipated in H1 2024

CHF ~207 million cash (incl. short-term time deposits) ensures **funding well into 2026***

*As of September 30, 2023.
AML, acute myeloid leukemia; IND, investigational new drug; R/R, relapsed/refractory; ASH, American Society of Hematology.