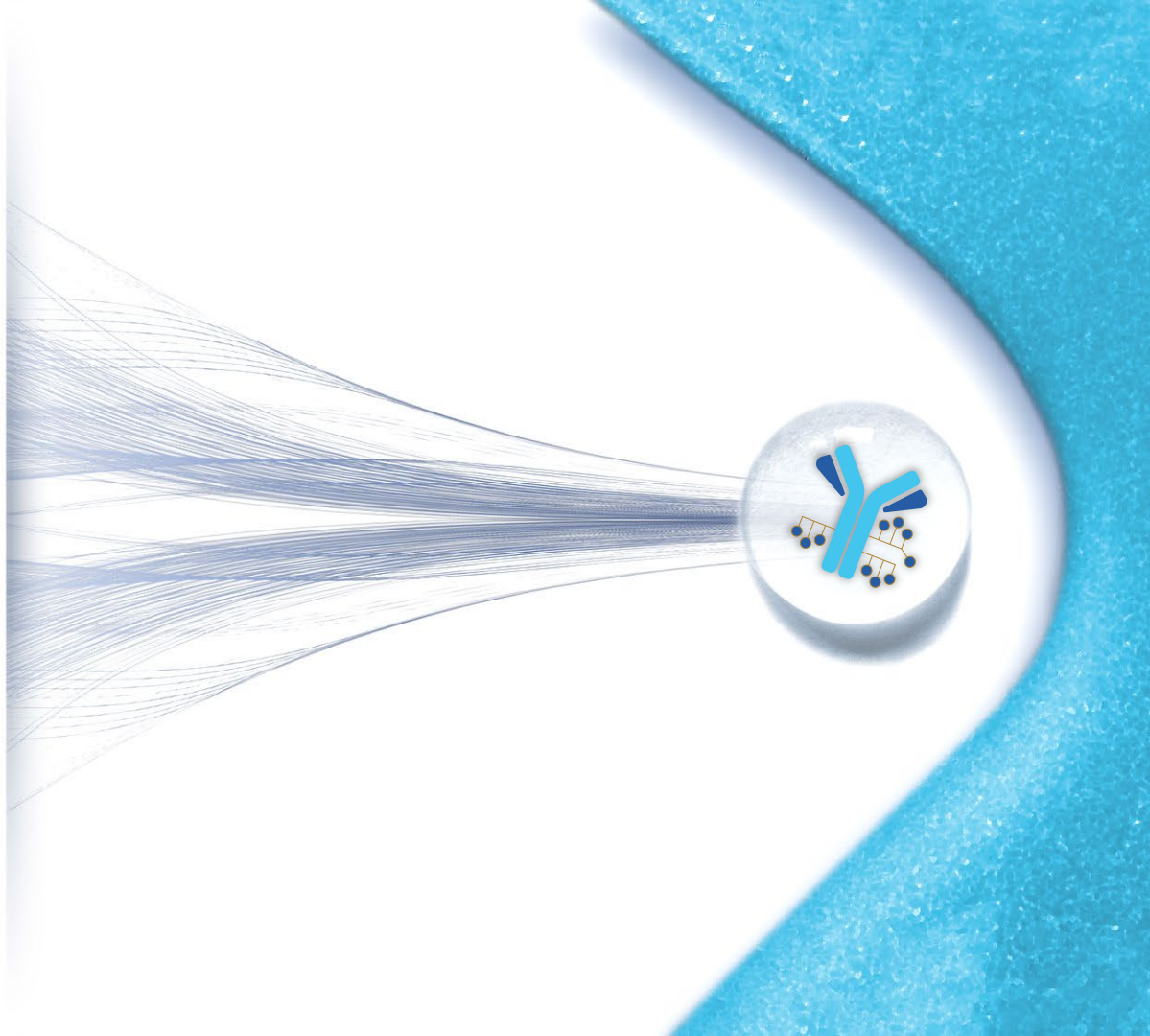
Mersana THERAPEUTICS

Interim Data from the Ovarian Cancer Expansion Cohort and Next Steps for UpRi Development Plan

September 10, 2021



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Copies of the Company’s Quarterly Report on Form 10-Q and our other SEC filings are available by visiting EDGAR on the SEC website at http://www.sec.gov.

Today's Agenda

Topic	Speaker
• Opening Remarks	Anna Protopapas, President & CEO
• Interim Data from the Ovarian Cancer Expansion Cohort of the UpRi Phase 1 Study	Debra L. Richardson, MD, Associate Professor and Section Chief, Division of Gynecological Oncology at OU Health Stephenson Cancer Center and the Sarah Cannon Research Institute

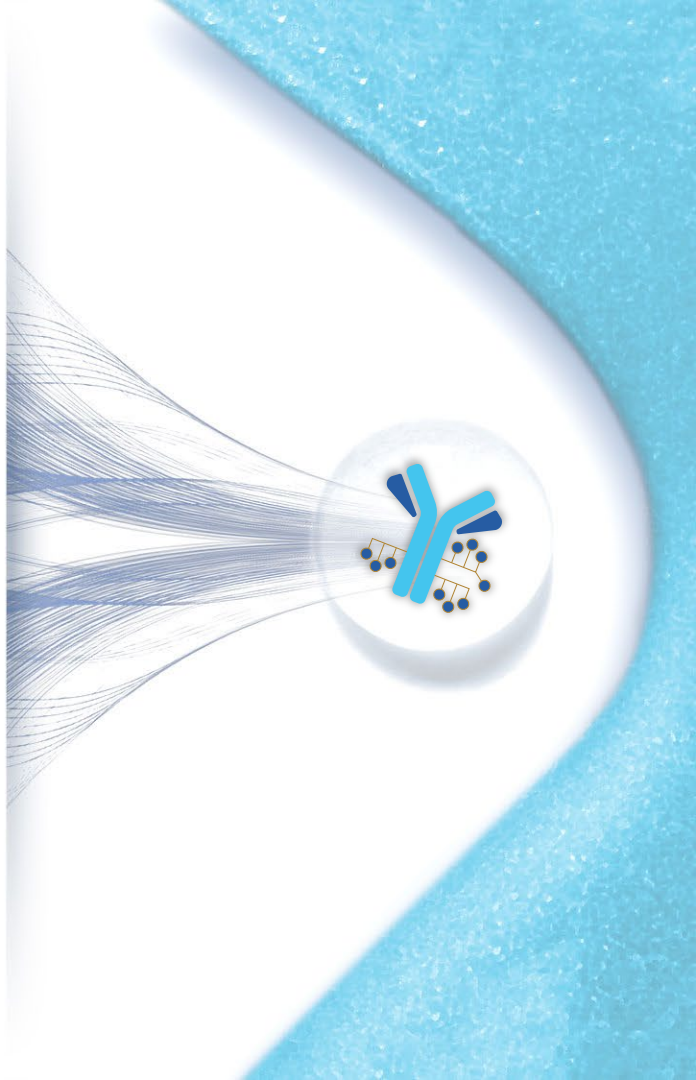
• UpRi Development Plan:
  • UPLIFT Update
  • UP-NEXT Phase 3 Maintenance Study
	Arvin Yang, MD, PhD, Chief Medical Officer

• Closing Remarks	Anna Protopapas, President & CEO
• Q&A	

UpRi: First-in-Class Dolaflexin ADC Targeting NaPi2b

Interim Data from the Ovarian Cancer Expansion Cohort of the UpRi Phase 1 Study

Debra L. Richardson, MD
Associate Professor and Section Chief, Division of Gynecological Oncology at OU Health Stephenson Cancer Center and the Sarah Cannon Research Institute



Significant Unmet Medical Need in Platinum-Resistant Ovarian Cancer

With PARPi and bevacizumab increasingly used in earlier lines, the current standard of care is single agent chemotherapies

Study	Demographics	Control Arm	Control Arm Performance
Forward I ESMO 2019 Annals of Oncology 2021; 32(6):757-765	1 – 3 Prior Median 2 Prior Prior PARPi: 10% Prior Bev: 47%	PLD, Topotecan, Weekly Paclitaxel	ORR 12%
Javelin 200 SGO 2019	1 – 3 Prior Median 2 Prior	PLD	ORR 4%
Corail ESMO 2018	1 – 3 Prior Median 2 Prior Prior PARPi: 5% Prior Bev: 46%	PLD or Topotecan	ORR 12%

Design for the Ovarian Cancer Expansion Cohort of the UpRi Phase 1 Study

Ovarian Cancer Cohort

- 1-3 prior lines in platinum resistant
- 4 prior lines regardless of platinum status
- High grade serous histology
- Archived tumor and fresh biopsy (if medically feasible) for NaPi2b
- Exclusion: primary platinum-resistant defined as lack of response or disease progression within 3 mos after completing front-line platinum containing therapy

Patient population: High grade serous ovarian cancer (including fallopian tube and primary peritoneal cancer) progressing after standard treatments

- Measurable disease per RECIST v1.1
- ECOG Performance Status 0 or 1

Dosing: IV every 4 weeks until disease progression or unacceptable toxicity

- 36 mg/m^2 cohort initiated in August 2019 and enrollment closed
- 43 mg/m^2 cohort initiated in December 2019 and enrollment is closed; 43 mg/m^2 up to a maximum of ~80 mg total evaluated in EXP*

Primary Objectives:

- Evaluate safety and tolerability of MTD or RP2D
- Assess preliminary efficacy (ORR, DCR)

Secondary Objectives:

- Association of tumor NaPi2b expression and objective tumor response using an immunohistochemistry (IHC) assay with a broad dynamic range to distinguish tumors with high and low NaPi2b expression
- Further assessment of preliminary anti-neoplastic activity (DOR)

Assessments:

- Tumor imaging (MRI or CT): baseline and every 2nd cycle; response assessed per RECIST v1.1

*Maximum Doses are Common in Oncology Drug Development (e.g., ADCETRIS®, PADCEV®, Mylotarg™)

Abbreviations: mos = months; EXP = expansion; RECIST = Response Evaluation Criteria in Solid Tumors; ECOG = Eastern Cooperative Oncology Group; MTD = maximum tolerated dose; ORR = objective response rate; DCR = disease control rate; DOR = duration of response

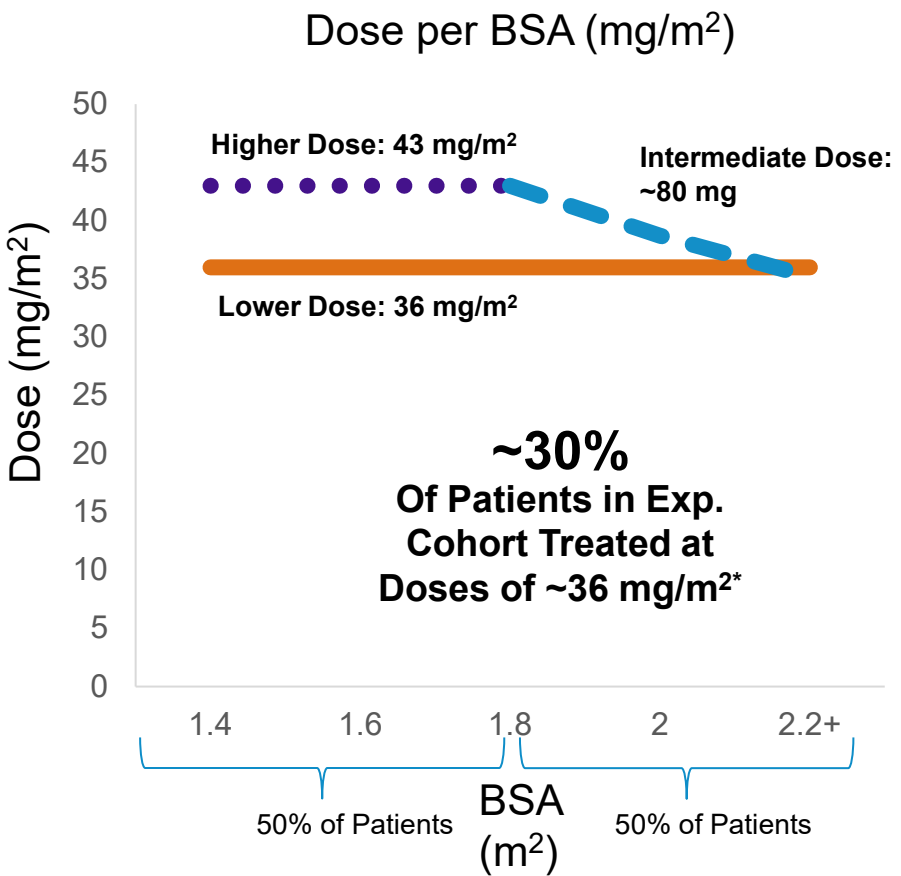
Expansion Cohort Experience Across a Range of Doses Allows for Further Optimization of UpRi Profile

Doses Studied in Expansion

36 mg/m² (N=12)

43 mg/m²

BSA < 1.8	BSA ≥ 1.8
43 mg/m² (N=39)	~80 mg (N=46)



*Doses from 33 mg/m² to 38 mg/m² (n=29)

Patient Demographics and Disease Characteristics

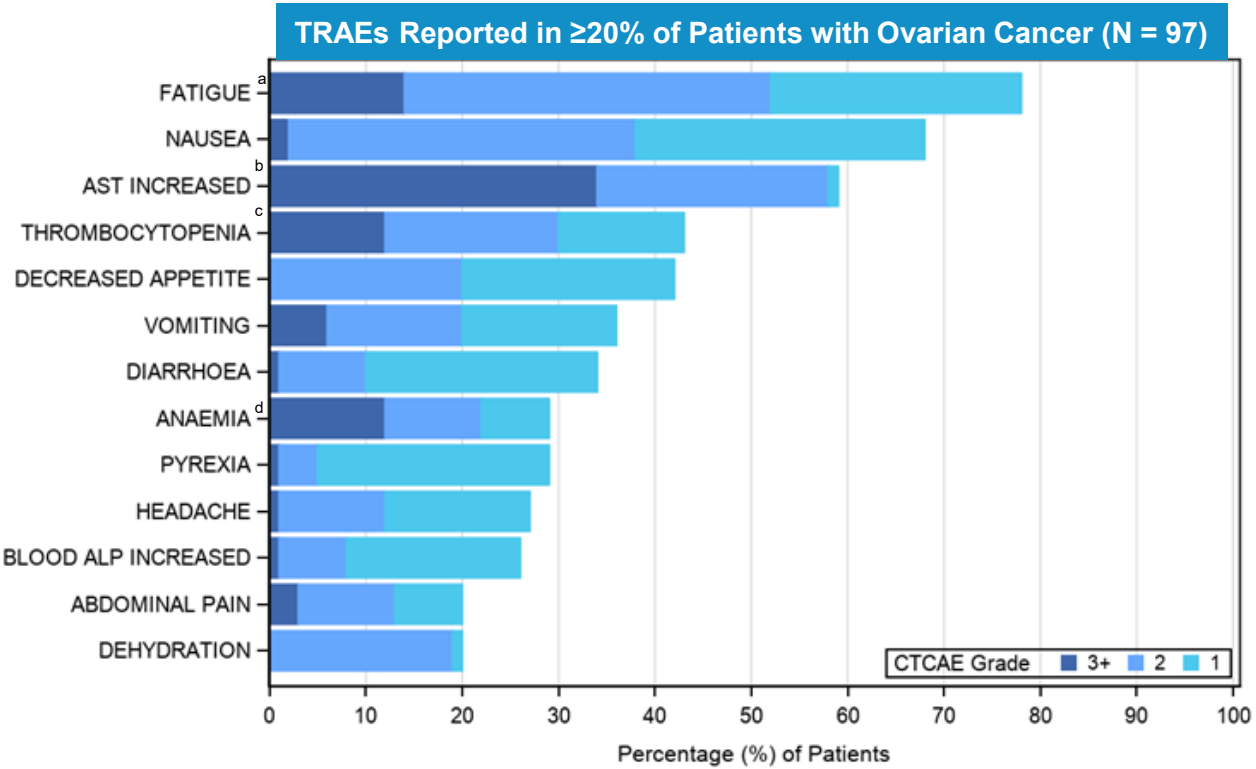
Data Cut: June 10, 2021

Ovarian Cancer Expansion Patients (N = 97)		
Age; years	Median (range)	68 (33, 87)
ECOG Performance Status; n (%)	0 1	33 (34) 64 (66)
Baseline BSA	≥ 1.8 m^2 ≥ 2.2 m^2	51 (53) 5 (5)
Primary Tumor Type; n (%)	Ovarian Fallopian Tube Primary Peritoneal	72 (74) 15 (15) 8 (8)
Prior Lines of Therapy; n (%)	1-3 4+[a]	65 (67) 32 (33)
Prior Therapy; n (%)	Bevacizumab PARP inhibitor	68 (70) 57 (59)
Platinum-free Interval[b]; n (%)	0-3 mos >3-6 mos >6 mos[c] Unknown[d]	34 (35) 46 (47) 10 (10) 7 (7)
BRCA1/2 Mutation; n (%)	Yes No Unknown[e]	15 (15) 65 (67) 17 (18)
NaPi2b TPS[f]; n (%)	Determined High Low Not Yet Determined (ND)	78 (80) 50 (64) 28 (36) 19 (20)

[a] Three patients enrolled with 5 prior lines of systemic therapy. [b] Platinum-free interval defined as the time between the last cycle of most recent platinum-containing regimen and evidence of disease progression; determined from treatment dates and/or clinic notes. [c] All patients had received 4 or 5 lines of prior therapy. [d] Treatment dates missing/not provided; unable to determine. [e] BRCA1/2 mutation status not available/not reported. [f] High NaPi2b Expression: Tumor Proportion Score (TPS) ≥75; Low NaPi2b Expression: TPS <75; ND = NaPi2b Expression not yet determined or tissue not available

UpRi Continues to Have a Consistent Tolerability Profile

No grade ≥ 3 (severe) TRAEs of neutropenia, peripheral neuropathy, or ocular toxicity have been reported



Data Cut: June 10, 2021

[a]Fatigue includes preferred terms of asthenia and fatigue; [b]AST increase is transient in nature, recovers to baseline or to Grade 1 prior to the next dose, no instances are associated with elevated bilirubin or cases of Hy's law; [c]Thrombocytopenia includes preferred terms of platelet count decreased and thrombocytopenia. Thrombocytopenia is transient in nature, nadirs at Day 8 and recovers prior to the next dose; [d]Anaemia includes preferred terms of anaemia of chronic disease, blood loss anaemia and iron deficiency anaemia

Decreased Grade 3+ Treatment Related AEs with Lower Dose

	Lower Dose 36 mg/m^2	Intermediate Dose ~80 mg	Higher Dose 43 mg/m^2
≥ Grade 3 Fatigue	1 (8%)	6 (13%)	9 (23%)
≥ Grade 3 Increased AST	1 (8%)	16 (35%)	16 (41%)
≥ Grade 3 Pneumonitis	0 (0%)	0 (0%)	4* (10%)

* 2 cases of Grade 5 pneumonitis including 1 previously reported; most recent case was in a 75-year-old 4th line recurrent ovarian cancer patient treated at higher dose of 43 mg/m^2 (BSA 1.47 m^2, 105 lb) with past medical history of poor pulmonary reserve: asthma and chronic obstructive pulmonary disease requiring intermittent supplemental oxygen at baseline, coronary artery disease and congestive heart failure

Data Cut: June 10, 2021

Observed Consistent Tolerability Profile with Limited Discontinuations due to TRAE

Dose modification due to Treatment-Related Adverse Events (TRAEs):

- Of the 97 patients, 43 (44%) had dose delay, reduction, and/or discontinuation due to a TRAE
  - Dose reductions due to TRAEs occurred in 27 (28%) patients
  - Dose delays due to TRAEs occurred in 16 (16%) patients
  - Dose discontinuation (withdrawn) due to TRAEs occurred in 10 (10%) patients

Treatment-Emergent Severe Adverse Events (SAEs) reported in ≥ 5% of Patients:

- Out of 97 patients, 47 (48%) reported Treatment-Emergent SAEs. The most frequent of which were Gastrointestinal Obstruction 7 (7%), 5 (5%) each for Pyrexia, Pneumonitis, and Abdominal Pain
- 22 (23%) of the SAEs were deemed by the investigator to be treatment-related

Data Cut: June 10, 2021

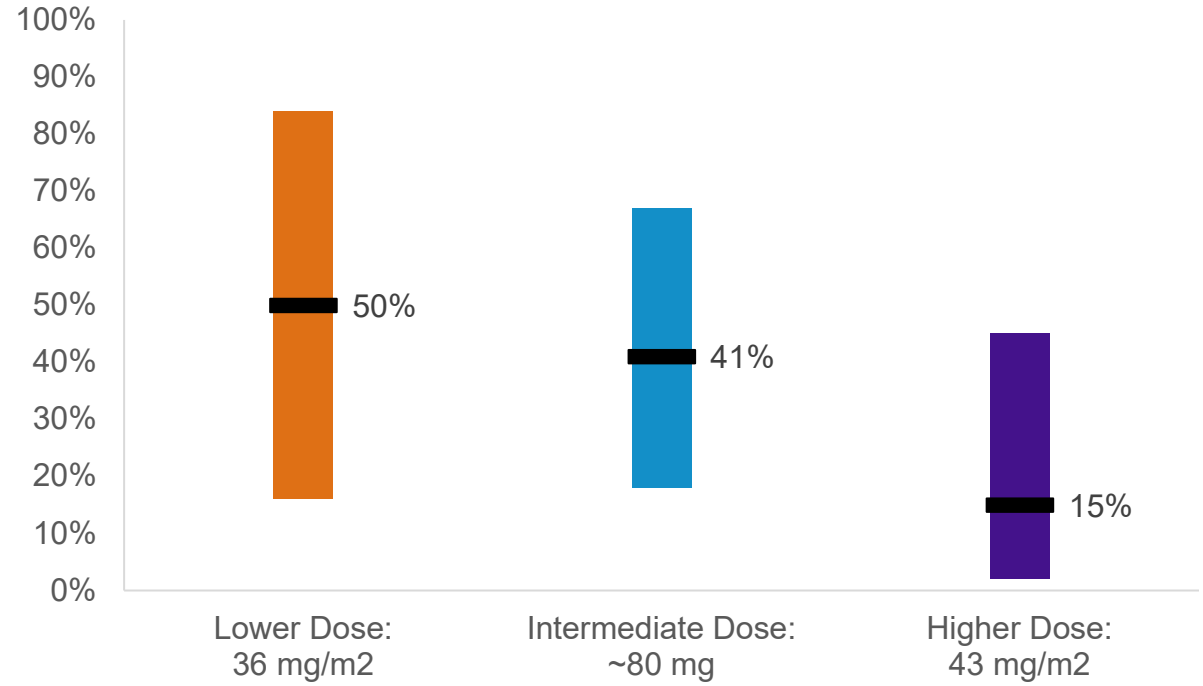
Consistent Activity Observed in Heavily-Pretreated Ovarian Cancer

Best Response in Evaluable Patients with Ovarian Cancer (n = 75)				
	NaPi2b High (TPS≥75)	NaPi2b Low (TPS<75)	Not Yet Determined NaPi2b	All Patients
N	**38**	**23**	**14**	**75**
CR	2 (5)	0	0	2 (3)
PR	11 (29)	2 (9)	2 (14)	15 (20)
uPR	1 (3)	0	2 (14)	3 (4)
SD	19 (50)	8 (35)	7 (50)	34 (45)
PD	5 (13)	13 (57)	3 (21)	21 (28)
Confirmed ORR	**13 (34)**	**2 (9)**	**2 (14)**	**17 (23)**
DCR	**33 (87)**	**10 (43)**	**11 (79)**	**54 (72)**

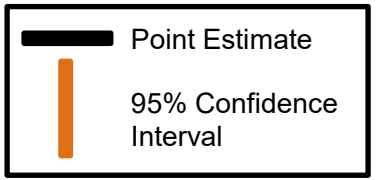
Data Cut: June 10, 2021
CR = complete response; PR = partial response; uPR = unconfirmed PR; confirmatory scan pending at the time of the data cut
ORR = Objective Response Rate; DCR = Disease Control Rate
22 patients were not evaluable by RECIST 1.1: 10 deaths (4 disease progression, 2 pneumonitis, 2 sepsis, 1 viral pneumonia, 1 unknown); 5 patient withdrawals; 1 enrolled in hospice; 1 clinical progression; 4 discontinued treatment; 1 had not yet reached first scan

Similar Efficacy Across the Three Dose Levels, with Trend to Higher Efficacy with Lower Dose

Confirmed ORR with 95% Confidence Interval
NaPi2b High, RECIST-Evaluable (N=38)



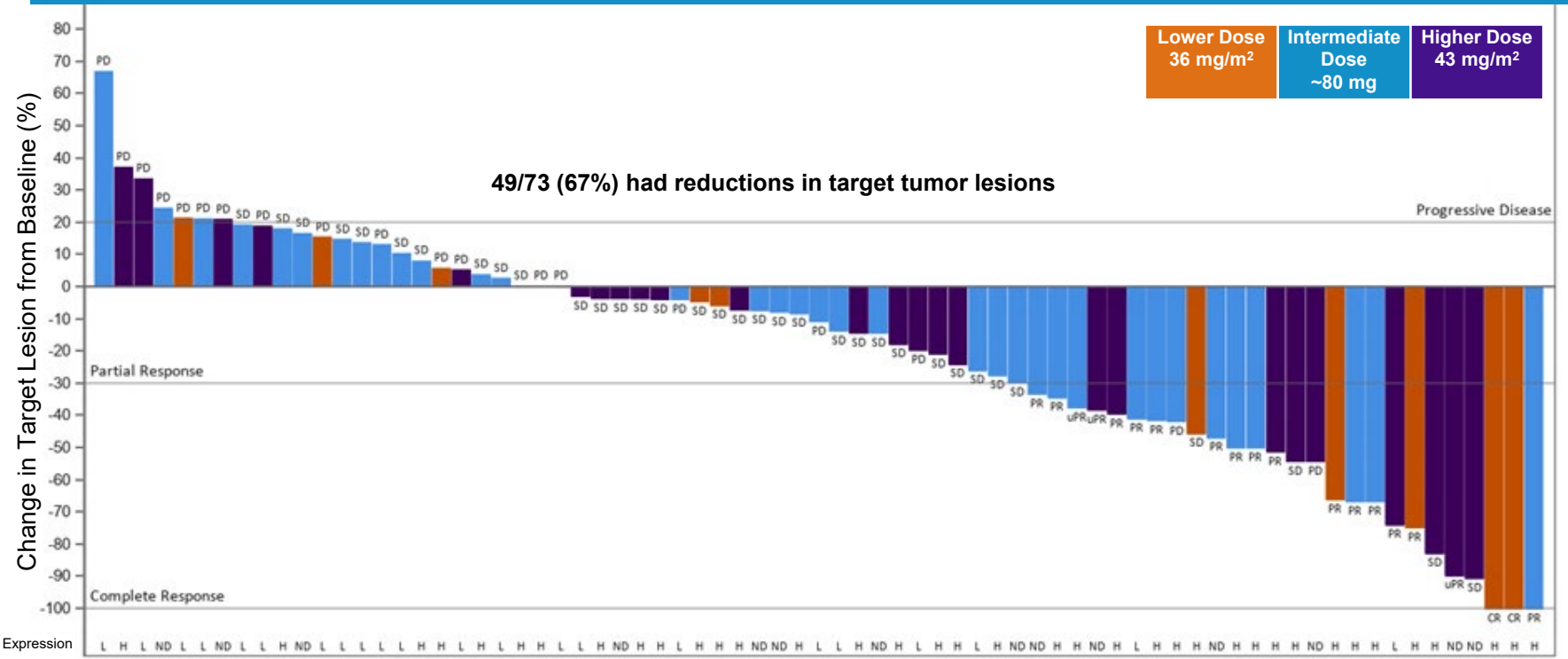
- Data trends consistent in the overall population



Data Cut: June 10, 2021
NaPi2b High based on TPS≥75

Two-Thirds of Patients Had Reductions in Target Tumor Lesions

Maximum % Change from Baseline in Target Lesions in Evaluable Patients with Ovarian Cancer (n=73*)

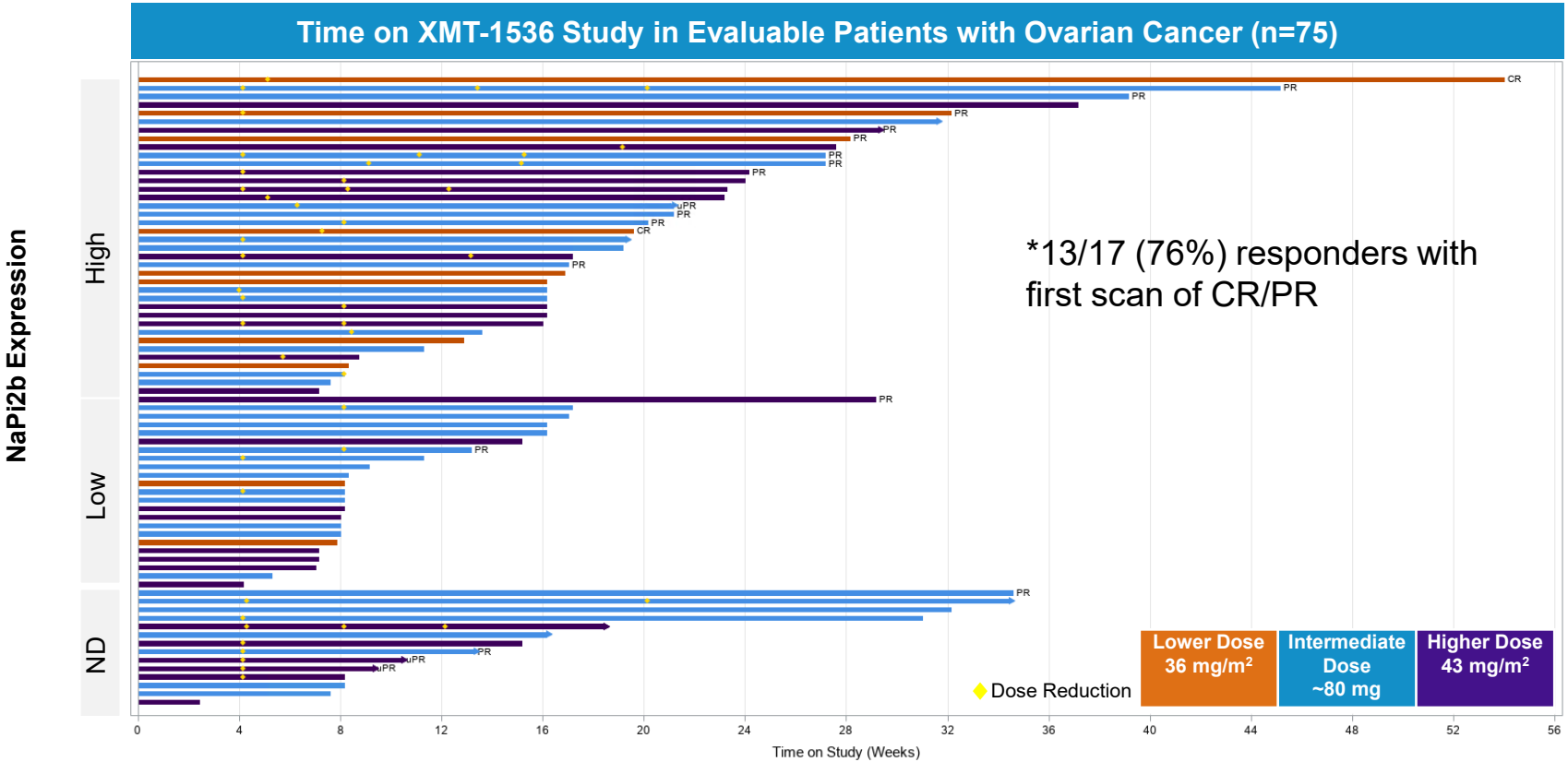


Data Cut: June 10, 2021

2 pts excluded as post-baseline tumor measurement shows "Not Measurable", yet "PD" was assigned by Investigator in the response dataset

Abbreviations: CR = complete response; PR = partial response; uPR = unconfirmed PR; H = High NaPi2b Expression; L = Low NaPi2b Expression; ND = NaPi2b Expression not yet determined or tissue not available

Trend to Longer Time on Study with High NaPi2b Expression

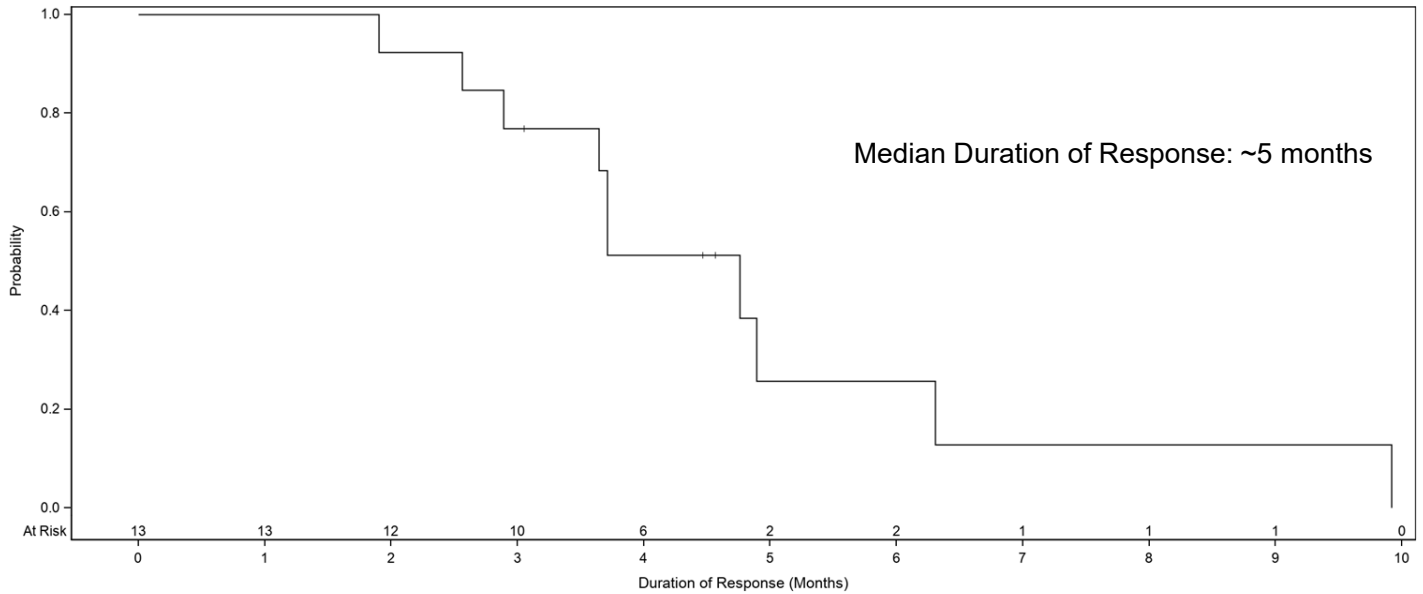


Data Cut: June 10, 2021

Abbreviations: CR = complete response; PR = partial response; uPR = unconfirmed PR; High = High NaPi2b Expression; Low = Low NaPi2b Expression; ND = NaPi2b Expression not yet determined or tissue not available

Median Duration of Response Consistent at ~5 Months in Patients with High NaPi2b Expression

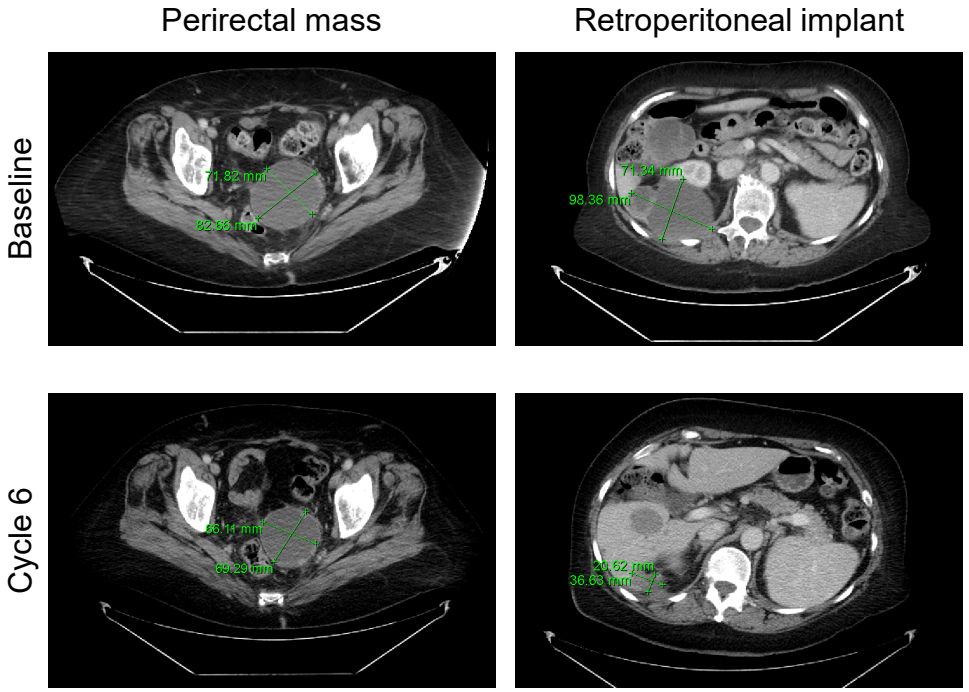
Duration of Response in Patients with NaPi2b High Ovarian Cancer (n=13)



Data Cut: June 10, 2021

*The median duration of response for NaPi2b Low and NaPi2b not yet determined expression is 3.9 months and 3.7 months, respectively.

Partial Response in a Patient with Ovarian Cancer Dosed at 36 mg/m^2 for a Total of 9 Cycles



- 66-year-old patient with BRCA1/2 negative high-grade serous ovarian cancer
- NaPi2b High (TPS≥75)
- 4 prior lines of systemic therapies including carboplatin/taxol/bevacizumab; carboplatin/doxil with PARP inhibitor maintenance; and cisplatin/paclitaxel
- Received 36 mg/m^2 (maximum dose of approximately 80 mg with a BSA of 2.16 m^2)
- Received 9 Cycles of UpRi
- Confirmed PR by RECIST v1.1 with -41.4% tumor reduction

Conclusions: UpRi Expansion in Ovarian Cancer

- In this updated analysis of patients with heavily-pretreated ovarian cancer, UpRi continued to be generally well-tolerated with a consistent profile – no severe neutropenia, peripheral neuropathy, or ocular toxicity
- Consistent antitumor activity observed with UpRi, including patients previously treated with bevacizumab and PARPi
  - Complete response observed in 2 patients with platinum-resistant ovarian cancer at the lower dose
  - Confirmed ORR of 34% and DCR of 87% in NaPi2b High population
  - Median duration of response ~5 months in NaPi2b High population
- This larger data set provides important observations to support the potential of UPLIFT as a registration strategy and to inform next steps in the UpRi development plan
  - Decreased grade 3+ Treatment Related AEs, including pneumonitis, with lower dose
  - Similar efficacy across the three dose levels, with trend toward higher efficacy with lower dose

Acknowledgements

We thank the patients, their families and caregivers for their contribution to this study

UNTED STATES
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Dana Farber Cancer Institute, Boston, MA
Emory University, Atlanta, GA
Fox Chase Cancer Center, Philadelphia, PA
H. Lee Moffitt Cancer Center, Tampa FL
Henry Ford Medical Center, Detroit, MI
Greenville Hospital System University Medical Center, Greenville, SC
Lahey Clinic, Burlington, MA
Levine Cancer Center, Charlotte, NC
Mary Crowley Cancer Research Center, Dallas, TX
Maryland Oncology and Hematology, Rockville, MD
Massachusetts General Hospital, Boston, MA
Mount Sinai, New York City, NY
NEXT Oncology, San Antonio, TX
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British Columbia Cancer Agency, Vancouver
AUSTRALIA
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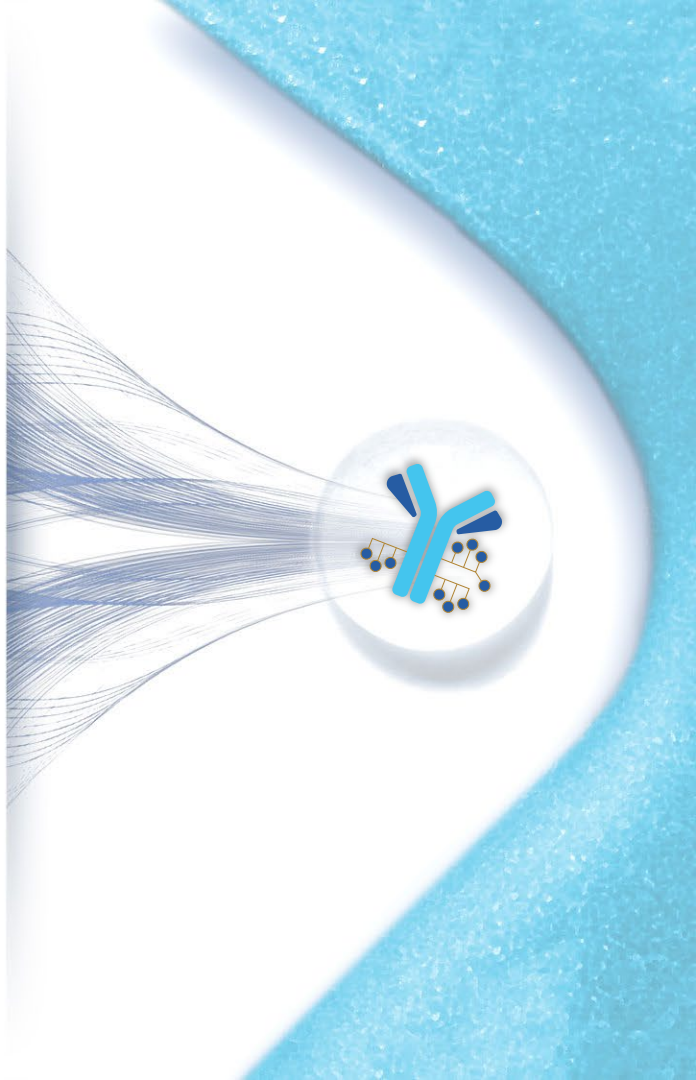
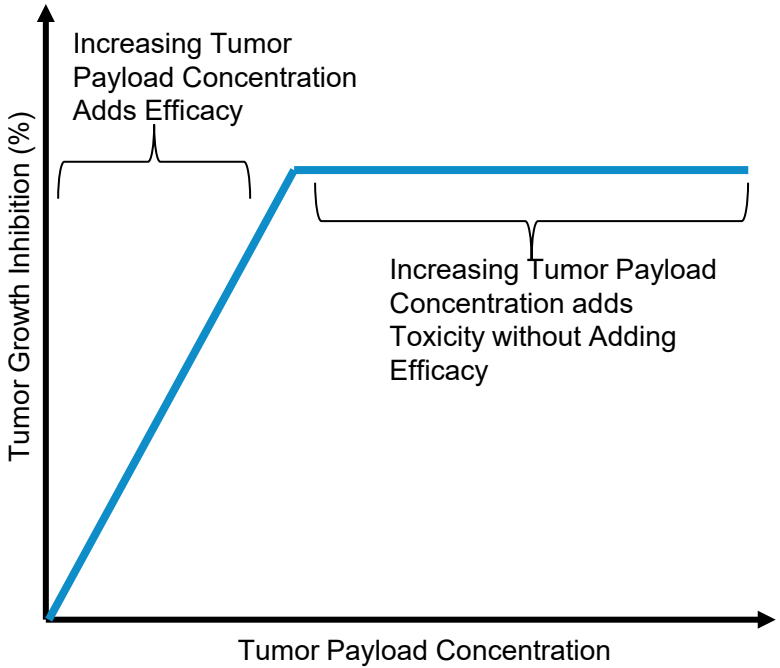
Next Steps for UpRi Development Plan



Increasing Dose Beyond the Optimal Threshold May Add Incremental Toxicity without Incremental Efficacy

Correlation of ADC Efficacy and Tumor Payload Concentration



Source: Drug Metab Dispos 47:1146–1155, October 2019

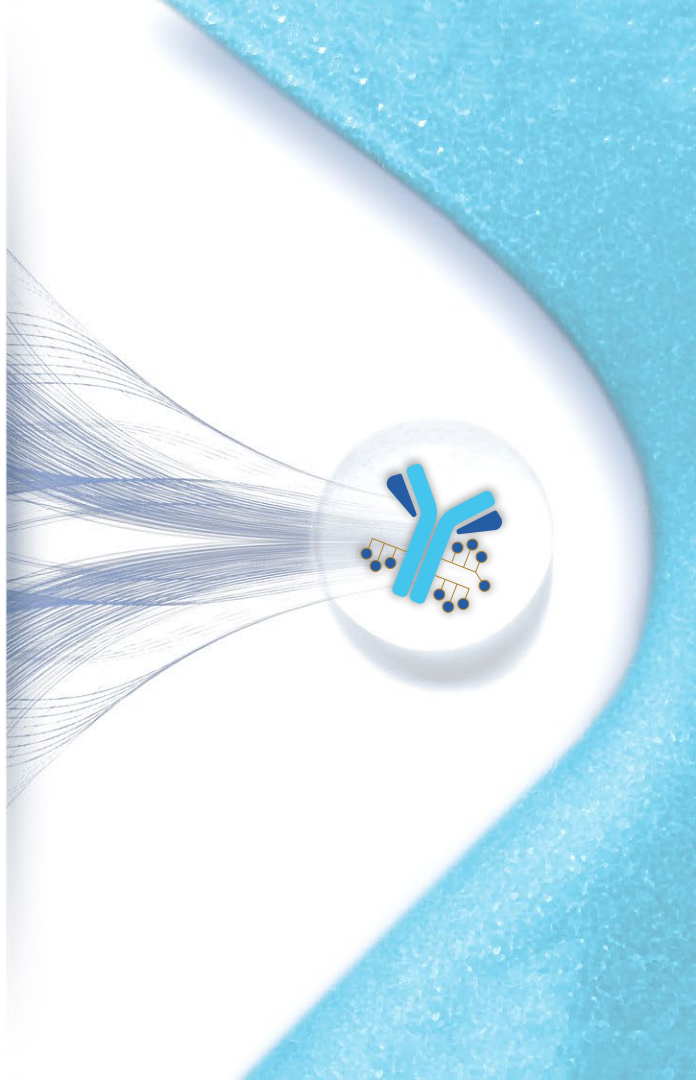
- Further analysis utilizing population PK models confirmed the efficacy and safety findings showing the association between increasing exposure and G3+ adverse events, including pneumonitis
- Preclinically, ADCs have a well-characterized exposure / response relationship
  - ADC efficacy increases with payload tumor concentration up to a plateau
  - Beyond this plateau, additional drug can decrease tolerability without improving efficacy
  - Preclinical data confirm relationship appears regardless of target, payload, linker, or platform

The Dose that Optimizes Therapeutic Index May Not be the Maximum Tolerated Dose

Action Plan to Implement Learnings from Expansion Cohort Data Set

- Data set from expansion cohort supports differentiated efficacy and tolerability profile
- Analysis of data combined with population PK modeling identifies the opportunity to further improve UpRi profile
- New UPLIFT Dose: 36 mg/m^2 up to a maximum of ~80 mg
  - ~15% or less change to dose
  - Potential to improve the therapeutic index of UpRi and the probability of success of UPLIFT
  - Implemented as amendment to the UPLIFT protocol with the support of investigators and cooperative groups
  - Proactively informed FDA
- Amendment is designed to optimize eligibility for management of pneumonitis
  - Exclude patients with severe uncontrolled pulmonary disease or cardiovascular disease, history of or suspected pneumonitis or interstitial lung disease, oxygen saturation or room air below 93%

UP-NEXT: UpRi Monotherapy vs. Placebo as Maintenance in Platinum-Sensitive Recurrent Ovarian Cancer



Despite Bevacizumab and PARPi Options, Significant Unmet Need Remains for New Maintenance Agents

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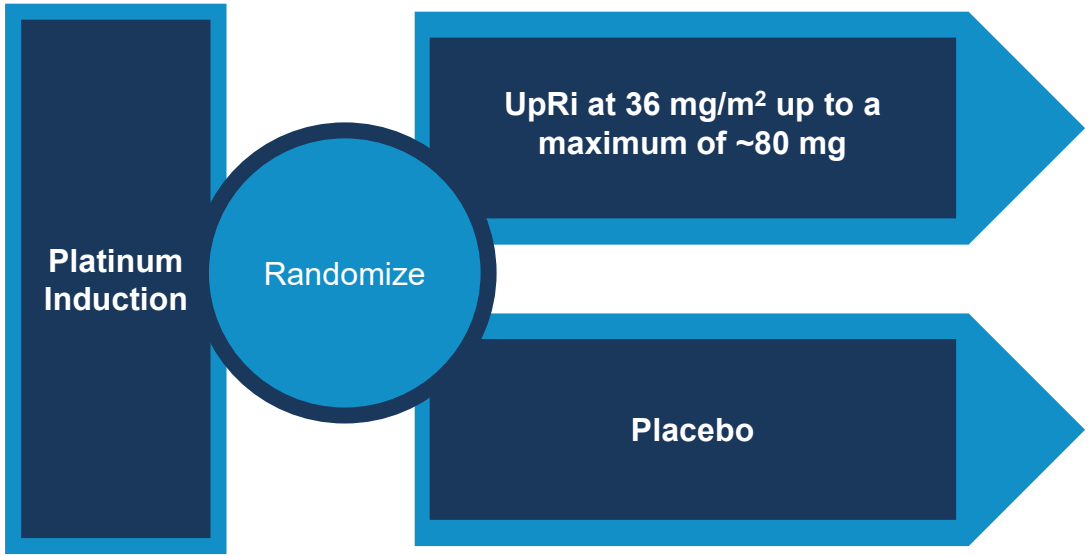
		UpRi Differentiation
Bevacizumab and PARP Moving into Earlier Lines and Combinations	• A population previously treated with bevacizumab and PARPi maintenance sequentially or in combination is emerging, with no standard of care upon relapse	Activity against Bev and PARPi Pre-Treated Disease
Watch & Wait Remains a Standard of Care for Some Patients	• Patients poorly served by current maintenance agents need additional options. Watch & wait remains an option in guidelines – 80% of patients without BRCA mutation (e.g., HRP, HRD) – Co-morbidities (e.g., hypertension, risk for bowel obstruction) – Tolerability (e.g., thrombocytopenia)	Optimized Dose with Differentiated Tolerability Profile and Biomarker Enrichment
PARPi Maintenance not Indicated for Stable Disease following Platinum	• PARPi activity is predicted by platinum responsiveness, patients that achieve stable disease to platinum were not included in PARPi maintenance studies • Emerging evidence of poor outcomes with platinum following PARPi may increase proportion achieving SD	Activity, including CRs, in Heavily Pre-Treated Patients

Source: Product labels; KOL interviews; NCCN Guidelines Aug 2021 OV-8; 813 MO ESMO 2020; Abstract 824P ESMO 2020; Abstract 828P ESMO 2020

UP-NEXT/GOG-3049: Phase 3 Study of UpRi Monotherapy Maintenance vs Placebo in Platinum-Sensitive Recurrent OC



Key Enrollment Criteria:

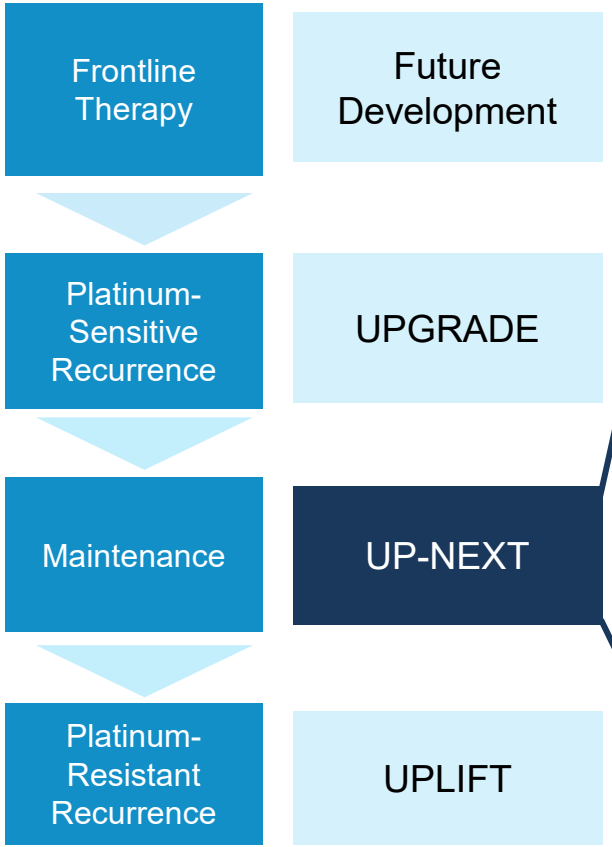
- Platinum-sensitive recurrence, following platinum induction
- NaPi2b High biomarker selection by TPS≥75
- 1 – 3 prior platinum-based regimes
- Prior PARPi therapy allowed, but only required for BRCAmut
- SD in addition to CR/PR as best response following platinum induction

Primary Endpoint:

- PFS

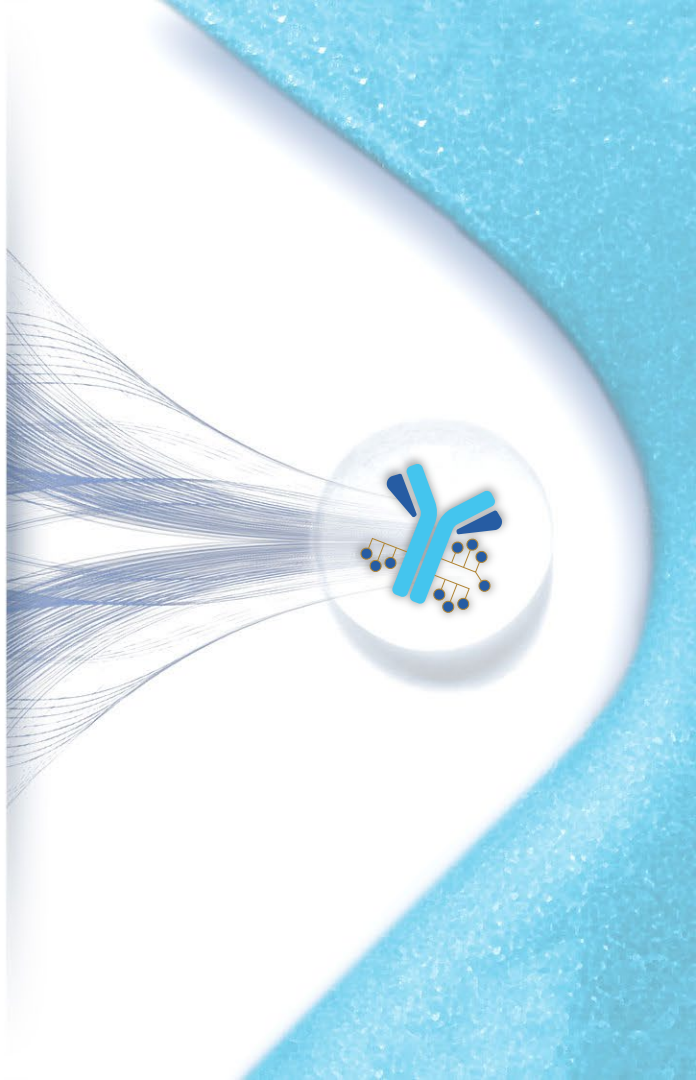
Informed by FDA Feedback, Final Design Pending CHMP Scientific Advice
Plans to Initiate in 2022

UP-NEXT Key Differentiators



- Platinum-Sensitive Population
  - Earlier in disease than UPLIFT population
  - Opportunity to be first ADC in earlier lines and platinum-sensitive disease
- UpRi Monotherapy
  - Randomized vs. placebo, potential for higher probability of success
- Broader Population than Existing Maintenance Options
  - Enrolls patients who have achieved stable disease to platinum doublet in addition to patients who achieve partial or complete responses
  - Enrolls patients with prior bevacizumab, prior PARPi, both, or neither
- Registration Intent
  - Intended to support global launches
  - If positive, could serve as confirmation of UPLIFT

Closing Remarks



Data Set Supports UpRi Profile and UPLIFT Registration Strategy

UpRi Profile

Meaningful and Durable Activity in Heavily-Pretreated Patients

>30% ORR with CRs in NaPi2b High Ovarian Cancer

Consistent Tolerability Profile

No Severe Neutropenia, Ocular Toxicity, or Peripheral Neuropathy

Robust, Predictive, and Reproducible Diagnostic

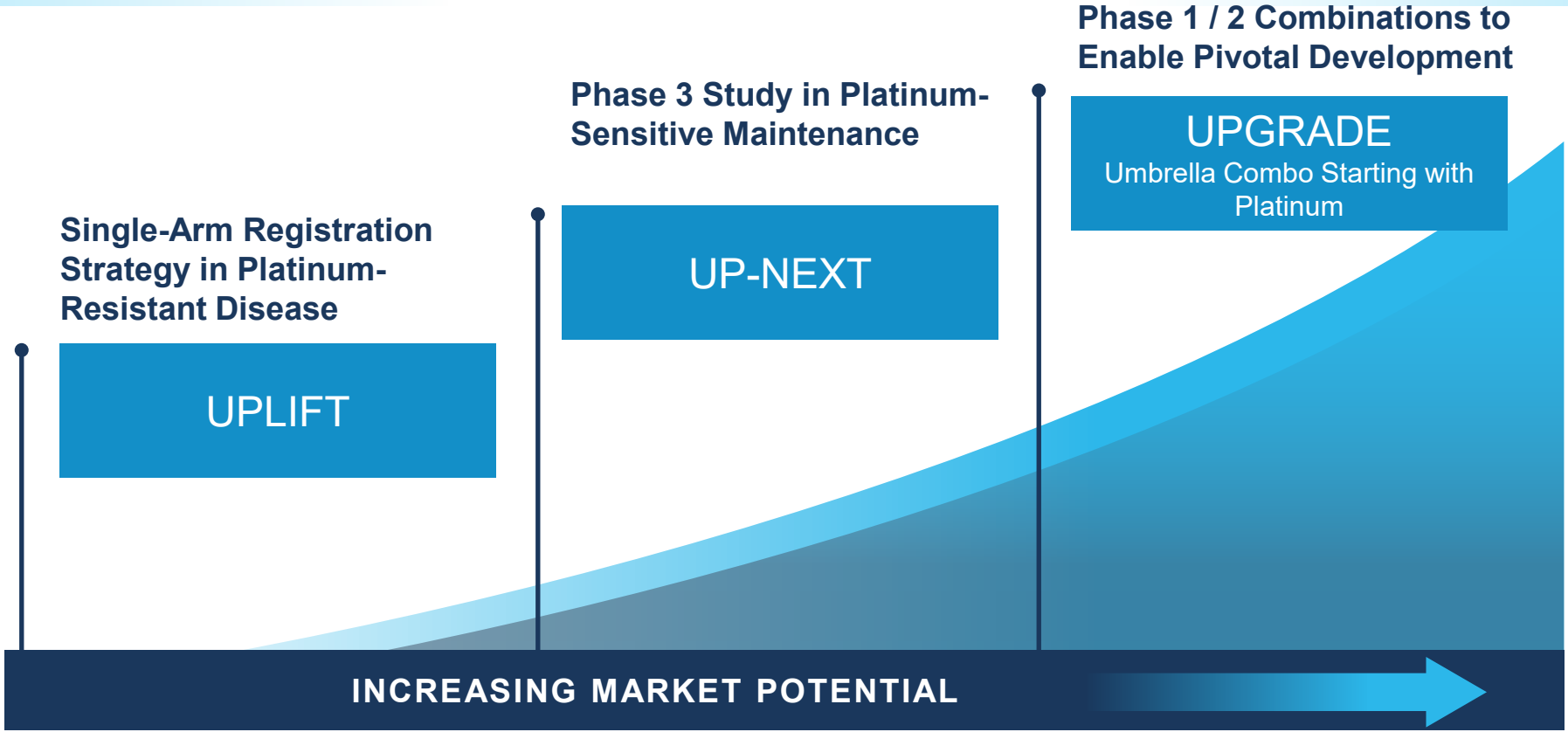
Tumor Proportion Score ≥ 75 Present in Two-Thirds of Patients Enriches for Improved Outcomes

36 mg/m^2 Up to a Maximum of ~80 mg

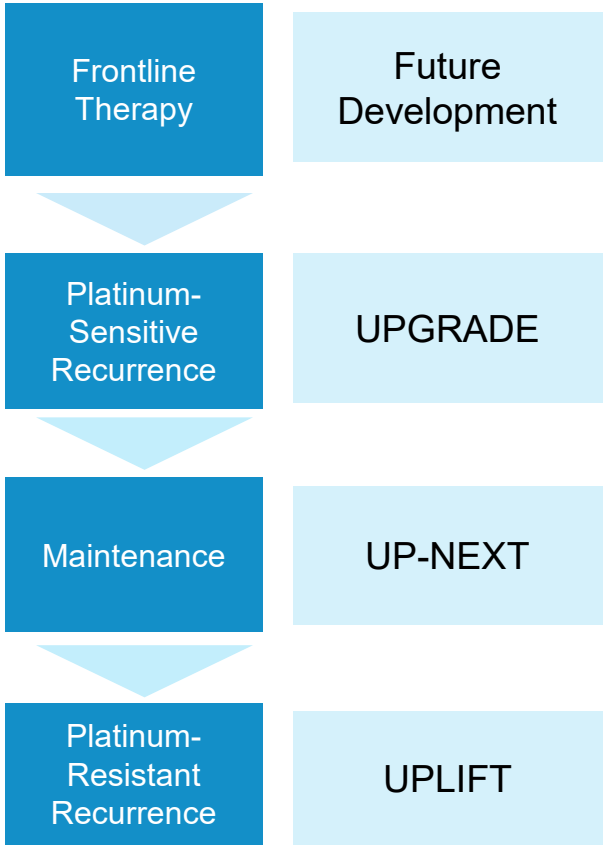
Potential to Further Improve Safety while Maintaining Efficacy

Data Cut: June 10, 2021

An Opportunity to Deliver a Potentially Foundational Medicine for Ovarian Cancer



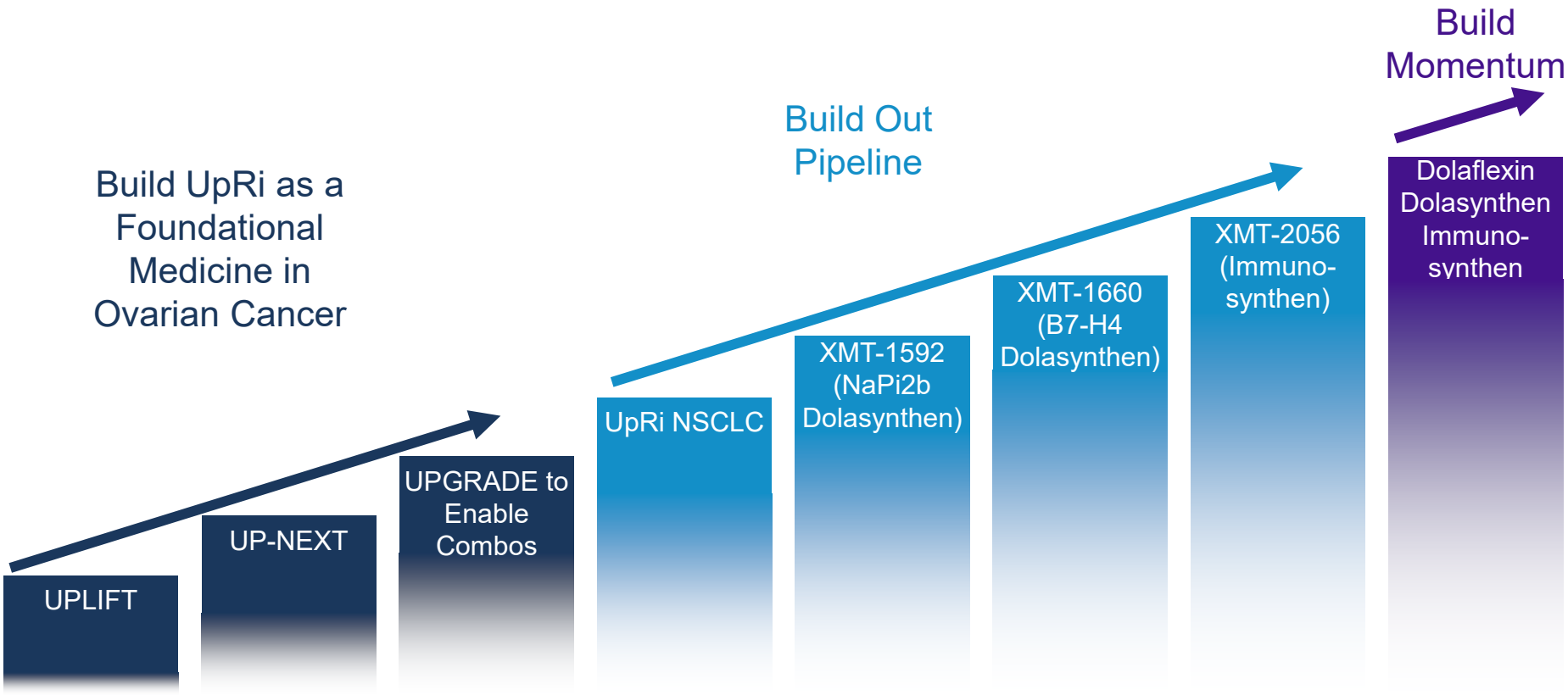
Opportunities in Platinum-Sensitive, Platinum-Resistant, Monotherapy, Combination, Treatment, and Maintenance



- 22,000 newly diagnosed ovarian cancer patients annually
- Plus, fallopian tube and primary peritoneal cancers treated in the same algorithm
- With a median survival 5 years from diagnosis
- 80% relapse following frontline therapy
- And 14,000 deaths per year

Source: SEER

Multiple Value-Drivers Across UpRi, Pipeline, and Platforms



Q&A