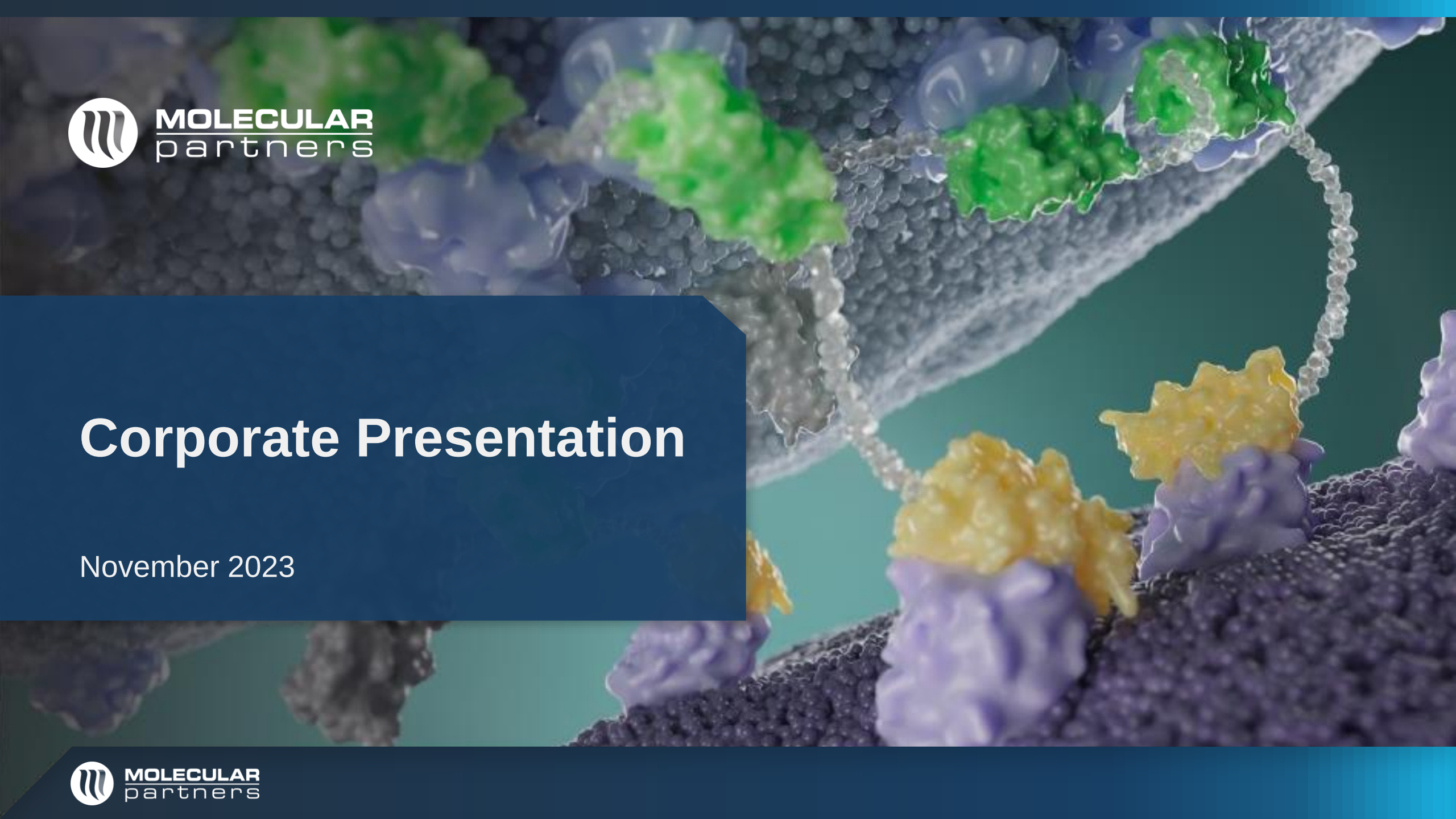


Corporate Presentation

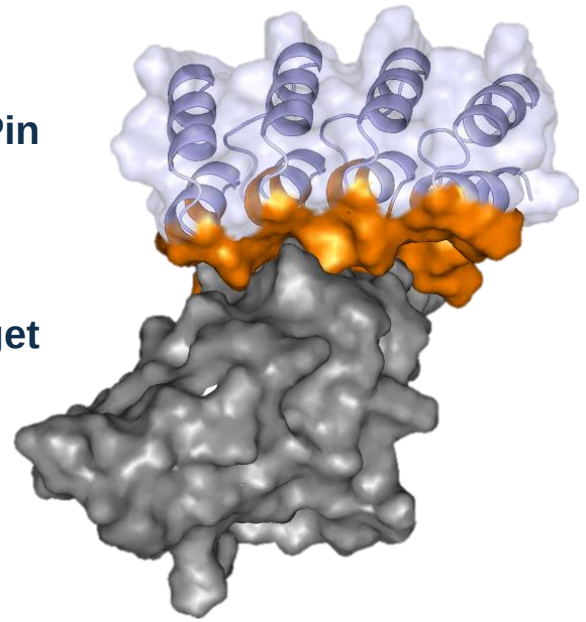
November 2023

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.

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 solution** for a defined medical problem not addressable by antibody designs
- Demonstrate **true patient value** with **early clinical read out**
- Combine our **capabilities with world-class partners** to deliver innovative therapeutics

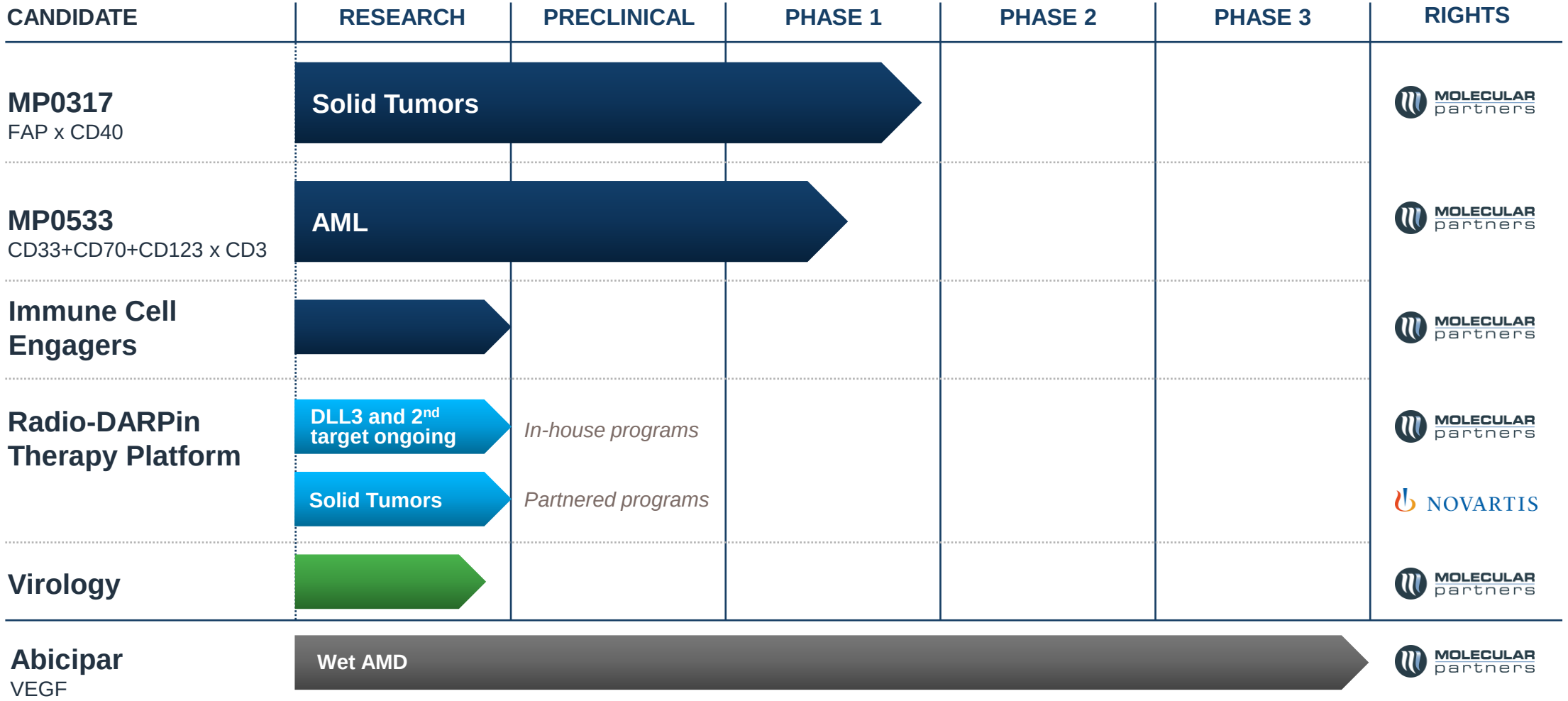
Highlights Q3 2023

MP0533	• Novel tetra-specific T cell engager for R/R AML and high-risk MDS • Phase 1 dose-escalation study well on track, **currently enrolling at dose regimen (DR) 5** • **Favorable safety profile** in DR1-3, **first responder in DR3**: additional data (up to DR4) at **ASH 2023**
MP0317	• Bi-specific targeting FAP and CD40 for tumor-localized immune activation • Phase 1 study in R/R solid tumors, dose escalation fully enrolled • **Favorable safety profile up to highest dose**, **tumor-localized CD40 activation leading to remodeling of tumor microenvironment** in patients presented at **SITC 2023**
Radio-DARPin Therapy Platform	• RDT platform successfully optimized to **reduce kidney accumulation & increase tumor uptake**, progress presented at EANM 2023 • Selected tumor-associated protein DLL3 as a first in-house target • Novartis collaboration further progressing
Operations	• Strong financial position with CHF ~207 M in cash (incl. short term deposits) as of Sept. 30, 2023 • **Capitalized well into 2026**

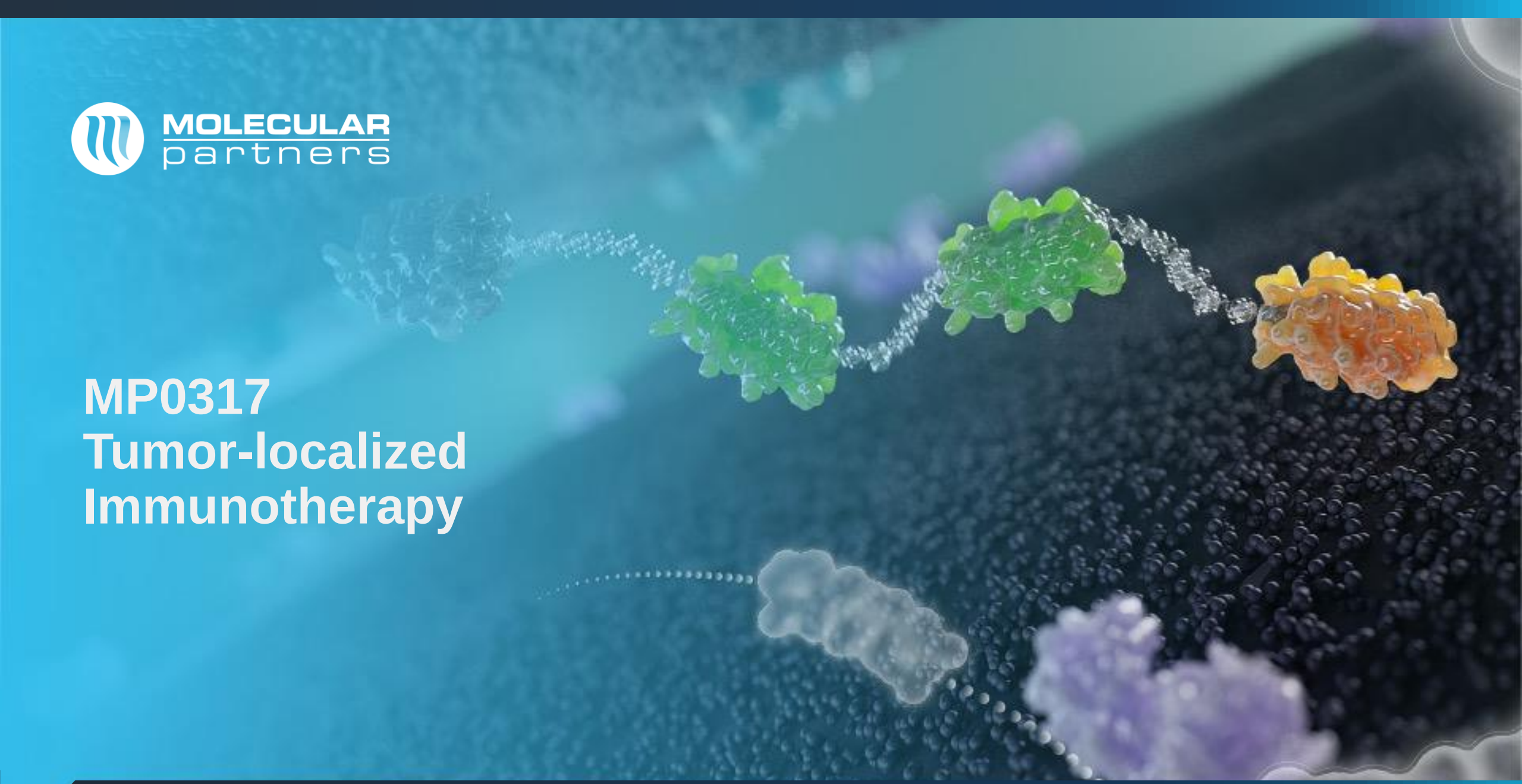
AML, acute myeloid leukemia; ASH, American Society of Hematology; FAP, fibroblast activation protein; SITC, Society for Immunotherapy of Cancer; DLL3, Delta-like ligand 3; MDS, myelodysplastic syndrome; EANM, European Association of Nuclear Medicine; RDT, Radio-DARPin Therapy; R/R, relapsed/refractory.

Pipeline

Oncology | Radio-DARPin Therapy | Virology[1] | Ophthalmology[2]



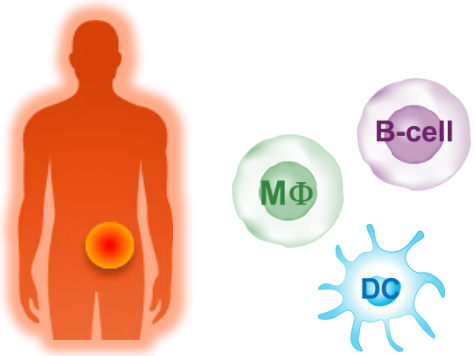
1) Ensovibep: Molecular Partners was informed by Novartis that the Emergency Use Authorization (EUA) application from the U.S. Food and Drug Administration (FDA) for ensovibep was withdrawn effective January 25, 2023. As previously disclosed, ensovibep is not presently in clinical development.
2) The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



MP0317
Tumor-localized Immunotherapy

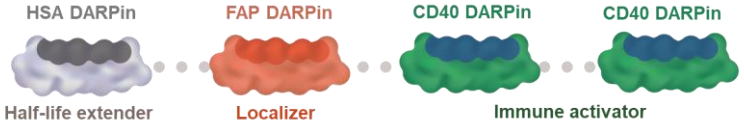
MP0317: Unlocking CD40 Activity by Local Activation

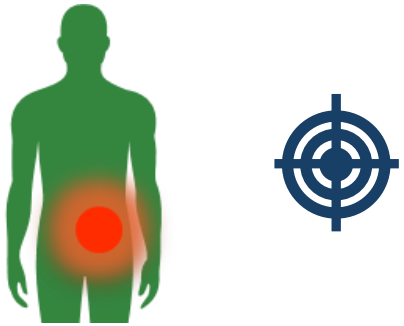
Problem: Toxicity of CD40 Antibodies Has So Far Limited Their Activity



- **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



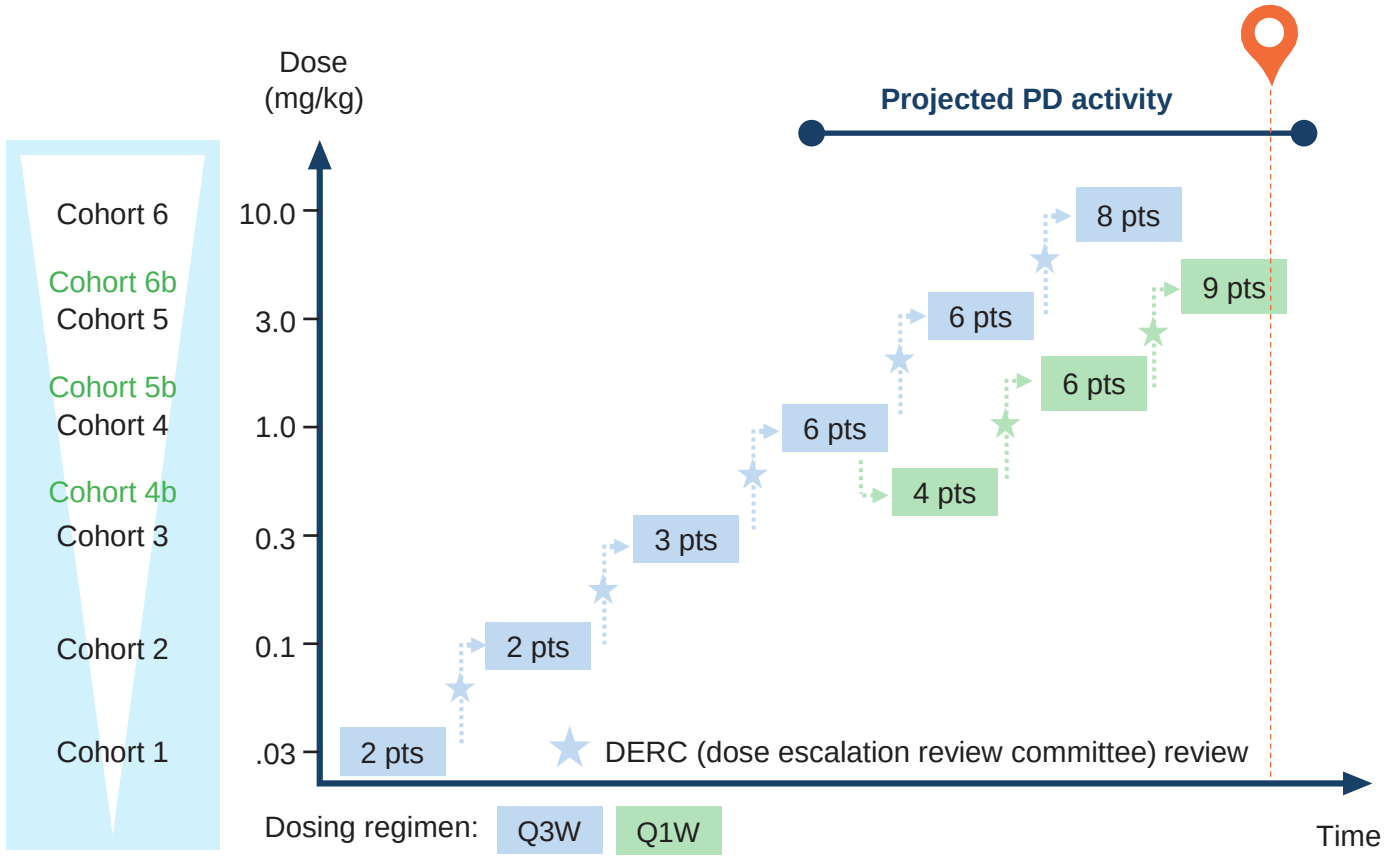


- **FAP is a validated tumor target** overexpressed in at least 28 different cancer types and its expression is not downregulated during disease progression
- **MP0317** is designed to bind tumor-localized FAP and induce CD40-mediated **activation of immune cells in the tumor**, thereby overcoming systemic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

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



Primary Study Objectives

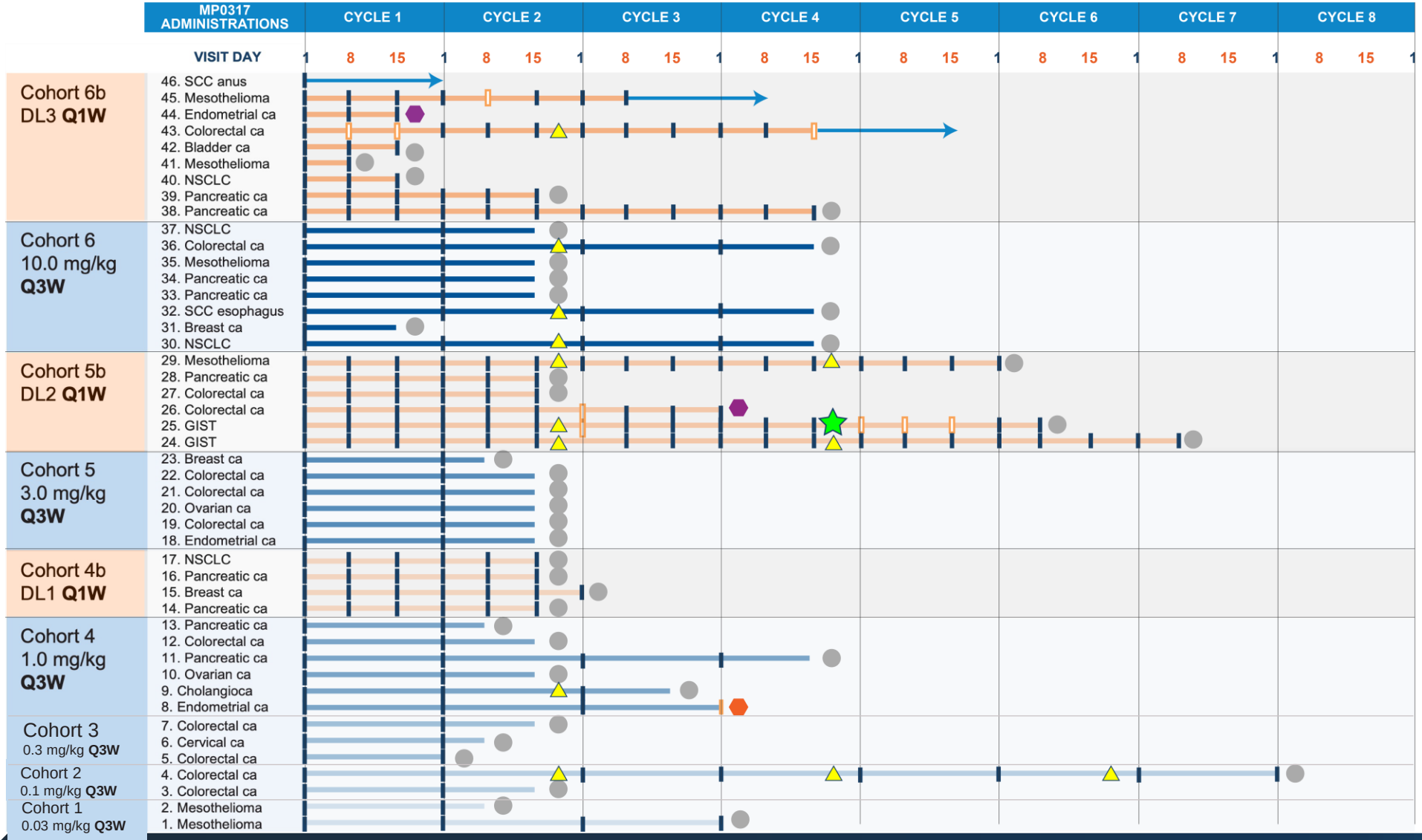
- MP0317 safety and tolerability
- Recommended dose for expansion and combination

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 & 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

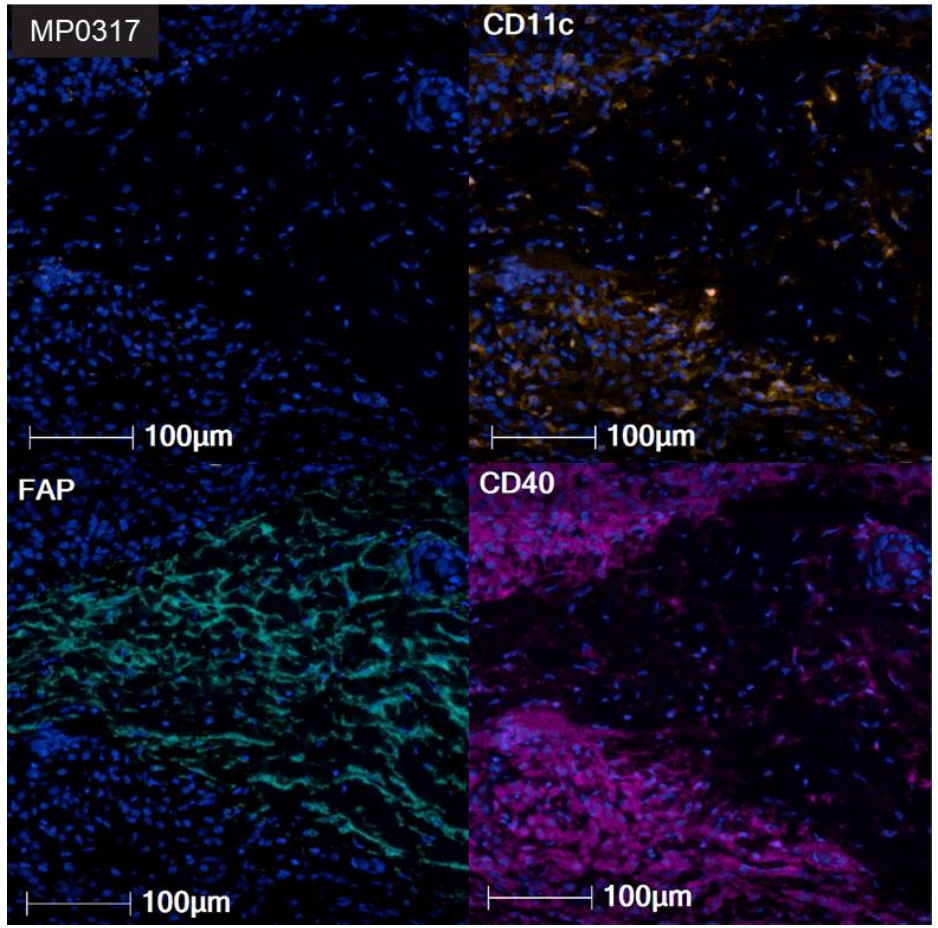
MOLECULAR partners

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

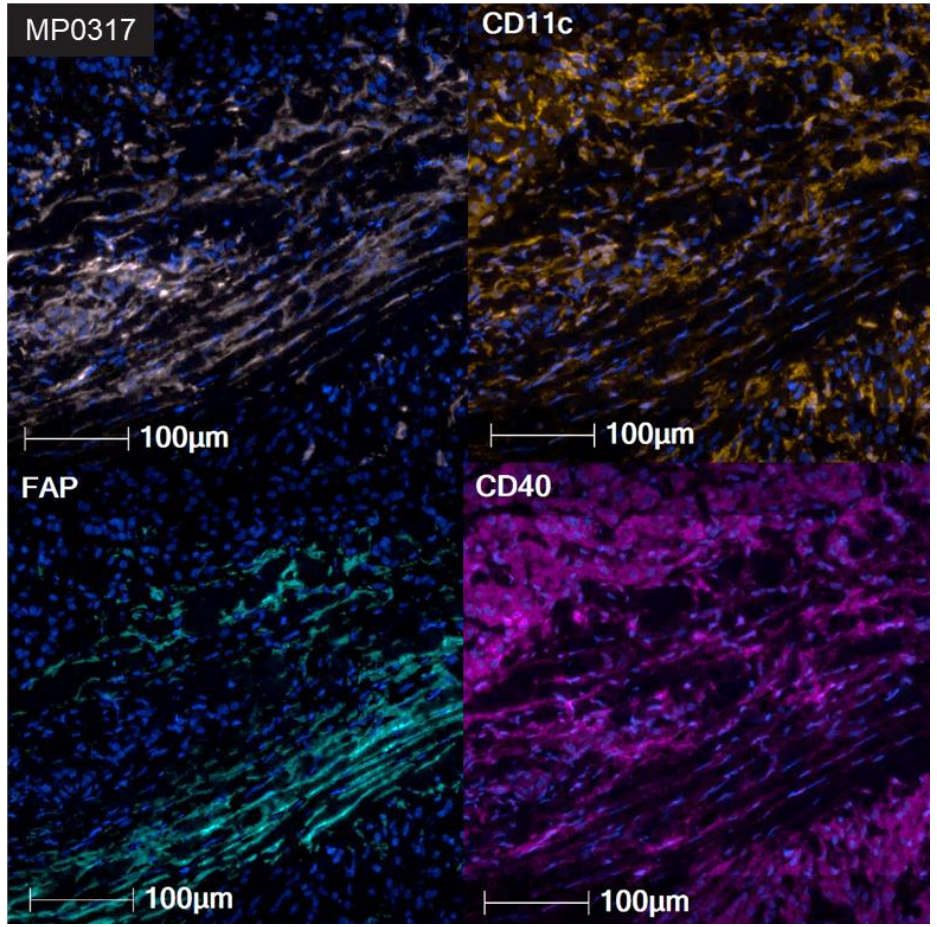


Minimal DC presence in FAP-positive tumor area

DC infiltration

MP0317

CYCLE 2 DAY 8

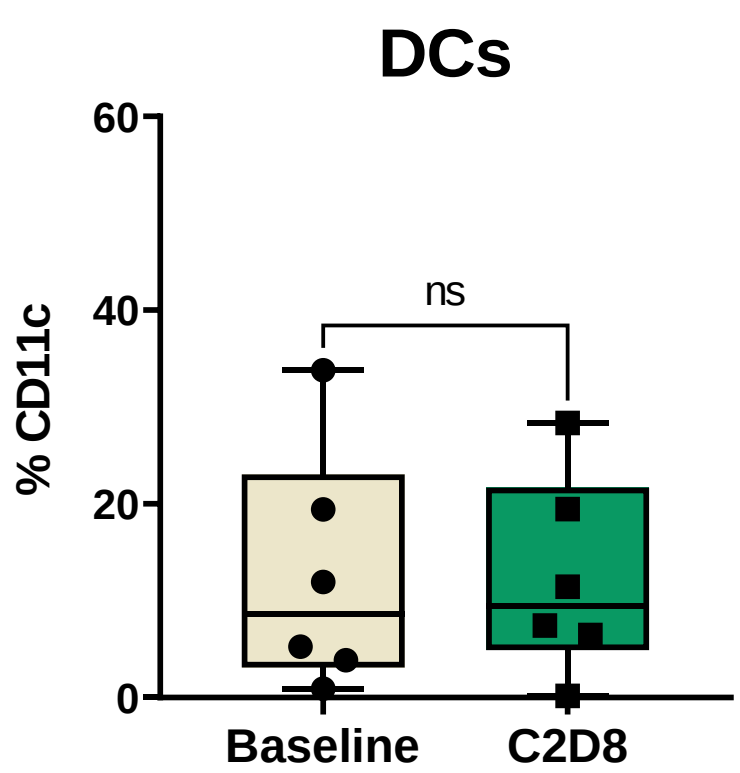


High DC infiltration in FAP-positive tumor area in MP0317 presence

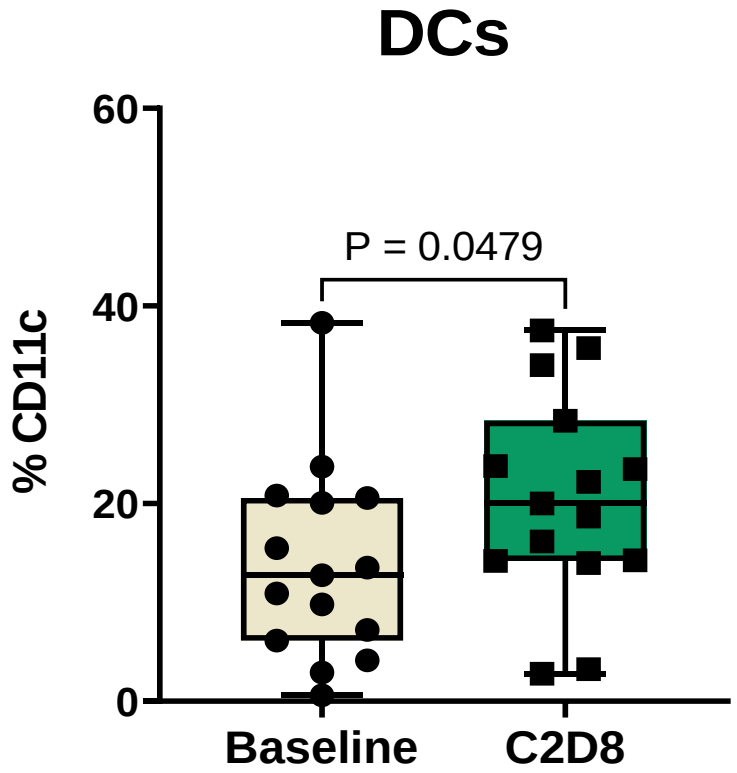
Tumor biopsy of a patient with GIST in Cohort 5b (Q1W); biopsy location: peritoneum.
DC, dendritic cell; FAP, fibroblast activation protein; GIST, gastrointestinal stromal tumor.

Increase in intra-tumoral DCs observed post MP0317 treatment

MP0317 low* doses or not detected in tumor (n=6)



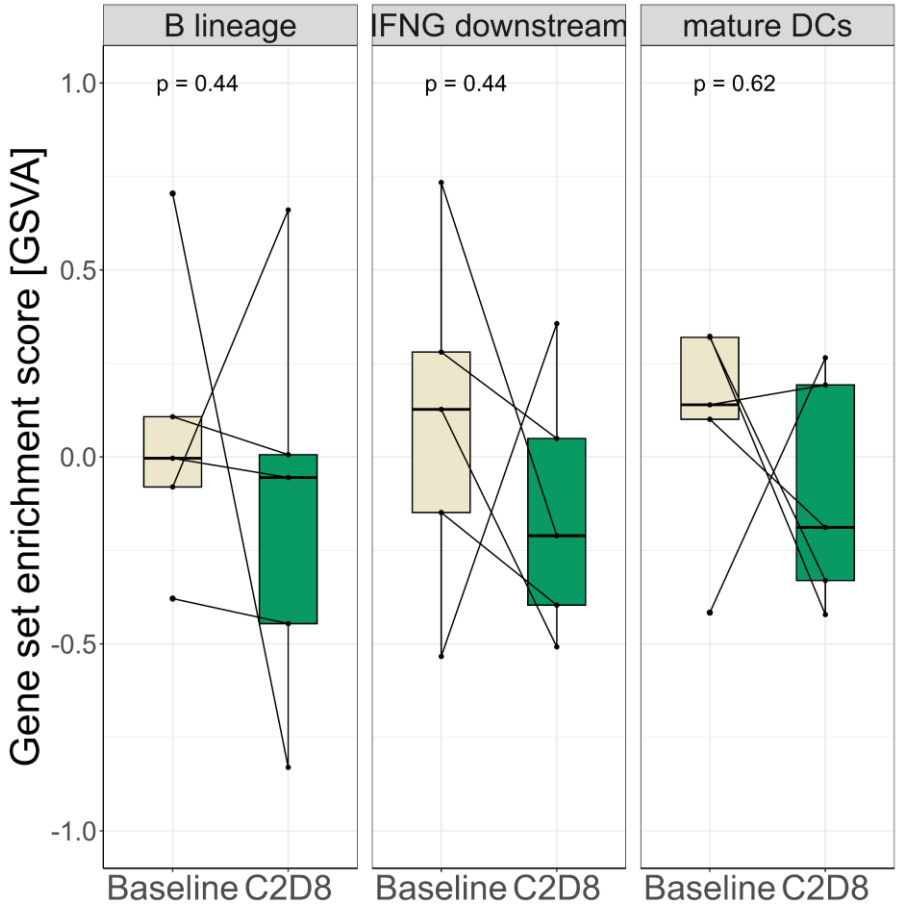
MP0317 higher doses and detected in tumor (n=15)**



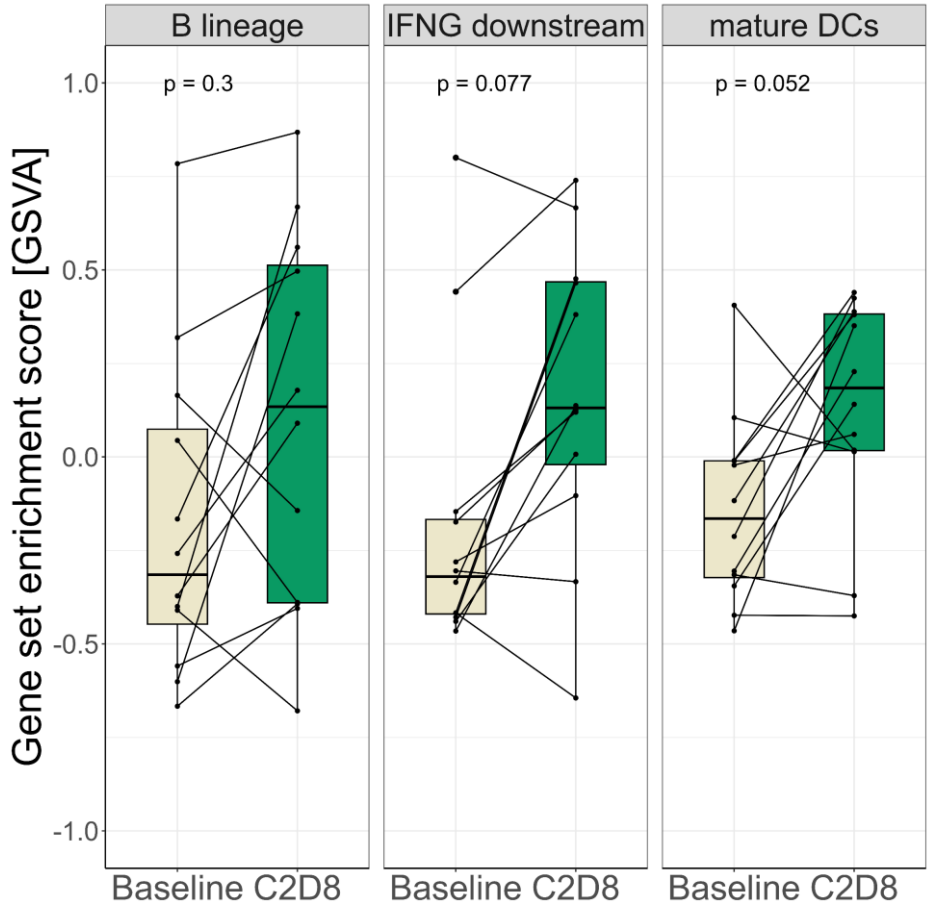
Treated patients up to Cohort 6 with evaluable paired biopsies for mIF (n=21). *Low doses = ≤0.1 mg/kg; **Higher doses = ≥0.3mg/kg. Upper (75%), median, and lower (25%) percentiles are indicated. P-values are derived from paired ranked sum Wilcoxon test.

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)

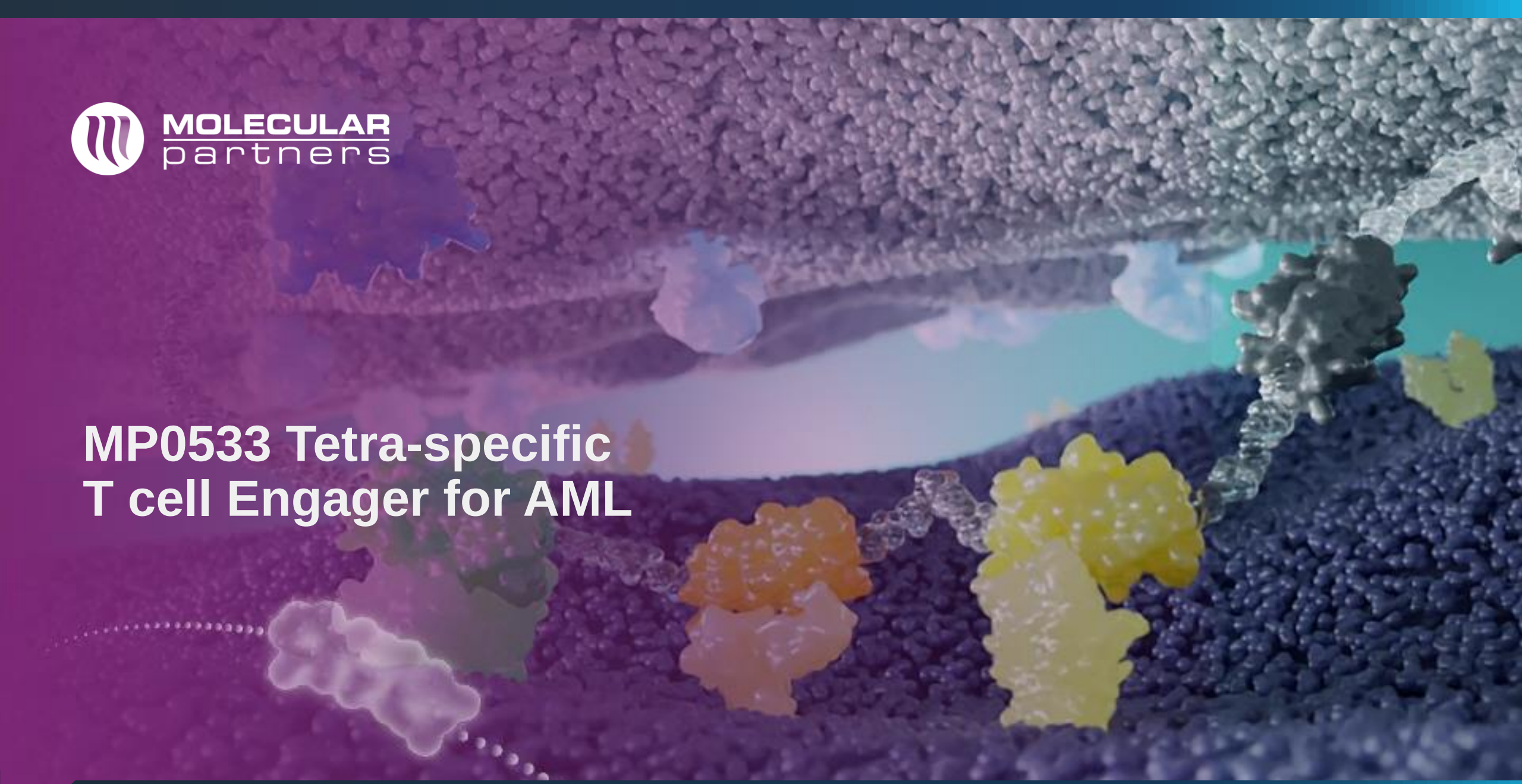


MP0317 higher doses and detected in tumor (n=12)**



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.

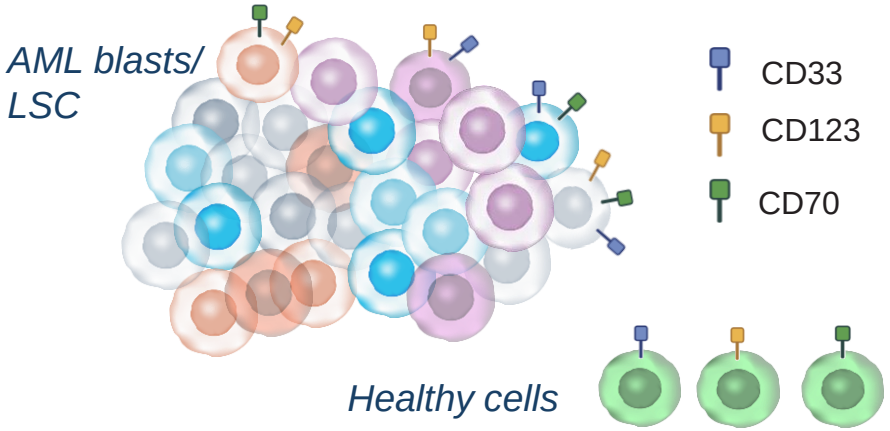
Gomez-Roca et al, SITC 2023 poster presentation



MP0533 Tetra-specific T cell Engager for AML

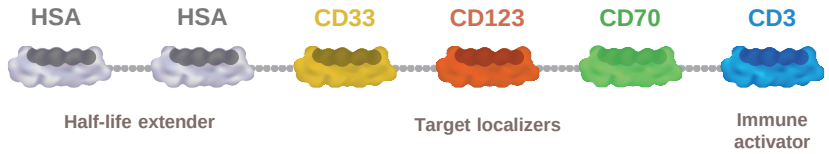
MP0533: Avidity-guided selectivity for cancer cells in AML

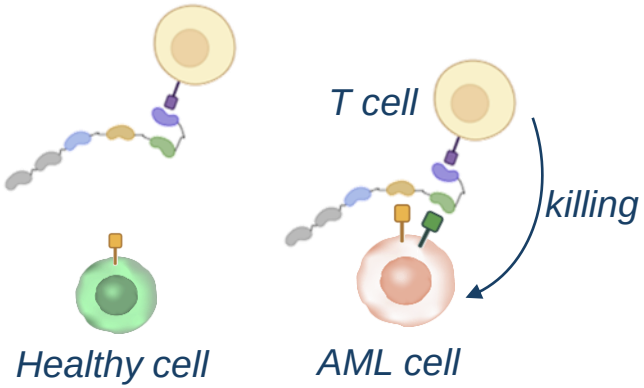
Problem: AML tumor-associated antigens are expressed on healthy cells



- **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 by their **co-expression of specific targets** (e.g. CD33, CD123, CD70)

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

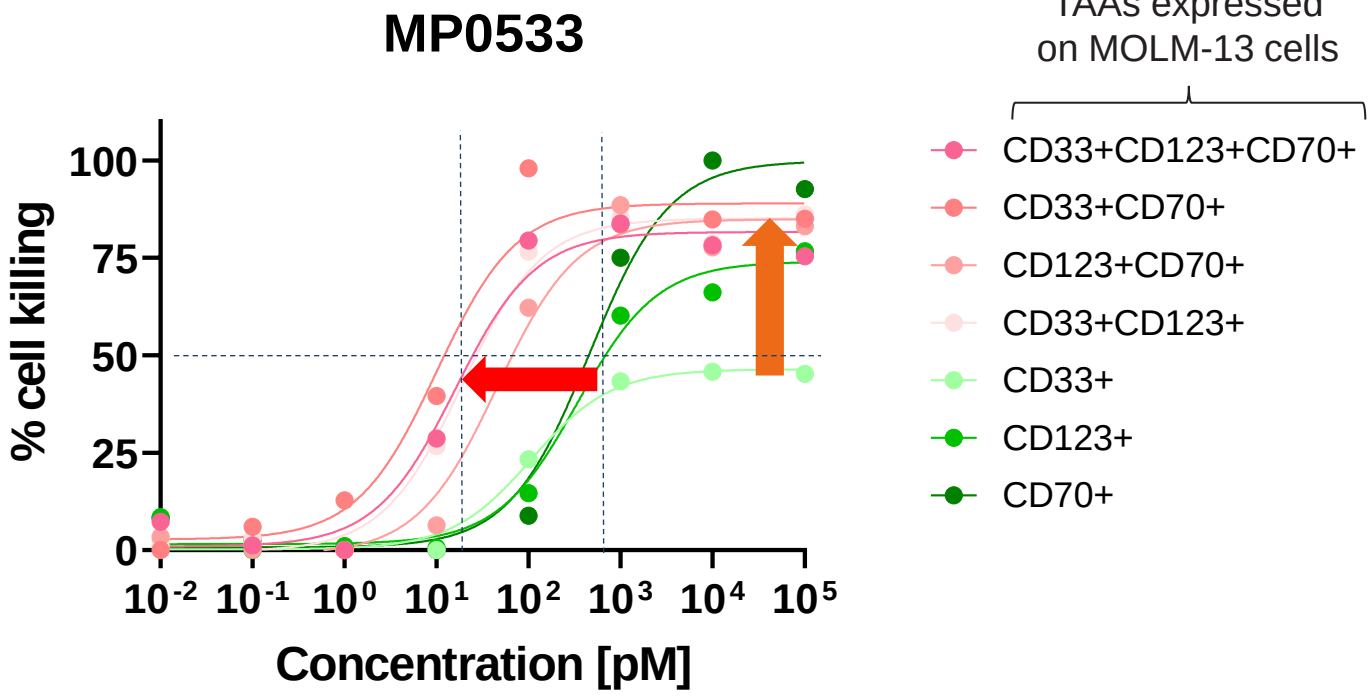




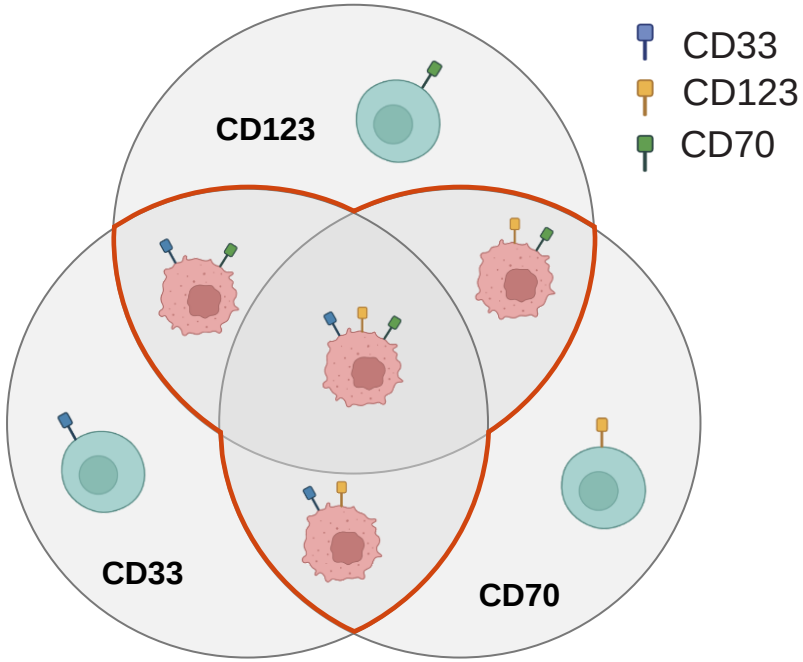
- MP0533 designed to induce **T cell-mediated killing preferentially when 2 or 3 target antigens (CD33, CD123, CD70) are co-expressed**
- MP0533 is hypothesized to preserve healthy cells hence **opening a therapeutic window**
- MP0533 has the potential to kill all AML cells (blasts and LSCs) despite heterogeneity hence ensuring **long term disease control**

AML, acute myeloid leukemia; HSA, human serum albumin.

MP0533 Induces Specific Killing of AML Cells Expressing 2 or 3 TAAs



SELECTIVITY



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

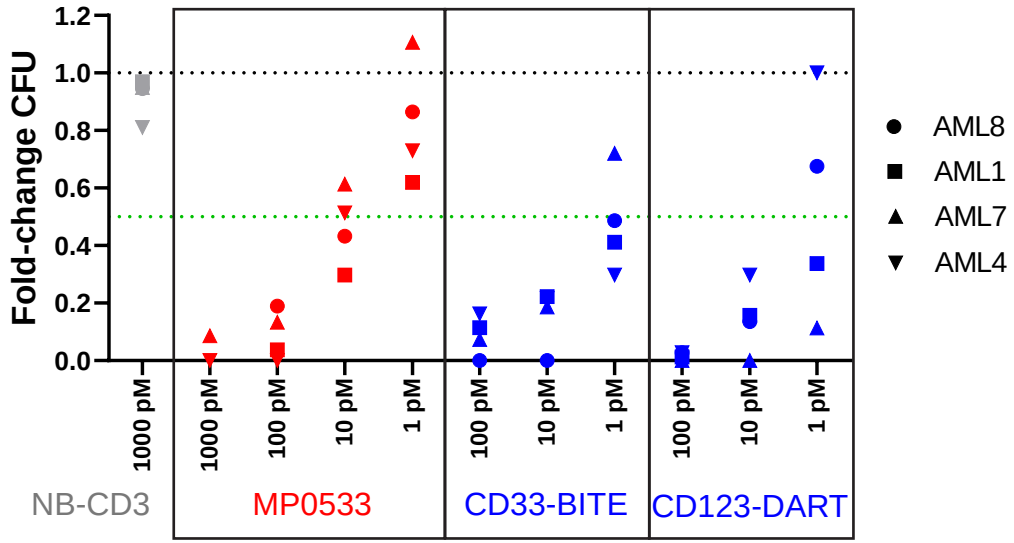
Sorted CD34+ LSC or HSC
+ Healthy donor T cells (E:T = 1:1)

MP0533 or controls

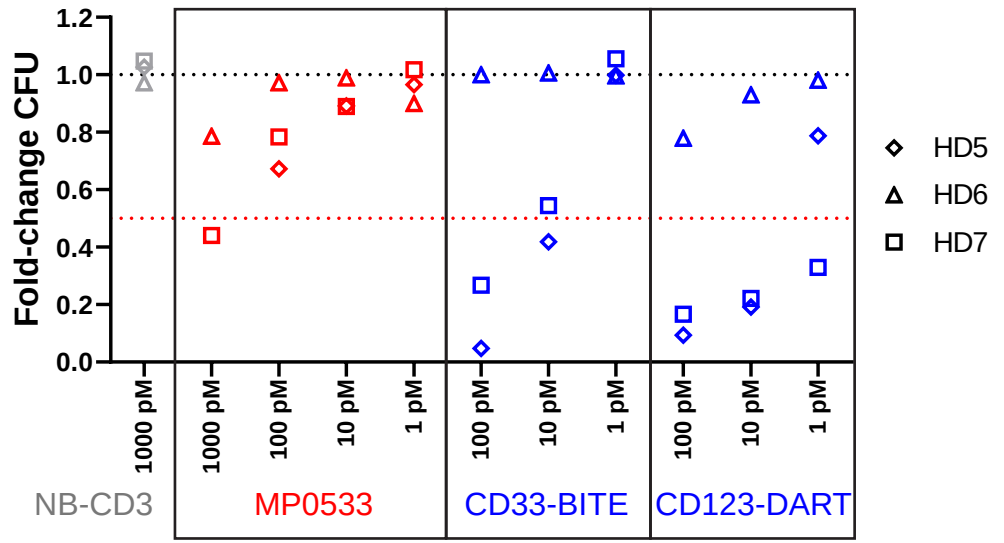
14 days colony forming assay

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

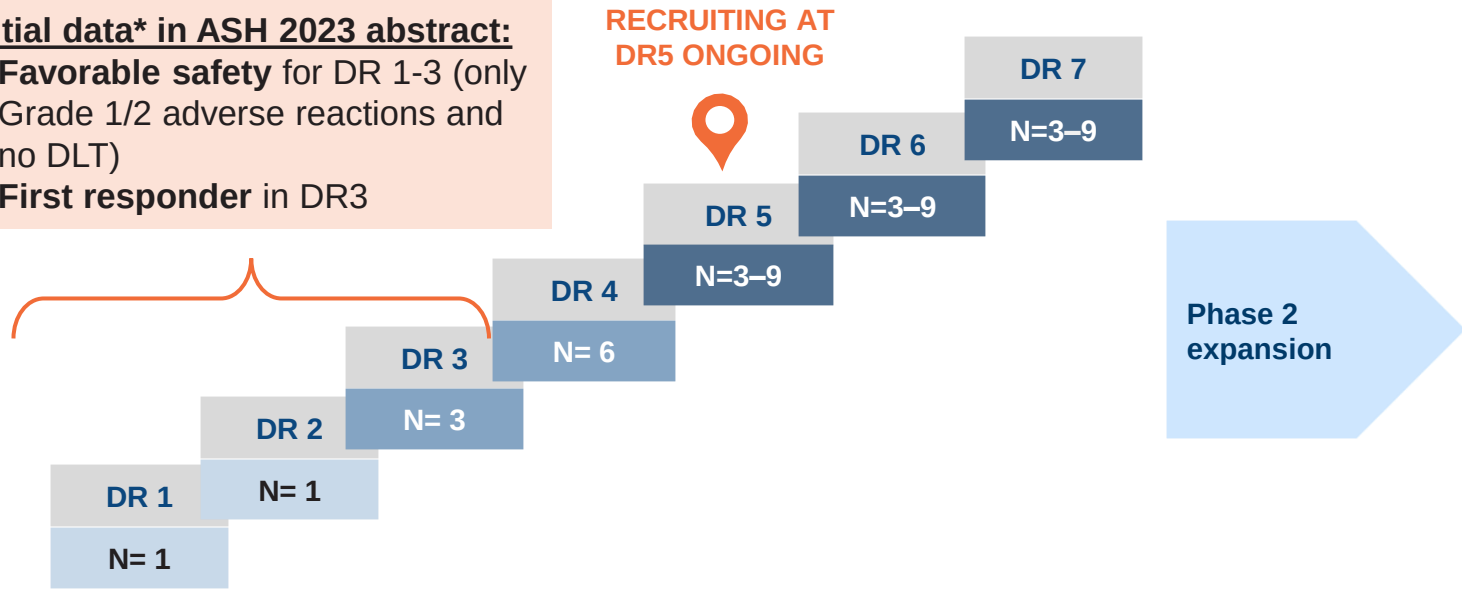
MP0533 Phase 1 Dose-escalation Trial in R/R AML patients

Patient population
AML or MDS/AML R/R to HMA, induction CT or allogenic HSCT
N=20–45 patients

Endpoints
DLTs, safety, tolerability
antileukemic activity
PK, T-cell activation, cytokine release

Centers
7 sites open across Europe (NCT05673057)

Initial data* in ASH 2023 abstract:
- **Favorable safety** for DR 1-3 (only Grade 1/2 adverse reactions and no DLT)
- **First responder** in DR3



Bayesian design, includes a step-up dosing

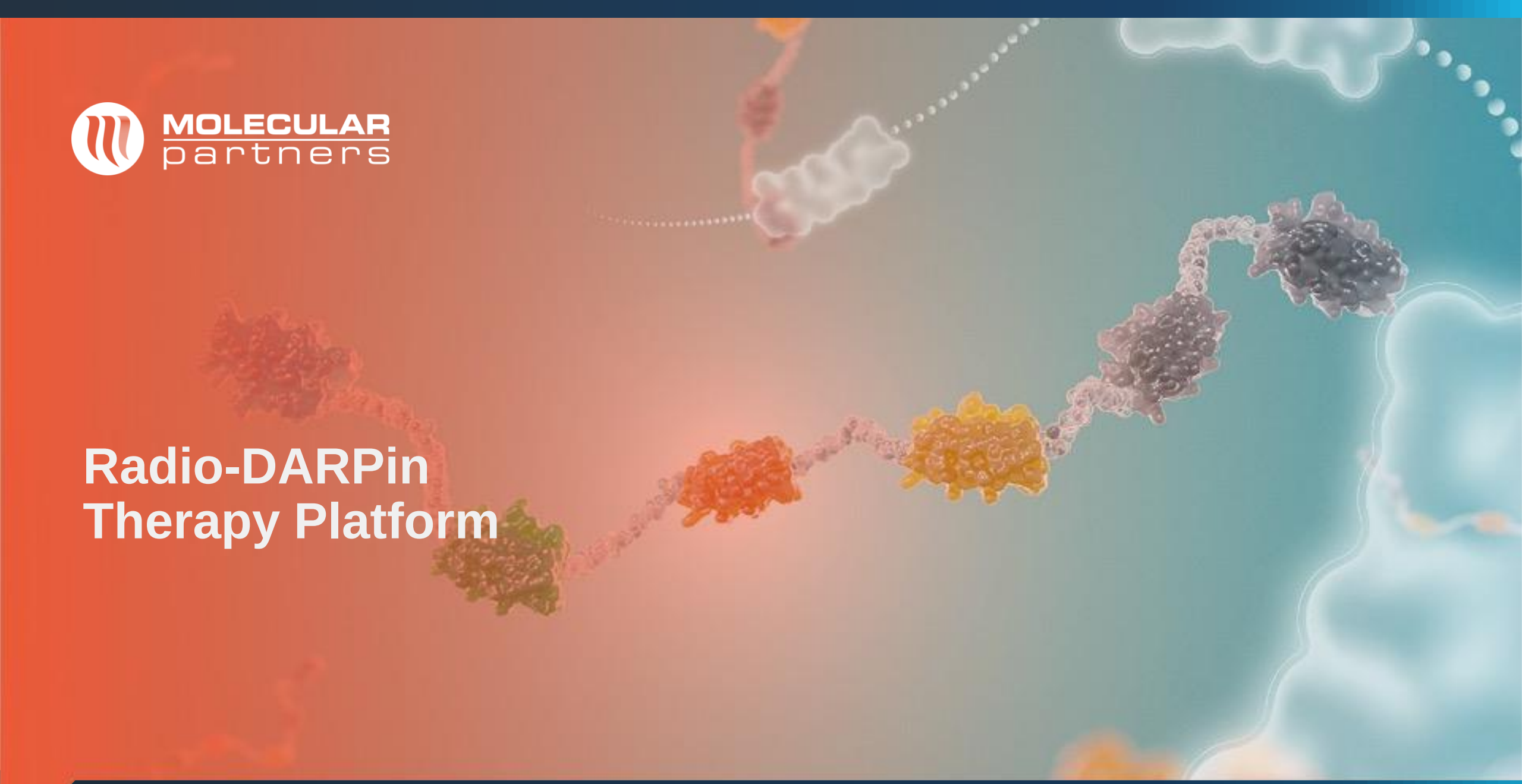
PK/PD Biomarkers

Study open and recruiting, initial results up to DR 4 to be presented at ASH 2023

MOLECULAR partners

**Data cut off: July 20, 2023*

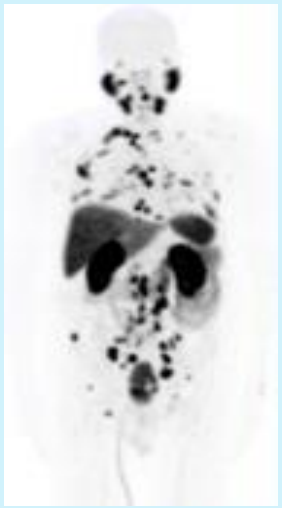
AML, acute myeloid leukemia; MDS, myelodysplastic syndrome; CT, chemotherapy; DLT, dose-limiting toxicity; HMA, hypomethylating agent; HSCT, hematopoietic stem cell transplantation; N, number of patients; PK, pharmacokinetics; PD, pharmacodynamic; R/R, relapsed/refractory; DR, dose regimen; ASH, American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



Radio-DARPin Therapy Platform

Precision Oncology by Targeted Radioligand Therapy

Effective radioligands deliver a sufficiently large dose of radioactivity to the tumor for cell killing, while sparing healthy tissues



Ligand:
Specific targeting of tumor cells

Therapeutic radioisotope:
DNA damage to kill tumor cells

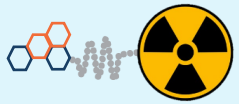
PET/CT scan pictures adapted from Sathekge M, Bruchertseifer F, Knoesen O et al. 225Ac-PSMA-617 in chemotherapy-naive patients with advanced prostate cancer: a pilot study. Eur J Nucl Med Mol Imaging 46, 129–138 (2019). https://doi.org/10.1007/s00259-018-4167-0.

Radio-DARPin Therapeutics (RDTs): Platform to Expand the Targetable Space in Nuclear Oncology

IDEAL RADIO PLATFORM PROPERTIES

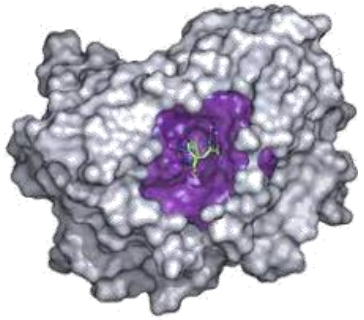
- High affinity
- High specificity
- Short systemic half-life
- Low kidney uptake
- **Broad target range**

RLTs



Most effective for

Targets where a small molecule ligand with high affinity & specificity can be generated or is available

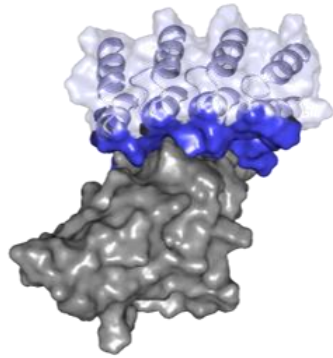


Example targets: PSMA…

RDTs

Most effective for

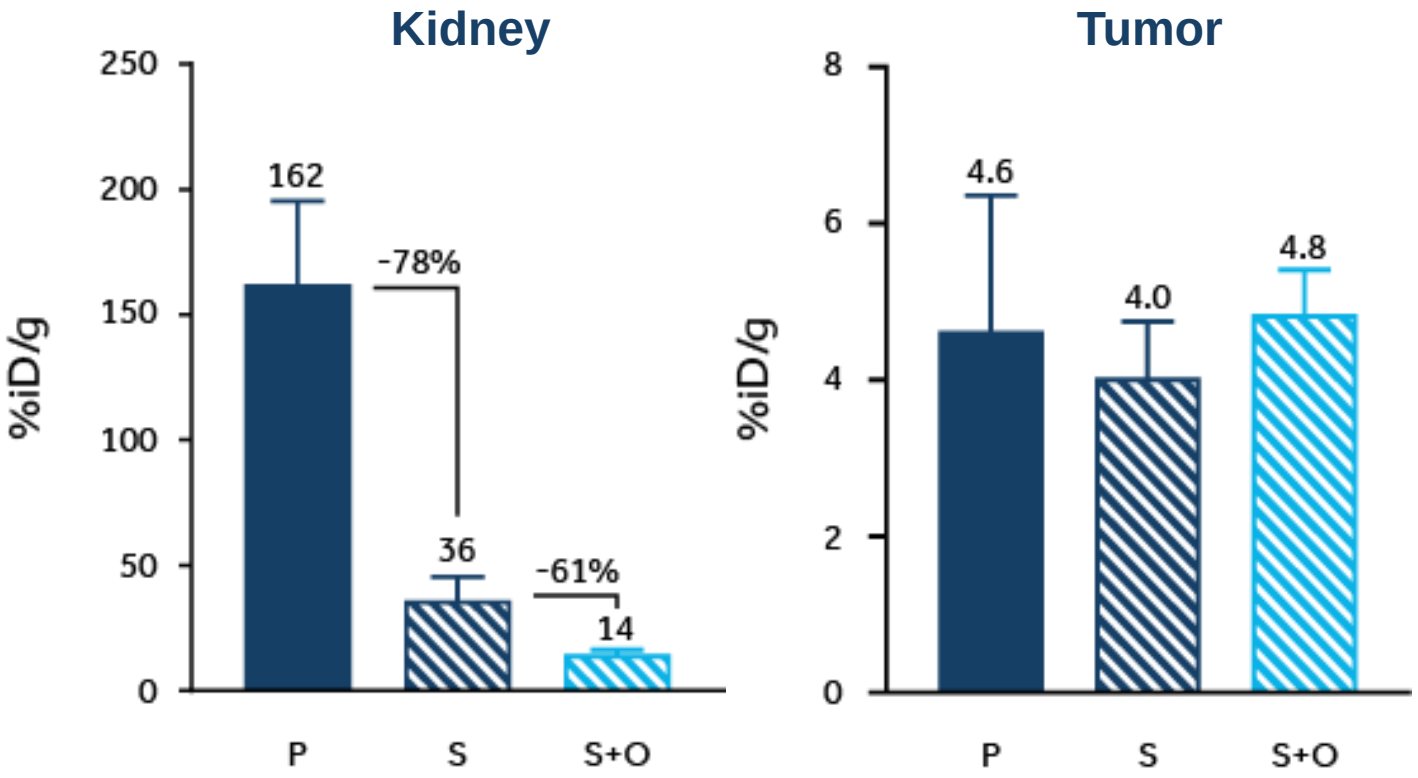
Targets that are challenging for peptides or small molecules (for desired specificity & affinity)



Example targets: Her2, DLL3, …

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.

Surface Engineered Radio-DARPins Show Strongly Reduced Kidney Update

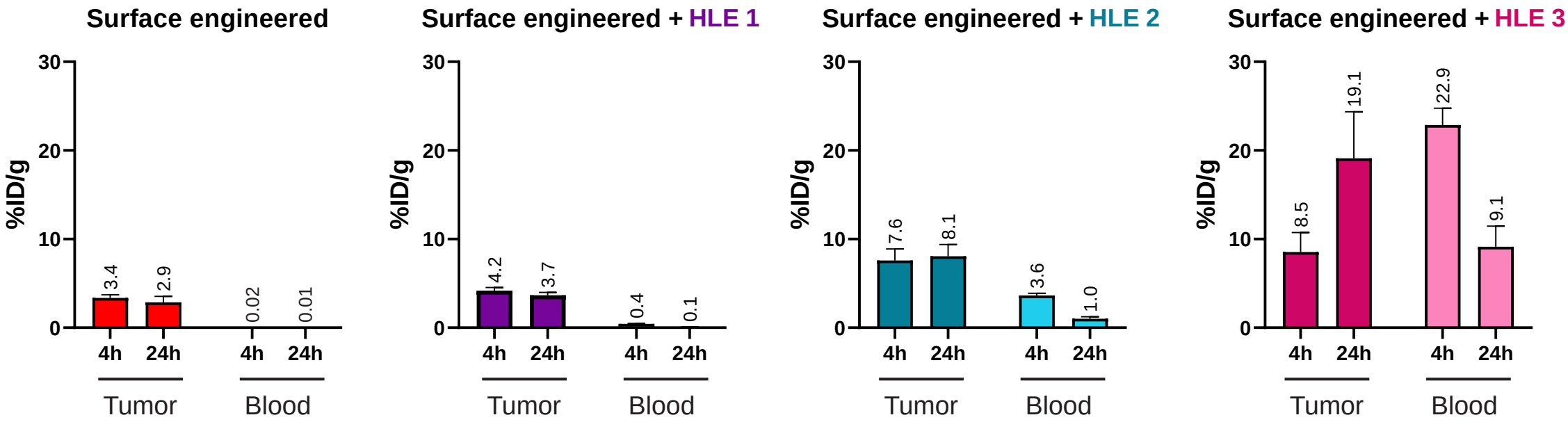


After 4 hour timepoint	T/K*
P: Parental	1/35
S: Surface Engineered	1/9
S+O: Surf. Eng. + Orthogonal + O**	1/3

*tumor to kidney ratio

**Orthogonal = MP proprietary kidney blocking or saturating agent

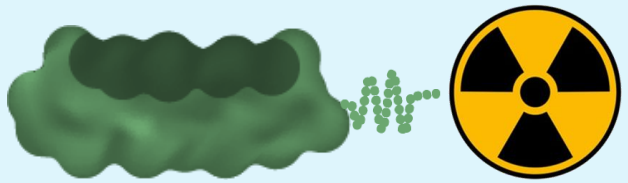
Systemic Half-life Extension (HLE) Increases Tumor Uptake



- 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 & payloads**

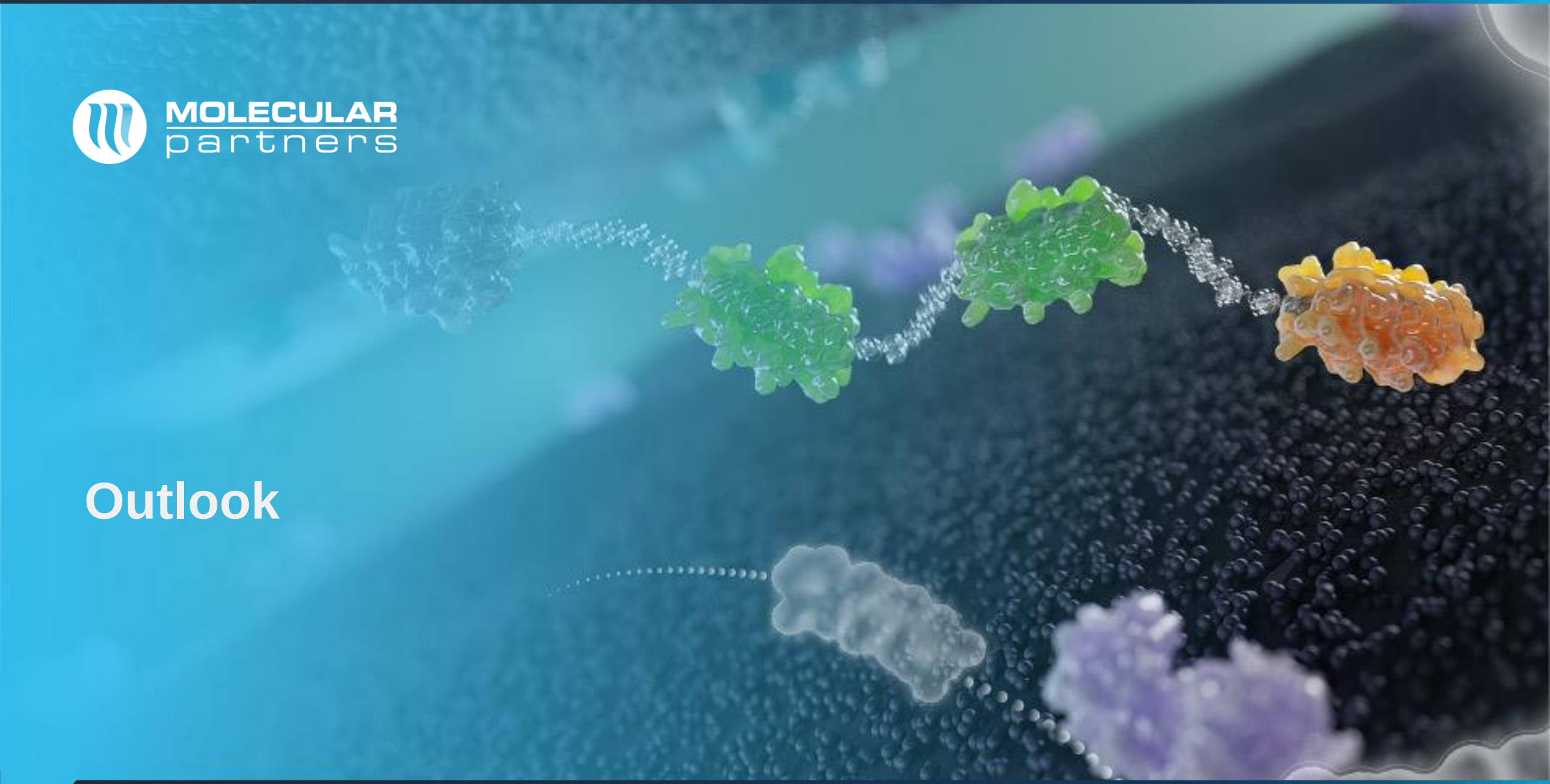
Collaborating with World Leader in Radio-Oncology

NOVARTIS



- $20m up front*
- Up to $560m in potential milestones
- Up to double-digit royalties
- Exclusive for two tumor antigens

Outlook



Outlook & Upcoming Milestones

MP0533	• **Initial encouraging Phase 1 results in R/R AML at ASH 2023** • Additional data (response durability and depth) expected 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 • Establish clinical and supply collaborations with radionuclide companies
Next Opportunities for DARPins	• Presentation of **SWITCH concept** at PEGS Europe 2023 • **Leverage DARPin platform** for next-generation immune cell engagers

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; PEGS, Protein & Antibody Engineering Summit.