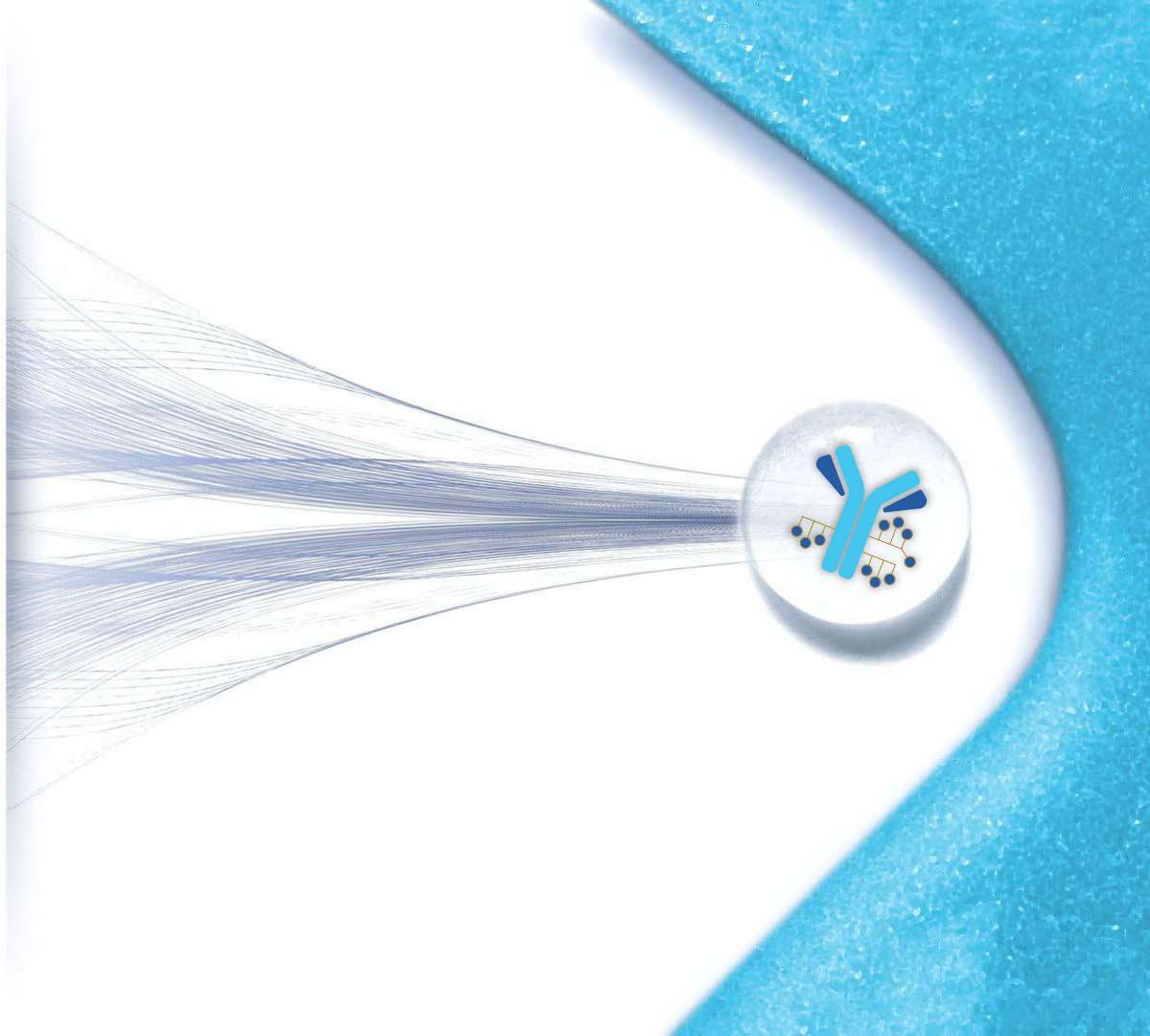
Mersana THERAPEUTICS

2020 ESMO Virtual Conference: Updated Interim Expansion Data From XMT-1536 Phase 1 Study

September 17, 2020



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This presentation contains “forward-looking” statements within the meaning of federal securities laws. These forward-looking statements are not statements of historical facts and are based on management’s beliefs and assumptions and on information currently available to management. Forward-looking statements include information concerning Mersana Therapeutics, Inc.’s (the “Company’s”) business strategy and the design, progression and timing of its clinical trials and expectations regarding future clinical results based on data achieved to date.

Forward-looking statements generally can be identified by terms such as “aims,” “anticipates,” “believes,” “contemplates,” “continues,” “could,” “estimates,” “expects,” “goal,” “intends,” “may,” “on track,” “plans,” “possible,” “potential,” “predicts,” “projects,” “seeks,” “should,” “target,” “will,” “would” or similar expressions and the negatives of those terms. Forward-looking statements represent management’s beliefs and assumptions only as of the date of this presentation. The Company’s operations involve risks and uncertainties, many of which are outside its control, and any one of which, or combination of which, could materially affect its results of operations and whether the forward-looking statements ultimately prove to be correct. Factors that may materially affect the Company’s results of operations and whether these forward-looking statements prove to be correct include, among other things, that preclinical testing or early clinical results may not be predictive of the results or success of ongoing or later clinical trials, and that the development and testing of the Company’s product candidates will take longer and/or cost more than planned, as well as those listed in the Company’s Annual Report on Form 10-K filed with the Securities and Exchange Commission (“SEC”) on February 28, 2020, the Company’s Quarterly Report on Form 10-Q filed with the SEC on May 8, 2020 and subsequent SEC filings. In addition, while we expect that the COVID-19 pandemic might adversely affect the Company’s preclinical and clinical development efforts, business operations and financial results, the extent of the impact on the Company’s operations and the value of and market for the Company’s common stock will depend on future developments that are highly uncertain and cannot be predicted with confidence at this time, such as the ultimate duration of the pandemic, travel restrictions, quarantines, physical distancing and business closure requirements in the U.S. and in other countries, and the effectiveness of actions taken globally to contain and treat the disease. Except as required by law, the Company assumes no obligation to update these forward-looking statements publicly, or to update the reasons actual results could differ materially from those anticipated in the forward-looking statements, even if new information becomes available in the future.

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

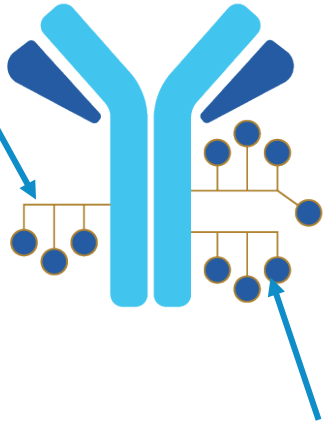
Agenda

- **Introduction** - Anna Protopapas, President & Chief Executive Officer
- **Updated Interim Data for XMT-1536 in Ovarian Cancer**– Erika Hamilton, MD, Director of the Breast Cancer and Gynecologic Cancer Research Program from the Sarah Cannon Research Institute at Tennessee Oncology
- **Next Steps & Closing –** Anna Protopapas, President & Chief Executive Officer
- **Questions & Answers**

XMT-1536: First-in-Class Dolaflexin ADC Targeting NaPi2b, an Ideal ADC Target

Differentiated Dolaflexin Platform

Hydrophilic Polymer Scaffold with ~10 – 12 Payloads per Antibody

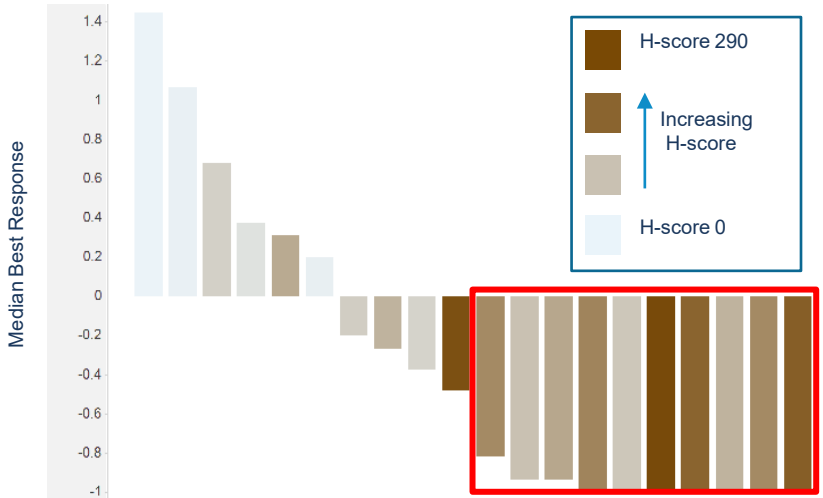


DolaLock Payload with Controlled Bystander Effect

Strong Preclinical Biomarker Response Relationship

Ovarian Cancer Patient-Derived Xenograft Models

Response correlated with NaPi2b Expression



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ASCO 2020 - XMT-1536 Demonstrated Differentiated Tolerability and Deep Confirmed Responses

Differentiated Tolerability Profile

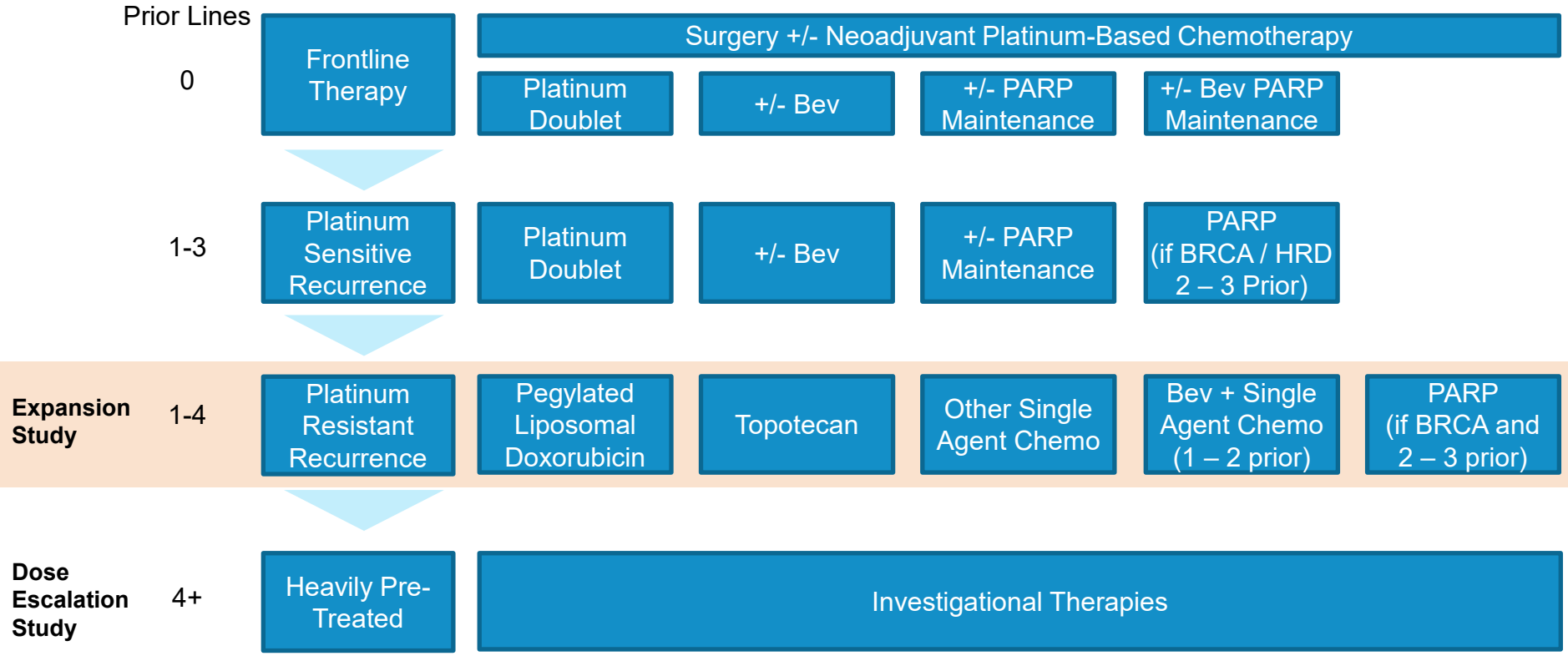
- Safety profile consistent with previously reported dose escalation data and no new safety signals observed
- No reported cases of severe neutropenia, ocular toxicities, or peripheral neuropathy
- The most common treatment-related adverse events (TRAEs) were Grade 1-2 fatigue, nausea, vomiting
- Transient AST elevation without associated changes in bilirubin or cases of Hy's law
- 12% discontinuation rate due to adverse events

Deep Confirmed Responses

- Of the 20 ovarian cancer patients that were evaluable for response as of May 1, 2020
  - 2/20 (10%) achieved confirmed complete responses, both had prior therapy with bevacizumab and PARP inhibitors
  - 5/20 (25%) achieved confirmed partial responses for an objective response rate of 35%
  - 16/20 (80%) achieved stable disease or better for a disease control rate of 80%
  - Responses appear to deepen over time
- Data continue to support a NaPi2b biomarker-based patient selection strategy
- More data needed to assess antitumor activity in NSCLC adenocarcinoma

Complete ASCO 2020 disclosure available here: https://www.mersana.com/wp-content/uploads/2020/05/2020-ASCO_XMT-1536_Poster_FINAL-14May2020.pdf
Data as of May 1, 2020

Ovarian Cancer Treatment Landscape is Moving to Earlier Use of Bevacizumab and PARP Inhibitors



Source: SmartAnalyst, Kantar Health, NCCN, Product Labels, KOL interviews

A Phase 1 Expansion of XMT-1536 in Patients with Ovarian Cancer Presented at 2020 ESMO Virtual Conference

Safety and Efficacy of XMT-1536 in Ovarian Cancer: A Subgroup Analysis from the Phase I Expansion Study of XMT-1536, a NaPi2b Antibody-Drug Conjugate

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NCT03319628

Design for the Ovarian Cancer Cohort of the XMT-1536 Phase 1 Expansion 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)
- 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) progressing after standard treatments

- Measurable disease per RECIST v1.1
- ECOG Performance Status 0 or 1
- Archived tissue and fresh tissue, when medically feasible, for retrospective assessment of NaPi2b expression

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

- 36 mg/m2 cohort initiated in August 2019 and enrollment closed
- 43 mg/m2 cohort initiated in December 2019 and ongoing; current dose evaluated in EXP

Primary Objectives:

- Evaluate safety and tolerability of MTD of XMT-1536
- Assess preliminary (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 higher and lower NaPi2b expression (as previously reported[1,2])
- 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

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

[1]Tolcher TW et al. J Clin Oncol 37, 2019 (suppl; abstr 3010)
[2]Richardson DL et al. Presented at SGO Annual Meeting 2020; LBA8

Patient Demographics and Disease Characteristics

Data cut off: 18 August 2020

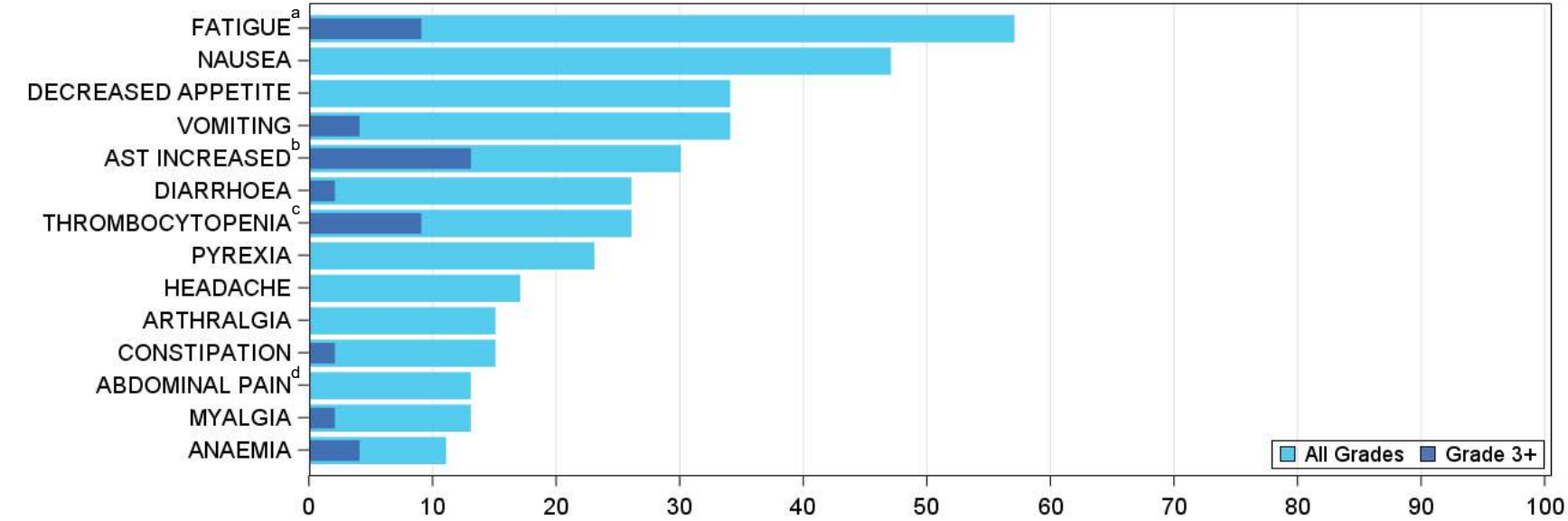
Ovarian Cancer Expansion Patients (N=47)		
Age; years	Median (range)	69 (37, 85)
ECOG Performance Status; n (%)	0	16 (34)
	1	31 (66)
Primary Tumor Type[a]; n (%)	Ovarian	34 (72)
	Fallopian Tube	7 (15)
	Primary Peritoneal	6 (13)
Prior Lines of Therapy; n (%)	1-3	28 (60)
	4+[b]	19 (40)
Prior Therapy; n (%)	Bevacizumab	33 (70)
	PARP inhibitor	25 (53)
Platinum-free Interval[c]; n (%)	0-3 mos	14 (30)
	>3-6 mos	27 (57)
	>6 mos[d]	5 (11)
	Unknown[e]	1 (2)
BRCA1/2 Mutation; n (%)	Yes	6 (13)
	No	37 (79)
	Unknown[f]	4 (9)
NaPi2b H-score[g]; n (%)	Higher	26 (55)
	Lower	15 (32)
	Not Yet Determined (ND)	6 (13)

[a] Includes 1 Endometrioid, 1 Low Grade, 1 Serous / Endometroid, and 1 Carcinosarcoma histology. [b] Two patients enrolled with 5 prior lines of systemic therapy. [c] 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. [d] All patients are platinum-sensitive and had received 4 or 5 lines of prior therapy. [e] Treatment dates missing/not provided; unable to determine. [f] BRCA1/2 mutation status not available/not reported. [g] Higher NaPi2b Expression: as defined in dose escalation as at / above lowest H-score at which response observed (≥110); Lower NaPi2b Expression: as defined in dose escalation as below the lowest H-score at which response observed (<110); ND = NaPi2b Expression not yet determined or tissue not available

Treatment-Related Adverse Events Reported in ≥10% of Patients with Ovarian Cancer Expansion Patients

- 38 (81 %) patients reported at least 1 treatment-related adverse event (TRAE)
- No ≥Grade 3 (severe) TRAEs of neutropenia, peripheral neuropathy, or ocular toxicity have been reported

TRAEs Reported in ≥10% of Patients with OC (n = 47)



[a] Includes preferred terms: fatigue and asthenia
[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] Includes preferred terms: thrombocytopenia and platelet count decrease. 1 patient with Grade 4 thrombocytopenia on C1D8 recovered within 3 days
[d] Includes preferred terms: abdominal pain, abdominal pain upper
Abbreviation: TRAEs = treatment-related adverse events; AST = Aspartate aminotransferase

XMT-1536 is Well Tolerated with Limited Discontinuations and Serious Adverse Events

- Of the 47 EXP patients with ovarian cancer, 11 (23%) patients had a dose reduction, delay, and/or discontinuation due to a TRAE
- Dose reductions due to TRAE occurred in 7 (15%) patients
  - Most frequent TRAEs leading to dose reductions were: AST increase [2 patients]; thrombocytopenia [3 patients]
- Dose delays due to TRAE occurred in 4 (9%) patients
- Dose discontinuation due to TRAE occurred in 2 (4%) patients
- 17 Serious adverse events (SAE) occurred in 11 (23%) patients
- SAEs reported in ≥2 (4%) patients included:
  - Abdominal pain [2 patients]
  - Cerebrovascular accident/transient ischemic attack [2 patients]
  - Pneumonia [2 patients]
  - Respiratory failure [2 patients]
- 2 of the 17 SAEs were deemed by the Investigator to be treatment-related: pneumonitis (Grade 2) and vomiting (Grade 3)

Continued Activity Observed in Platinum-Resistant Ovarian Cancer

- Response observed within 2 cycles in 70% of patients (7 of 10)
- Response observed within 4 cycles in 100% of patients (10 of 10)

Best Response in Evaluable Patients with OC (n = 29)

	All (n = 29)	Higher NaPi2b^{O} (n = 20)	Lower NaPi2b^{OO} (n = 7)	NaPi2b Not Yet Determined (n = 2)
CR; n(%)	2 (7)	2 (10)	0	0
PR; n (%)	8 (28)	5 (25)	2 (29)	1 (50)
SD; n (%)	13 (45)	10 (50)	2 (29)	1 (50)
PD; n (%)	6 (21)	3 (15)	3 (43)	0
DCR [CR + PR + SD]; n (%)	23 (79)	17 (85)	4 (57)	2 (100)

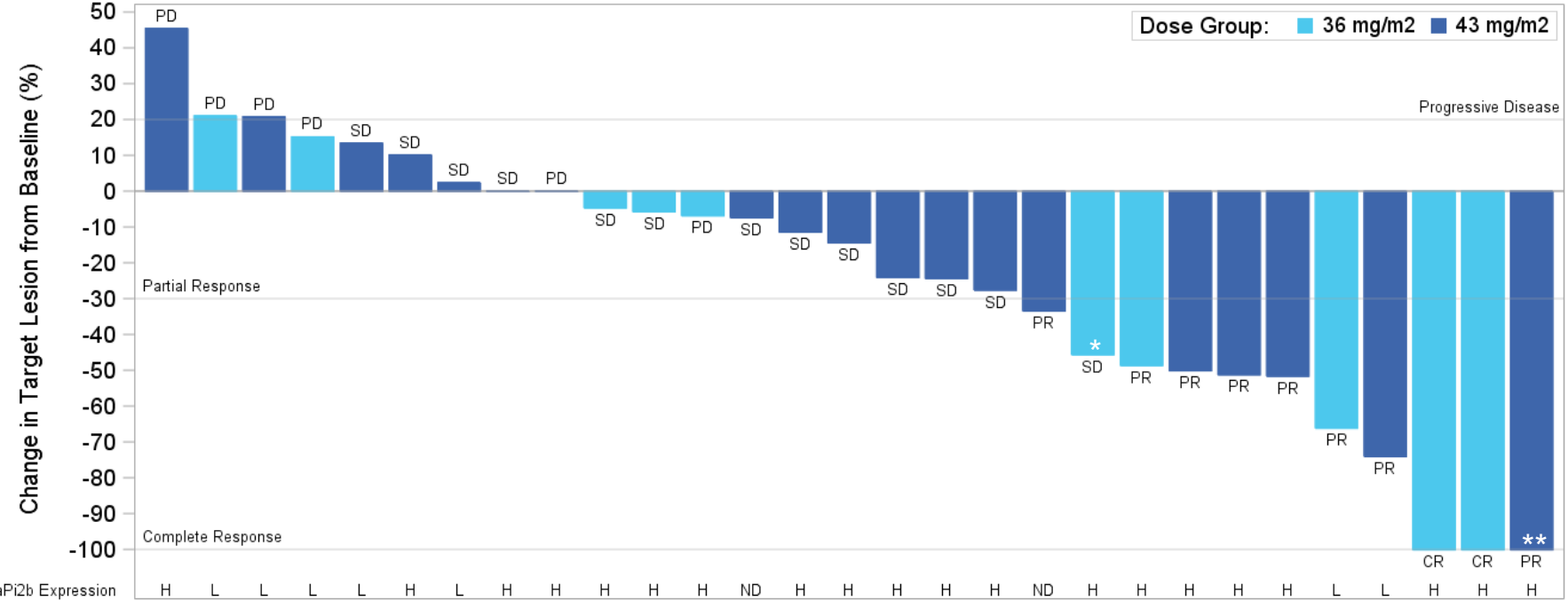
*18 patients were not evaluable for RECIST response: 1 clinical progression (Lower NaPi2b Expression); 1 withdrew consent (Lower NaPi2b Expression); 1 unrelated Grade 5 SAE (Lower NaPi2b Expression); 15 patients did not have RECIST assessment as of the data cut

^{O} Higher NaPi2b Expression: defined in dose escalation as at / above lowest H-score at which response observed (≥110)

^{OO} Lower NaPi2b Expression: defined in dose escalation as below the lowest H-score at which response observed (<110)

Deep Responses Observed in Platinum-Resistant Ovarian Cancer

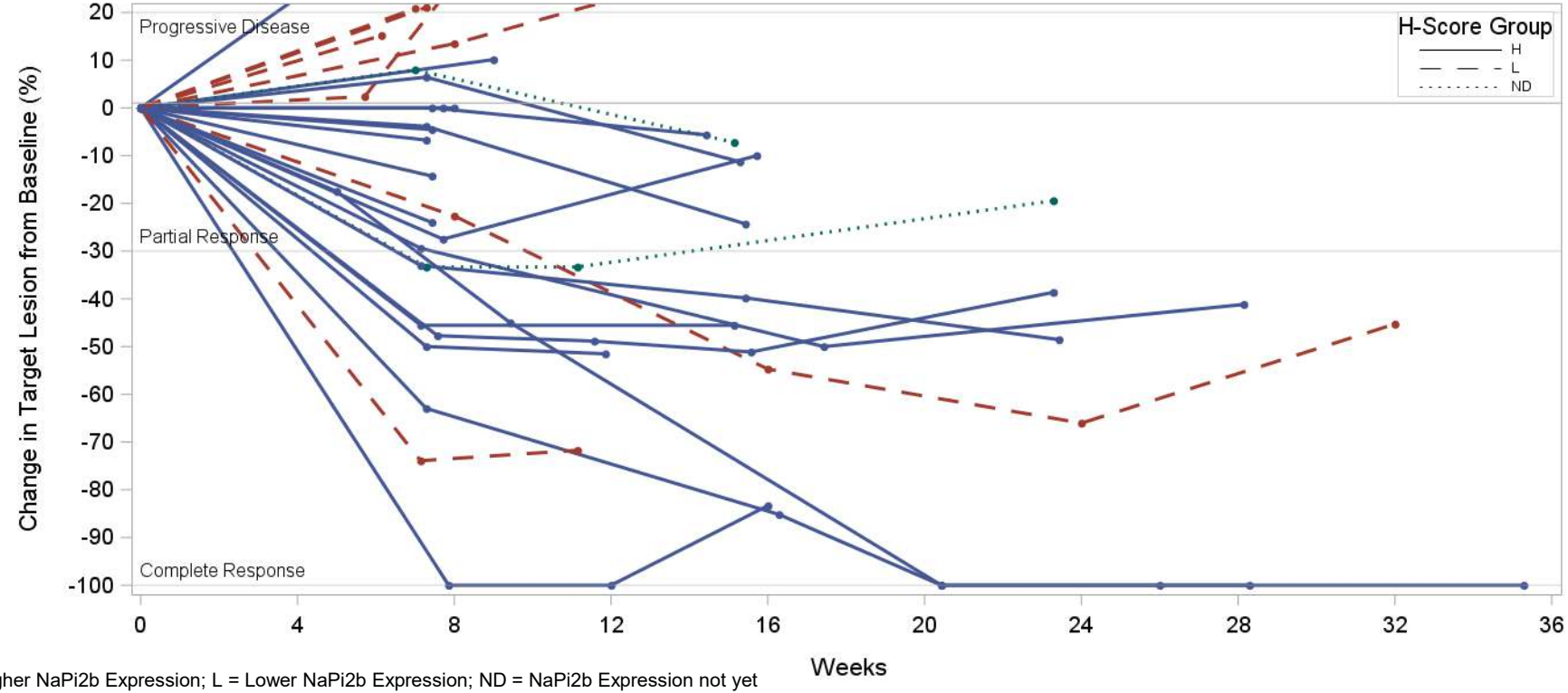
Maximum % Change from Baseline in Target Lesions in Patients with OC (n = 29)



* Following PR next scan showed new lesions, BOR per RECIST v1.1 is SD
** CR of target lesions and non-CR/non-PD of non-target lesions, BOR per RECIST v1.1 is PR
Abbreviations: PD = progressive disease; SD = stable disease; PR = partial response; CR = complete response; H = Higher NaPi2b Expression; L = Lower NaPi2b Expression; ND = NaPi2b Expression not yet determined or tissue not available

XMT-1536 Patient Responses Appear to Deepen Over Time

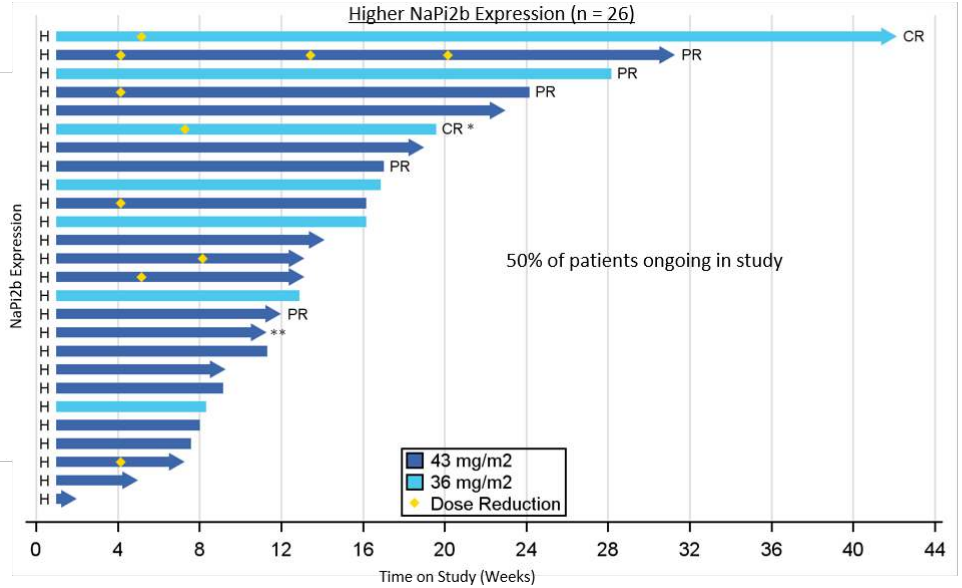
Change from Baseline in Target Lesions in Patients with OC (n = 29)

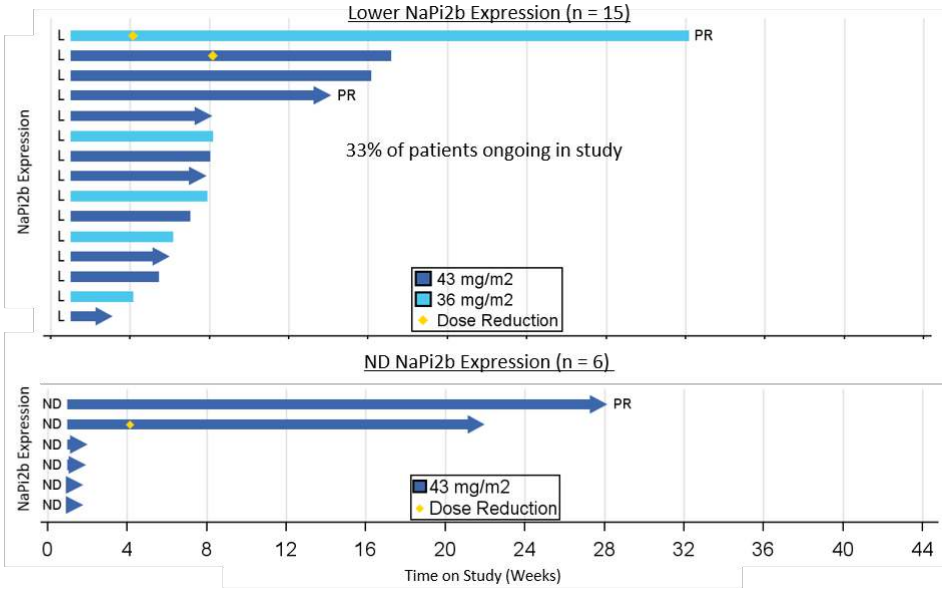


H = Higher NaPi2b Expression; L = Lower NaPi2b Expression; ND = NaPi2b Expression not yet determined or tissue not available

Durability Data are Immature: 50% of Ovarian Cancer Patients with Higher NaPi2b are Still Ongoing

Time on XMT-1536 Study in Patients with OC (n = 47)





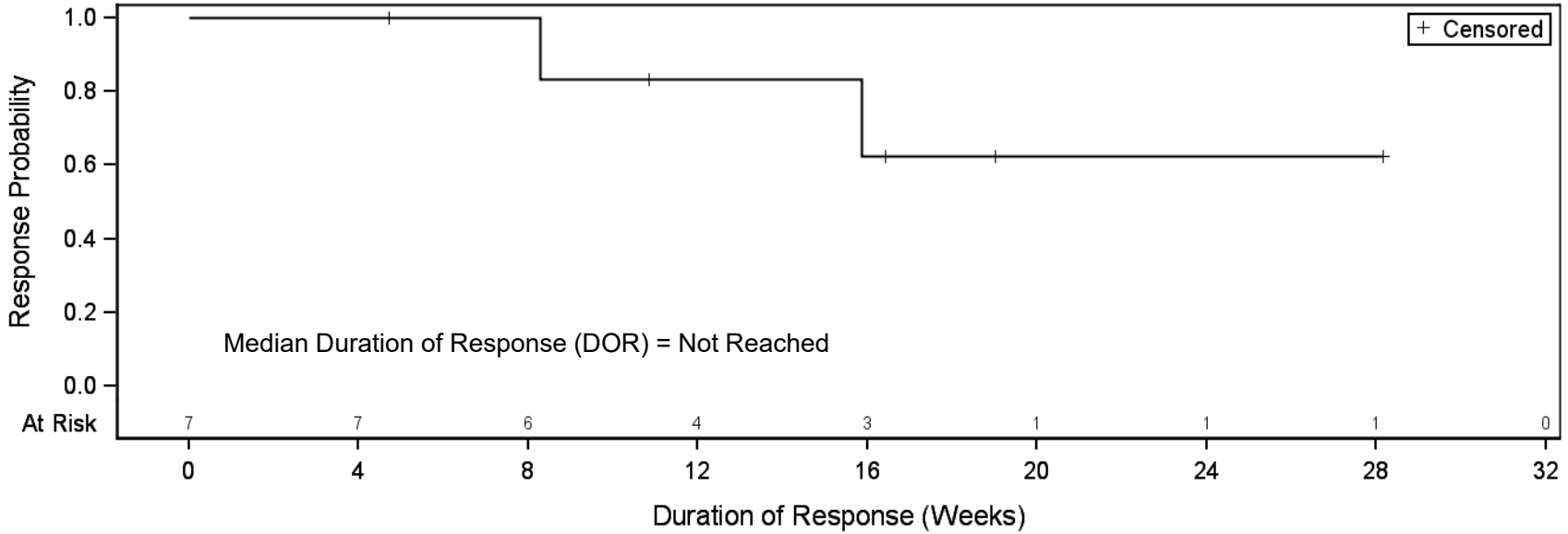
* Scans at 28-weeks confirmed ongoing CR in this patient

** Patient previously reported as unconfirmed PR at ASCO 2020; patient discontinued study after 1 Cycle and confirmatory scans not completed; patient off study for 3.5 months, with disease progression and study treatment re-initiated; plot is shown from re-initiation of study treatment

Abbreviations: CR = complete response; PR = partial response; H = Higher NaPi2b Expression; L = Lower NaPi2b Expression; ND = NaPi2b Expression not yet determined or tissue not available

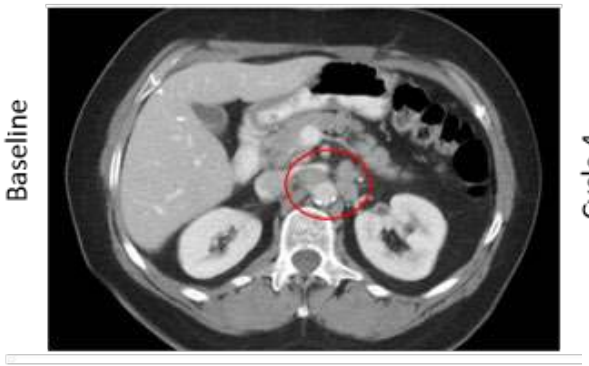
Median Duration of Response Not Yet Reached in Higher NaPi2b Ovarian Cancer

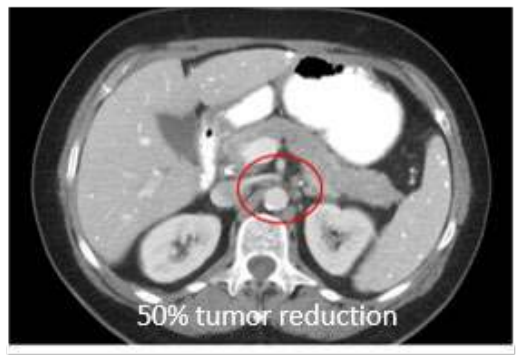
Durability of Response in Patients with OC and Higher NaPi2b (n = 7)

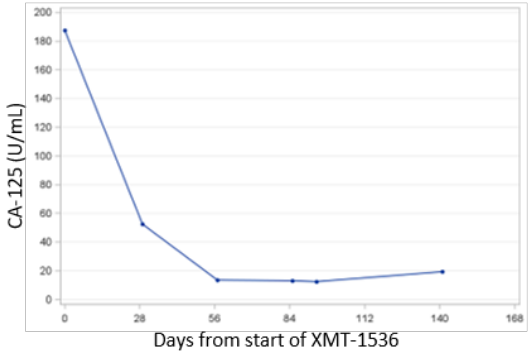


- Median duration of response (DOR) not reached in Higher NaPi2b (n = 7) subgroup
- 2 patients with Lower NaPi2b with DOR of 4.1 week and 16.1 weeks, respectively
- 1 patient with NaPi2b ND with DOR 16.1 weeks
- Longest DOR in a patient with Higher NaPi2b is ongoing at 28.1+ weeks and the patient continues on study at 42.1 weeks
- Data support NaPi2b as a proposed biomarker of response to XMT-1536

Partial Response in a Patient with Platinum-Resistant Ovarian Cancer







- 61-year old BRCA1/2 negative patient with platinum-resistant high grade serous ovarian cancer
- Prior systemic therapies included carboplatin/paclitaxel; carboplatin/liposomal doxorubicin; bevacizumab and maintenance therapy with PARPi
- Initiated XMT-1536 at 43 mg/m^2; dose reductions to 20 mg/m^2 (current dose)
- Confirmed PR by RECIST v1.1 after Cycle 4 of treatment
- Remains on study treatment at 31 weeks

Conclusions

- In this subgroup analysis of patients with ovarian cancer, XMT-1536 continued to be well tolerated with a favorable safety profile – no severe neutropenia, peripheral neuropathy, or ocular toxicity
- Antitumor activity is observed with XMT-1536, as previously reported, including patients previously treated with bevacizumab and PARPi
    - Complete response observed in 2 patients with platinum-resistant ovarian cancer; one patient ongoing on study at 42.1 weeks with DOR ongoing at 28.1 weeks
    - ORR of 34% in patients with ovarian cancer with a DCR of 79%
- Median DOR was not reached in patients with ovarian cancer with higher NaPi2b, supporting the continued development of NaPi2b companion diagnostic
- These data support the continued development of XMT-1536 for the treatment of patients with platinum-resistant high-grade serous ovarian cancer who have received up to three prior lines of systemic therapy or patients who have received four prior lines of systemic therapy regardless of platinum status
- XMT-1536 granted FDA Fast Track Designation in August 2020

Acknowledgements

We would like to thank the patients, their families, our co-investigators and the site staff for making this study possible. QualTek/Discovery Life Sciences for IHC analysis, Brooks Life Sciences for lab sample management, and IQVIA Biotech for clinical trial support.

This study is sponsored by Mersana Therapeutics, Inc

XMT-1536: Significant Data Events in Ovarian Cancer Throughout 2020

	Dose Escalation	Ovarian Cancer Expansion		
Population	• Late stage platinum-resistant ovarian cancer • Late stage recurrent NSCLC adenocarcinoma	• 1-3 prior lines in platinum resistant • 4 prior lines regardless of platinum status • High grade serous histology		
Current Standard of Care	Investigational Agent	ORR: 4-12% mPFS: 3-4 mos mOS: 9-12 mos		
Data Disclosures	**Data at SGO 2020**	**Proof of Concept Demonstrated at ASCO**	**Incremental Data Update Planned at ESMO**	**Comprehensive Update Planned Around End of Year**

K Moore et al., ESMO 2019; Pujade-Lauraine et al., SGO 2019; Gaillard et al., ESMO 2018; SmartAnalyst report 2019

2020: A Transformational Year for Mersana with Multiple Data Readouts

2020 Goals & Anticipated Milestones

XMT-1536	✓ Report dose escalation in 1H 2020 ✓ Report interim data from OC and NSCLC expansion cohorts in 2Q 2020 • Report more mature data from expansion cohorts in 2H 2020
XMT-1592	✓ File IND and initiate clinical study in 1H 2020. Achieve rapid dose escalation
B7-H4	✓ Advance IND-enabling studies • Disclose development candidate data package in 2H 2020
Immunosynthen	• Select first development candidate • Disclose development candidate data package in 2H 2020
Product Engine	• Continue to leverage proprietary platforms to expand pipeline
Corporate	• Proactively evaluate potential for strategic collaborations that maximize value

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