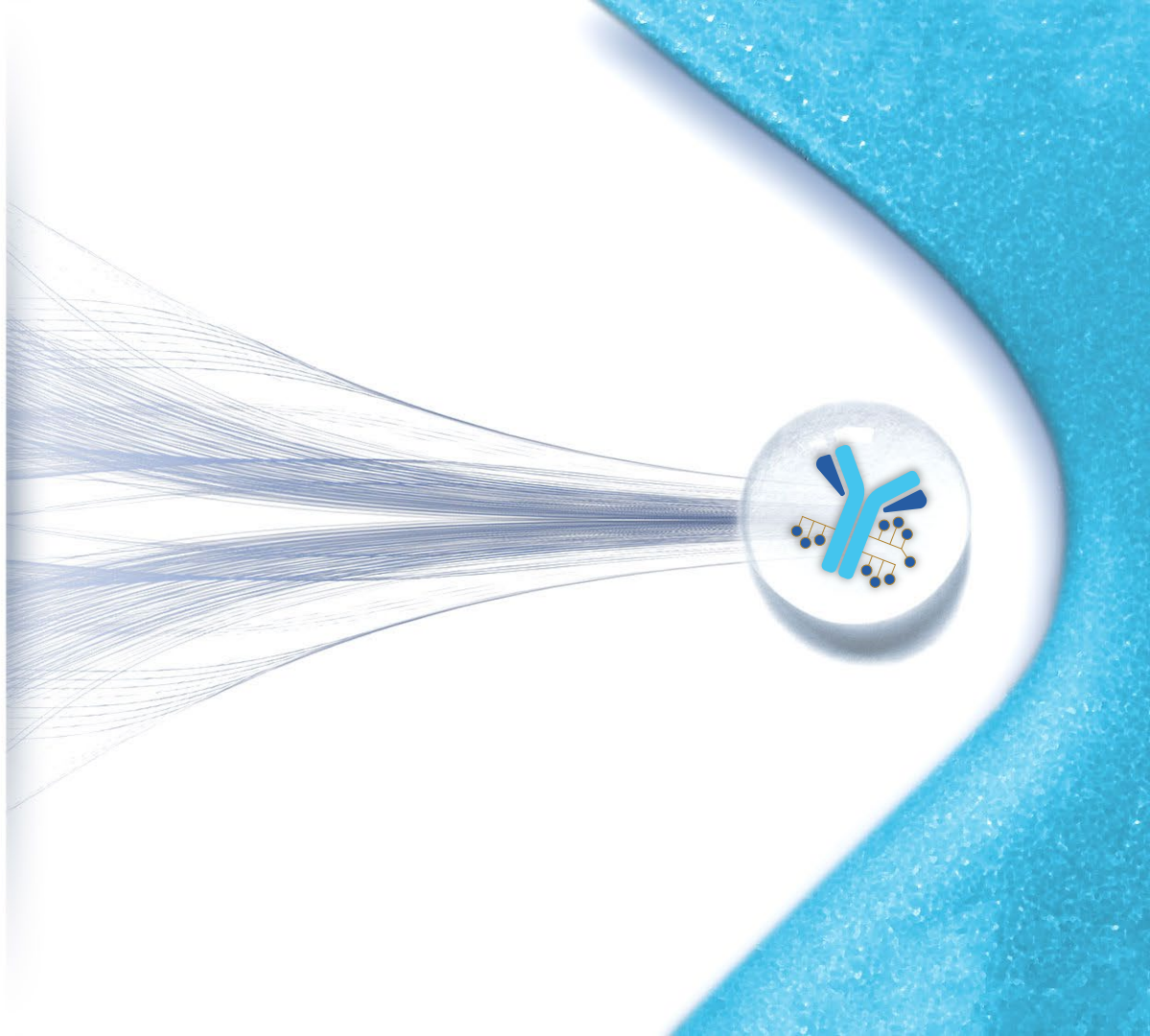
Mersana THERAPEUTICS

XMT-1536 Interim Expansion Data from Phase 1 Study

May 27, 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 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 press release. 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.

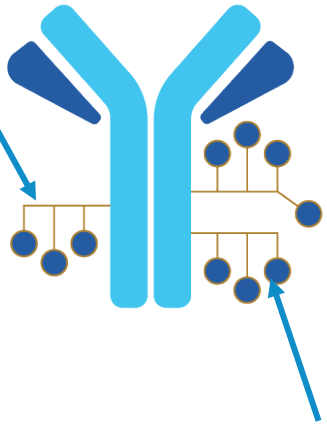
Agenda

- **Introduction** - Anna Protopapas, President & Chief Executive Officer
- **XMT-1536 Interim Expansion Data** - Debra L. Richardson, MD, Associate Professor of Gynecologic Oncology at the Stephenson Cancer Center at the University of Oklahoma Health Sciences Center and the Sarah Cannon Research Institute
- **Next Steps** – Dirk Huebner, MD, Chief Medical Officer
- **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

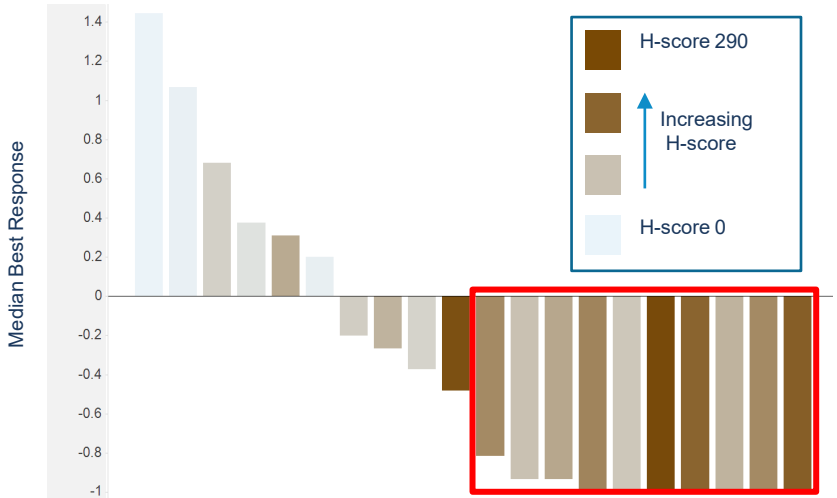


DolaLock Payload with Controlled Bystander Effect

Strong Preclinical Biomarker Response Relationship

Ovarian Cancer Patient-Derived Xenograft Models

Response correlated with NaPi2b Expression



H-score measures the percentage of cells staining multiplied by their intensity (0, 1+, 2+, 3+) for a range of 0 - 300

In Dose Escalation XMT-1536 was Well-Tolerated with Encouraging Activity in Heavily Pre-Treated Patients

Well-Tolerated

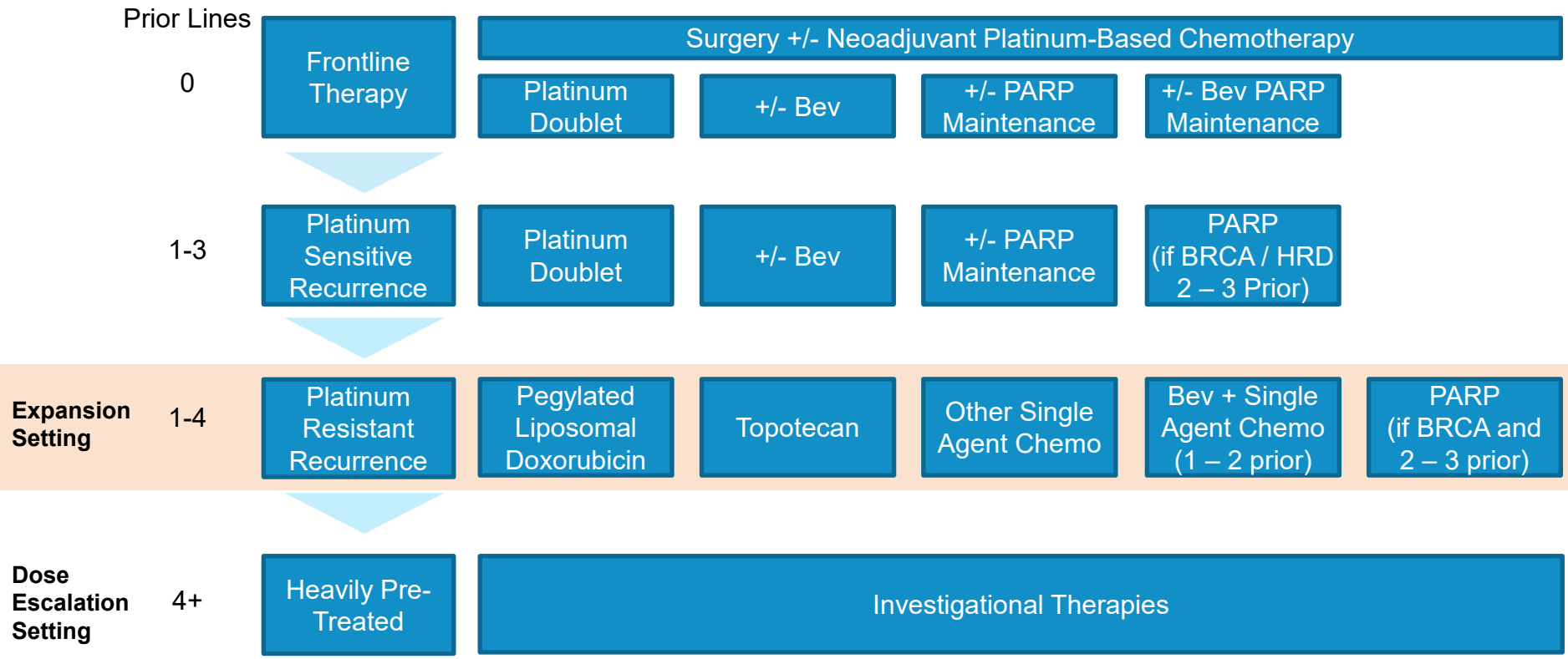
- No severe toxicities commonly seen with other ADCs: neutropenia, ocular toxicities, or peripheral neuropathy
- The most common treatment-related adverse events (TRAEs) were Grade 1-2 nausea, fatigue, headache
- Transient AST elevation without associated changes in bilirubin or cases of Hy's law
- MTD 43 mg/m^2

Encouraging Clinical Activity

- Confirmed responses and prolonged stable disease in heavily pretreated patients (median 5 prior lines of therapy)
- Activity in both platinum-resistant ovarian cancer and NSCLC adenocarcinoma
- 33% ORR (5/15) at doses $\geq$ 30 mg/m^2 with higher NaPi2b expression (preclinical data estimate >60% of ovarian cancer patients express NaPi2b at sufficient levels[1])
- Historical ORR of ~0% in median 5 prior line platinum-resistant ovarian cancer[2,3,4]

[1] Mosher et al, AACR-NCI-EORTC International Conference, October 2017
[2] Bruchim, Eur J Obs&Gyn and Repro Biology 2013;166:94-98
[3] Griffiths, Int J Gynecol Cancer 2011;21:58-65
[4] Hoskins, Gynecologic Onc 2005;97:862-869

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 and Non-Small Cell Lung Adenocarcinoma

A Summary of Interim Dose Expansion

Debra L. Richardson, Minal A. Barve, James F. Strauss, Susanna V. Ulahannan, Kathleen N. Moore, Erika P. Hamilton, Melissa L. Johnson, Kyriakos P. Papadopoulos, Corrine Zarwan, Charles K Anderson, Joseph Buscema, Deborah B Doroshow, William J Edenfield, Ursula A. Matulonis, Timothy F. Burns, Dirk Huebner, Valerie M. Jansen, Rebecca Mosher, Donna Jarlenski, Anthony W. Tolcher

Stephenson Cancer Center/Sarah Cannon Research Institute at the University of Oklahoma Health Sciences Center, Oklahoma City, OK; Mary Crowley Cancer Research Center, Dallas, TX; Sarah Cannon Research Institute and the University of Oklahoma Health Sciences Center, Nashville, TN and Oklahoma City, OK; Sarah Cannon Research Institute/Tennessee Oncology, Nashville, TN; Sarah Cannon Research Institute,Tennessee Oncology, Nashville, TN; South Texas Accelerated Research Therapeutics, LLC, San Antonio, TX; Lahey Hospital and Medical Center, Burlington, MA; Willamette Valley Cancer Institute, Eugene, OR; Arizona Oncology Associates, Tucson, AZ; Tisch Cancer Institute, Icahn School of Medicine at Mount Sinai, New York, NY; Institute for Translational Oncology Research, Prisma Health- Upstate Cancer Institute, Greenville, SC; Dana-Farber Cancer Institute, Boston, MA; University of Pittsburgh Medical Center (UPMC) Hillman Cancer Center, Pittsburgh, PA; Mersana Therapeutics, Inc., Cambridge, MA; NEXT Oncology, San Antonio, TX

NCT03319628

XMT-1536 Expansion Portion of Phase 1 Study Design

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)

NSCLC Cohort

- Prior treatment with platinum doublet and PD-1/L1 inhibitor
- Prior TKIs if targetable mutation
- Up to 2 prior lines of cytotoxic therapy
- Adenocarcinoma histology
- Archived tumor and fresh biopsy (if medically feasible)

Primary Objectives: Evaluate safety and tolerability of MTD/RP2D; assess preliminary antitumor activity

Secondary Objective: Association of tumor NaPi2b expression and objective tumor response

Patient population: Platinum-resistant, serous ovarian cancer and NSCLC adenocarcinoma progressing after standard treatments

- Measurable disease per RECIST v1.1
- ECOG 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/m^2 cohort initiated in August 2019 and enrollment closed. 43 mg/m^2 cohort initiated in December 2019 and ongoing. MTD is 43 mg/m^2

Assessments: Tumor imaging (MRI or CT): baseline and every 2nd cycle; response assessed per RECIST 1.1

Patient Demographics and Disease Characteristics

Data cut off: 1 May 2020

Expansion Patients (N=34)		
Age, years	Median (range)	67 (53, 85)
Sex, n (%)	Female Male	31 (91) 3 (9)
ECOG performance Status, n (%)	0 1	11 (32) 23 (68)
Primary Tumor Type; n (%)	Ovarian [a,b] NSCLC, adenocarcinoma	27 (79) 7 (21)
Prior lines of Systemic Therapy, Median (range)	Ovarian [c] NSCLC, adenocarcinoma [d]	3 (1, 5) 2 (1, 3)
Prior Therapies Ovarian Cancer, n (%)	Platinum Taxane Bevacizumab PARP inhibitor	27 (100) 27 (100) 17 (63) 14 (52)
Prior Therapies NSCLC, n (%)	Platinum Pemetrexed Immune checkpoint inhibitor Taxane	7 (100) 7 (100) 7 (100) 3 (43)

Notes: a. Includes fallopian tube and primary peritoneal; b. Includes 1 Endometrioid, 1 Low Grade, 1 Serous / Endometroid, and 1 Carcinosarcoma; c. 2 patients with ovarian cancer enrolled with 5 lines of systemic therapy; d. For NSCLC, patients may have had up to 2 chemotherapies and 1 immune checkpoint inhibitor

Treatment-Related Adverse Events Reported in ≥10% of Patients

- 28 (82%) patients reported at least 1 treatment-related adverse event (TRAE)
- No Grade 4 or Grade 5 TRAEs have been reported
- No severe TRAEs of neutropenia, peripheral neuropathy, or ocular toxicity have been reported

TRAEs Reported in ≥10% of Patients Overall, by Dose and Severity							
Preferred Term (MedDRA); n (%)	Expansion Dose 36 mg/m² (n=15)			Expansion Dose 43 mg/m² (n=19)			All Pts (N=34)
	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3	
Fatigue [a]	1 (7)	8 (53)	1 (7)	6 (32)	2 (11)	2 (11)	20 (59)
Nausea	1 (7)	4 (27)	0	4 (21)	5 (26)	0	14 (41)
Vomiting	3 (20)	1 (7)	1 (7)	3 (16)	3 (16)	0	11 (32)
Pyrexia	5 (33)	0	0	5 (26)	0	0	10 (29)
Decreased appetite	2 (13)	2 (13)	0	4 (21)	1 (5)	0	9 (26)
Diarrhea	2 (13)	1 (7)	1 (7)	4 (21)	1 (5)	0	9 (26)
AST increased [b]	0	2 (13)	1 (7)	1 (5)	4 (21)	0	8 (24)
Thrombocytopenia	0	3 (20)	0	2 (11)	0	1 (5)	6 (18)
Abdominal pain	2 (13)	2 (13)	0	1 (5)	0	0	5 (15)
Constipation	1 (7)	1 (7)	1 (7)	1 (5)	1 (5)	0	5 (15)
Dyspnea	1 (7)	2 (13)	0	1 (5)	0	1 (5)	5 (15)
Headache	0	2 (13)	0	2 (11)	1 (5)	0	5 (15)
Myalgia	1 (7)	1 (7)	0	1 (5)	1 (5)	1 (5)	5 (15)

a. Includes fatigue and asthenia
b. AST increase is transient in nature, recovers to baseline or to Grade 1 prior to the next dose, none are associated with cases of Hy's law

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

Treatment-Related Adverse Events (TRAEs):

- Of the 34 patients, 7 (21%) had a dose delay, reduction, and/or discontinuation due to a TRAE
- Dose delays due to TRAEs occurred in 3 (9%) patients
- Dose reductions due to TRAEs occurred in 7 (21%) patients
- Dose discontinuation due to TRAEs occurred in 4 (12%) patients

Serious Adverse Events (SAEs):

- 18 SAEs have been reported in 10 (29%) patients
- 2 of the 18 SAEs were deemed by the Investigator to be treatment-related: cerebrovascular accident and pneumonitis (both Grade 2)
- SAEs reported in ≥ 2 (6%) patients included:
  - Infection (3 pts [9%]; pneumonia and lung infection)
  - Cerebrovascular accident/transient ischemic attack (3 pts [9%])
  - Pulmonary embolism/deep vein thrombosis (2 pts [6%])
  - Respiratory failure (2 pts [6%]; acute resp failure and resp failure)

Continued Activity Observed in Platinum-Resistant Ovarian Cancer

Ovarian Cancer, RECIST Response N=20*	N (%)			
	All	**Higher NaPi2b^{o}**	**Lower NaPi2b^{oo}**	**NaPi2b Not Yet Determined**
N	20	14	4	2
CR	2 (10%)	2 (14%)	0	0
PR	5 (25%)	2 (14%)	1 (25%)	2 (100%)
uPR**	1 (5%)	1 (7%)	0	0
SD	8 (40%)	7 (50%)	1 (25%)	0
PD	4 (20%)	2 (14%)	2 (50%)	0

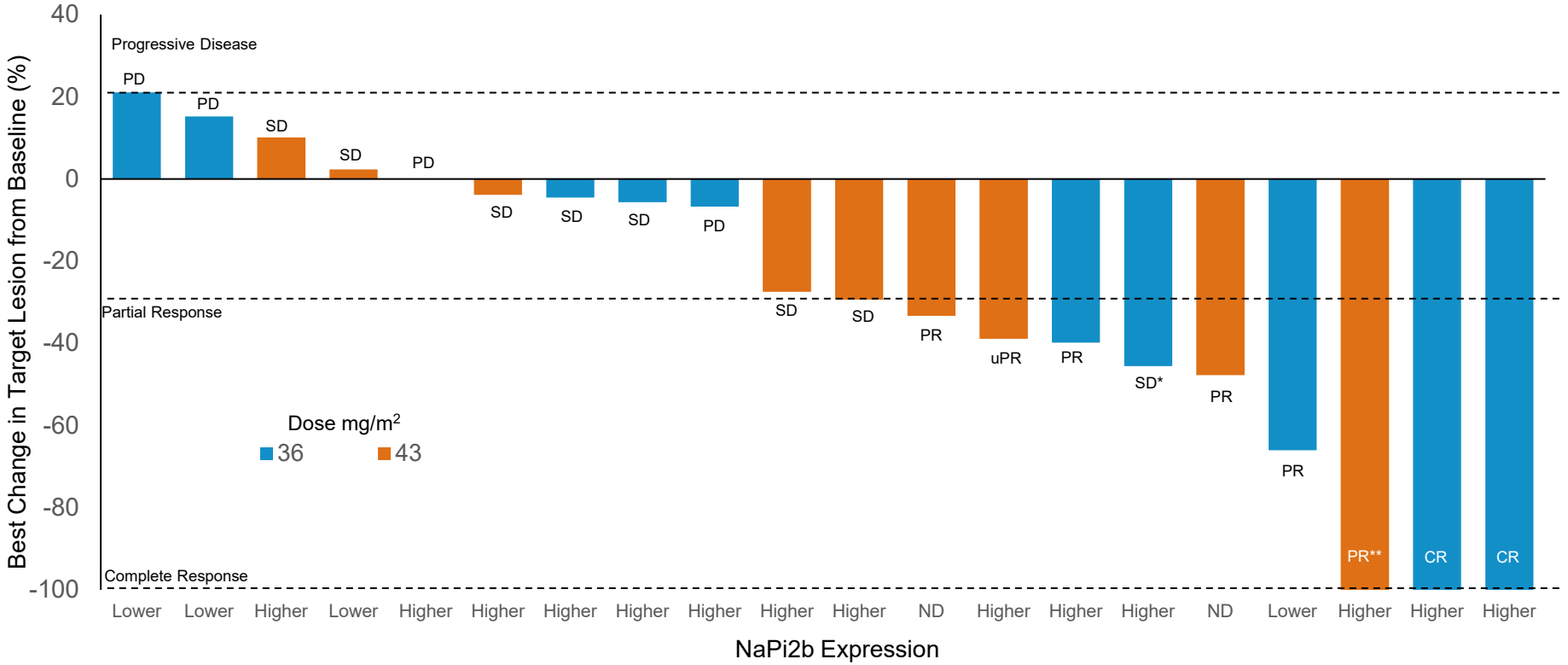
*7 patients are not evaluable: 1 withdrew consent (Lower NaPi2b Expression); 1 with unrelated SAE leading to discontinuation and death (Lower NaPi2b Expression); 5 have not yet received a scan

**uPR=1 patient with unconfirmed PR; confirmatory scan pending at the time of data cut

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

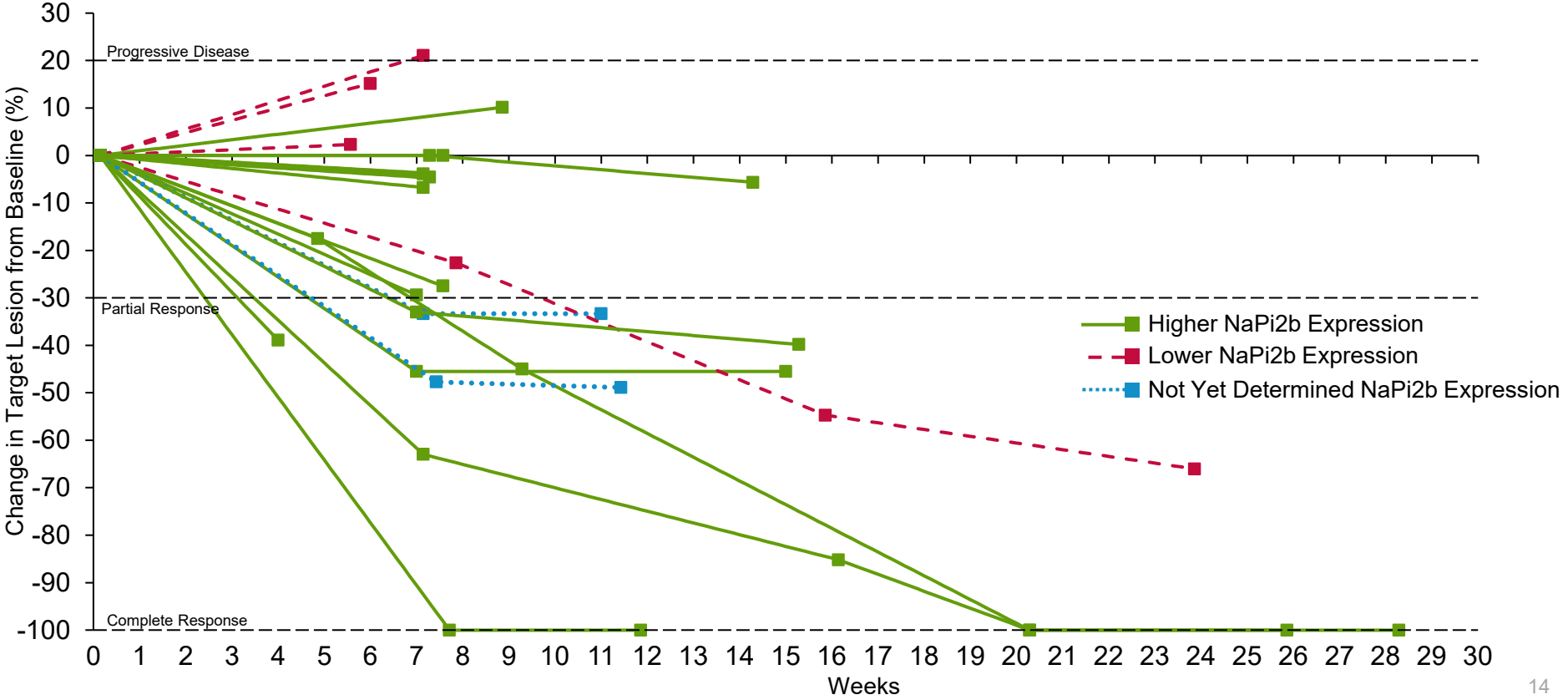
^{oo} Lower NaPi2b Expression: defined in dose escalation as below the lowest H-score at which response observed (<110)

Deep Responses Observed in Platinum-Resistant Ovarian Cancer

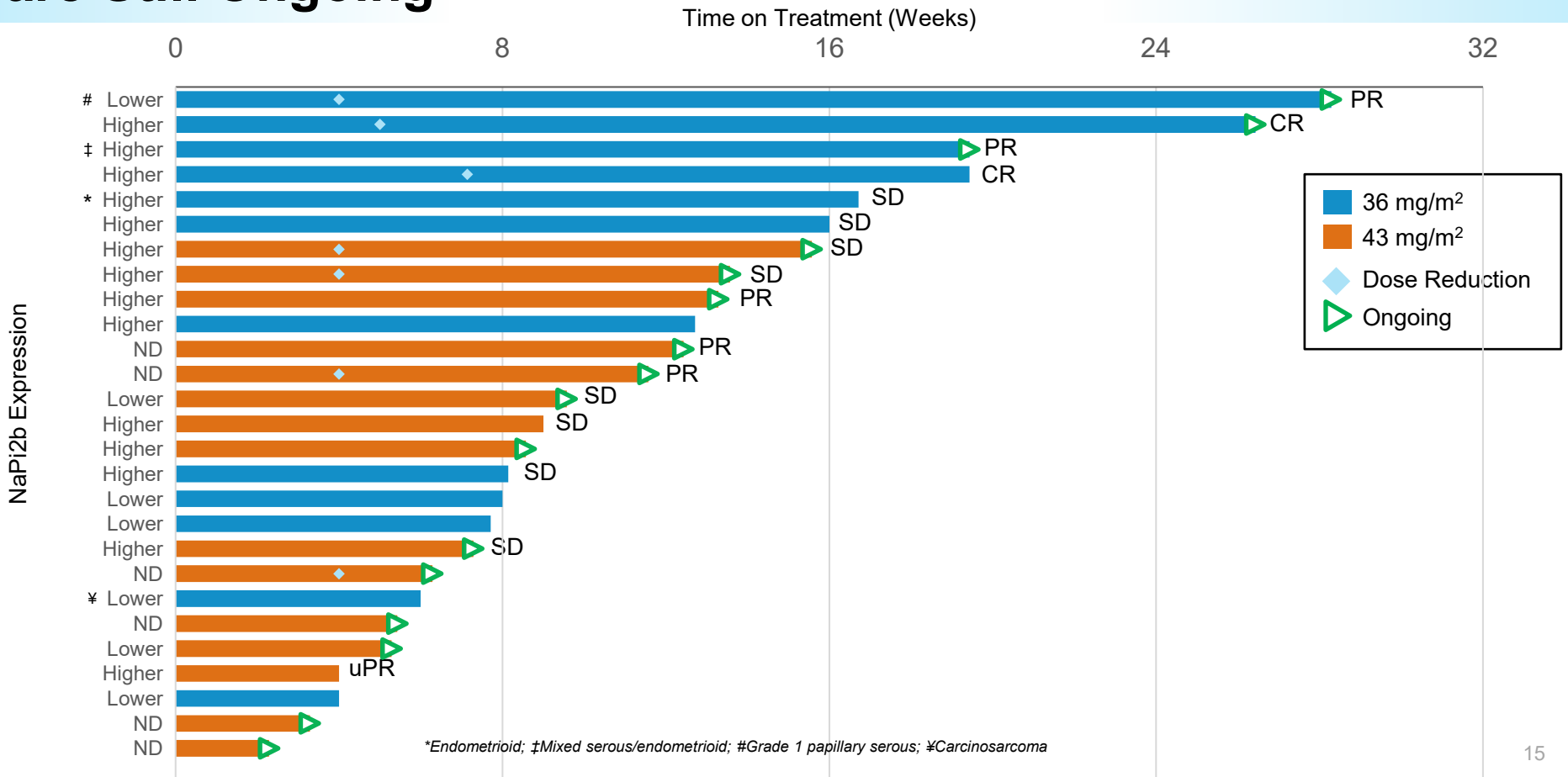


* Following PR next scan showed new lesions, best overall response per RECIST v1.1 is SD
** CR of target lesions and non-CR/non-PD of non-target lesions, best overall response per RECIST v1.1 is PR

XMT-1536 Patient Responses Appear to Deepen Over Time

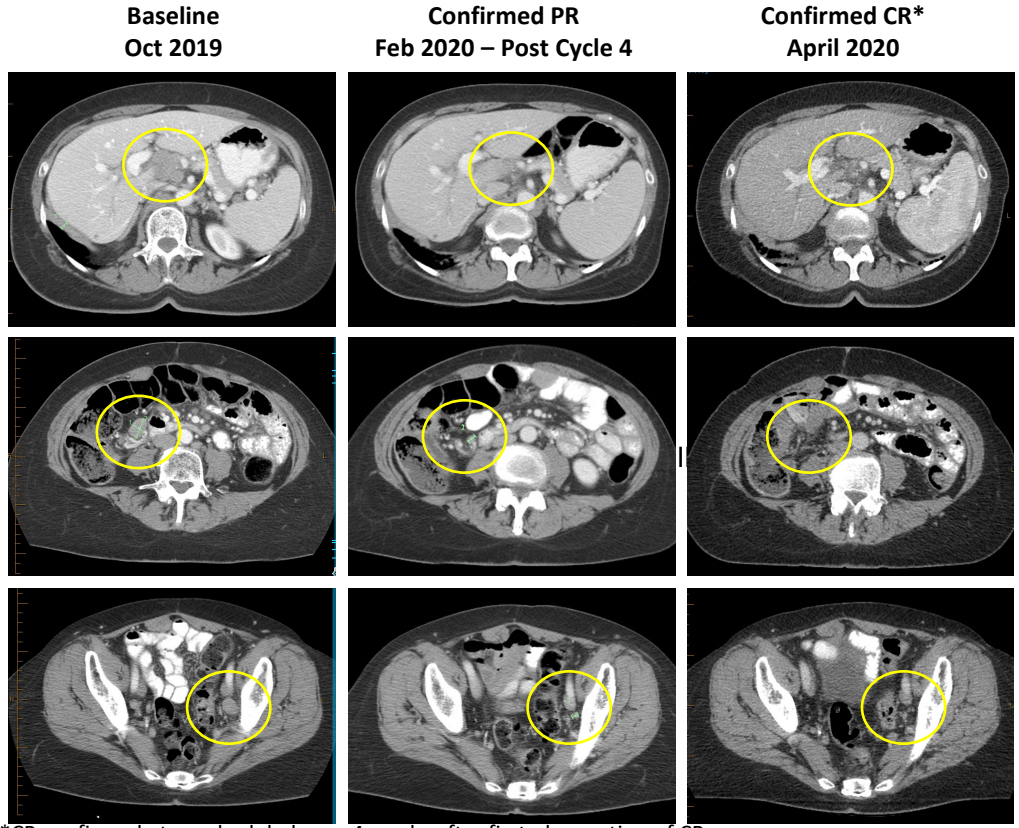


Data are Immature: ~60% of Ovarian Cancer Patients are Still Ongoing



*Endometrioid; ‡Mixed serous/endometrioid; #Grade 1 papillary serous; ¥Carcinosarcoma

Complete Response in a Patient with Ovarian Cancer

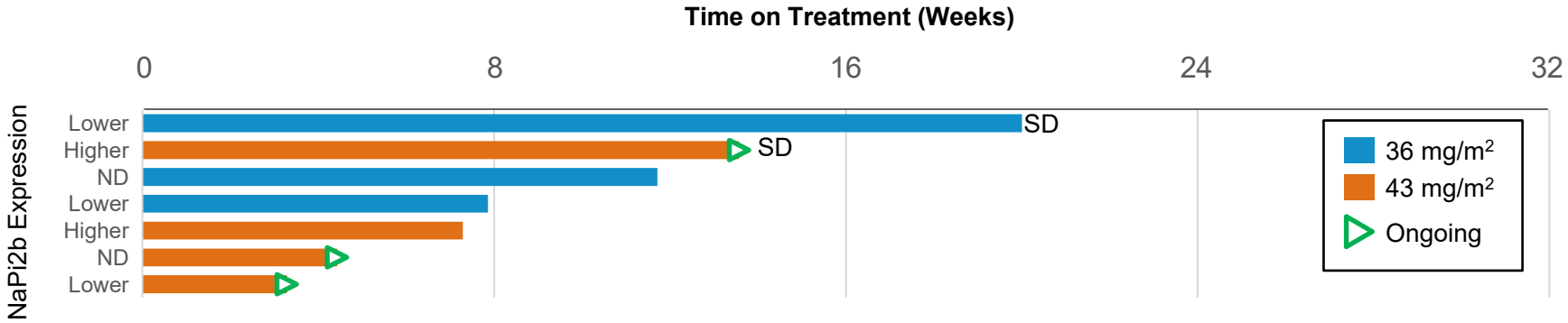


*CR confirmed at unscheduled scan 4 weeks after first observation of CR

- 70-yr-old woman with platinum-resistant high-grade serous OC previously treated with carboplatin/paclitaxel; carboplatin/gemcitabine; bevacizumab; niraparib; investigational anti-PD1
- Treated with 36 mg/m^2 q4w (with dose reduction to 30 mg/m^2 at Cycle 2); first PR observed after approx. 7 weeks of treatment with XMT-1536 (end of Cycle 2) which was confirmed with the following scan (end of Cycle 4); best overall response of CR
- Patient remains disease free and on study for >6 months

More Data in Patients with NSCLC are Needed to Assess Activity

NSCLC, RECIST Response N=4*	N (%)
N	4
SD	2 (50%)
PD	2 (50%)



*Of the 7 NSCLC patients, 4 were evaluable at the time of data cut
(3 patients were not evaluable: 2 have not yet received a scan; 1 discontinued for disease progression with ND NaPi2b expression and no scan done prior to 01 May 2020)

Conclusions

- XMT-1536 has a favorable safety profile
  - Most TRAEs were Grade 1 or 2
  - Fatigue, nausea, vomiting, pyrexia, decreased appetite, diarrhea, AST increased (transient) were the most frequently (≥ 20%) reported TRAEs
  - No severe neutropenia, peripheral neuropathy, or ocular toxicity
- Antitumor activity is observed with XMT-1536 in patients with platinum-resistant OC
  - CR observed in 2 (10%) patients with platinum-resistant OC, both patients had prior treatment with bevacizumab and PARP inhibitors
  - ORR of 35% in patients with platinum-resistant OC (excludes 1 patient with an unconfirmed PR) with a DCR of 80%
  - There is a trend toward response in patients with ovarian cancer with higher NaPi2b expression
  - More data are needed before a biomarker cut-off point can be declared and used to prospectively select patients likely to respond to XMT-1536
- These data support the continued evaluation of XMT-1536 in the ongoing Phase 1 study (NCT03319628) in patients with platinum-resistant OC and NSCLC adenocarcinoma

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***Sponsored by Mersana Therapeutics, Inc.**

XMT-1536: Path to Pivotal Study in High Unmet Need Indications

	Dose Escalation	Ovarian Cancer Expansion Data in 2H 2020	NSCLC Adeno Expansion Data in 2H 2020
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	• Prior treatment with a platinum doublet and PD-1/L1 inhibitor • Prior TKIs if targetable mutation • Up to 2 prior lines of cytotoxic therapy • Adenocarcinoma histology
Dose	• Determined 43 mg/m^2 MTD	• 36 mg/m^2 dose initiated in Aug 2019 • 43 mg/m^2 dose initiated in Dec 2019	• 36 mg/m^2 dose initiated in Aug 2019 • 43 mg/m^2 dose initiated in Dec 2019
Current Standard of Care	Investigational Agent	ORR: 4-12% mPFS: 3-4 mos mOS: 9-12 mos	ORR: 14-23% mPFS: 3-4 mos mOS: 9-12 mos

K Moore et al., ESMO 2019; Pujade-Lauraine et al., SGO 2019; Gaillard et al., ESMO 2018; SmartAnalyst report 2019
Garon et al., Lancet 2014; Rittmeyer A, et al. Lancet. 2017; Borghaei H, et al. N Engl J Med. 2015; SmartAnalyst report 2019

Three Recent Clinical Studies Have Defined the Standard of Care in Platinum-Resistant Ovarian Cancer

Comparators for Expansion Population

Study	Status	Experimental Arm	Control Arm	Control Arm Performance
Forward I ESMO 2019	Failed	Mirvetuximab soravtansine	PLD, Topotecan, Weekly Paclitaxel	ORR 12% PFS 4.4 mo
Javelin 200 SGO 2019	Failed	Avelumab / Avelumab + PLD	PLD	ORR 4% PFS 3.5 mo
Corail ESMO2018	Failed	Lurbinectedin	PLD or Topotecan	ORR 12% PFS 3.6 mo

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K Moore et al., ESMO 2019; Pujade-Lauraine et al., SGO 2019; Gaillard et al., ESMO 2018; SmartAnalyst report 2019
Garon et al., Lancet 2014; Rittmeyer A, et al. Lancet. 2017; Borghaei H, et al. N Engl J Med. 2015; 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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