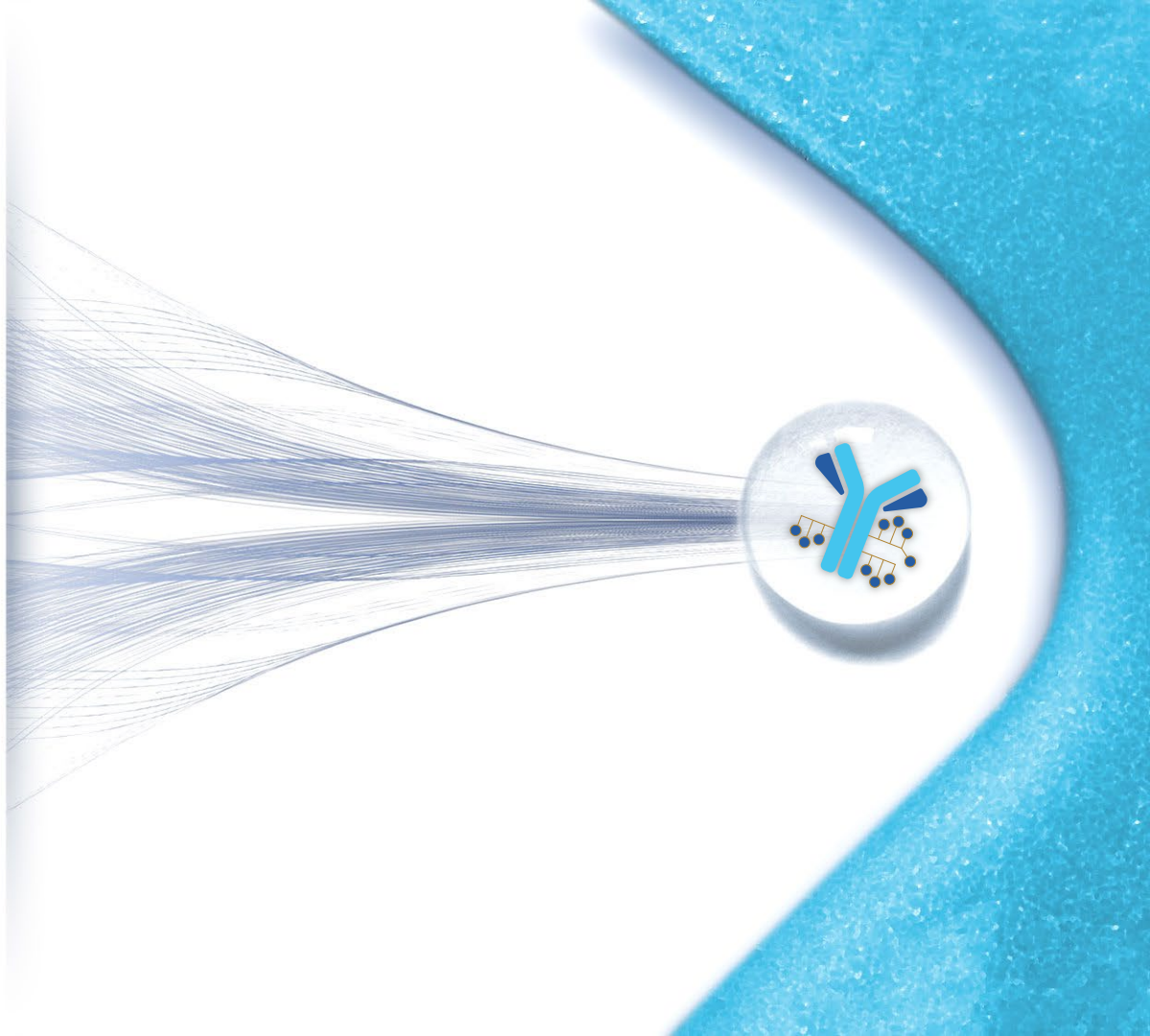
Mersana
THERAPEUTICS

Accelerating ADC Innovation

…because patients are waiting

April 2020



Legal Disclaimer

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.

Forward-looking statements generally can be identified by terms such as “aims” “anticipates,” “believes,” “contemplates,” “continues,” “could,” “estimates,” “expects,” “goal,” “intends,” “may,” “plans,” “possible,” “potential,” “predicts,” “projects,” “seeks,” “should,” “target,” “will,” “would” or similar expressions and the negatives of those terms. 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 may not be predictive of the results or success of ongoing or later preclinical or clinical trials, that the development of the Company’s product candidates and new platforms will take longer and/or cost more than planned, and that the identification of new product candidates will take longer than planned, as well as those listed in our Annual Report on Form 10-K filed on February 28, 2020, with the Securities and Exchange Commission (“SEC”) and subsequent SEC filings. In addition, while we expect that the COVID-19 pandemic might adversely affect the Company’s business operations and financial results, the extent of the impact on the Company’s preclinical and clinical development efforts 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 Near-Term Proof of Concept	1 IND and 2 Development Candidates in 2020	DolaLock (Dolaflexin, Dolasynthen) and Immunosynthen	~$100M in Cash[2] +$15M Credit Facility
• First-in-class asset • Clinically-Validated • Wholly-Owned[1] • Fast-to-market strategy	• Addressing unmet patient needs • Fast-to-market strategies	• Multiple partnering opportunities • Efficient product engines	• Experienced team • Raised $65 million in gross proceeds from ATM[3] facility in April 2020

[1] Excluding Brazil
[2] Cash, Cash Equivalents, and Marketable Securities as of December 31, 2019
[3] ATM = At-the-Market

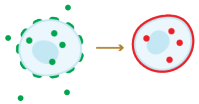
We are Leveraging our Novel ADC Platforms to Generate Differentiated Product Candidates

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	NSCLC Adenocarcinoma Ovarian Cancer	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					
Platform Collaborators								
Multiple EMD SERONO	Multiple	Undisclosed	Dolaflexin					
ASN004 ASANA BioSciences	5T4	Undisclosed	Dolaflexin					

Innovative and Highly Differentiated ADC Technologies and Platforms

DolaLock

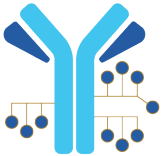
Efficacy without severe neutropenia, neuropathy, or ocular toxicity



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

Dolaflexin

Improved therapeutic index vs. other platforms



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

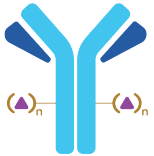
Dolasynthen

Homogenous & Customizable Platform

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

Immunosynthen

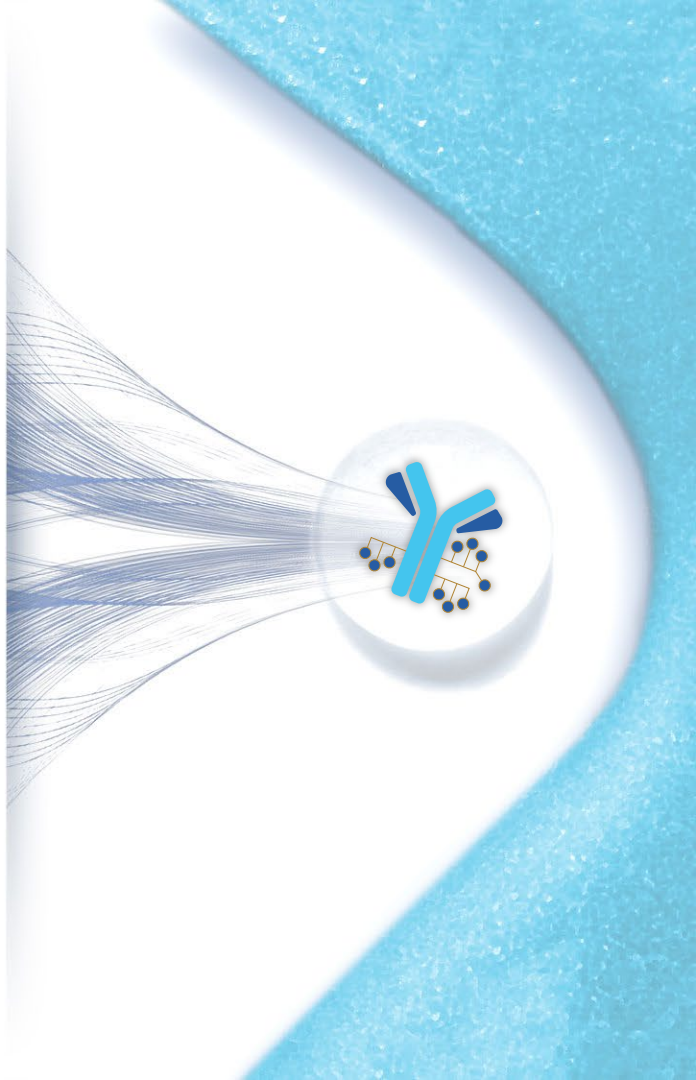
Systemic administration with targeted immuno-stimulatory effect



- Novel STING agonist
- Complete regression with one dose in multiple preclinical models
- Limited effect on systemic cytokines

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

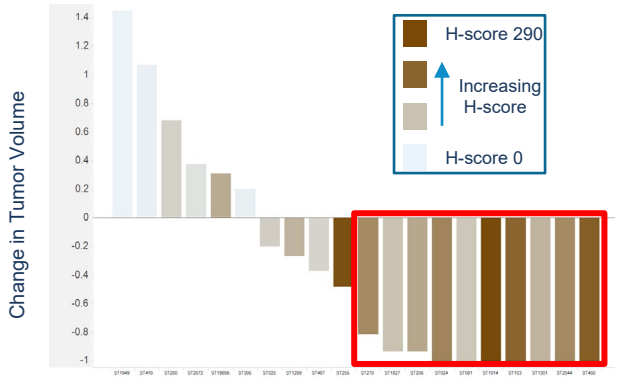
XMT-1536: First-in-Class Dolaflexin ADC Targeting NaPi2b



Leader in Targeting NaPi2b, an Ideal and Validated ADC Target

- 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 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: Advancing Through Proof-of-Concept Studies in Ovarian Cancer and NSCLC Adenocarcinoma

First-in-Class

- Clinically-validated target
- Fast-to-market strategy with expansion cohorts in Ovarian Cancer and NSCLC adenocarcinoma
- Wholly-owned[1]

Encouraging Clinical Activity

- Confirmed responses and prolonged stable disease in heavily pretreated patients
- 33% ORR (5/15) at doses $\geq$ 30 mg/m^2 with higher NaPi2b expression

Well-Tolerated

- No severe toxicities commonly seen with other ADCs: neutropenia, ocular toxicities, or peripheral neuropathy
- Transient AST elevation without associated changes in bilirubin
- MTD 43 mg/m^2

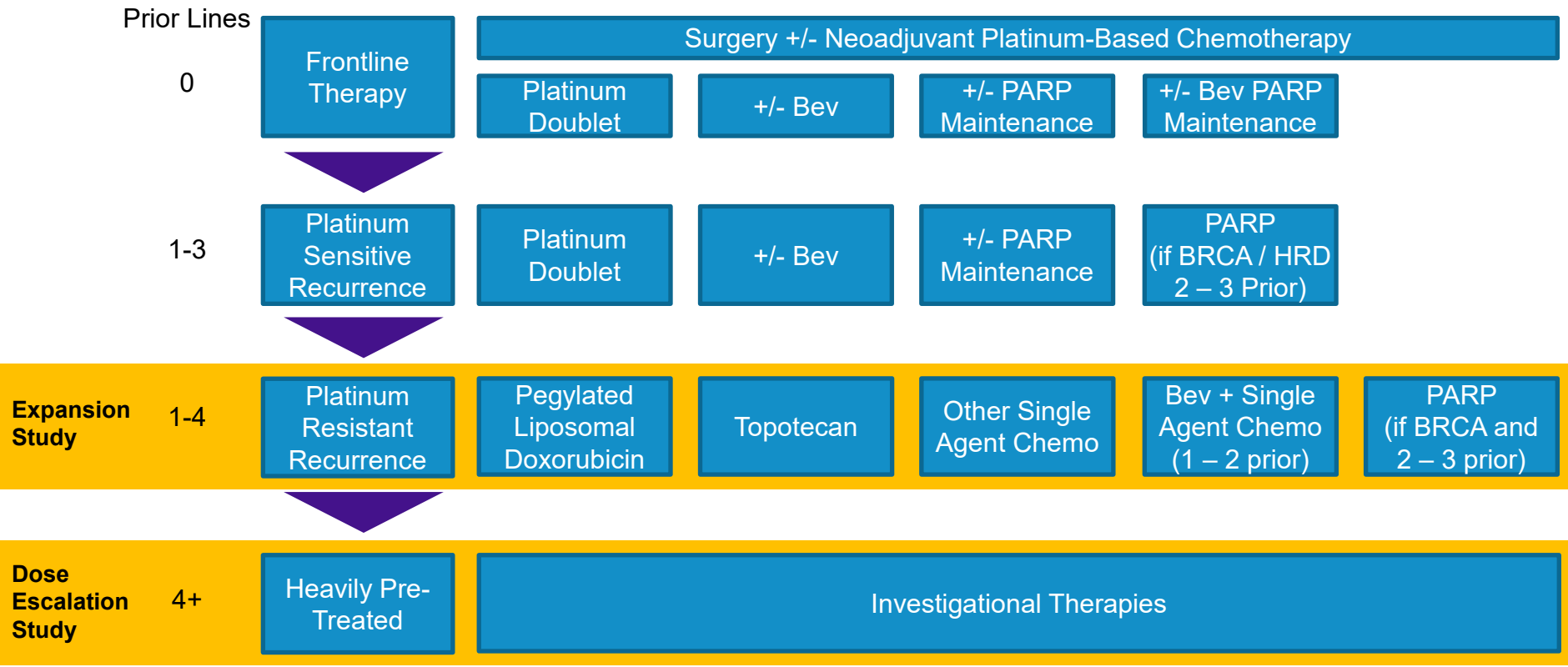
Multiple Data Read Outs Expected in 2020

[1] Excluding Brazil

ASCO 2019 Poster #3010; Phase 1 dose escalation study of XMT-1536, a novel NaPi2b-targeting antibody-drug conjugate (ADC), in patients (pts) with solid tumors likely to express NaPi2b; June 2019, Data Cutoff May 10, 2019

Mersana Data Disclosure March 30, 2020 with data cutoff Feb 3, 2020

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



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

Literature Shows Declining Performance of Heavily-Pretreated Platinum-Resistant Ovarian Cancer

Representative Lines of Therapy for OC Patients in XMT-1536 Dose Escalation Study

Source	2nd Line	3rd Line	4th Line	5th Line	6th Line	Notes
Griffiths 2011 N=274	ORR:16% DCR:37%	ORR:8% DCR:31%	ORR:3% DCR:18%	ORR:2% DCR:18%	ORR:0% DCR:3%	2004 – 2008 UK dataset Platinum Resistant and Refractory. Assume 1 prior lines before PROC
Hoskins 2005 N=120	ORR:20% DCR:45%	ORR:20% DCR:41%	ORR:11% DCR:44%	ORR:8% DCR:23%	ORR:0% DCR:20%	Pre-1999 Canada dataset Not limited to platinum resistant
Bruchim 2013 N=156	ORR:26%	ORR:12%	ORR:3%	ORR:5%	ORR:0%	1995 – 2003 Israel dataset. Platinum status not specified after 2L

ORR: Overall Response Rate (CR + PR)/Evaluable Patients
DCR: Disease Control Rate (CR + PR + SD)/Evaluable Patients

Bruchim, Eur J Obs&Gyn and Repro Biology 2013;166:94-98
Griffiths, Int J Gynecol Cancer 2011;21:58-65
Hoskins, Gynecologic Onc 2005;97:862-869

XMT-1536 was Studied in a Heavily Pre-Treated Population

Dosing: Q3 weeks	Dosing: Q4 weeks
	DL 8A 52 mg/m² (1.4 mg/kg) Evaluation Ongoing, Not Included
	DL 7A 43 mg/m² (1.2 mg/kg)
DL 6 40 mg/m² (1.08 mg/kg)	**DL 6A 36 mg/m²** (0.97 mg/kg)
DL 5 30 mg/m² (0.81 mg/kg)	**DL 5A 30 mg/m²** (0.81 mg/kg)
DL 4 20 mg/m² (0.54 mg/kg)	**DL 4A 20 mg/m²** (0.54 mg/kg)
DL 3 12 mg/m² (0.324 mg/kg)	
DL 2 6 mg/m² (0.162 mg/kg)	
DL 1 3 mg/m² (0.081 mg/kg)	

ClinicalTrials.gov: NCT03319628

N=59 Patients Dosed at 3 mg/m² to 43 mg/m²					
Age, years; Median (range)			65 (39-93)		
ECOG performance status; n (%) 0 1			 21 (36%) 38 (64%)		
Primary Tumor Type; n (%) Ovarian NSCLC Other			 37 (64%) 11 (18%) 11 (18%)		
Prior lines of Therapy, Median (range) All patients Ovarian NSCLC			 5 (1 to 10) 5 (1 to 10) 4 (2 to 6)		
Prior Therapies Ovarian, N=36* * One patient prior treatment data not reported yet	Platinum Taxane Bevacizumab PARPi Investigational	n (%) 36 (100) 33 (92) 23 (64) 20 (56) 14 (39)	Prior Therapies NSCLC, N=10* * One patient prior treatment data not reported yet	Platinum Pemetrexed I/O Taxane TKI Investigational	n (%) 10 (100) 10 (100) 10 (100) 7 (70) 1 (10) 7 (70)

Mersana Data Disclosure March 30, 2020 with data cutoff Feb 3, 2020 accepted as late-breaking abstract for oral presentation at SGO 2020

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

	Patients dosed 3 to 40 mg/m^2 N=52				Patients dosed 43 mg/m^2 N=7			
Preferred Term	**Grade 1 n (%)**	**Grade 2 n (%)**	**Grade 3 n (%)**	**Total – All Grades n (%)**	**Grade 1 n (%)**	**Grade 2 n (%)**	**Grade 3 n (%)**	**Total – All Grades n (%)**
NAUSEA	16 (31)	5 (10)	0	21 (40)	1 (14)	1 (14)	0	2 (29)
FATIGUE	7 (13)	13 (25)	0	20 (38)	1 (14)	3 (43)	0	4 (57)
AST INCREASED	5 (10)	5 (10)	6 (12)	16 (32)	2 (29)	1 (14)	0	3 (43)
HEADACHE	7 (13)	5 (10)	0	12 (23)	1 (14)	0	0	1 (14)
VOMITING	8 (15)	2 (4)	1 (2)	11 (21)	0	0	0	0
PYREXIA	8 (15)	1 (2)	0	9 (17)	2 (29)	0	0	2 (29)
ALK PHOS INCREASED	7 (13)	1 (2)	0	8 (15)	0	0	0	0
DECREASED APPETITE	1 (2)	7 (13)	0	8 (15)	0	1 (14)	0	1 (14)
DIARRHEA	5 (10)	1 (2)	1 (2)	7 (13)	1 (14)	0	0	1 (14)
ALT INCREASED	5 (10)	1 (2)	0	6 (12)	1 (14)	0	0	1 (14)
ANEMIA	0	3 (6)	2 (4)	5 (10)	1 (14)	1 (14)	0	2 (29)
THROMBOCYTOPENIA	2 (4)	1 (2)	0	3 (6)	2 (29)	1 (14)	0	3 (43)

No Severe Toxicities Associated with Other ADC Platforms such as Neutropenia, Ocular Toxicities, or Peripheral Neuropathy

Mersana Data Disclosure March 30, 2020 with data cutoff Feb 3, 2020

Favorable Biomarker-Response Relationship Observed

Response - Ovarian Cancer and NSCLC Adenocarcinoma N=39*		All	Higher NaPi2b [o]
20 mg/m^2	N	10	7
	PR	**1 (10%)**	**0 (0%)**
	SD	6 (60%)	4 (57%)
	DCR (PR+SD)	**7 (70%)**	**4 (57%)**
30, 36, 40 mg/m^2	N	22	12
	PR	**3 (14%)**	**3 (25%)**
	SD	10 (45%)	6 (50%)
	DCR (PR+SD)	**13 (59%)**	**9 (75%)**
43 mg/m^2	N	7	3
	PR	**2 (29%)**	**2 (67%)**
	SD	4 (57%)	0 (0%)
	DCR (PR+SD)	**6 (86%)**	**2 (67%)**

PR: 33%
DCR: 73%

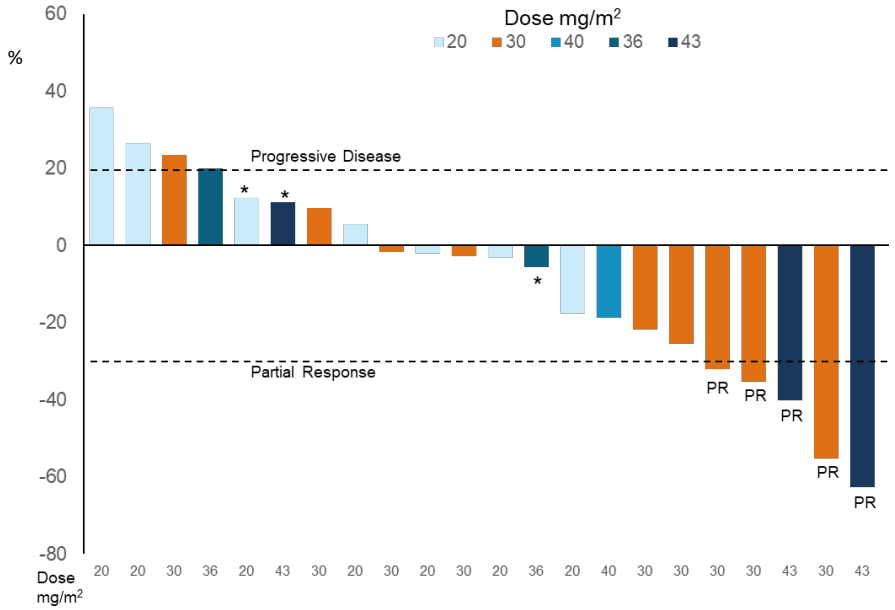
* Excludes 1 patient discontinued due to investigator/patient choice
[o] Higher NaPi2b Expression: at / above lowest H-score at which response observed (≥110)
[oo] Lower NaPi2b Expression: below the lowest H-score at which response observed (<110)

Mersana Data Disclosure March 30, 2020 with data cutoff Feb 3, 2020

- One response with indeterminate NaPi2b expression at 20 mg/m^2 (hypocellular sample)
- No responses with lower NaPi2b expression (55% SD ≥ 30 mg/m^2)[oo]
- Response in NSCLC adenocarcinoma at 43 mg/m^2 with higher NaPi2b Expression
- Emerging data will define biomarker cut-off for patient selection in future studies

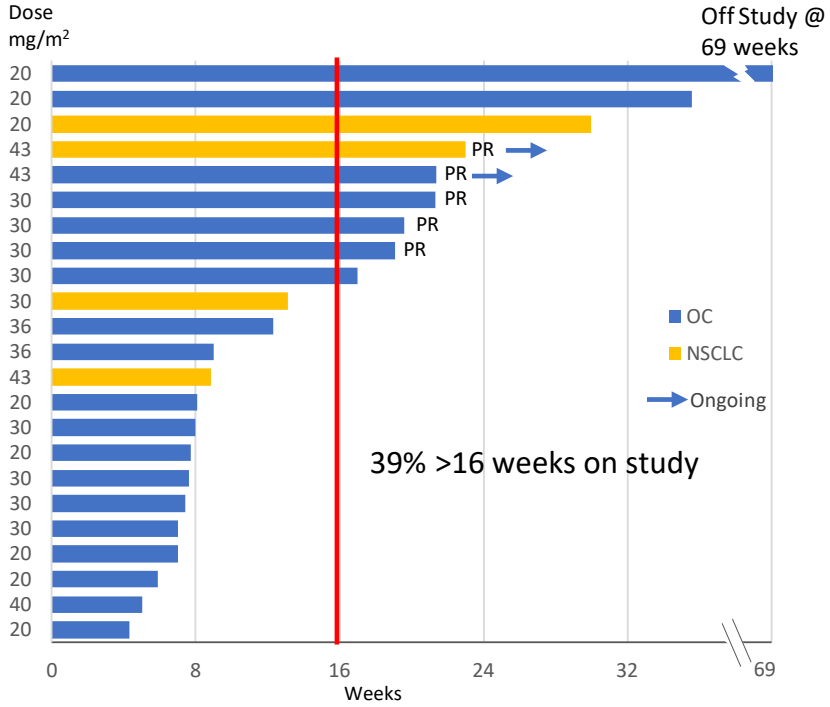
Higher NaPi2b Expression: Deep Responses and Meaningful Duration of Therapy

Higher NaPi2b Expression: Best Percent Change in Sum of Target Lesion Dimensions from Baseline**



* Best overall response of progressive disease
**Excludes 1 patient discontinued due to investigator/patient choice

Higher NaPi2b Expression: Duration on Therapy



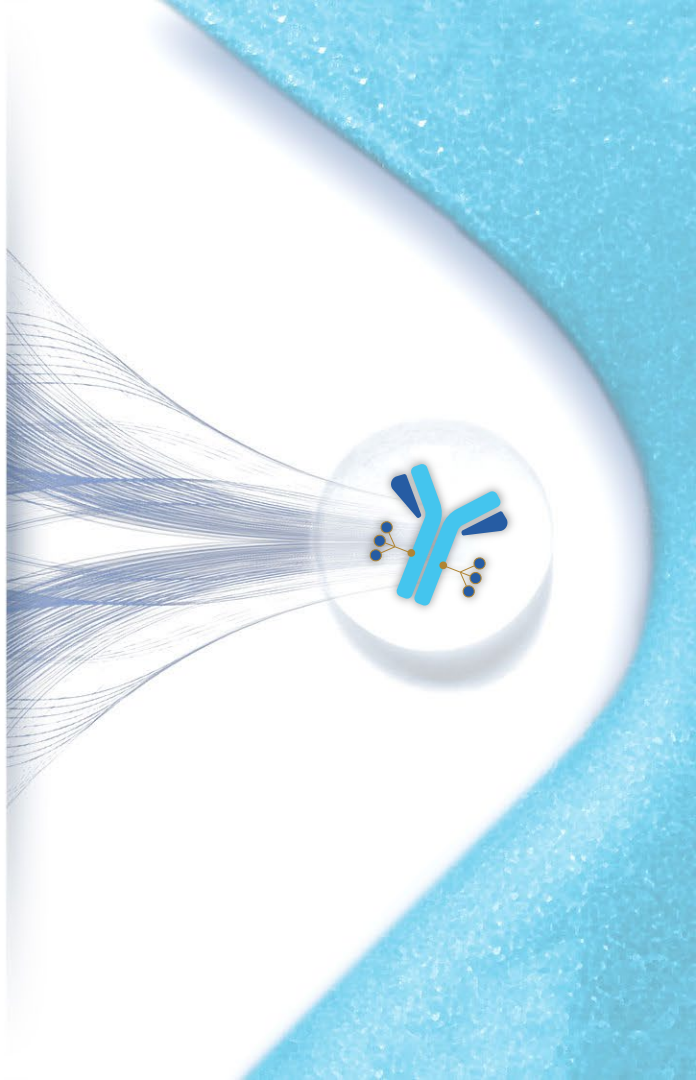
Mersana Data Disclosure March 30, 2020 with data cutoff Feb 3, 2020

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

	Dose Escalation	Ovarian Cancer Expansion Data in 2Q & 2H 2020	NSCLC Adeno Expansion Data in 2Q & 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

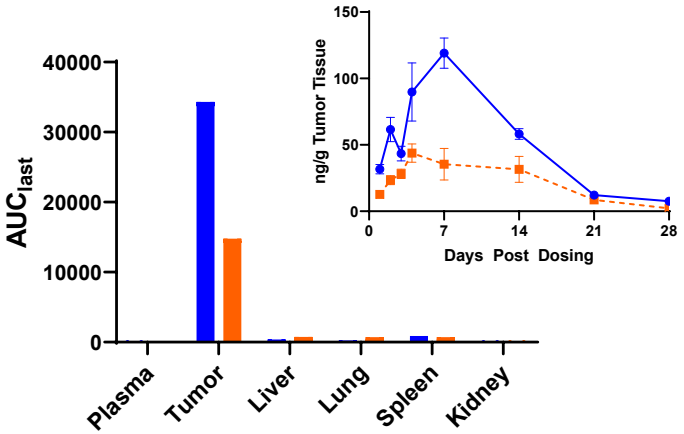
XMT-1592 is a Dolasynthen ADC Targeting NaPi2b



XMT-1592 Shows Four-Fold Greater Efficacy in Lung Tumor Model

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

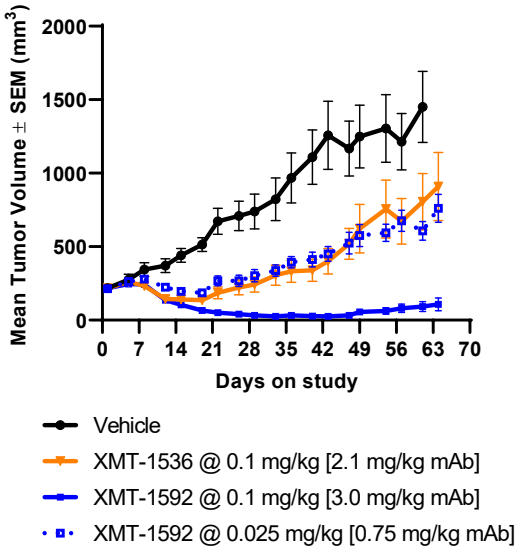
2X Tumor Exposure of Payload



XMT-1536 | XMT-1592

After single, equal dose of 0.05 mg/kg by payload

4X Greater Activity in Lung PDX

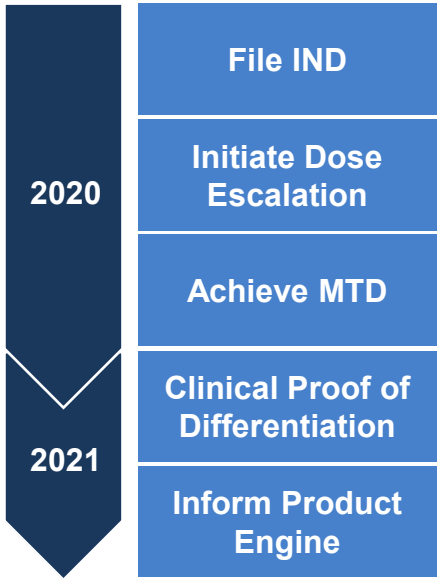


Leveraging NaPi2b Experience for Rapid Dose Escalation of XMT-1592

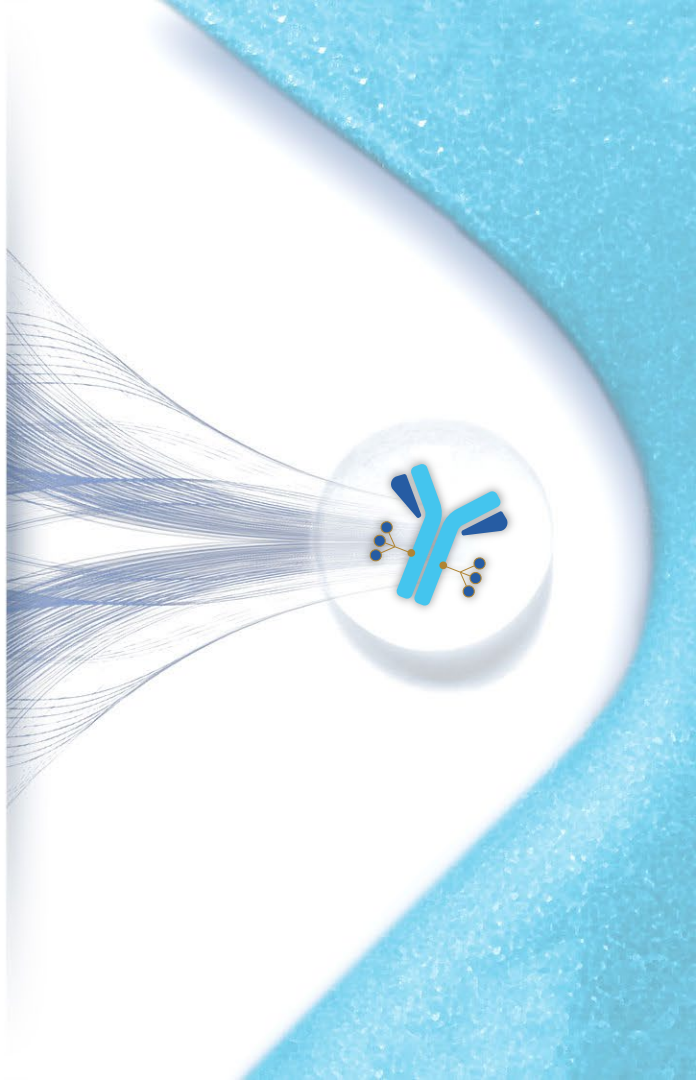
Leveraging insights from XMT-1536

- Target
- Antibody
- Payload
- Biomarker
- Patient Populations
- Investigators

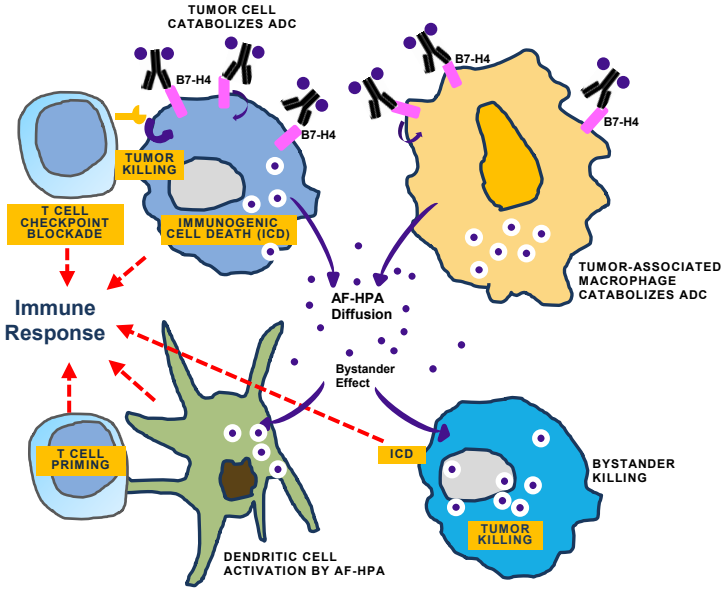
Solidify NaPi2b Leadership



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



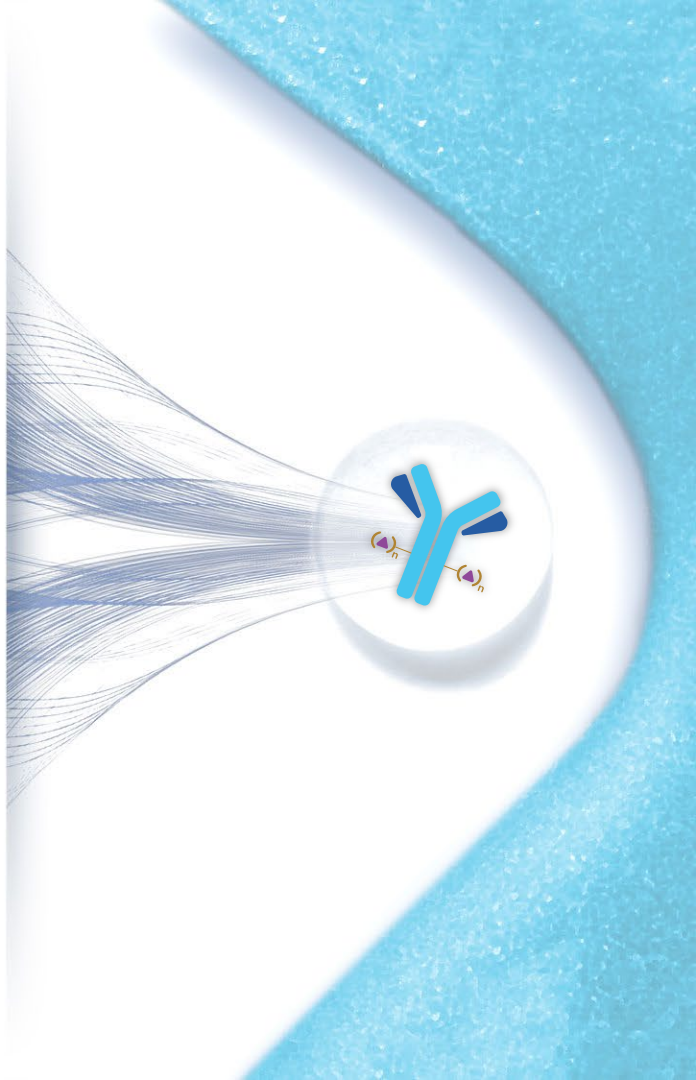
B7-H4 Expression Ideally Suited for a DolaLock ADC



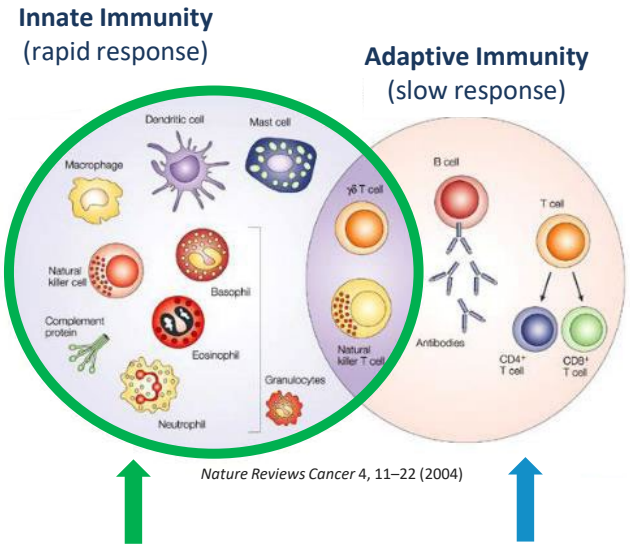
- B7-H4 is expressed on both tumor cells and immunosuppressive tumor-associated macrophages (TAMs)
  - Limited expression in normal tissues
- A DolaLock ADC targeting B7-H4 can exert its effect through multiple mechanisms of action:
  - Uptake by tumor cells and direct cytotoxicity
  - Uptake by TAMs 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



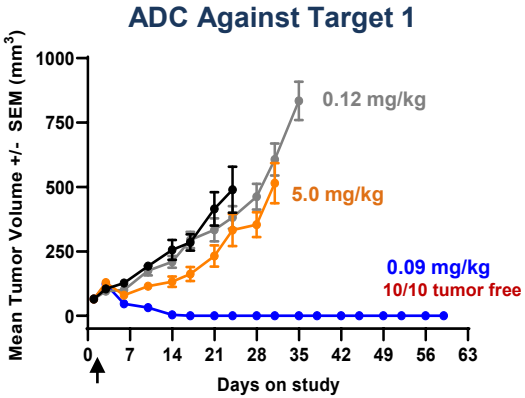
Immunosynthen: Strong Rationale for a STING Agonist ADC Approach

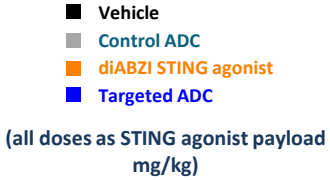


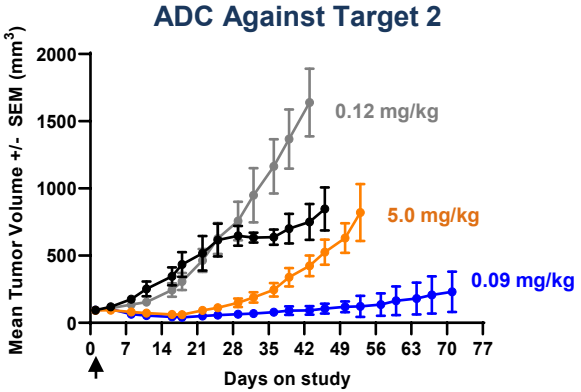
ADCs are suited to overcome limitations of free agonist:

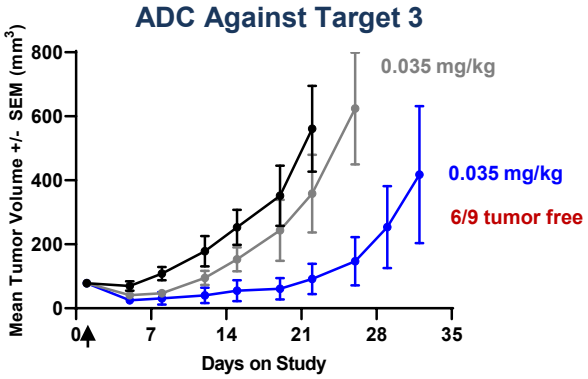
- Targeted delivery reduces toxicity liabilities
- Improved pharmacokinetics
- Accessibility to metastatic sites
- No restriction on tumor type, location or size

Immunosynthen ADCs Show *In Vivo* Activity Against Multiple Targets and Immune Memory

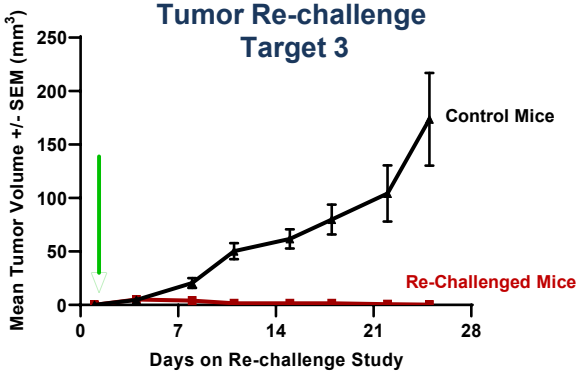






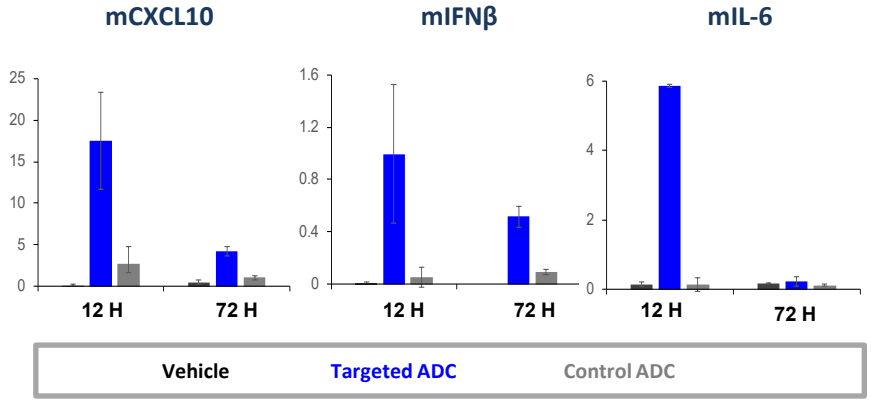


Tumor re-challenge of 6 tumor-free mice

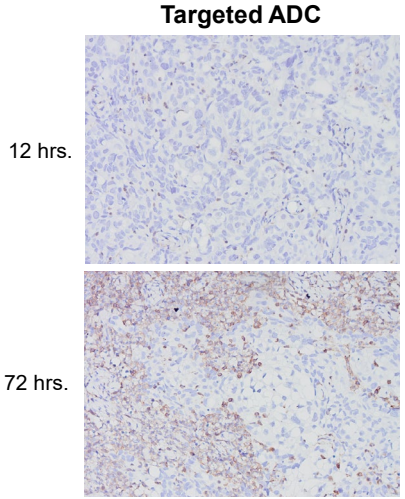


Immunosynthen ADC Activates STING Pathway and Induces Marked Immune Cell Infiltration in Tumors

Cytokine expression (qPCR on FFPE samples)



CD45 Immunohistochemistry Immune cell infiltration



Data shown for Immunosynthen ADC for Target 1
After single dose of 0.09 mg/kg by STING agonist payload

On Track to Select First Immunosynthen ADC Development Candidate in 2020

- ✓ Identified proprietary STING payload specifically designed for ADCs
- ✓ Demonstrated efficacy across multiple targets in a variety of models
- ✓ Confirmed tolerability in multidose exploratory NHP study
- ○ Finalize proprietary STING ADC scaffold (linker, DAR, method and site of bioconjugation)
- ○ Select first Immunosynthen ADC from current targets and leads

Expect to disclose data package in 2H 2020

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

Positioned to Create Value for Patients and Shareholders

XMT-1536	• First-in-class NaPi2b ADC • Completion of proof-of-concept studies in 2020 • Fast-to-market registration strategy
XMT-1592	• Extends NaPi2b leadership • Fast to clinical validation of preclinical differentiation
Pipeline	• First-in-class B7-H4 and Immunosynthen ADCs • Targeting high unmet medical needs
Platforms	• Dolaflexin, Dolasynthen (DolaLock) • Immunosynthen (Novel STING Agonist) • Efficient product engines with multiple partnership opportunities
Fundamentals	• Strong team • Strong balance sheet

Mersana
THERAPEUTICS