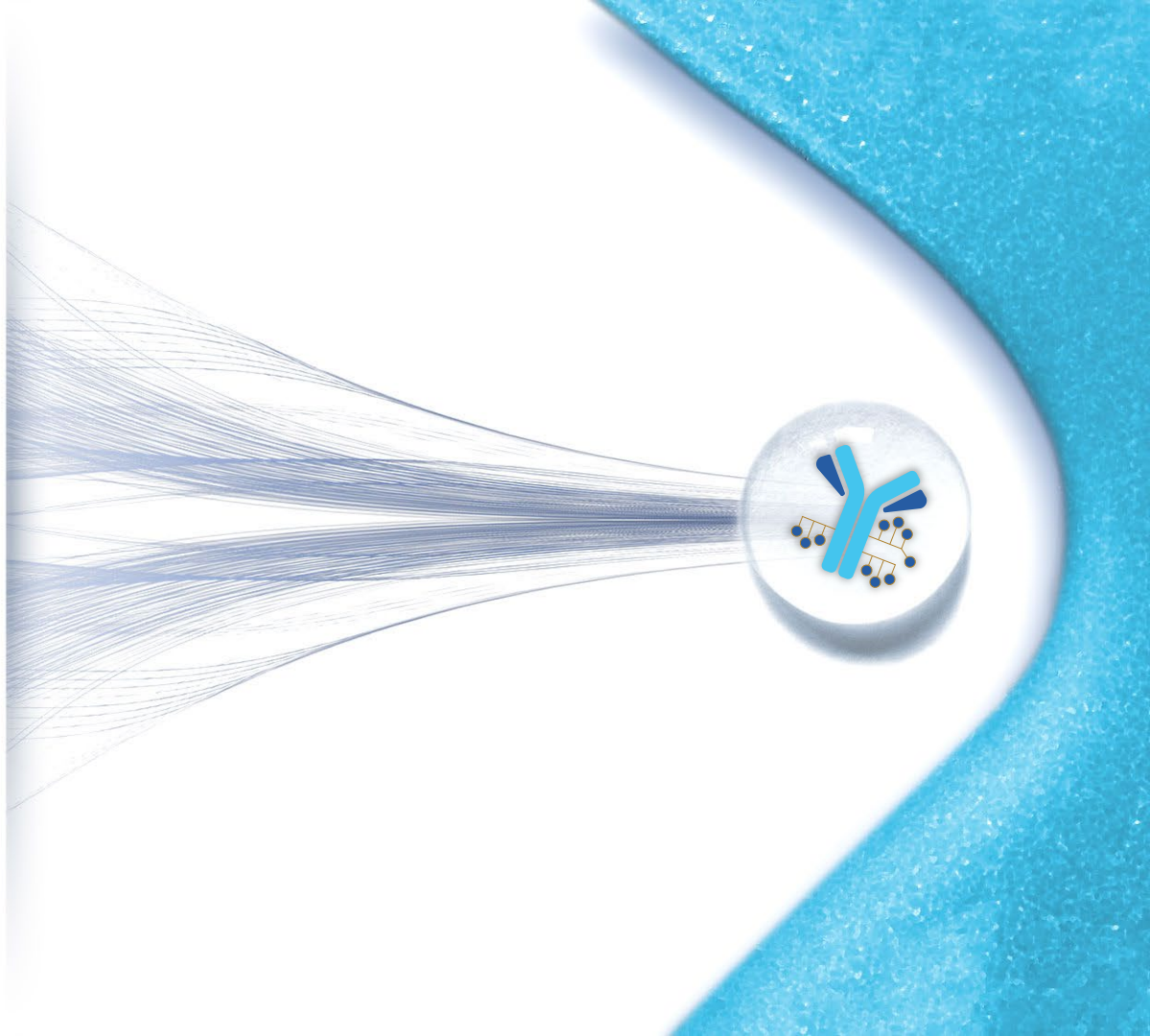
Mersana THERAPEUTICS

Accelerating ADC Innovation

…because patients are waiting

June 2020



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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.

Mersana is Poised for a Transformational 2020

XMT-1536	First-In-Class Pipeline	Innovative Platforms	Strong Foundation
On Track for Proof of Concept by Year End	**1 Phase I and 2 Development Candidates in 2020**	**DolaLock (Dolaflexin, Dolasynthen) and Immunosynthen**	**~$140M in Pro Forma Cash[2]**
• First-in-class asset • Ovarian and NSCLC adenocarcinoma • Wholly-owned[1] • Fast-to-market strategy	• Addressing unmet patient needs • Fast-to-market strategies	• Multiple partnering opportunities • Efficient product engines	• Additional $15M Credit Facility • Experienced team

NSCLC = Non-small cell lung cancer

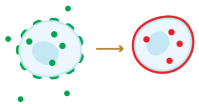
[1] Excluding Brazil

[2] $78.4 M in Cash, Cash Equivalents, and Marketable Securities as of March 31, 2020 plus net proceeds from the At-the-Market transaction on April 7, 2020

Innovative and Highly Differentiated ADC Technologies and Platforms

DolaLock

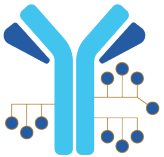
Demonstrated efficacy without severe neutropenia, neuropathy, or ocular toxicity



- Controlled bystander effect
- Selectively toxic to rapidly dividing cells
- Not a PgP substrate
- Induces immunogenic cell death

Dolaflexin

Demonstrated improved therapeutic index vs. other platforms



- DolaLock payload
- Polymer scaffold
- DAR ~10-12
- Excellent drug like properties

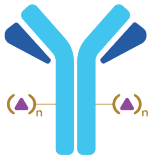
Dolasynthen

Homogenous & Customizable Platform

- DolaLock payload
- Synthetic scaffold
- Site-specific
- Precise DAR (2-24)

Immunosynthen

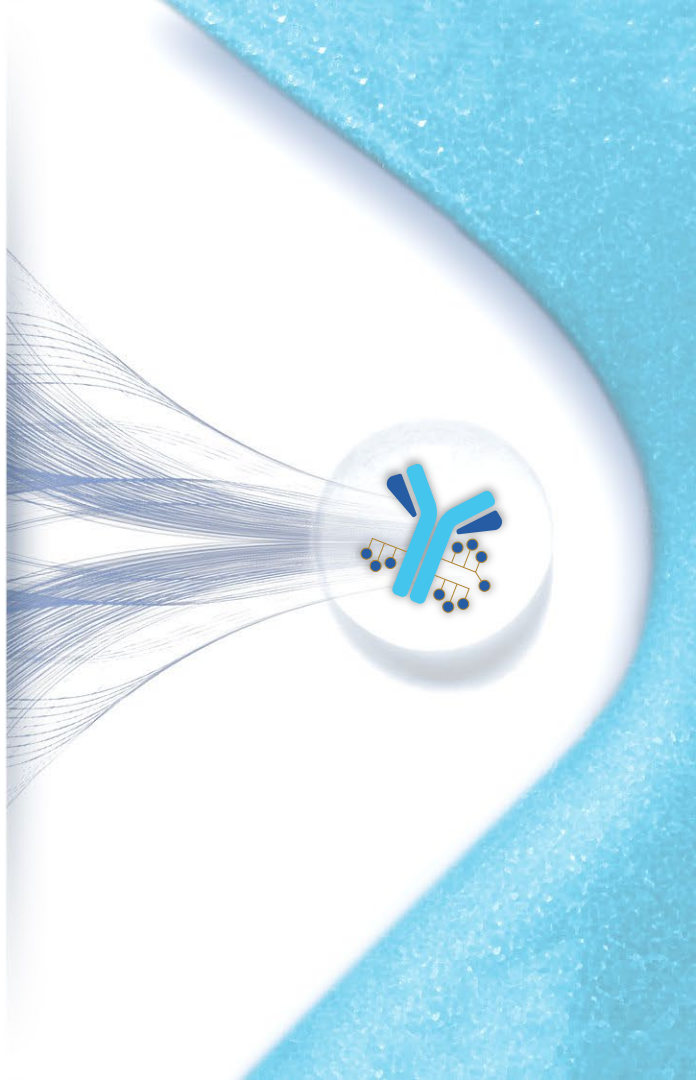
Systemic administration with targeted immuno-stimulatory effect



- Novel STING agonist
- Demonstrated complete regression of tumors with one dose in multiple preclinical models
- Limited effect on systemic cytokines

DAR = Drug-to-antibody ratio
STING = Stimulator of Interferon Genes
PgP = P-glycoproteins

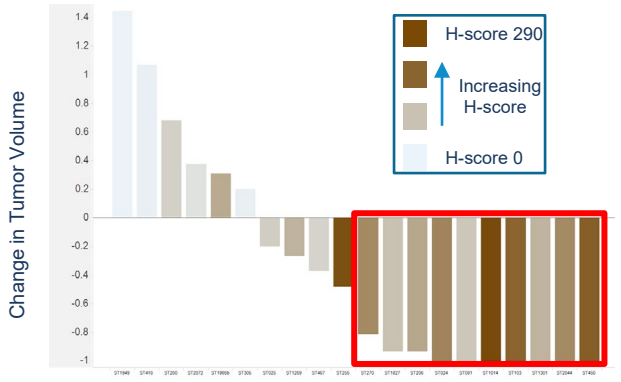
XMT-1536: First-in-Class Dolaflexin ADC Targeting NaPi2b



Leader in Targeting NaPi2b, an Ideal and Validated ADC Target

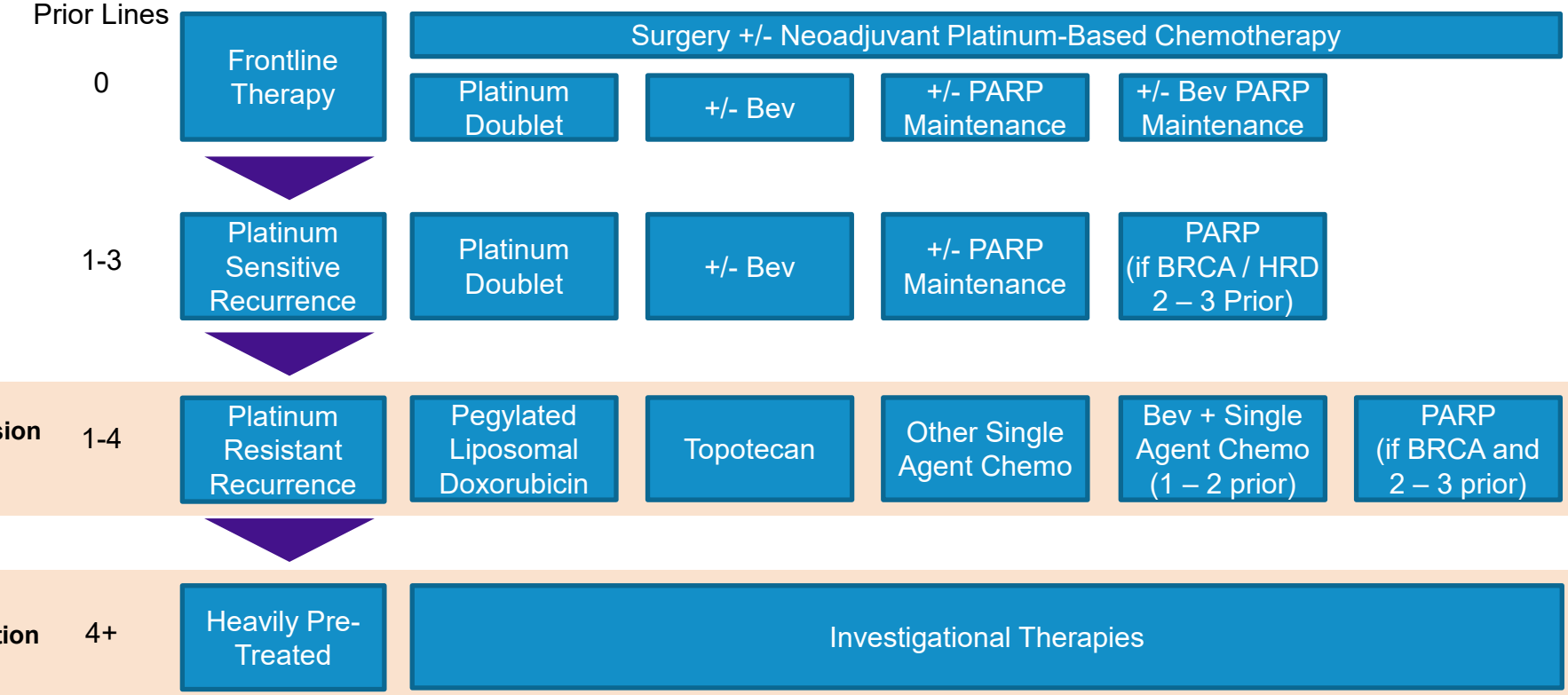
- NaPi2b is broadly expressed in ovarian cancer and NSCLC adenocarcinoma
  - No detectable expression in squamous NSCLC
  - Limited expression in healthy tissues
- NaPi2b is a lineage marker (not an oncogene) that transports phosphate into the cell
  - The presence of EGFR and KRAS mutations in NSCLC adenocarcinoma correlates with more frequent expression of NaPi2b
- Proprietary biomarker assay can distinguish across low, medium, and high expression
  - Correlation between biomarker expression and tumor response in preclinical and clinical settings
  - Developing companion diagnostic for use in registration enabling study

In Ovarian PDX Models, only tumors with an H-score above cutoff had a tumor response >50%



Mosher et al, AACR-NCI-EORTC International Conference, October 2017
Mitchell et al, AACR-NCI-EORTC International Conference, October 2019
D'Archangelo, et al. Abstract 194P ESMO 2014

XMT-1536 Has Been Studied in Two Populations: Dose Escalation and Expansion



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

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] R. 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

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

XMT-1536 Continues to Have a Favorable Safety Profile

- 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

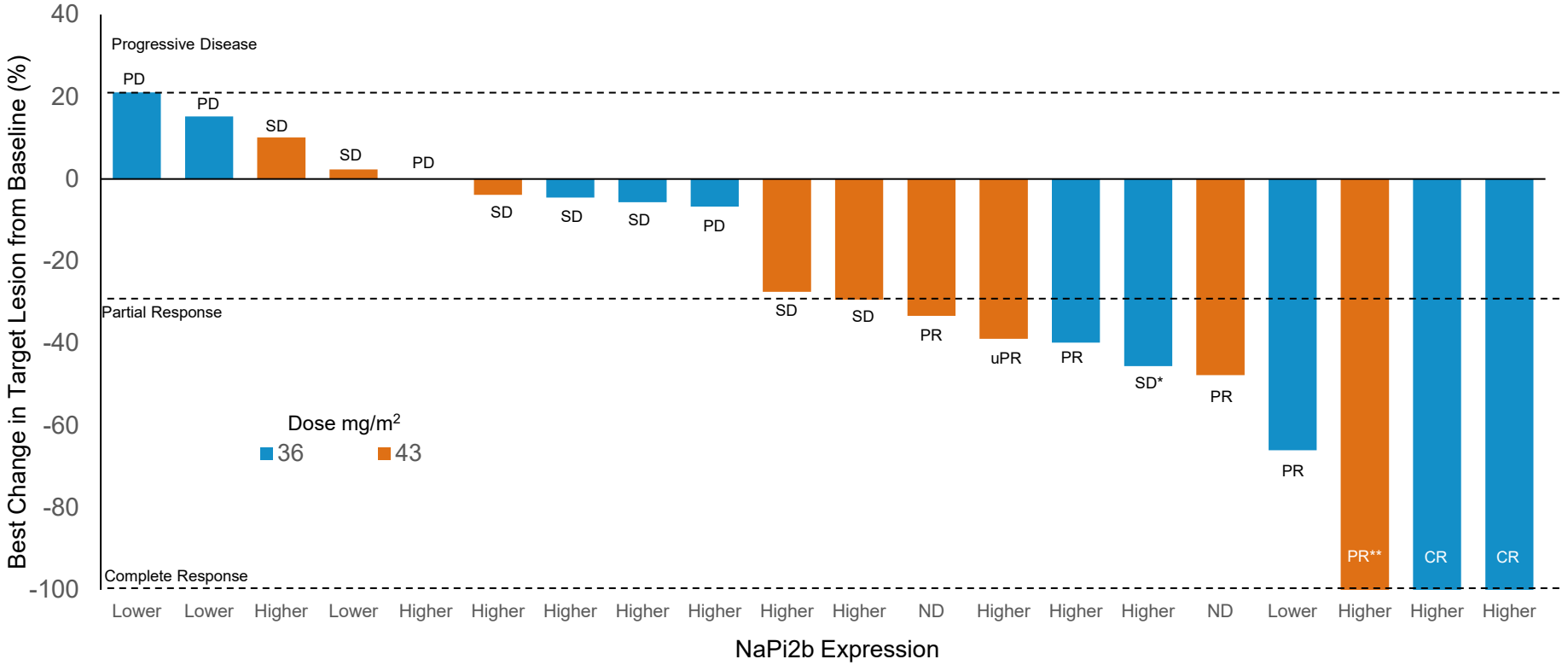
*7 patients are not evaluable: 1 withdrew consent (Lower NaPi2b Expression); 1 with unrelated SAE leading to discontinuation and death (Lower NaPi2b Expression); 5 have not yet received a scan

**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)

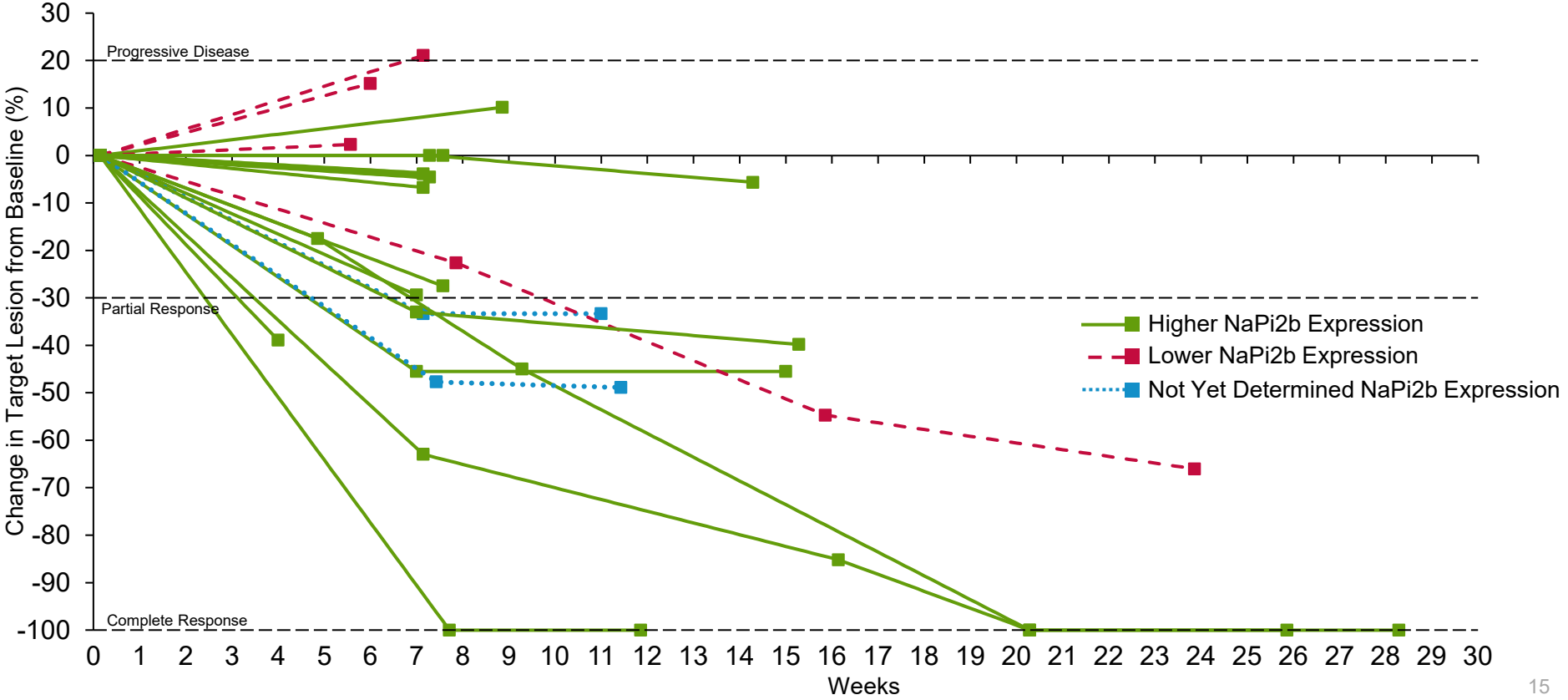
^{oo} Lower NaPi2b Expression: defined in dose escalation as below the lowest H-score at which response observed (<110)

Deep Responses Observed in Platinum-Resistant Ovarian Cancer

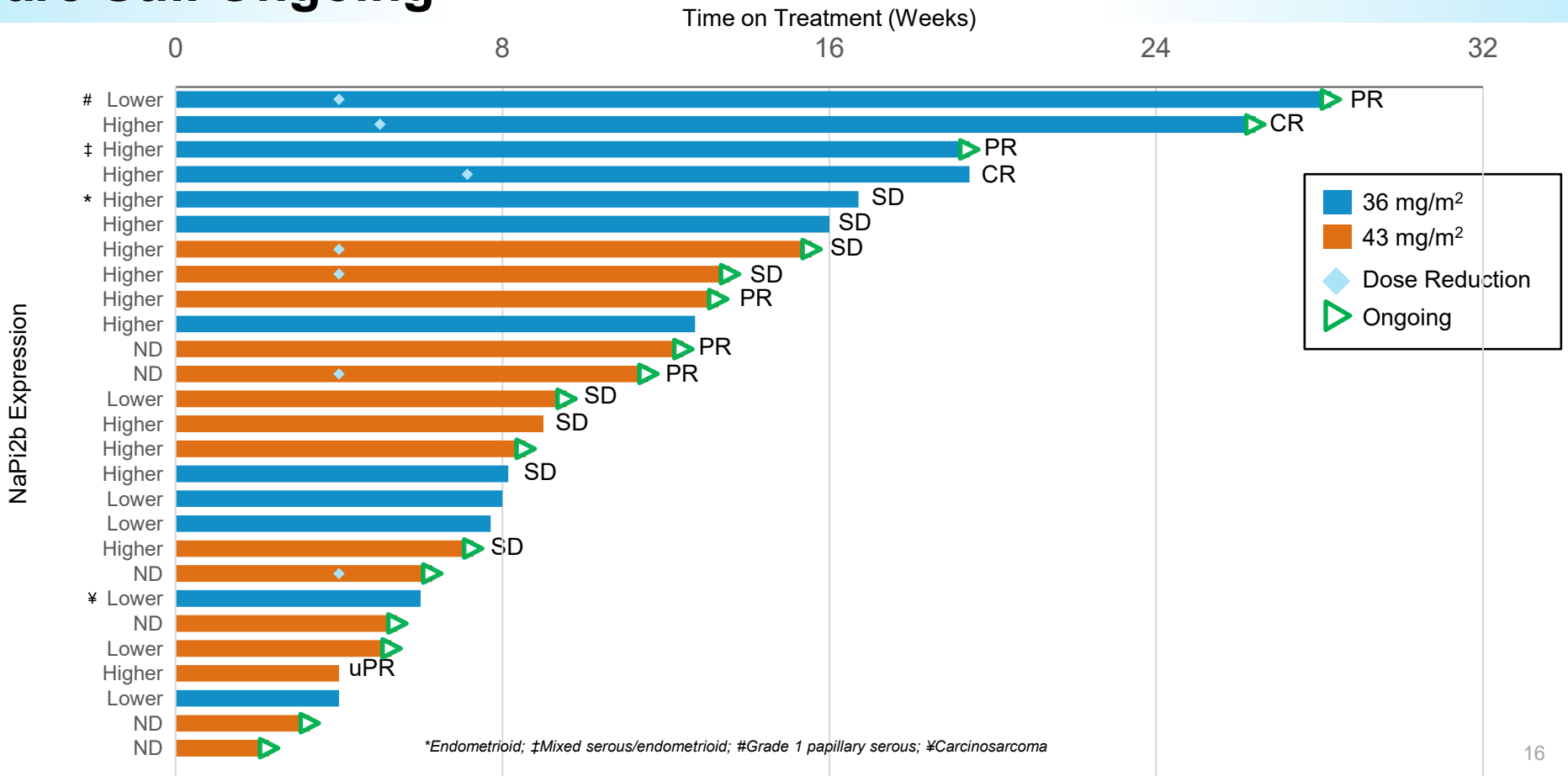


* Following PR next scan showed new lesions, best overall response per RECIST v1.1 is SD
** CR of target lesions and non-CR/non-PD of non-target lesions, best overall response per RECIST v1.1 is PR

XMT-1536 Patient Responses Appear to Deepen Over Time



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



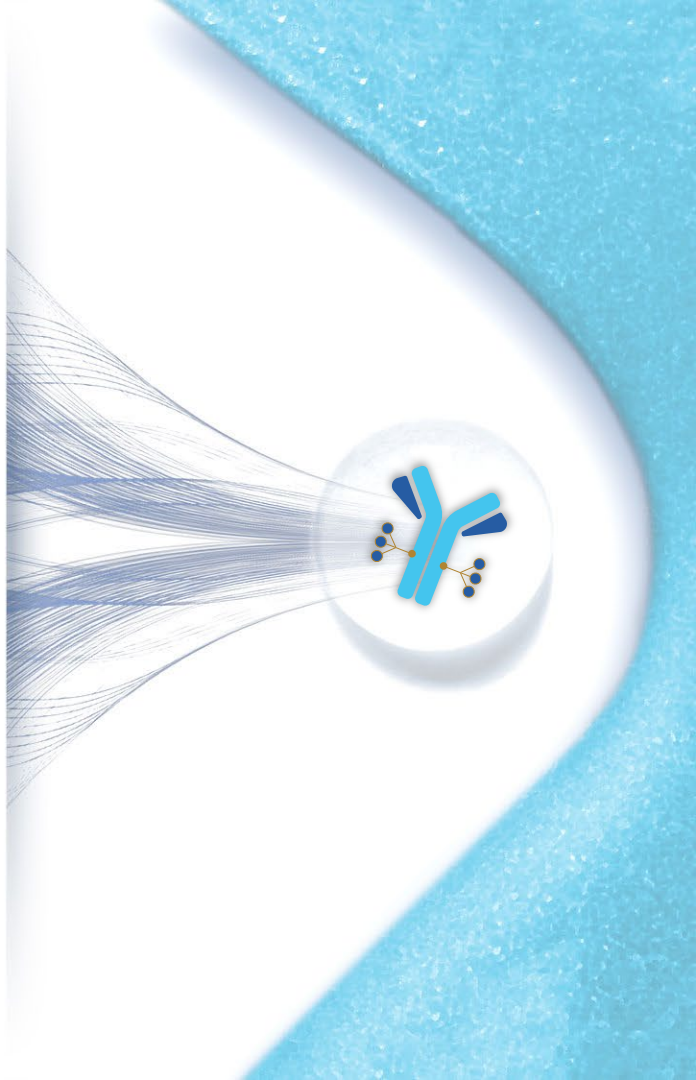
*Endometrioid; ‡Mixed serous/endometrioid; #Grade 1 papillary serous; ¥Carcinosarcoma

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

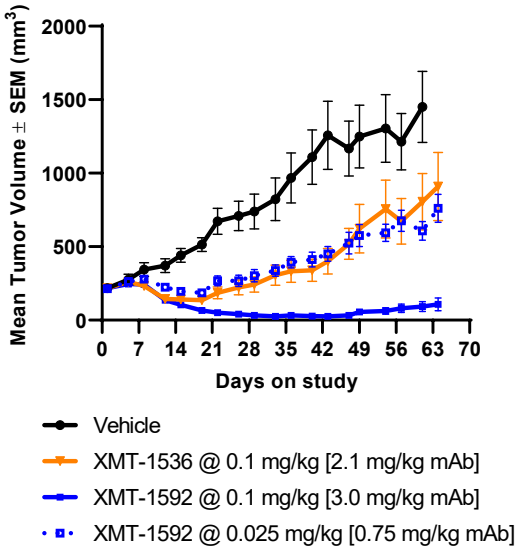
K Moore et al., ESMO 2019; Pujade-Lauraine et al., SGO 2019; Gaillard et al., ESMO 2018; SmartAnalyst report 2019
Garon et al., Lancet 2014; Rittmeyer A, et al. Lancet. 2017; Borghaei H, et al. N Engl J Med. 2015; SmartAnalyst report 2019

XMT-1592 is a Dolasynthen ADC Targeting NaPi2b



Our Success with NaPi2b Makes it an Ideal Target for Evaluation of the Clinical Differentiation of Dolasynthen

4X Greater Activity in Lung PDX



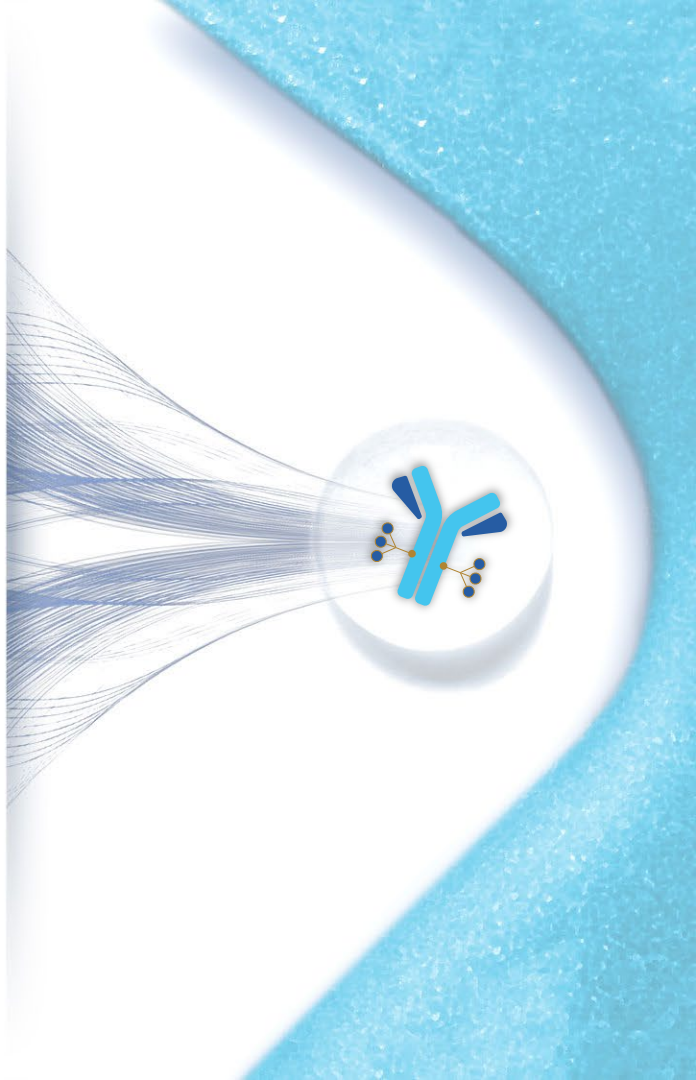
2020

- File IND Application ✓
- Initiate Dose Escalation ✓
- Achieve MTD

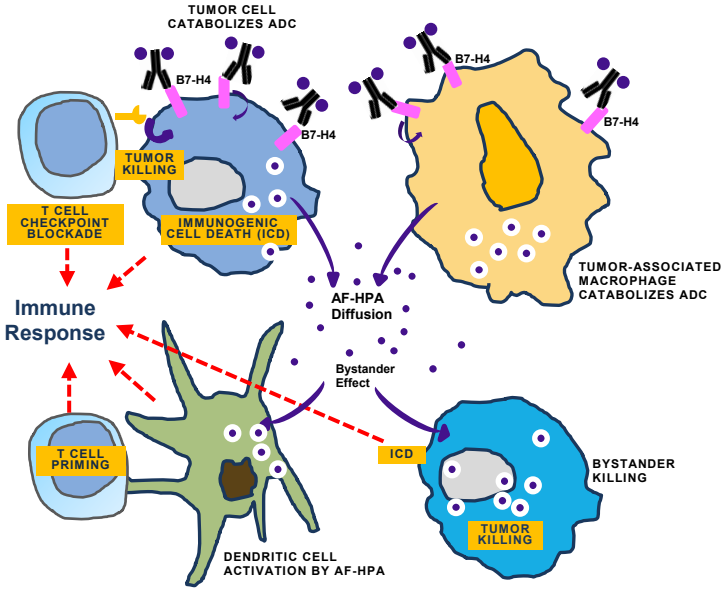
2021

- Clinical Proof of Differentiation
- Inform Product Engine

First-in-Class B7-H4 ADC in IND-Enabling Studies



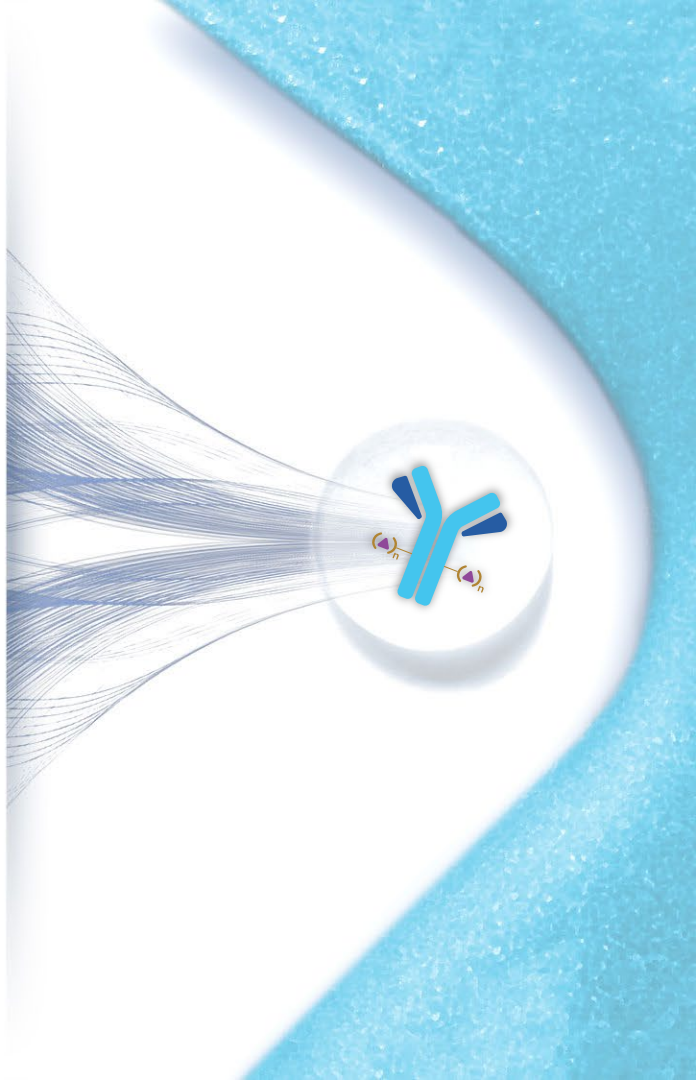
B7-H4 Expression Ideally Suited for a DolaLock ADC



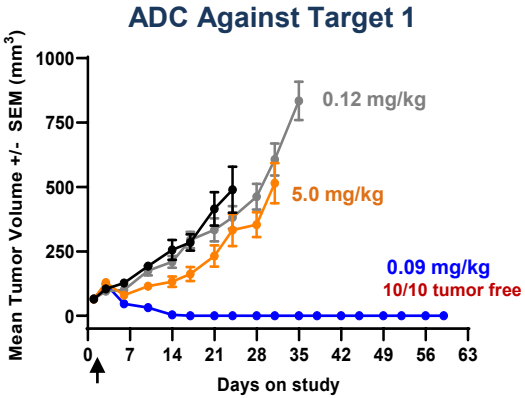
- B7-H4 is expressed on both tumor cells and immunosuppressive tumor-associated macrophages (TAMs)
  - Limited expression in normal tissues
- A DolaLock ADC targeting B7-H4 can exert its effect through multiple mechanisms of action:
  - Uptake by tumor cells and direct cytotoxicity
  - Uptake by TAMs to release payload in the tumor microenvironment
  - Free payload can activate dendritic cells and a secondary immune response
- Expression in PD-L1 negative tumors, provides a potential fast to market opportunities (e.g., triple negative breast cancer)

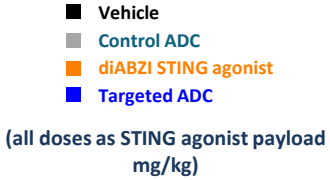
IND-enabling studies in 2020

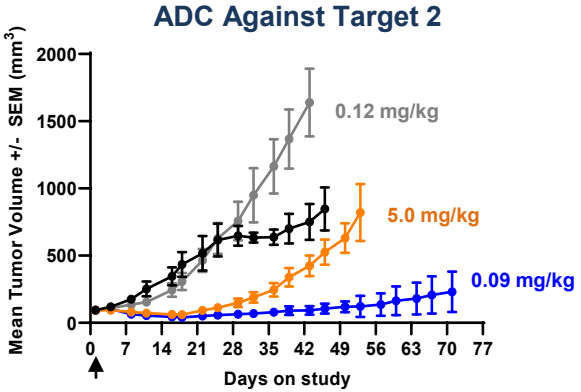
Immunosynthen Development Candidate in 2020

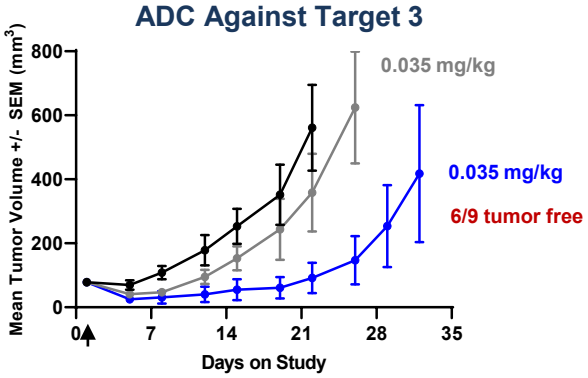


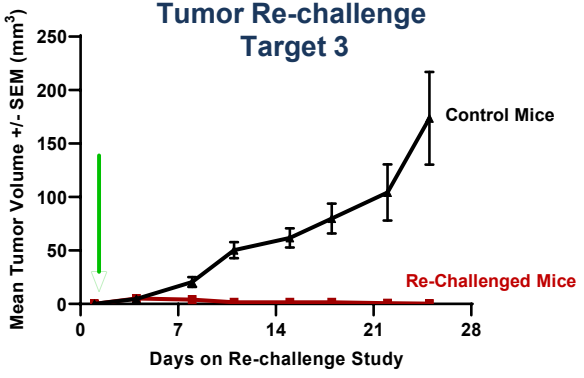
Immunosynthen ADCs Show *In Vivo* Activity Against MultipleTargets and Immune Memory











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

We are Leveraging our Novel ADC Platforms to Generate Differentiated Product Candidates

ADC Program	Target	Indication	Platform	Discovery	Preclinical	P1 Dose Escalation	P1 Proof of Concept	P2/Pivotal Study
XMT-1536*	NaPi2b	Ovarian Cancer NSCLC Adenocarcinoma	Dolaflexin					
XMT-1592*	NaPi2b	Ovarian Cancer NSCLC Adenocarcinoma	Dolasynthen					
To Be Named	B7-H4	Multiple Solid Tumors	Dolaflexin or Dolasynthen					
To Be Named	Multiple	Multiple Solid Tumors	Immunosynthen					
To Be Named	Multiple	Undisclosed	Dolasynthen					
To Be Named	Multiple	Undisclosed	Dolaflexin					
Multiple EMD SERONO	Multiple	Undisclosed	Dolaflexin					
ASN004 ASANA BioSciences	5T4	Undisclosed	Dolaflexin					

*NaPi2b antibody used in XMT-1536 and XMT-1592 is in-licensed from Recepta Biopharma. Recepta has rights to commercialize XMT-1536 and XMT-1592 in Brazil

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