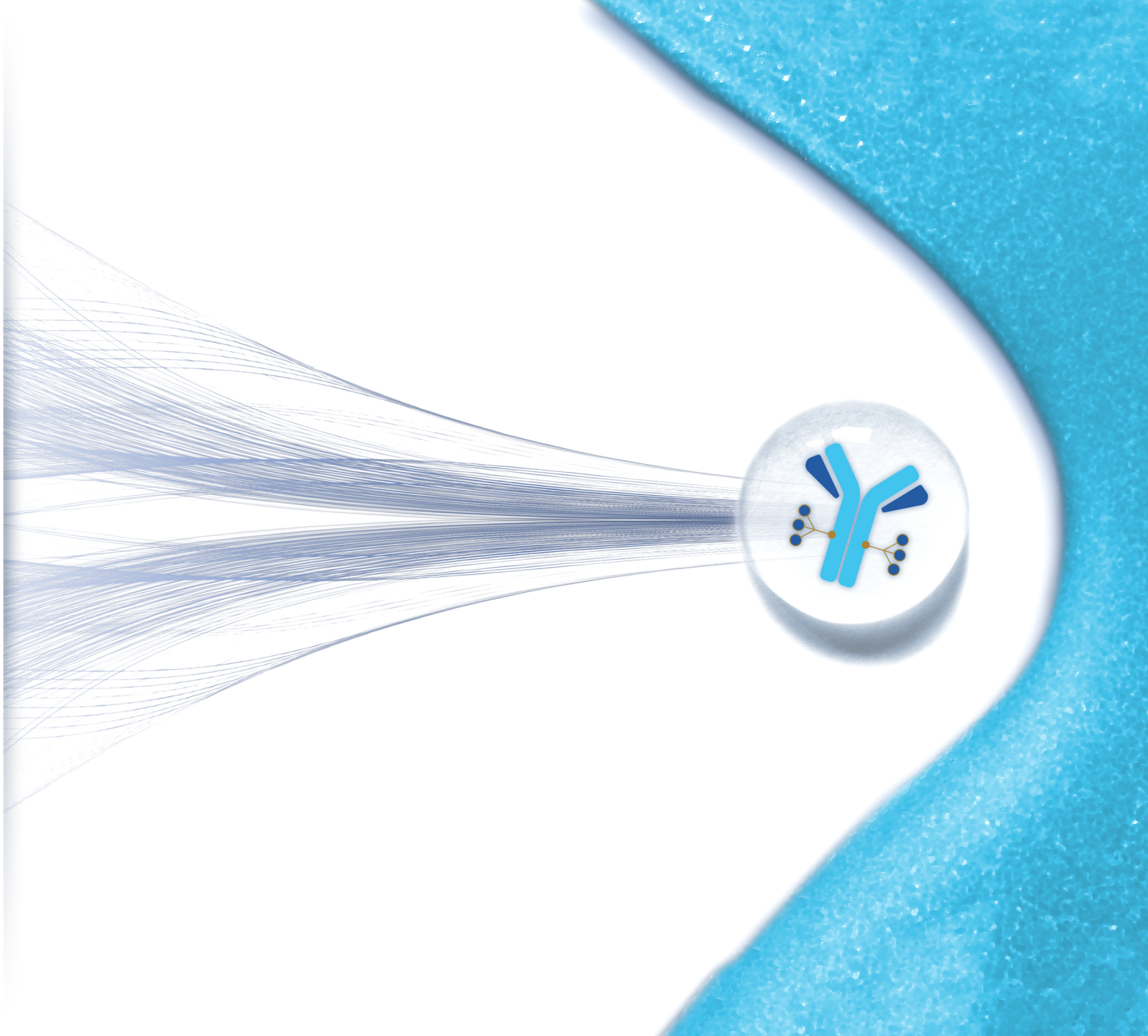
Mersana THERAPEUTICS

Accelerating ADC Innovation

…because patients are waiting

38th Annual JP Morgan
Healthcare Conference

January 16, 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.

Forward-looking statements generally can be identified by terms such as “expects,” “anticipates,” “believes,” “could,” “seeks,” “estimates,” “intends,” “may,” “plans,” “potential,” “predicts,” “projects,” “should,” “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 March 8, 2019, with the Securities and Exchange Commission (“SEC”) and subsequent SEC filings. 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**	**$112M 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 • Runway to mid-2021

[1] Excluding Brazil
[2] Cash, Cash Equivalents, and Marketable Securities as of September 30, 2019

2020 Will Be a Data Rich Year

	2019 ACCOMPLISHMENTS	2020 PRIORITIES
XMT-1536	✓ Established proof of activity & tolerability	○ Establish proof of concept
IND Candidate (XMT-1592)	✓ Established preclinical proof of concept	○ Rapid dose escalation
DolaLock Development Candidate	✓ Advanced through discovery	○ Progress into IND-enabling studies
Immunosynthen Development Candidate	✓ Advanced through discovery	○ Select first development candidate

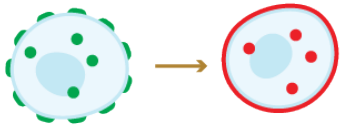
We are Leveraging our Novel ADC Platforms to Generate Differentiated Product Candidates

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 Payload

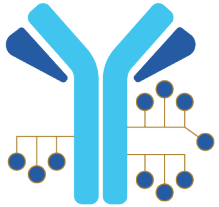
Efficacy without severe neutropenia, neuropathy, or ocular toxicity



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

Dolaflexin

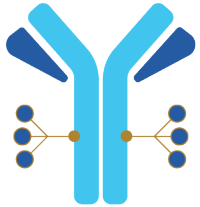
Improved therapeutic index vs. other platforms



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

Dolasynthen

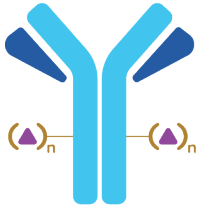
Homogenous & customizable platform



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

Immunosynthen

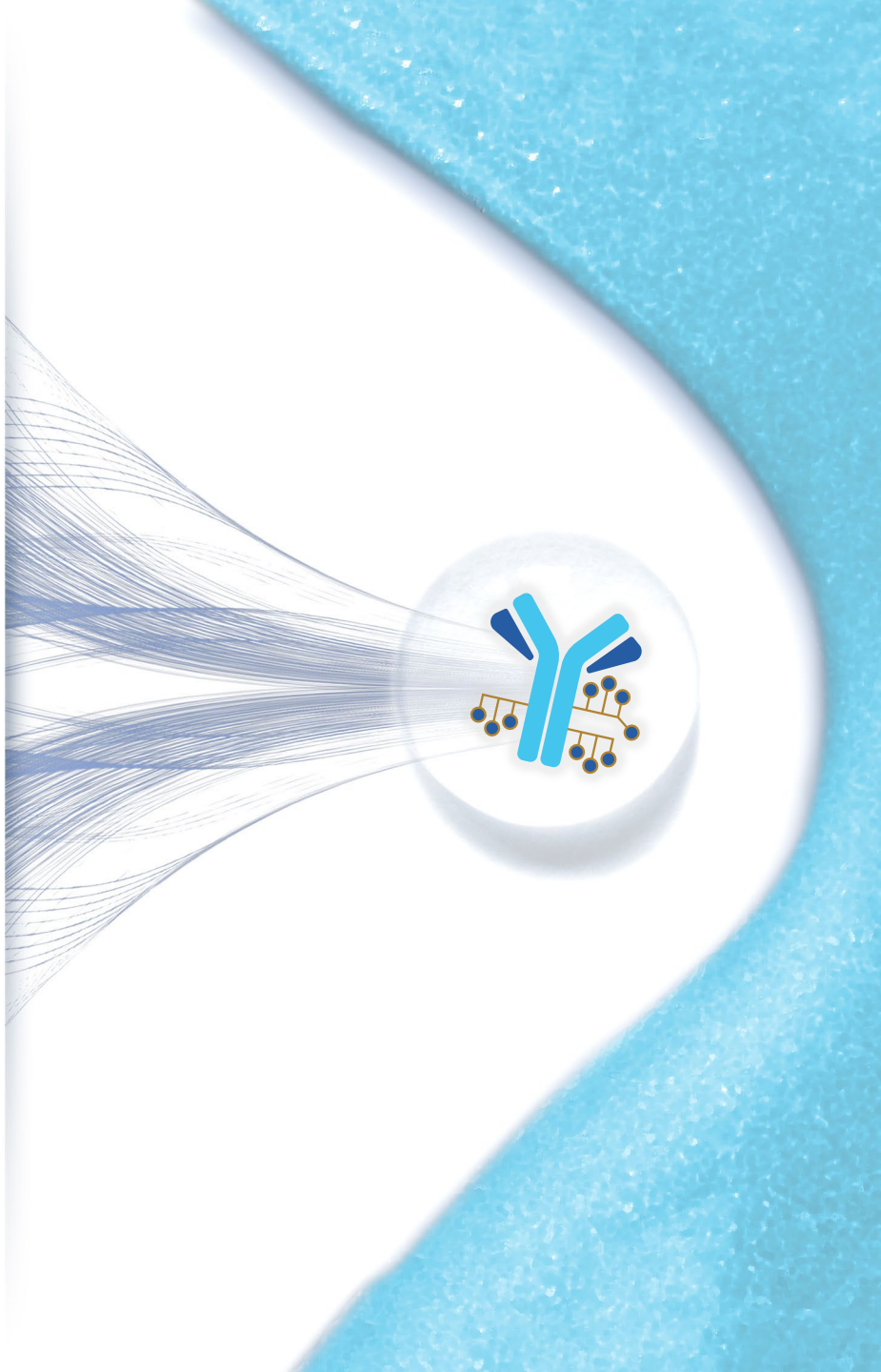
Activate Innate Immune System in Targeted, Safe and Effective Manner



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

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

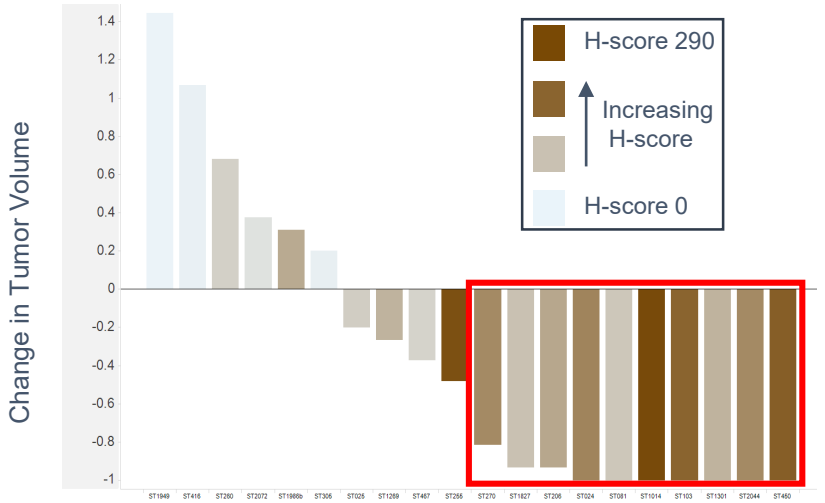
XMT-1536: First-in-Class Dolaflexin ADC Targeting NaPi2b



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
- Wholly-owned[1]

Encouraging Clinical Activity

- Confirmed responses and prolonged stable disease in heavily pretreated and biomarker unselected patients reported at ASCO 2019
- Expansion cohorts ongoing in ovarian cancer and NSCLC adenocarcinoma

Well-Tolerated

- MTD not yet reached
- Dose escalating to 52 mg/m^2
- No severe toxicities commonly seen with other ADCs: neutropenia, ocular toxicities, or peripheral neuropathy
- Transient AST elevation without associated changes in bilirubin

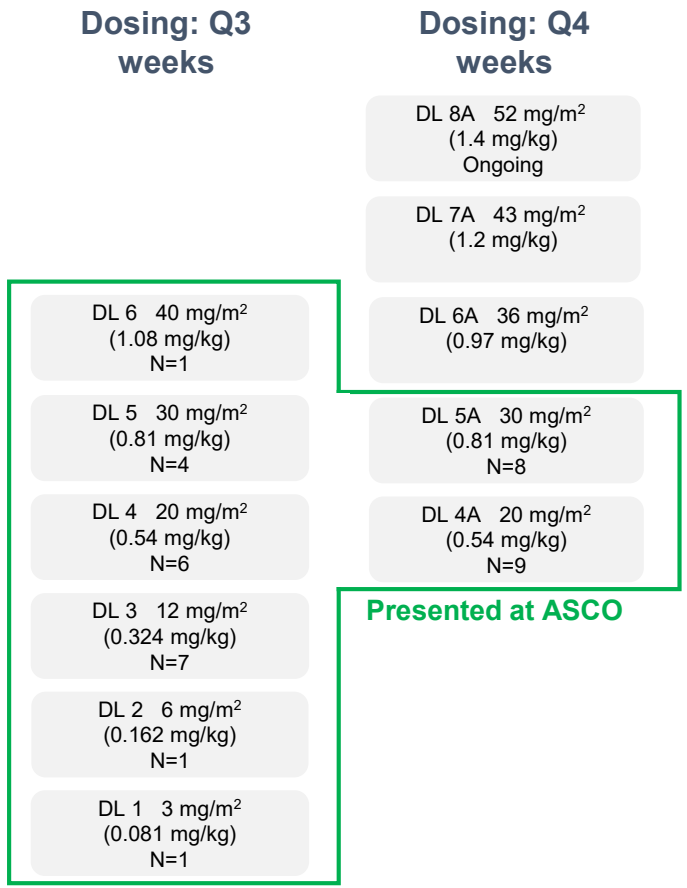
Multiple Data Read Outs Expected in 2020

[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

XMT-1536 was Well-Tolerated with Most AE's Grade 1-2

Data Presented at ASCO with a Data Cutoff of May 10, 2019



Treatment Related Adverse Events in ≥10% of Patients

N = 37	N (%)			
Preferred Term	**Grade 1**	**Grade 2**	**Grade 3**	**Total**
Nausea	12 (32)	2 (5)	0	14 (38)
Fatigue	4 (11)	7 (19)	0	11 (30)
Headache	5 (14)	5 (14)	0	10 (27)
Aspartate aminotransferase (AST) increased	3 (8)	2 (5)	4 (11)	9 (24)
Decreased appetite	1 (3)	6 (16)	0	7 (19)
Blood alkaline phosphatase increased	6 (16)	0	0	6 (16)
Vomiting	4 (11)	1 (3)	0	5 (14)
Gamma-glutamyltransferase (GGT) increased	3 (8)	1 (3)	0	4 (11)
Myalgia	3 (8)	0	1(3)	4 (11)
Pyrexia	3 (8)	1 (3)	0	4 (11)

Safety:
- No Grade 4 or 5 treatment-related adverse events (TRAEs)

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

ClinicalTrials.gov: NCT03319628

XMT-1536 Showed Activity in Heavily Pretreated Patients, Unselected for NaPi2b

Data Presented at ASCO with a Data Cutoff of May 10, 2019

Clinical Activity at Doses of 20mg/m^2 and Above*

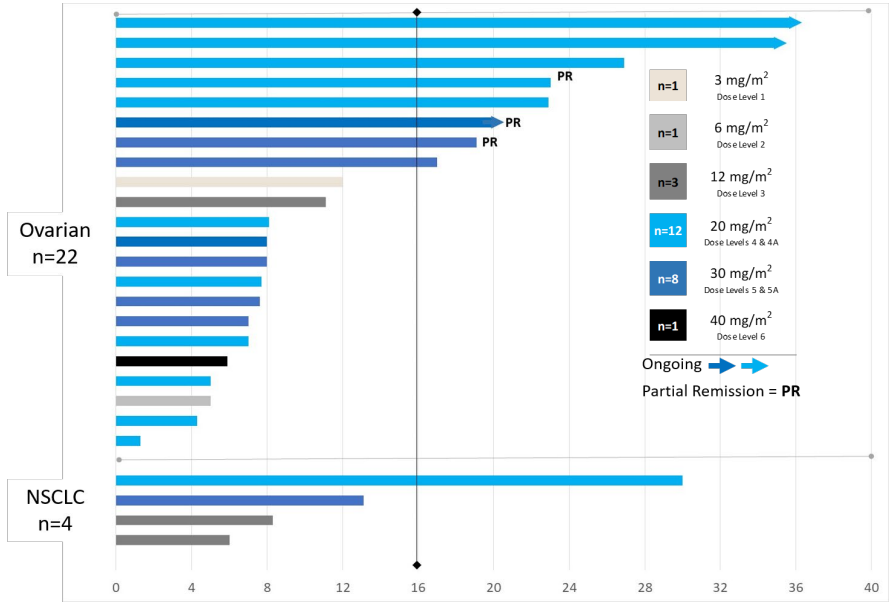
Outcomes in Ovarian Cancer (OC) & Non-small Cell Lung Cancer (NSCLC)	All OC	All NSCLC	OC ≥20 mg/m^2	NSCLC ≥20 mg/m^2	OC ≥30 mg/m^2
N	19	3	16	2	7
PR*	3 (16%)	0 (0%)	3 (19%)	0 (0%)	2 (28%)
SD*	8 (42%)	2 (67%)	6 (38%)	2 (100%)	3 (43%)
DCR (PR + SD)	11 (58%)	2 (67%)	9 (57%)	2 (100%)	5 (71%)
PD*	8 (42%)	1 (33%)	7 (43%)	0 (0%)	2 (28%)

Response evaluable

Based on objective responses and duration of treatment

***As measured by RECIST, version 1.1**

Clinically Meaningful Treatment Duration > 16 weeks



Treatment Duration (weeks)

Response evaluable

All Completed Dose Levels (OC and NSCLC Patients), N=26

XMT-1536: Significant Progress Since ASCO 2019 in Maximizing Patient Benefit and Charting Path to Registration

Higher Dose

- Cleared 36 and 43 mg/m^2 with primarily Grade 1 and Grade 2 AEs with no severe neuropathy, neutropenia or ocular toxicities
- Increased expansion cohort dose to 43 mg/m^2
- Currently evaluating 52 mg/m^2

Earlier, More Homogeneous Patient Population

- Initiated expansion cohorts in earlier line, more homogeneous populations

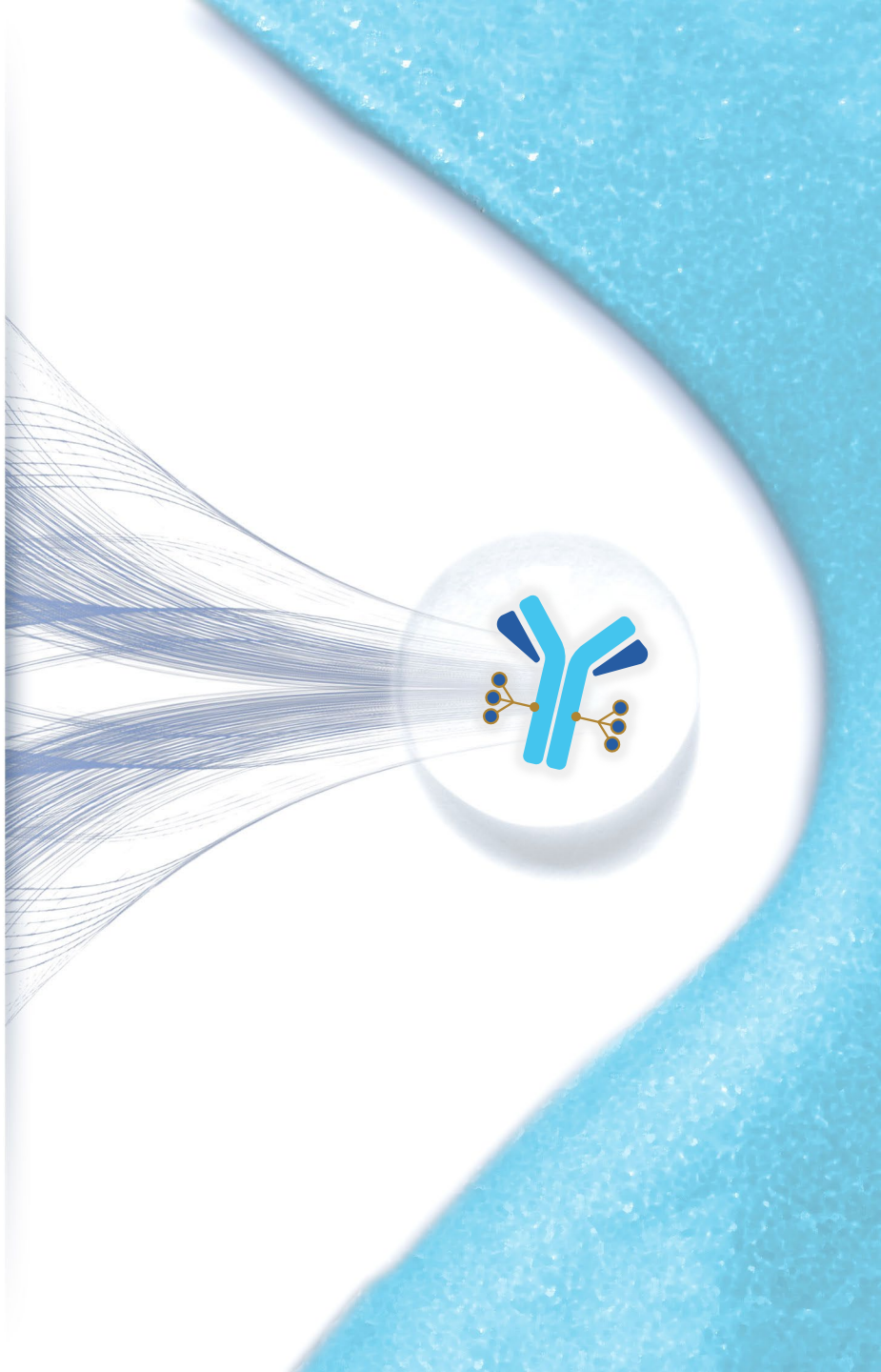
Opportunity for Biomarker Selection

- Correlating H-score and efficacy in anticipation of patient selection
- Collecting archival and fresh tissue to confirm concordance

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

	Dose Escalation Data in 1H 2020	Ovarian Cancer Expansion Data in 1H & 2H 2020	NSCLC Adeno Expansion Data in 1H and 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	• Evaluating 52 mg/m^2	• 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

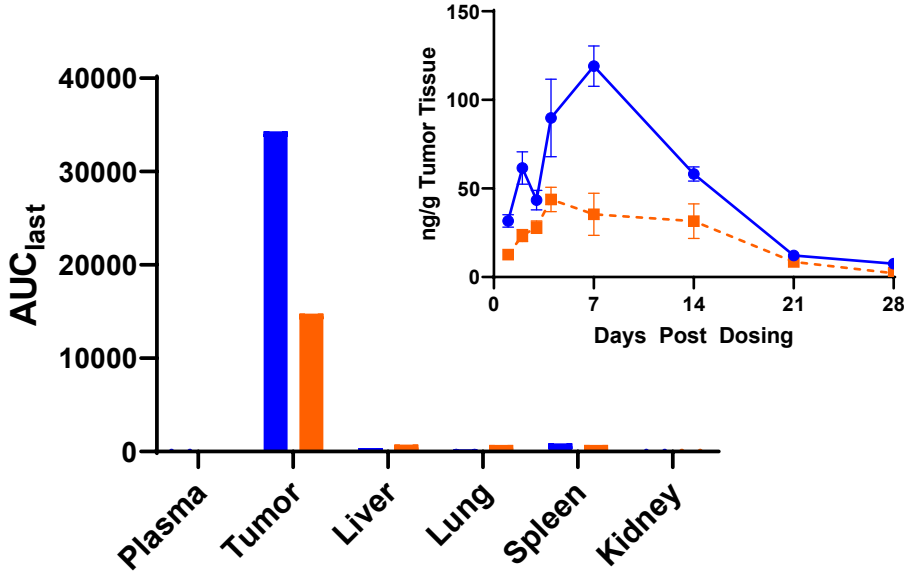
XMT-1592 is a Dolasynthen ADC Targeting NaPi2b



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

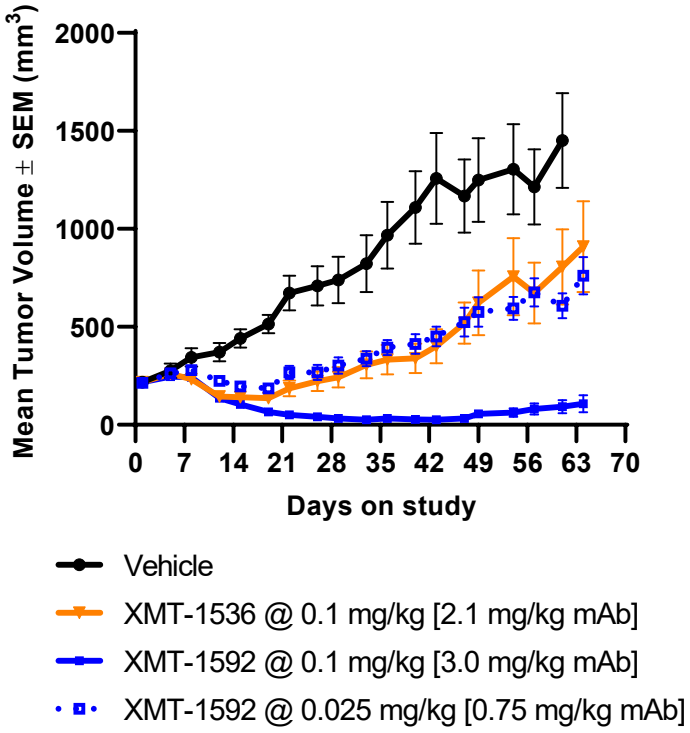
2X Tumor Exposure of Payload



XMT-1536 | XMT-1592

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

4X Greater Activity in Lung PDX

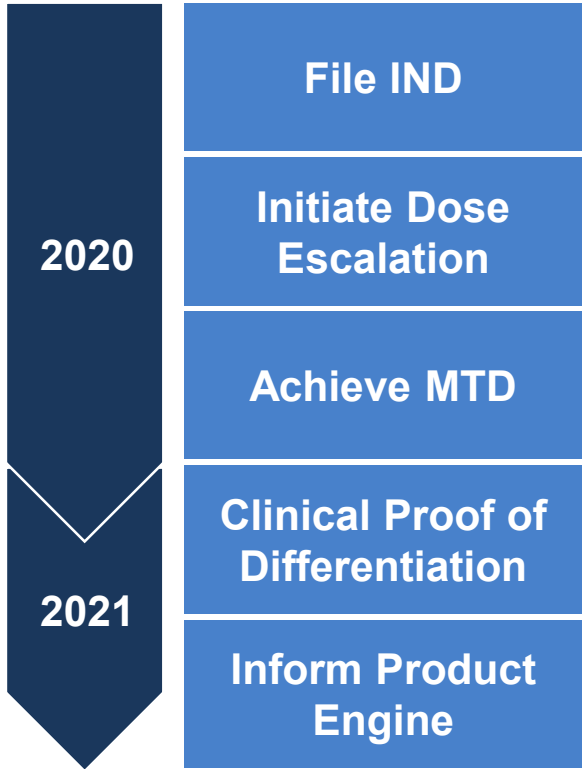


Leveraging NaPi2b Experience for Rapid Dose Escalation of XMT-1592

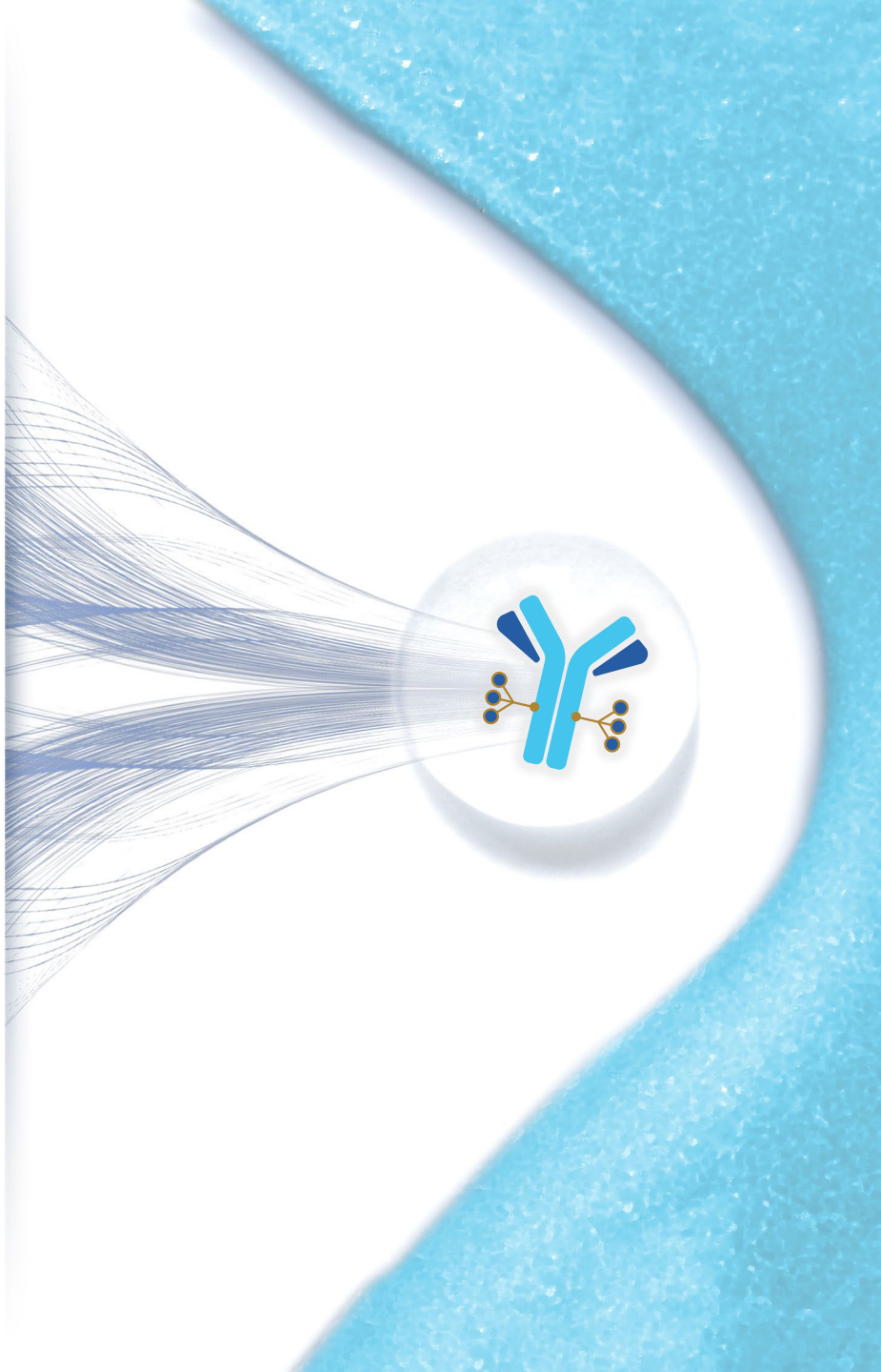
Leveraging insights from XMT-1536

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

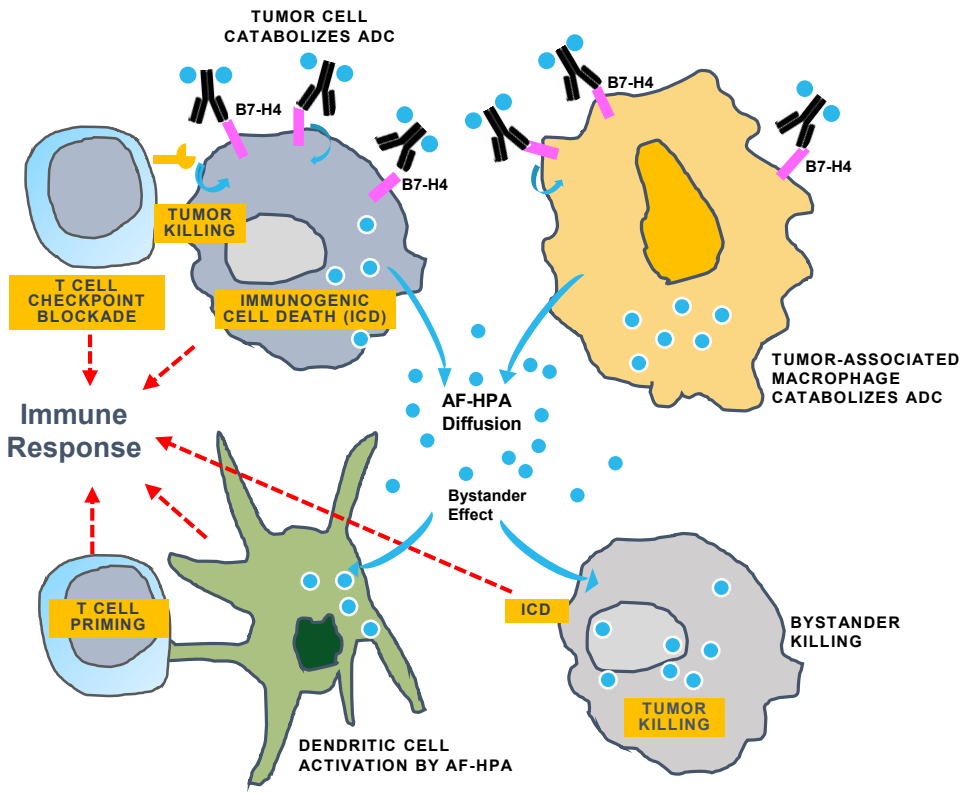
Solidify NaPi2b Leadership



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



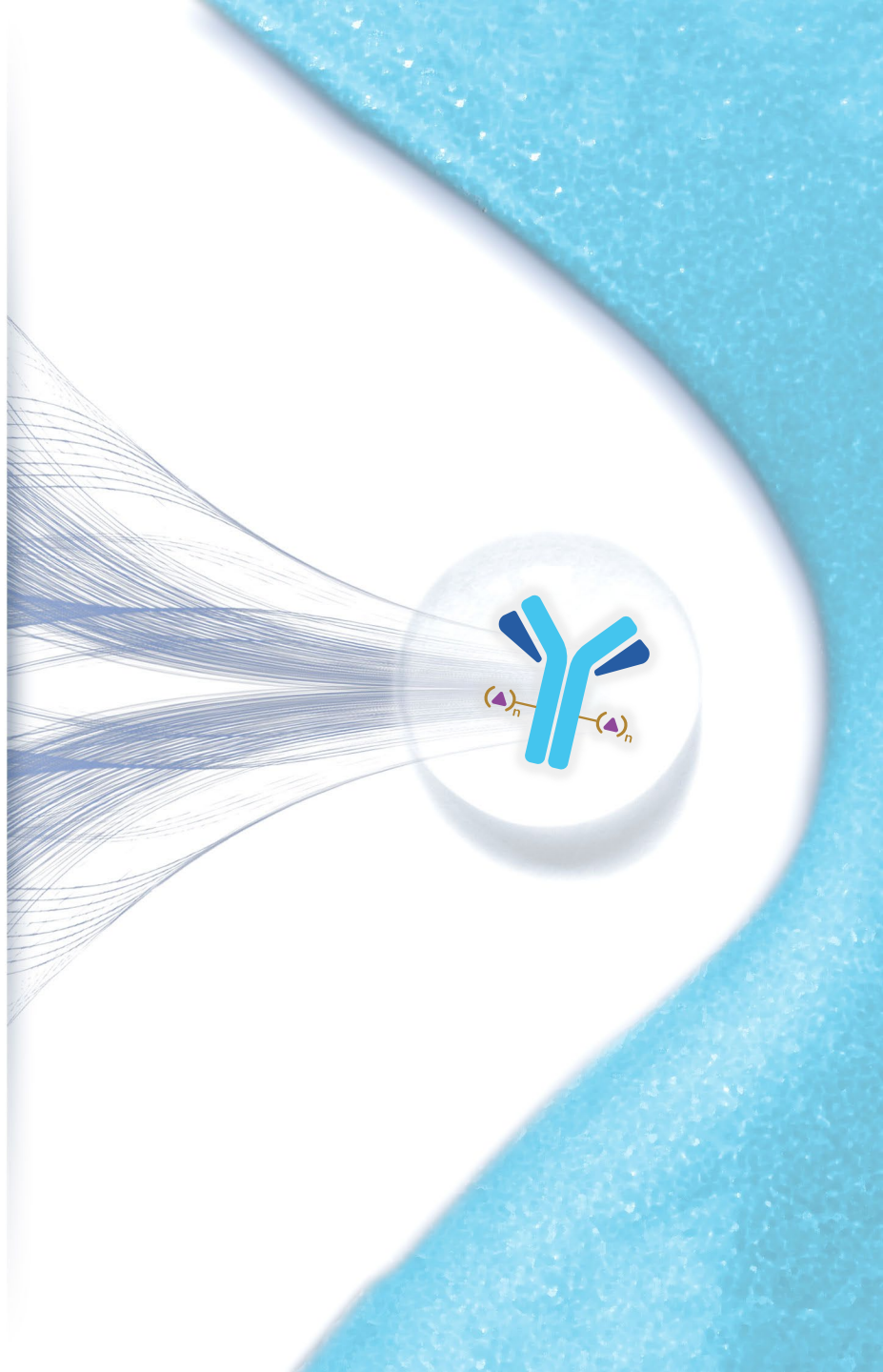
B7-H4 Expression Ideally Suited for a DolaLock ADC



- 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

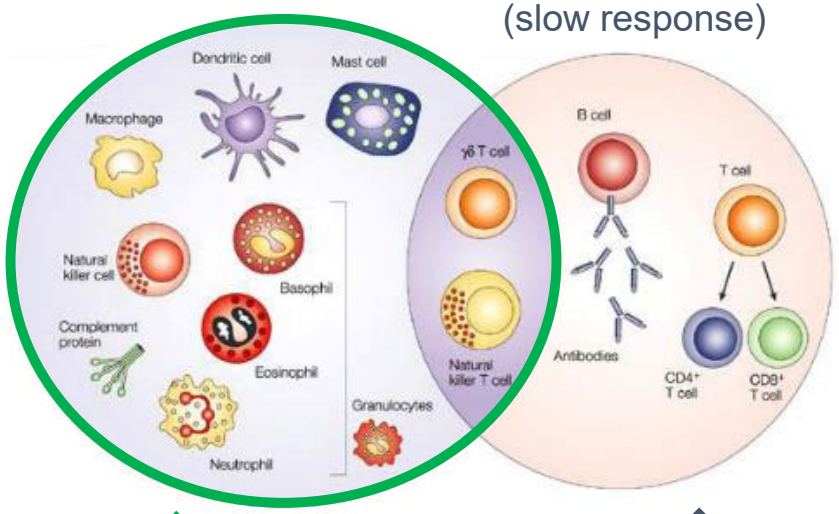
Immunosynthen Development Candidate in 2020



Immunosynthen: Strong Rationale for a STING Agonist ADC Approach

Innate Immunity
(rapid response)

Adaptive Immunity
(slow response)



Nature Reviews Cancer 4, 11–22 (2004)

Stepping on the gas pedal of the immune system
(e.g. STING agonists)

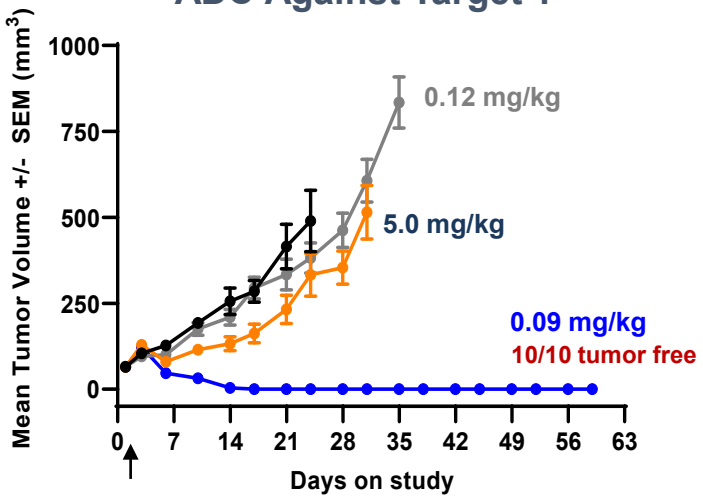
Releasing the brakes of the immune system
(e.g. checkpoint inhibitors)

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

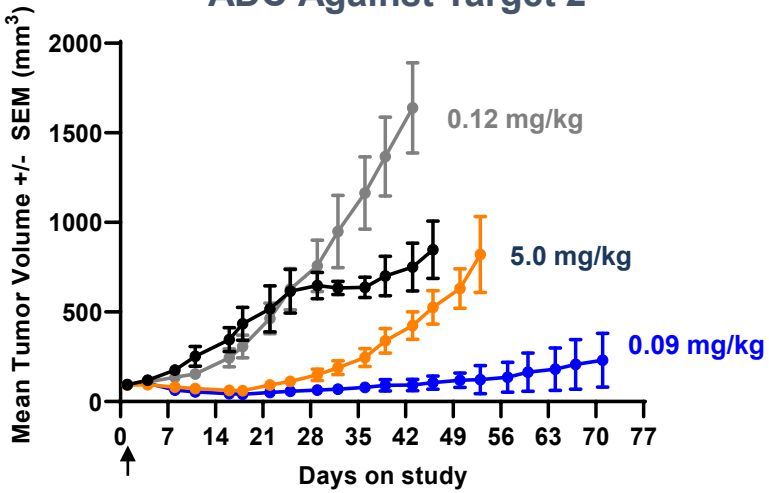
ADC Against Target 1



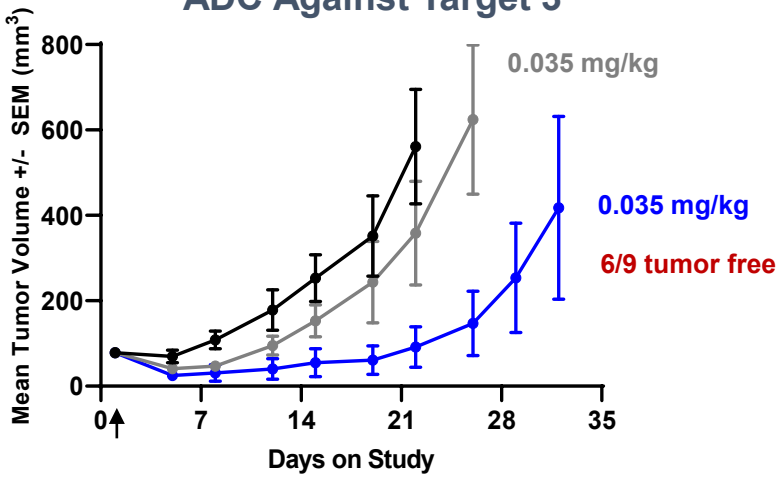
Vehicle
Control ADC
diABZI STING agonist
Targeted ADC

(all doses as STING agonist payload mg/kg)

ADC Against Target 2

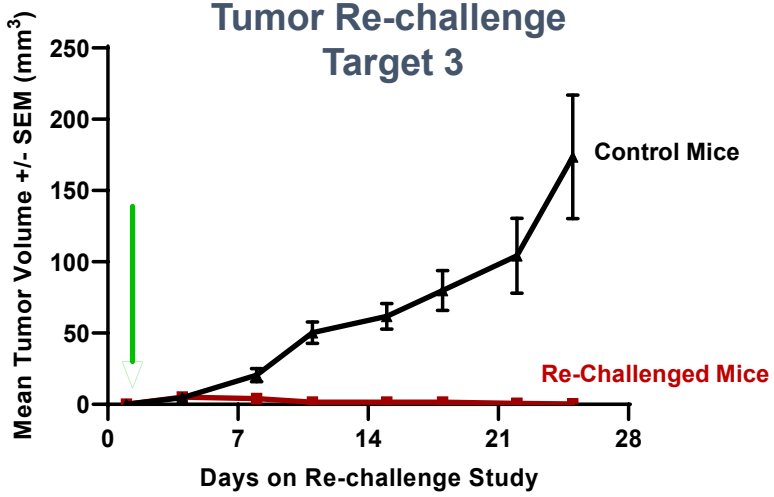


ADC Against Target 3



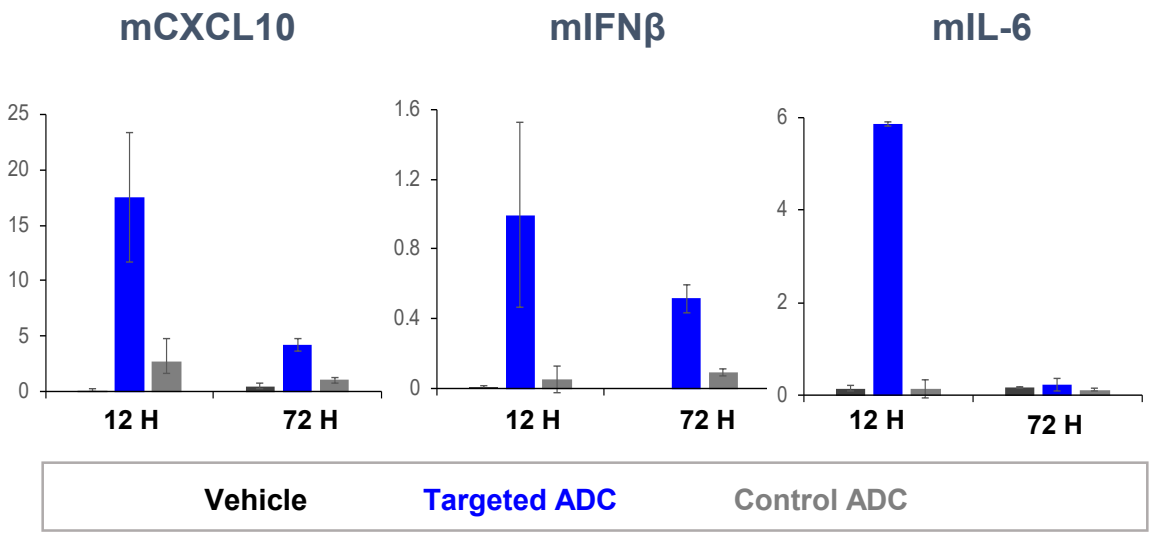
Tumor re-challenge of 6 tumor-free mice

Tumor Re-challenge Target 3

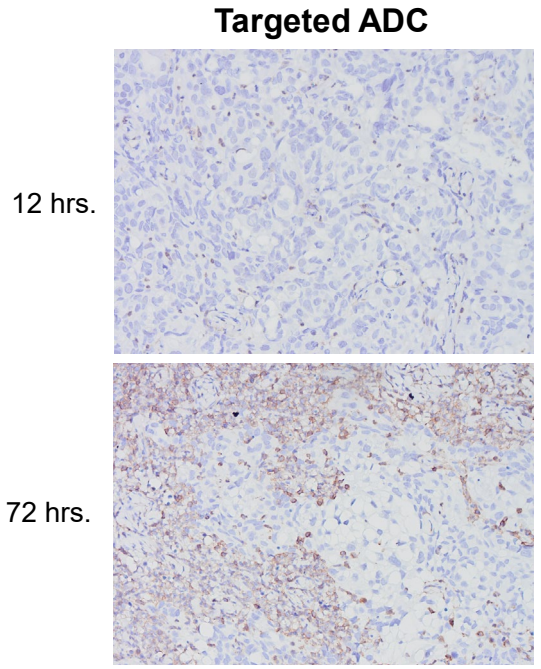


Immunosynthen ADC Activates STING Pathway and Induces Marked Immune Cell Infiltration in Tumors

Cytokine expression (qPCR on FFPE samples)



CD45 Immunohistochemistry Immune cell infiltration

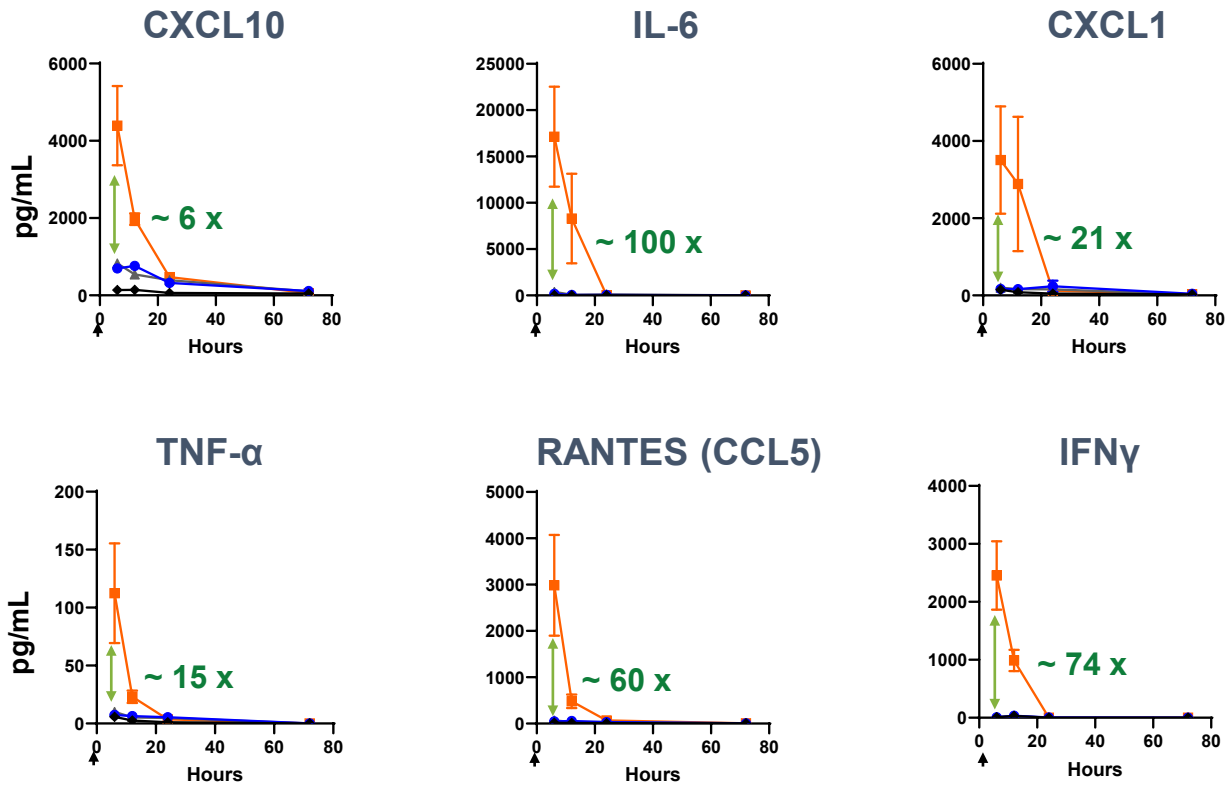


Data shown for Immunosynthen ADC for Target 1
After single dose of 0.09 mg/kg by STING agonist payload

Limited Induction of Serum Cytokines *In Vivo* by Immunosynthen ADC Despite Extended Plasma Exposure

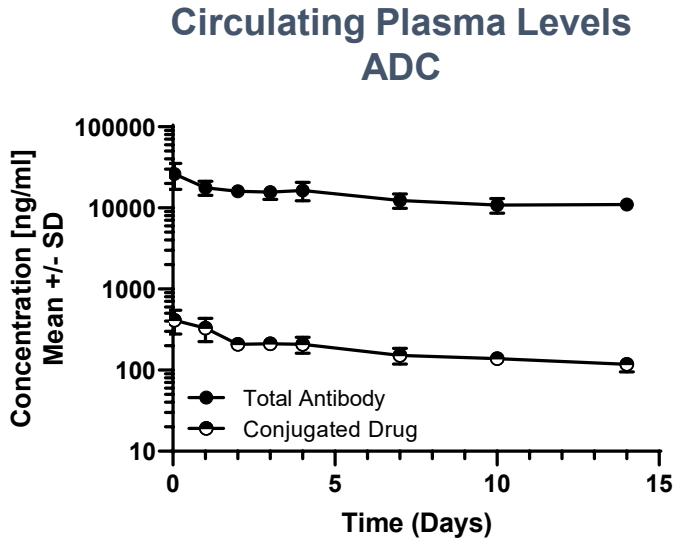
Analysis of Serum Cytokine Levels by Luminex Assay

Data shown for Immunosynthen ADC for Target 1



Vehicle	Control ADC 0.12 mg/kg	Targeted ADC 0.09 mg/kg	diABZI STING agonist 5.0 mg/kg

(All doses by STING agonist payload mg/kg)



Extended plasma exposure to Immunosynthen ADC does not result in extended exposure to systemic cytokines

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 1H 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

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