Unleashing the Targeted Power of ADCs

37th Annual JP Morgan Healthcare Conference

January 9, 2019

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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.

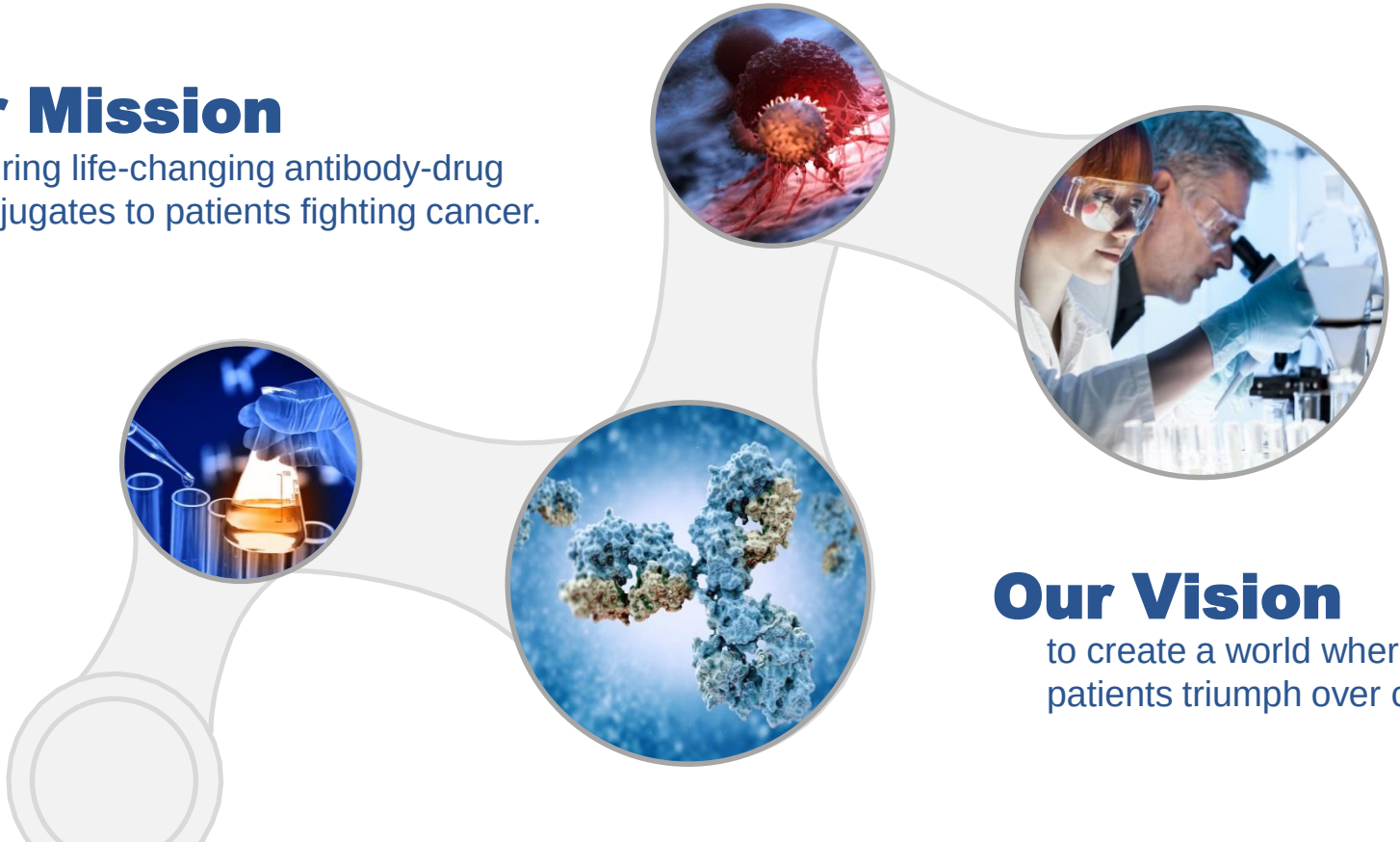
Forward-looking statements generally can be identified by terms such as “expects,” “anticipates,” “believes,” “could,” “seeks,” “estimates,” “intends,” “may,” “plans,” “potential,” “predicts,” “projects,” “should,” “will,” “would” or similar expressions and the negatives of those terms. The Company’s 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 28, 2018, with the Securities and Exchange Commission (“SEC”), our Quarterly Report on Form 10-Q filed with the SEC on November 13, 2018, 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 Quarterly Report on Form 10-Q and our other SEC filings are available by visiting EDGAR on the SEC website at http://www.sec.gov.

Mersana's Mission & Vision

Our Mission

to bring life-changing antibody-drug conjugates to patients fighting cancer.



Our Vision

to create a world where all patients triumph over cancer.

Leadership Team

Highly Experienced in Oncology and Business

Management Team

Anna Protopapas
Chief Executive Officer

Eva Jack
Chief Business Officer

Michael Kaufman Ph.D.
Senior Vice President, CMC

Timothy Lowinger, Ph.D.
Chief Scientific Officer

David Spellman
Chief Financial Officer

Dirk Huebner, M.D.
Chief Medical Officer

Takeda MILLENNIUM THE TAKEDA ONCOLOGY COMPANY

pulmatrix
MedImmune
AstraZeneca

MERCK Be well
Takeda MILLENNIUM THE TAKEDA ONCOLOGY COMPANY
Biogen

Bayer

VERTEX
Takeda MILLENNIUM THE TAKEDA ONCOLOGY COMPANY

Bristol-Myers Squibb
Takeda MILLENNIUM THE TAKEDA ONCOLOGY COMPANY
genzyme
Roche
BOSTON BIOMEDICAL

Board of Directors

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Director

Celgene

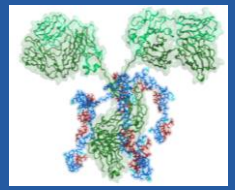
Anna Protopapas
Director

Takeda MILLENNIUM THE TAKEDA ONCOLOGY COMPANY

Building a Leading ADC Company

XMT-1536 – Lead Asset in POC Development

- Validated NaPi2b target
- First- and best-in-class potential
- On track to achieve POC in 2019



Robust Discovery Effort Matching Target to Appropriate Platform

- Plan to disclose next clinical candidate in 2H19

Four Differentiated, Proprietary ADC Platforms

- Dolaflexin
- Dolasynthen
- Alkymer
- Immunosynthen

Wholly-owned Assets and Partnering Opportunities

- Product candidates and platform collaborations

XMT-1536

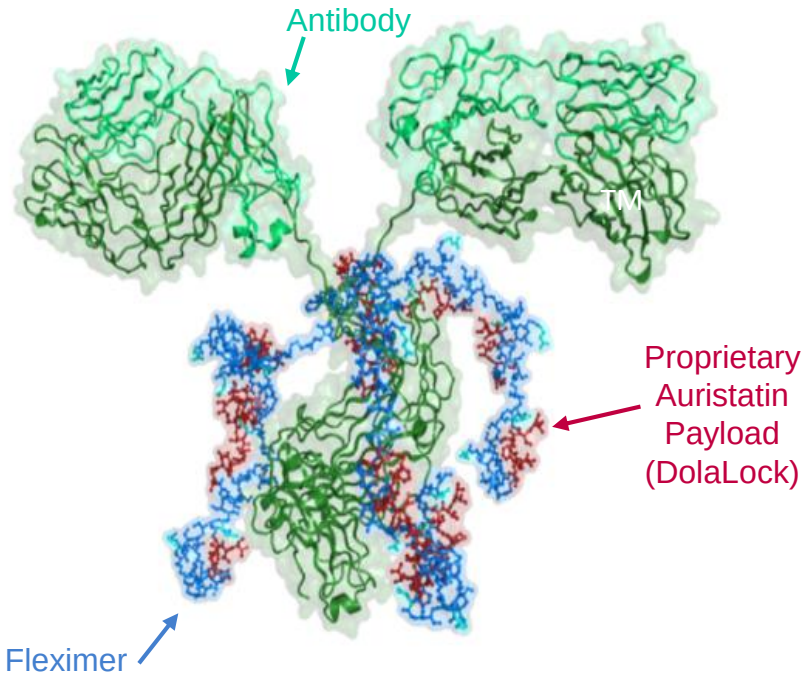
NaPi2b Targeted Therapy with Improved Efficacy and Tolerability

Mersana THERAPEUTICS

XMT-1536: A Dolaflexin ADC Targeting NaPi2b

First-in-class Molecule, Target Expressed in Cancer Types with High Unmet Medical Need

- **Validated Drug Target**
  - Transmembrane sodium-phosphate transporter
  - Expressed in 87% of NSCLC adenocarcinoma, 96% of serous ovarian adenocarcinoma, 91% of papillary thyroid carcinoma[1]
  - Restricted normal tissue expression
- **In-licensed Novel anti-NaPi2b Antibody**
- **Mersana Retains Full Global Rights**

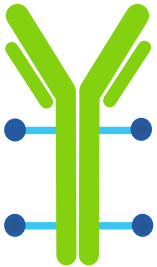


[1] Lin *et al, Clin Cancer Res* 2015, 21:5139-5150;

XMT-1536 is a First-in-Class Opportunity for a Clinically Validated Target

Lifastuzumab vedotin

Genentech-developed ADC using Seattle Genetics vc-MMAE platform



- Pre-clinical and clinical tolerability limited by vc-MMAE toxicity
- No significant target-related toxicity in either Ovarian or Lung patients

→ Appropriate target for ADC development but need for better tolerated platform

- ~40% ORR in ovarian cancer in Phase 1; low NSCLC ORR in Phase 1
- Ovarian Cancer Phase 2 with positive trends on all efficacy endpoints

→ Evidence of efficacy but need for more potent platform

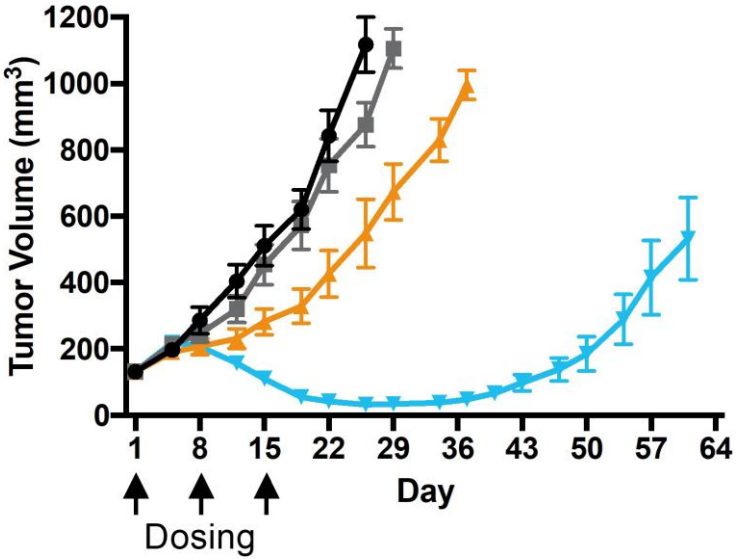
- Development discontinued by Genentech

→ First-in-class opportunity for XMT-1536

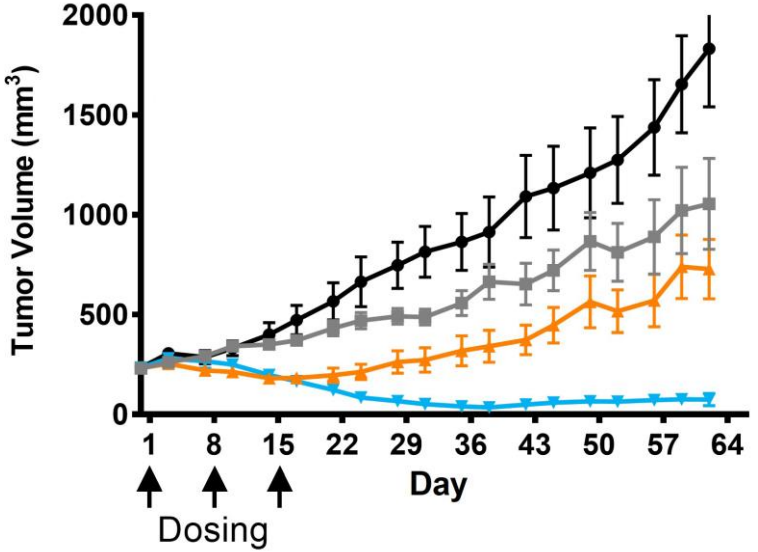
Banerjee et al. Ann Oncol. 2018 Apr 1;29(4):917-923

XMT-1536 Data Show Improved Efficacy and Tolerability to Genentech ADC in Head to Head Preclinical Studies

OVCAR3
Ovarian Xenograft



CTG-0852
NSCLC Patient Derived Xenograft



Dolaflexin Safety Profile Predictable and Easily Monitored, High Consistency between Clinical and Preclinical Data

Current Clinical Study Data Show:

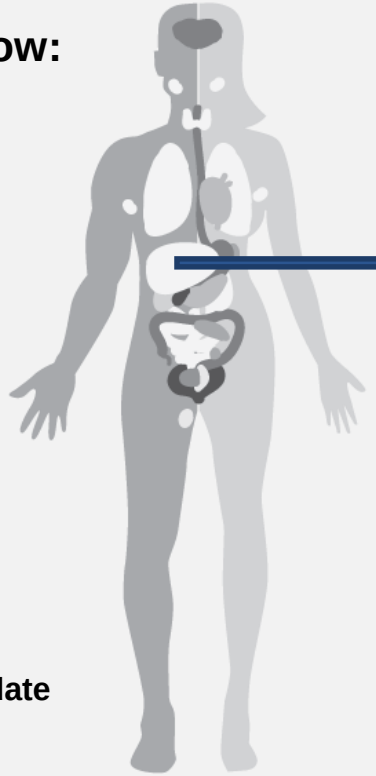
Dolaflexin Platform Characteristics

- Favorable PK profile
- Highly stable in circulation
- Transient AST elevations that can be clinically monitored and managed with dose and regimen modifications

No observations of toxicities associated with other ADC platforms to date

- NO evidence of clinically relevant neutropenia, neuropathy, ocular toxicity or pneumonitis

No observation of on-target toxicities to date



Preclinical Studies Demonstrate Depletion of Kupffer Cells Results in Transient AST Elevations

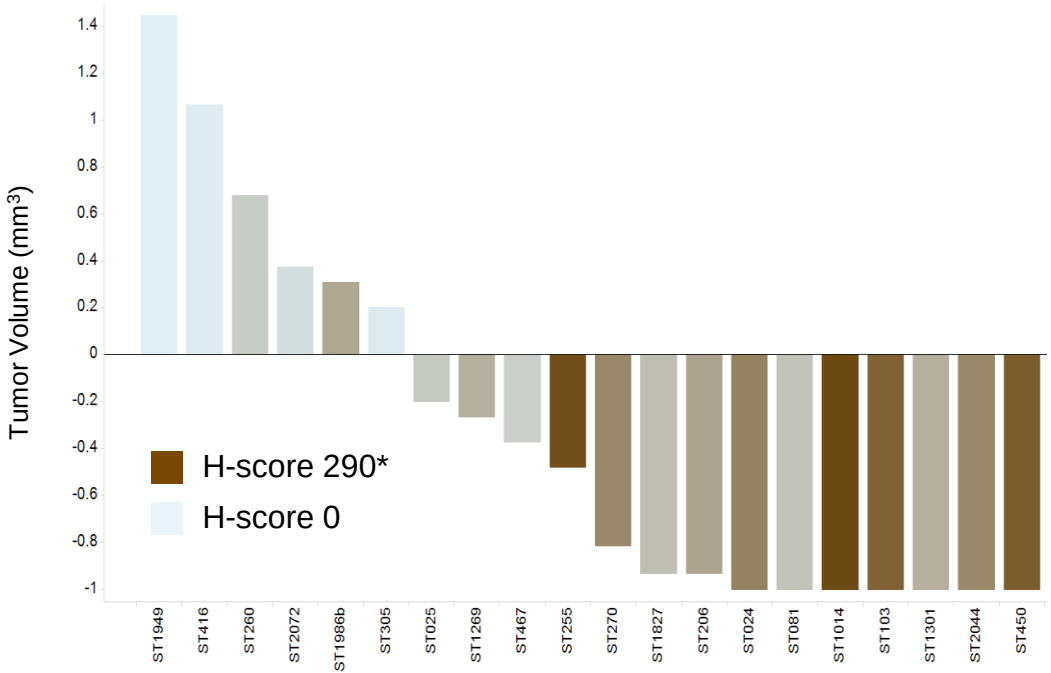
- Transient elevations of AST in animals was not associated with hepatic necrosis based on histopathology
- Hypertrophy of Kupffer cells in liver was observed
- Kupffer cells are involved in AST clearance; transient elevation is consistent with a change in clearance kinetics

XMT-1536: NaPi2b Addresses Two Areas of Significant Unmet Clinical Need

	Ovarian Cancer	Non Small Cell Lung Cancer (NSCLC)
Incidence (U.S.)	~24,000[1]	~189,000[4]
Deaths Per Year (U.S.)	~14,000[2]	~ 132,000[5]
Frontline SOC	Debulking surgery plus systemic chemotherapy	PD1 + chemotherapy
Area of Unmet Need	Resistant to platinum based therapy	Following PD1 + platinum treatment failure
Target Population Treatment Options	(Platinum Resistant OC) Single agent chemotherapy, e.g. PLD, weekly Paclitaxel, Topotecan, Gemcitabine, PARP	(2nd Line NSCLC Adenocarcinoma) Docetaxel, Premetrexed, Gemcitabine, or Docetaxel + Ramucirumab
Approximate Treatment Outcome	ORR ~10-20%[3] med PFS ~ 3-4 mos[3] med OS ~12 mos[3]	ORR ~10-20%[3] med PFS ~ 3–4.5 mos[3] med OS ~ 8-10 mos[3]

[1]Based on CancerMPact® Patient Metrics for US, Western Europe, and Japan, accessed in March 2018.
[2]https://cancerstatisticscenter.cancer.org/#!/
[3]Hanna et al. JCO 2004 & Garon, Lancet 2014 & Pujade, JCO 2014 & Gordon, JCO 2001 & Rose, Gynecol Oncol 2003 & Sehouli, JCO 2011 & Mutch, JCO 2007 & Ferrandina, JCO 2008.
[4]Globoscan 2012 & SEER.
[5]Estimate based on 85% NSCLC incidence and total lung cancer death cases in the US in 2017 of 155900 deaths

NaPi2b Expression Levels Have Been Predictive of Response to XMT-1536 in Ovarian Cancer Patient Derived Models



- Proprietary research assay validated and used for retrospective evaluation of patients
- Preclinical data demonstrate NaPi2b expression highly correlated with response
- ~60% of ovarian cancer patients estimated to have NaPi2b expression associated with deep responses in PDX models

R. Mosher et al, AACR-NCI-EROTC International Conference, October 2017

*Semi-quantitative measure of antigen expression; ranges from 0-300

XMT-1536 Dose Escalation Ongoing

Target to Complete Dose Escalation and Initiate Dose Expansion Cohorts in 1H 2019

2018 / 1H 2019 | **1H 2019** | **2H 2019 / 1H 2020**

Dose Escalation: 3 week dosing		
	Dose, mg/ m^2	Dose, mg/ kg
DL4	20.0	*0.54*
DL5	30.0	*0.81*
DL6	40.0	*1.08*

Dose Escalation: 4 week dosing		
	Dose, mg/ m^2	Dose, mg/ kg
DL4-A	20	0.54
DL5-A	30	0.81
Escalate Dose		

Phase 1 Dose Escalation

- Ongoing in ovarian and lung cancers and certain rare tumors (endometrial, papillary renal, papillary thyroid and salivary duct)
- Currently dosing IV every 4 week cycles until disease progression or unacceptable toxicity
- No pre-selection for NaPi2b expression; retrospective testing based on archival tissue

1H 2019 Milestones

Establish Recommended Go Forward Dose & Regimen

Report Dose Escalation Data

Initiate Expansion Cohorts

- Platinum-resistant ovarian cancer
- NSCLC Adenocarcinoma in PD1 failure

Execute on Expansion Studies

XMT-1536 Phase 1 Dose Escalation Study Status

Gaining Experience and Insights Into Our Lead Program

- 36 patients dosed as of December 20, 2018
  - Ovarian, lung cancers and selected rare tumors (endometrial, papillary renal, papillary thyroid and salivary duct)
  - 20 patients in 3 week regimen; 16 patients in 4 week regimen
- No pre-selection for NaPi2b expression
- Patients had multiple lines of prior therapies before enrollment
- 20 mg/m^2 appears to be a clinically meaningful dose level

Encouraging Early Data in Heavily Pretreated Platinum Resistant and Refractory Ovarian Cancer Patients

- 21 ovarian cancer patients enrolled across all dose levels
- No pre-selection for NaPi2b expression
- Heavily pretreated platinum resistant and refractory patients
  - Current median # of prior regimens: 6
  - Current range of prior regimens: 3 – 11
- 12 patients are response evaluable as of Dec 20, 2018
- 8 evaluable patients in dose levels greater or equal to 20 mg/m^2
  - Current best response: 2 PRs, 6 SDs

ADC Platforms

Leveraging our ADC Platforms to Bring New Breakthrough Products Forward

Mersana THERAPEUTICS

Highly Differentiated ADC Platforms to Create a Pipeline of Clinically Meaningful Candidates

Mersana THERAPEUTICS

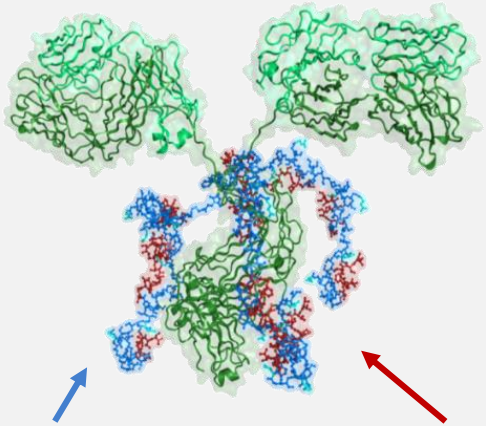
Dolaflexin	Dolasynthen	Alkymer	Immunosynthen
• High DAR • Efficacy against low expressing antigens • DolaLock payload	• Precise DAR • Enables homogeneous ADCs • DolaLock payload	• Broadens addressable indications • Alkylating payload	• Localized and controlled harnessing of the immune system • Immunostimulatory payload

Proprietary platforms to address broad unmet patient needs

Novel Dolaflexin Platform Technology

Designed to Expand Therapeutic Index

Significantly Higher DAR



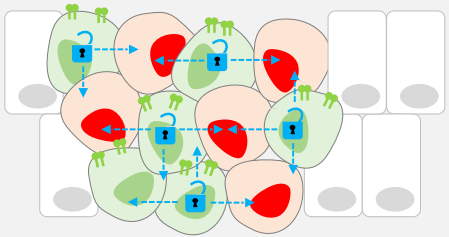
Fleximer® Polymer

- High DAR
- Optimal PK and drug-like properties
- Efficacy against low antigen expressing tumors

DolaLock Payload

- Controlled bystander effect for **greater efficacy and tolerability**

DolaLock Designed to Enhance Efficacy and Tolerability

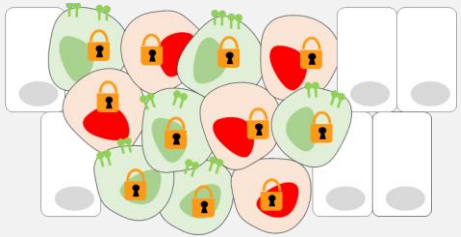


Benefit of bystander effect for greater efficacy

AF-HPA:
Initial release product highly potent and freely cell permeable

Intra-tumor metabolism

AF: Non cell permeable metabolite – highly potent and trapped in tumor



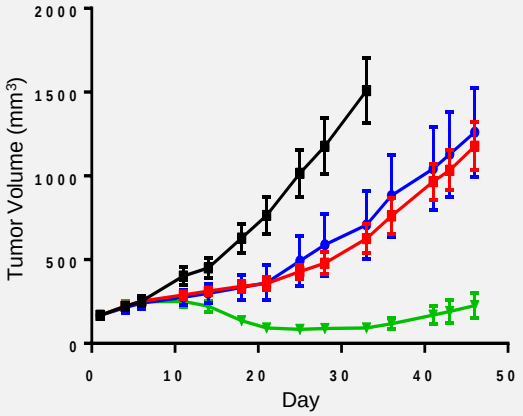
Locked in tumor
High intracellular potency with high systemic tolerability

Dolasynthen: Precise Control to Create Optimal ADC

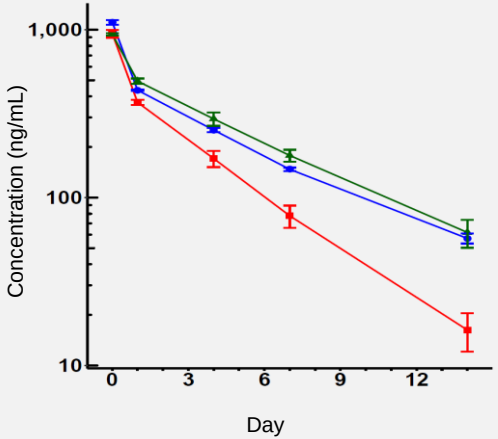
Critical Attributes Matched to Antibody and Target

Antibody | Bioconjugation Site / Technology | Aqueous solubility | Charge balance | Drug load per scaffold | DolaLock AF-HPA

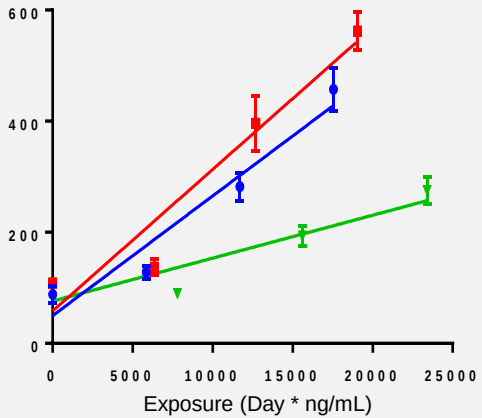
Anti-Tumor Efficacy



Pharmacokinetics



Tolerability Parameter



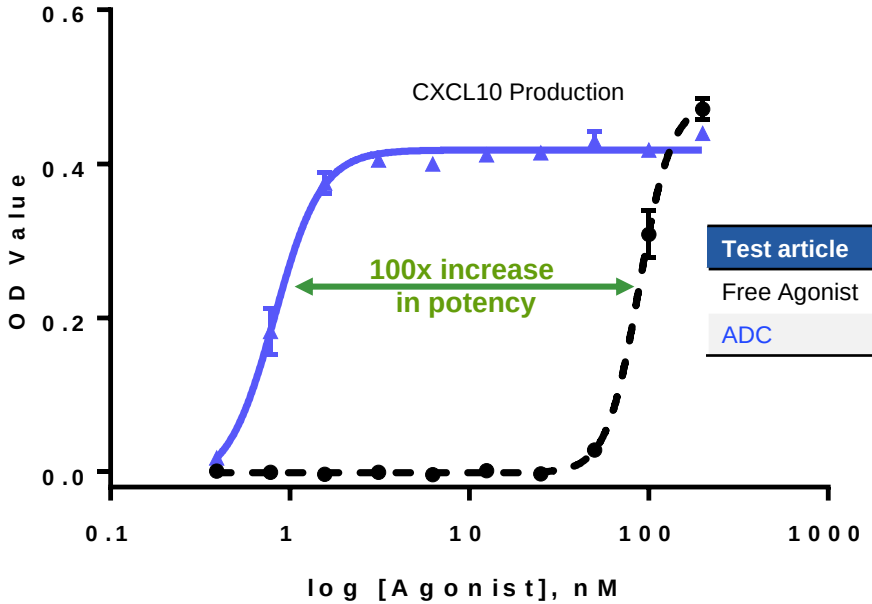
Dolasynthen ADC 1 | Dolasynthen ADC 2 | Dolasynthen ADC 3

Immunosynthen: Leveraging our ADC Expertise &Technologies for Targeted Delivery of a Potent Immunostimulatory Payload

Therapeutic Opportunity

- ADCs can ideally address the challenge of systemic delivery and tolerability of immunomodulatory payloads
- Specifically deliver STING agonists to targeted cells while increasing systemic tolerability
- Significantly improve potency and provide safe and convenient dosing regimens

Synthemer-STING ADC is >100x More Potent Than Free Agonist

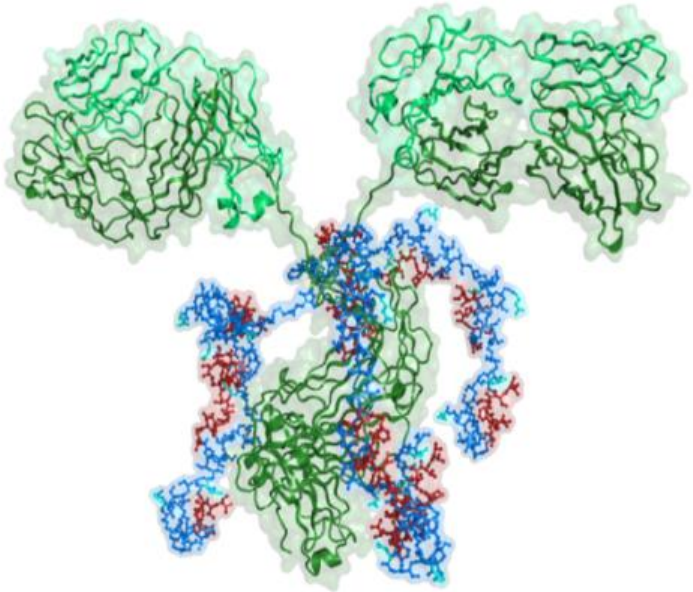


Test article	EC50 (nM)
Free Agonist	88
ADC	0.8

Corporate Summary

Mersana THERAPEUTICS

XMT-1522 Update



- Mersana and Takeda to discontinue further development and terminate collaboration agreement
  - Highly competitive environment for HER2-targeted therapies presents challenges

Key 2019 Goals & Milestones

XMT-1536	• Select go forward dose and initiate expansion cohorts in 1H 2019 • Planning to report Phase 1 dose escalation data in 1H 2019
ADC Candidate	• Planning to disclose next clinical candidate in 2H 2019
R&D	• Continue to leverage our proprietary, differentiated platforms to build a robust pipeline of ADC candidates • Disclose progress on platforms and programs at scientific meetings throughout 2019
Corporate	• Proactively evaluate potential for strategic collaborations that maximize the value of Mersana's pipeline and platforms • Continue to recruit and retain top talent and maintain a culture focused on scientific excellence, execution and patient needs

Robust Pipeline Focused on Clinically Meaningful Cancer Therapies

	Target	Discovery	Preclinical Development	Phase 1
Preclinical/Clinical Pipeline:				
XMT-1536	NaPi2b			
ASANA BioSciences	5T4			
EMD Serono / EMD Innovation	Multiple Undisclosed			
Discovery Pipeline:				
1H 2020 IND	Undisclosed			
Immunosynthen	Undisclosed			
Others	Undisclosed			

$86M in cash* as of Q3 2018 extends cash runway into 2020

*Cash, cash equivalents and marketable securities as of September 30, 2018

Unleashing the Targeted Power of ADCs

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