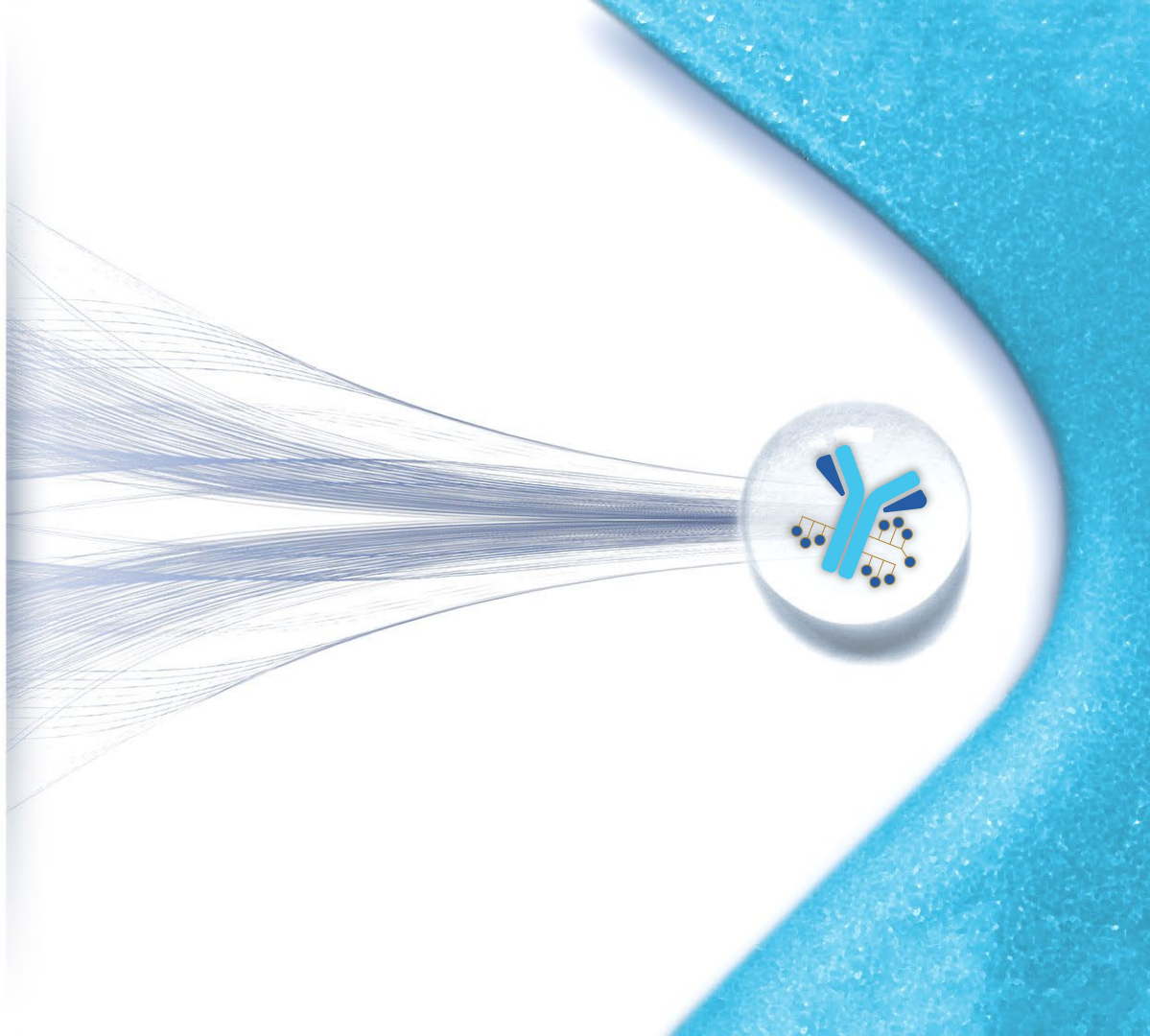
Mersana THERAPEUTICS

Accelerating ADC Innovation

…because patients are waiting

November 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 Mersana Therapeutics, Inc.’s (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 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.

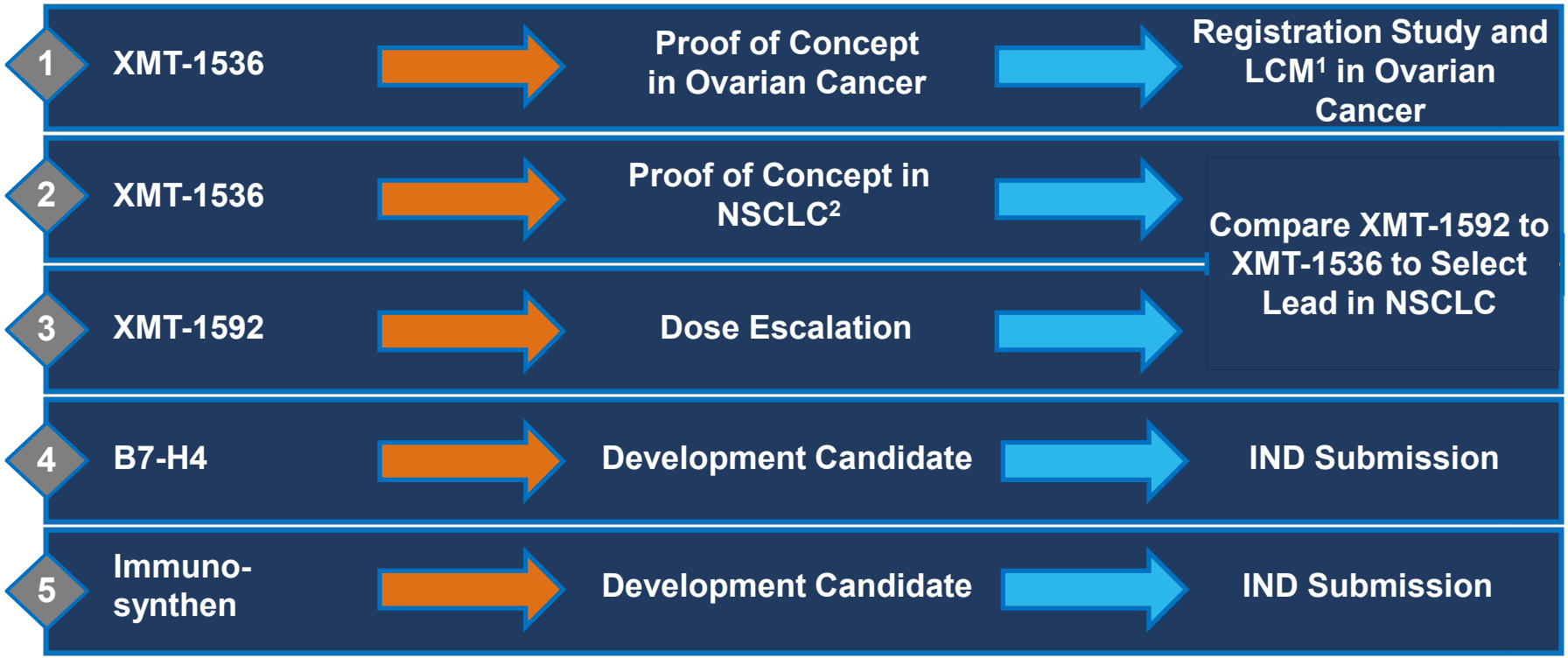
Mersana's Mission: Discover and Develop Life-Changing Antibody-Drug Conjugates for Patients Fighting Cancer

Innovative Platforms	First-in-Class Product Candidates
DolaLock Controlled Bystander Effect	**XMT-1536 (NaPi2b Dolaflexin)** Proof of Concept in Ovarian
Dolaflexin High DAR DolaLock Payload	**XMT-1592 (NaPi2b Dolasynthen)** Preclinical Differentiation over XMT-1536 in Lung Models
Dolasynthen Precise, Customizable and Site-Specific DAR (2-24)	**B7-H4 DolaLock ADC** First-in-Class with Compelling Biology
Immunosynthen Targeted Immune Stimulation	**Immunosynthen STING-Agonist ADC** Multiple Programs

Strong foundation with $271 M in cash[1]

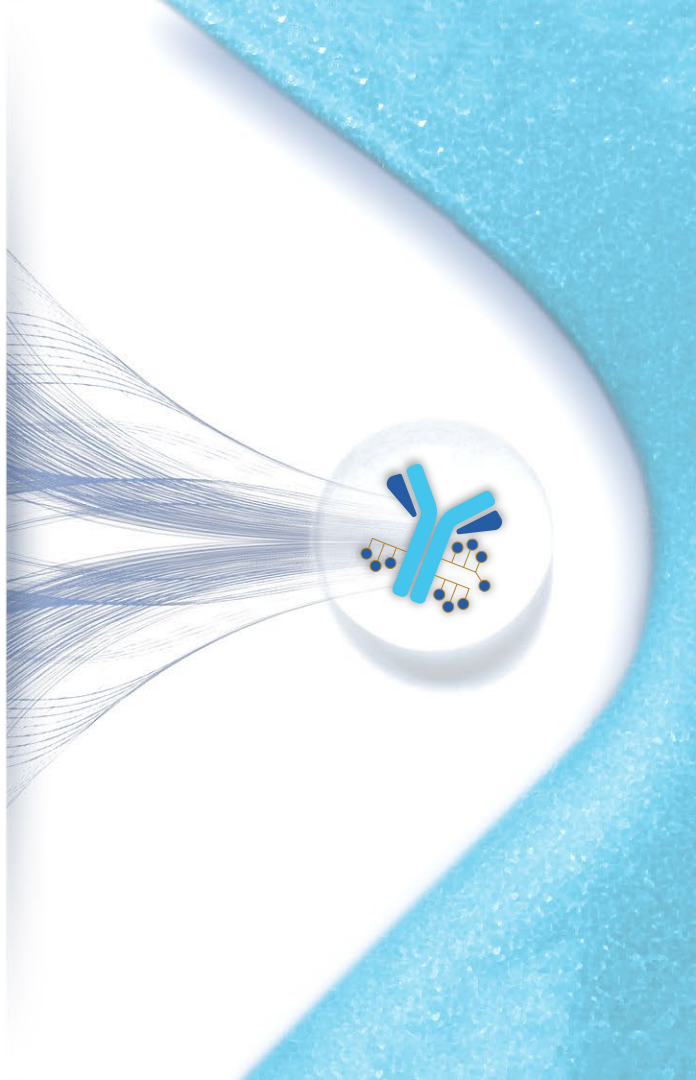
[1]$270.9 M in Cash and Cash Equivalents as of September 30, 2020

The Path Forward: Mersana's Strategic Imperatives



[1]Life-cycle management
[2]Non-small cell lung cancer

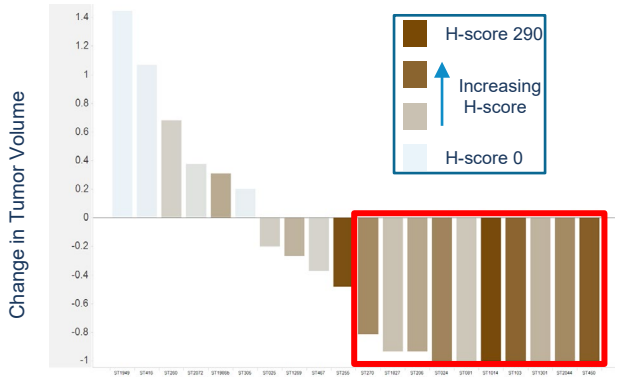
XMT-1536: First-in-Class Dolaflexin ADC Targeting NaPi2b



Mersana is the Leader in Targeting NaPi2b, an Ideal and Validated ADC Target

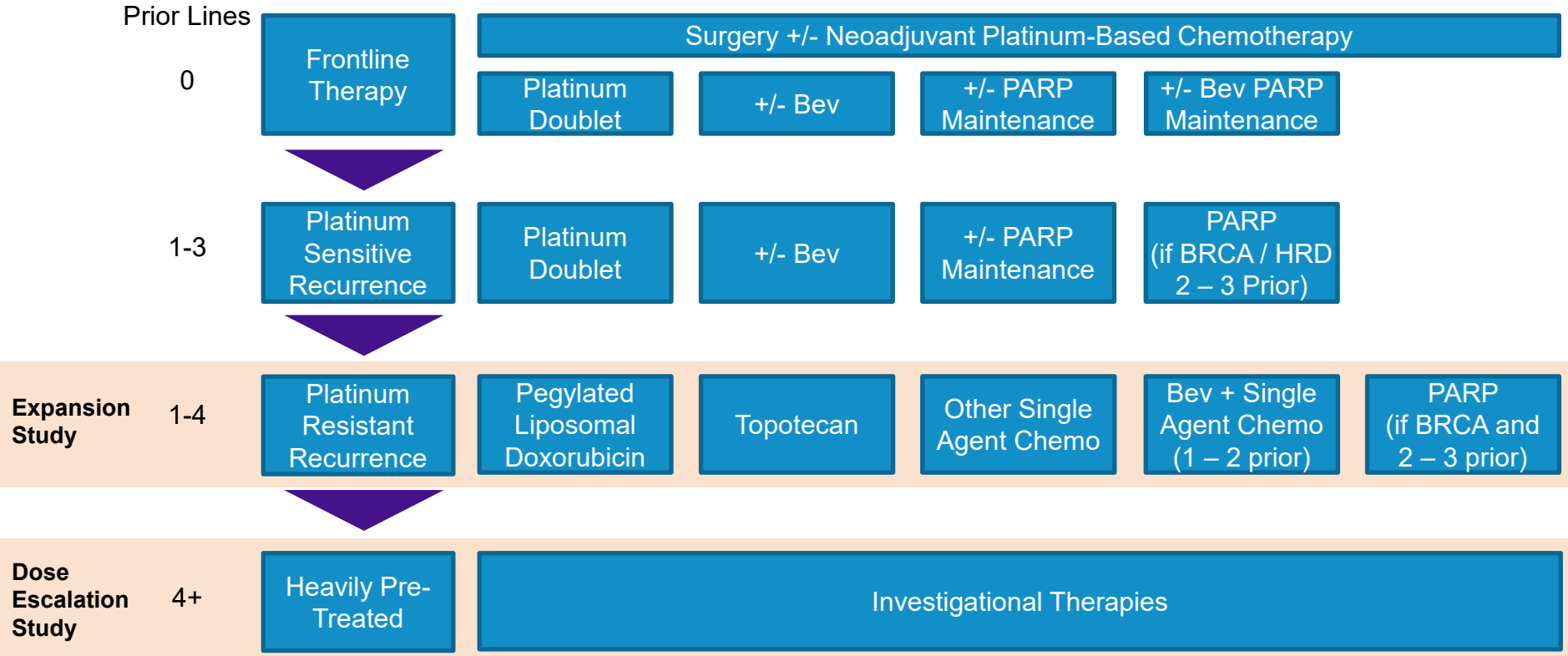
- NaPi2b is broadly expressed in ovarian cancer and NSCLC adenocarcinoma with limited expression in healthy tissues
  - No detectable expression in squamous NSCLC
- NaPi2b is a lineage marker (not an oncogene) that transports phosphate into the cell
  - The presence of EGFR and KRAS mutations in NSCLC adenocarcinoma correlates with more frequent expression of NaPi2b
- Initial clinical validation of target by Genentech using MMAE platform in era before introduction of bevacizumab and PARP
  - Genentech ADC not combinable with platinum due to overlapping severe neutropenia
- 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

In Expansion, XMT-1536 Demonstrated Differentiated Tolerability and Deep Confirmed Responses

Differentiated Tolerability Profile

- Safety profile consistent with previously reported dose escalation data and no new safety signals observed
- No reported cases of severe neutropenia, ocular toxicities, or peripheral neuropathy
- The most common treatment-related adverse events (TRAEs) were Grade 1-2 fatigue, nausea, decreased appetite, vomiting
- Transient AST elevation without associated changes in bilirubin or cases of Hy's law
- 4% discontinuation rate due to adverse events

Deep Confirmed Responses

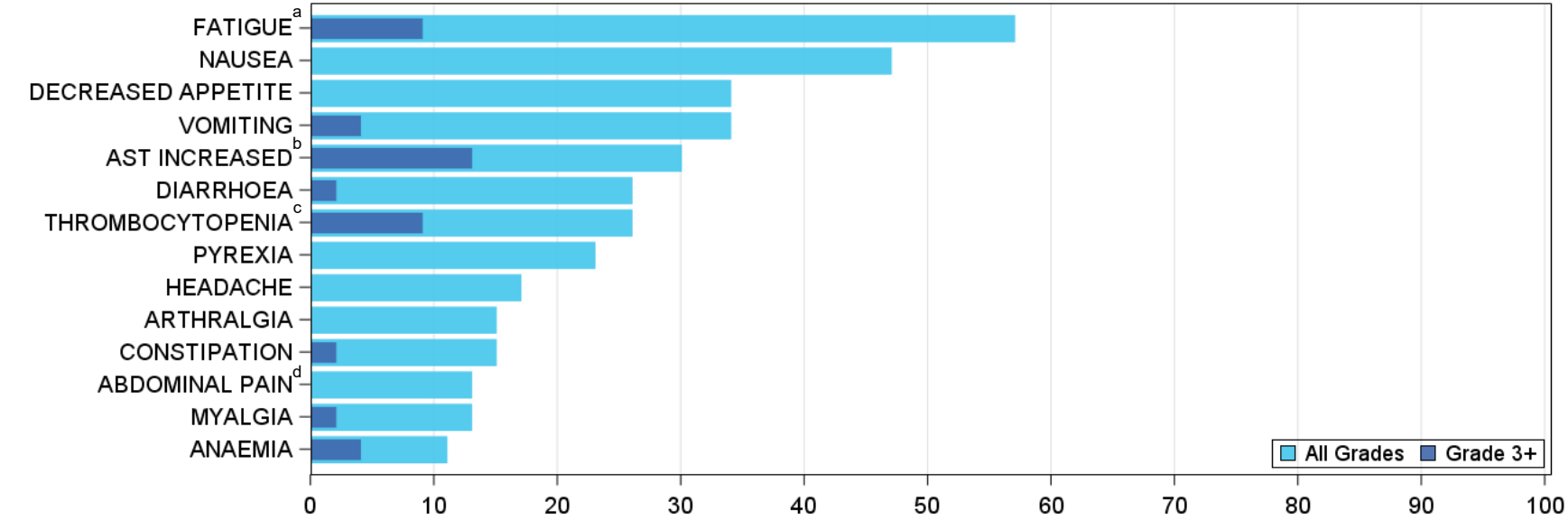
- Of the 29 ovarian cancer patients that were evaluable for response as of August 18, 2020
  - 2/29 (7%) achieved confirmed complete responses, both had prior therapy with bevacizumab and PARP inhibitors
  - 8/29 (28%) achieved confirmed partial responses for an objective response rate of 34%
  - 23/29 (79%) achieved stable disease or better for a disease control rate of 79%
  - Responses appear to deepen over time
- Data continue to support a NaPi2b biomarker-based patient selection strategy
- More data needed to assess antitumor in NSCLC adenocarcinoma

Data as of August 18,2020. Complete ESMO 2020 disclosure available here: https://www.mersana.com/wp-content/uploads/2020/09/Mersana_ESMO-2020_Poster_FINAL.pdf
Complete ASCO 2020 disclosure available here: https://www.mersana.com/wp-content/uploads/2020/05/2020-ASCO_XMT-1536_Poster_FINAL-14May2020.pdf

XMT-1536 Has Continued to Have a Favorable Safety Profile

- 38 (81 %) patients reported at least 1 treatment-related adverse event (TRAE)
- No ≥Grade 3 (severe) TRAEs of neutropenia, peripheral neuropathy, or ocular toxicity have been reported

TRAEs Reported in ≥10% of Patients with OC (n = 47)



[a] Includes preferred terms: fatigue and asthenia
[b] AST increase is transient in nature, recovers to baseline or to Grade 1 prior to the next dose, no instances are associated with elevated bilirubin or cases of Hy's law
[c] Includes preferred terms: thrombocytopenia and platelet count decrease. 1 patient with Grade 4 thrombocytopenia on C1D8 recovered within 3 days
[d] Includes preferred terms: abdominal pain, abdominal pain upper
Abbreviation: TRAEs = treatment-related adverse events; AST = Aspartate aminotransferase
Data as of August 18, 2020

Continued Activity Observed in Platinum-Resistant Ovarian Cancer

- Response observed within 2 cycles in 70% of patients (7 of 10)
- Response observed within 4 cycles in 100% of patients (10 of 10)

Best Response in Evaluable Patients with OC (n = 29)

	All (n = 29)	Higher NaPi2b^{O} (n = 20)	Lower NaPi2b^{OO} (n = 7)	NaPi2b Not Yet Determined (n = 2)
CR; n(%)	2 (7)	2 (10)	0	0
PR; n (%)	8 (28)	5 (25)	2 (29)	1 (50)
SD; n (%)	13 (45)	10 (50)	2 (29)	1 (50)
PD; n (%)	6 (21)	3 (15)	3 (43)	0
DCR [CR + PR + SD]; n (%)	23 (79)	17 (85)	4 (57)	2 (100)

*18 patients were not evaluable for RECIST response: 1 clinical progression (Lower NaPi2b Expression); 1 withdrew consent (Lower NaPi2b Expression); 1 unrelated Grade 5 SAE (Lower NaPi2b Expression); 15 patients did not have RECIST assessment as of the data cut

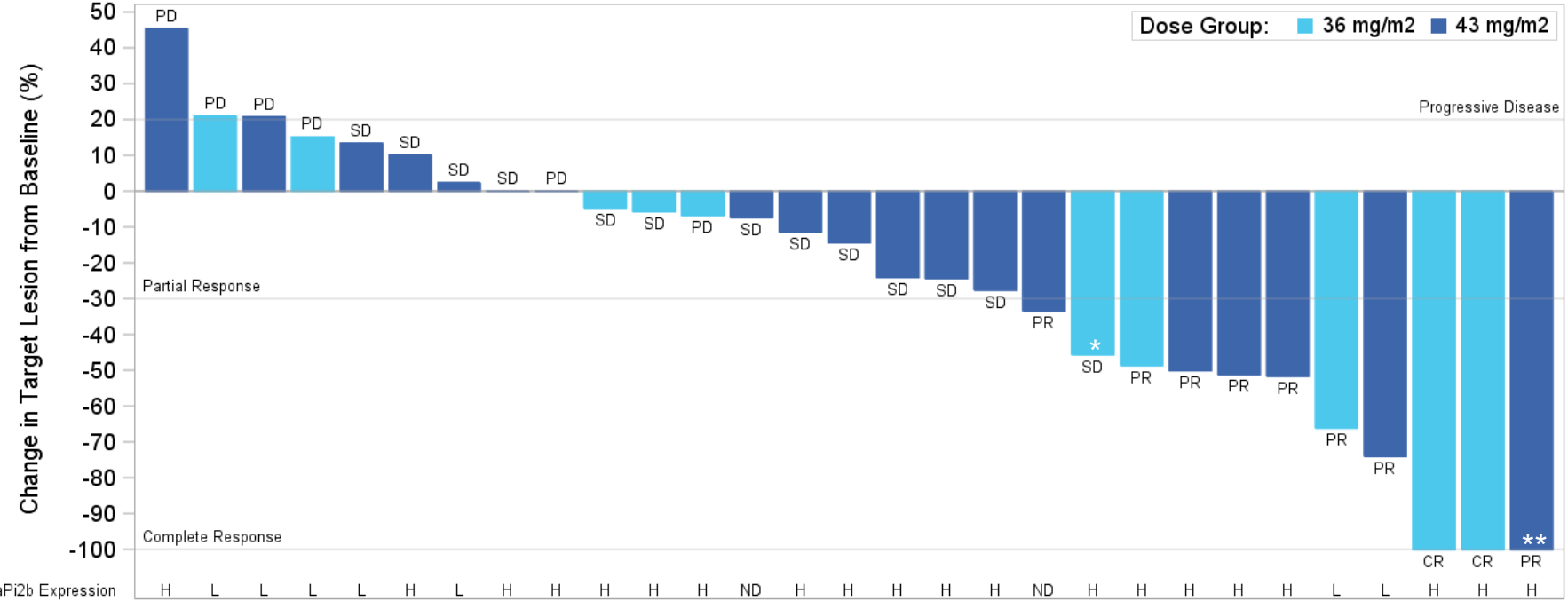
^{O} Higher NaPi2b Expression: defined in dose escalation as at / above lowest H-score at which response observed (≥110)

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

Data as of August 18, 2020

Deep Responses Observed in Platinum-Resistant Ovarian Cancer

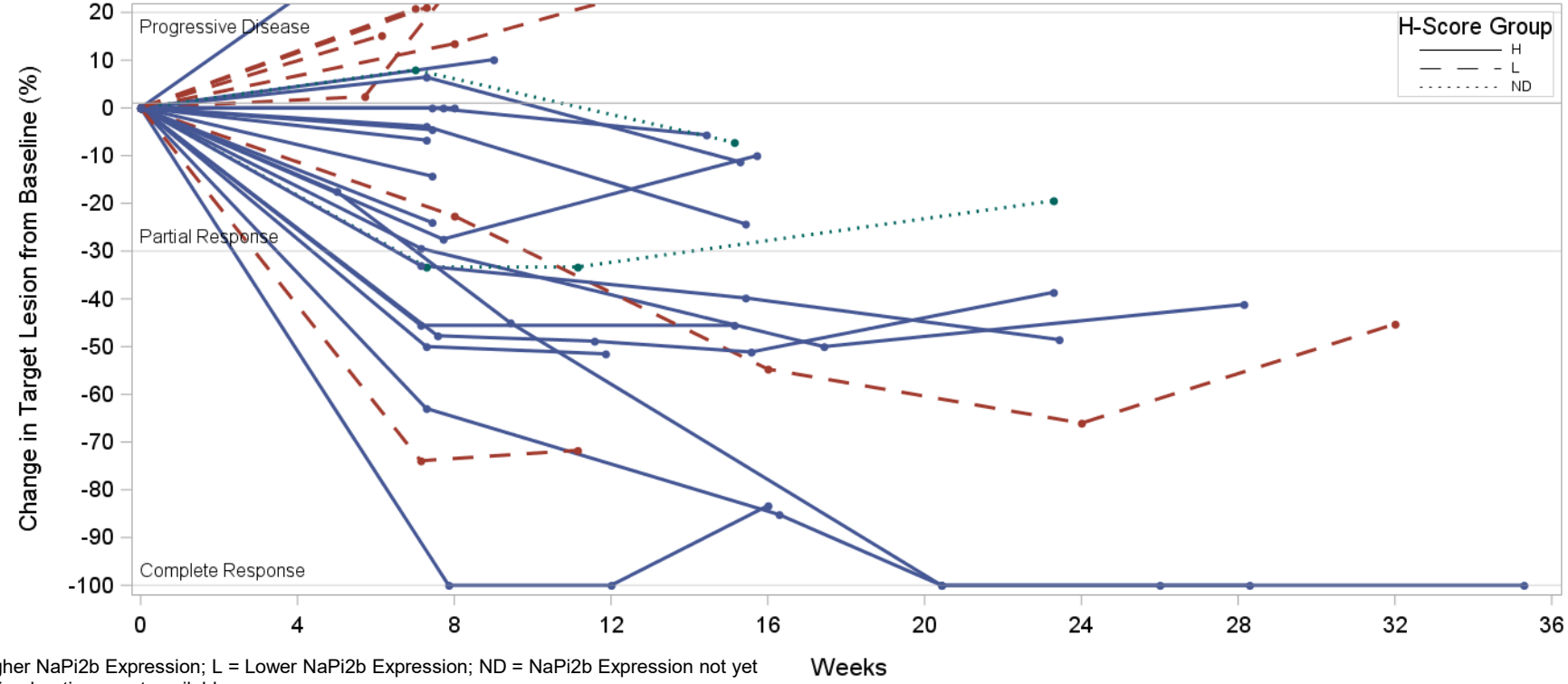
Maximum % Change from Baseline in Target Lesions in Patients with OC (n = 29)



* Following PR next scan showed new lesions, BOR per RECIST v1.1 is SD
** CR of target lesions and non-CR/non-PD of non-target lesions, BOR per RECIST v1.1 is PR
Abbreviations: PD = progressive disease; SD = stable disease; PR = partial response; CR = complete response; H = Higher NaPi2b Expression; L = Lower NaPi2b Expression; ND = NaPi2b Expression not yet determined or tissue not available
Data as of August 18, 2020

XMT-1536 Patient Responses Have Appeared to Deepen Over Time

Change from Baseline in Target Lesions in Patients with OC (n = 29)

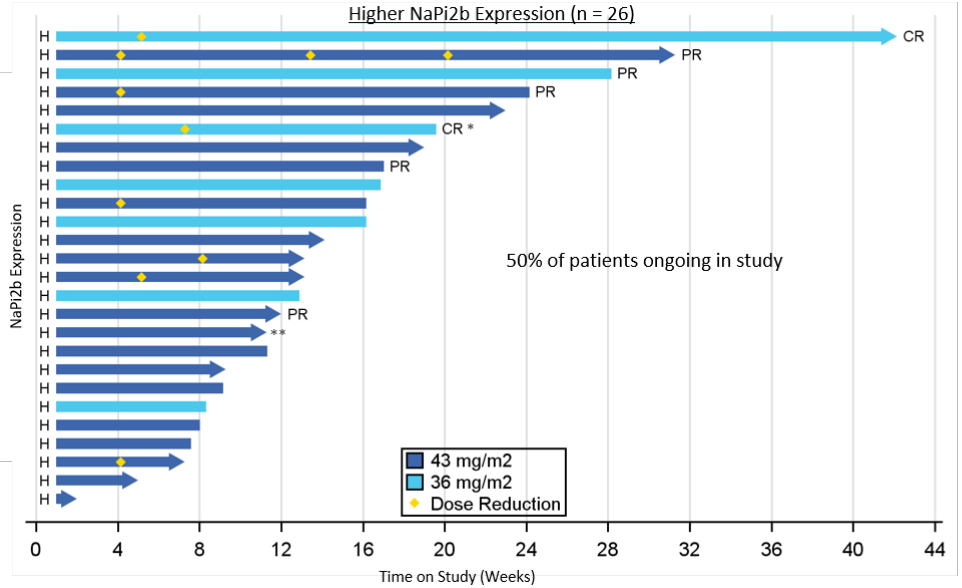


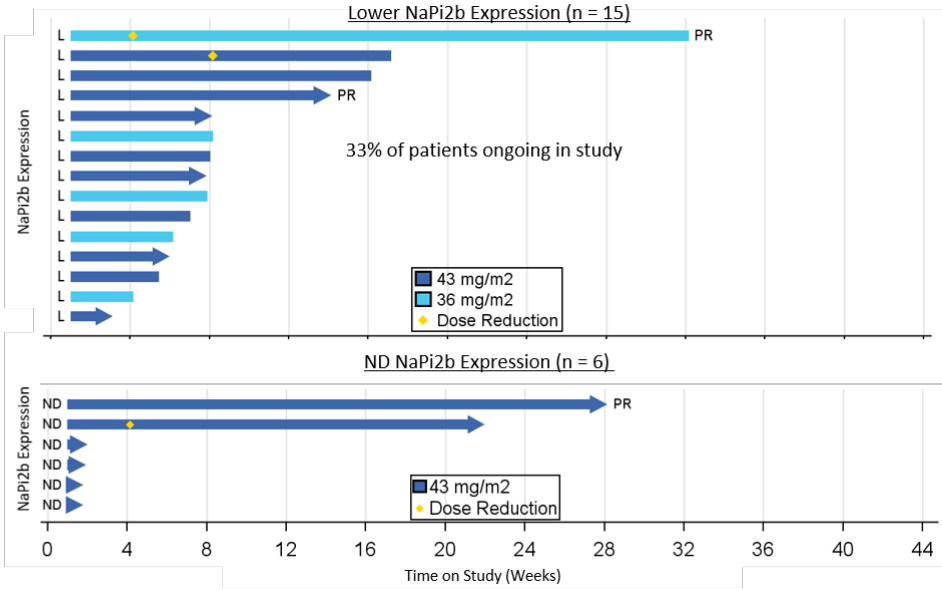
H = Higher NaPi2b Expression; L = Lower NaPi2b Expression; ND = NaPi2b Expression not yet determined or tissue not available
Data as of August 18, 2020

Durability Data are Immature: 50% of Ovarian Cancer Patients with Higher NaPi2b Still Ongoing

As of August 18, 2020

Time on XMT-1536 Study in Patients with OC (n = 47)





* Scans at 28-weeks confirmed ongoing CR in this patient

** Patient previously reported as unconfirmed PR at ASCO 2020; patient discontinued study after 1 Cycle and confirmatory scans not completed; patient off study for 3.5 months, with disease progression and study treatment re-initiated; plot is shown from re-initiation of study treatment

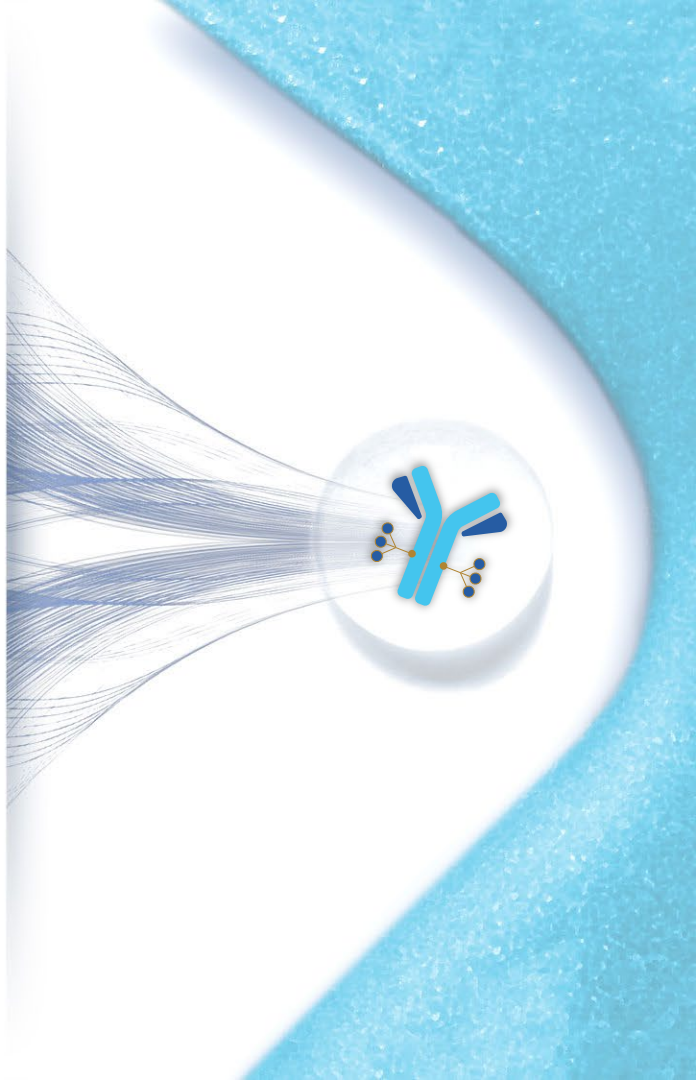
Abbreviations: CR = complete response; PR = partial response; H = Higher NaPi2b Expression; L = Lower NaPi2b Expression; ND = NaPi2b Expression not yet determined or tissue not available

XMT-1536: Significant Data Events Throughout 2020

	Dose Escalation	Ovarian Cancer Expansion	NSCLC Adeno Expansion
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
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
Data Disclosures	**Data at SGO 2020**	**Proof of Concept Demonstrated at ASCO** **Continued Favorable Tolerability and Antitumor Activity Data at ESMO** **Additional Update Planned Around End of Year**	**Expect to Provide Data Disclosure Plan in January 2021**

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

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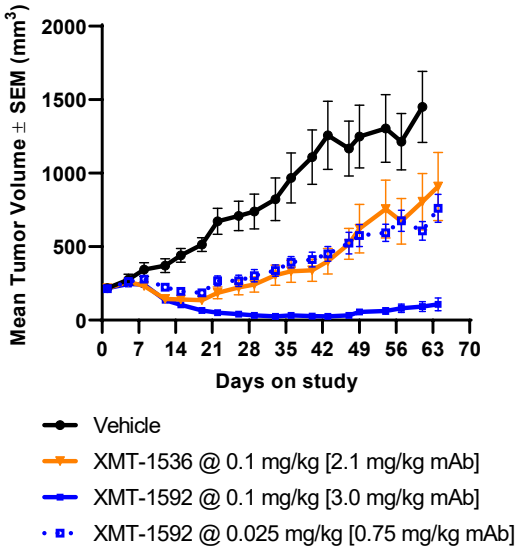
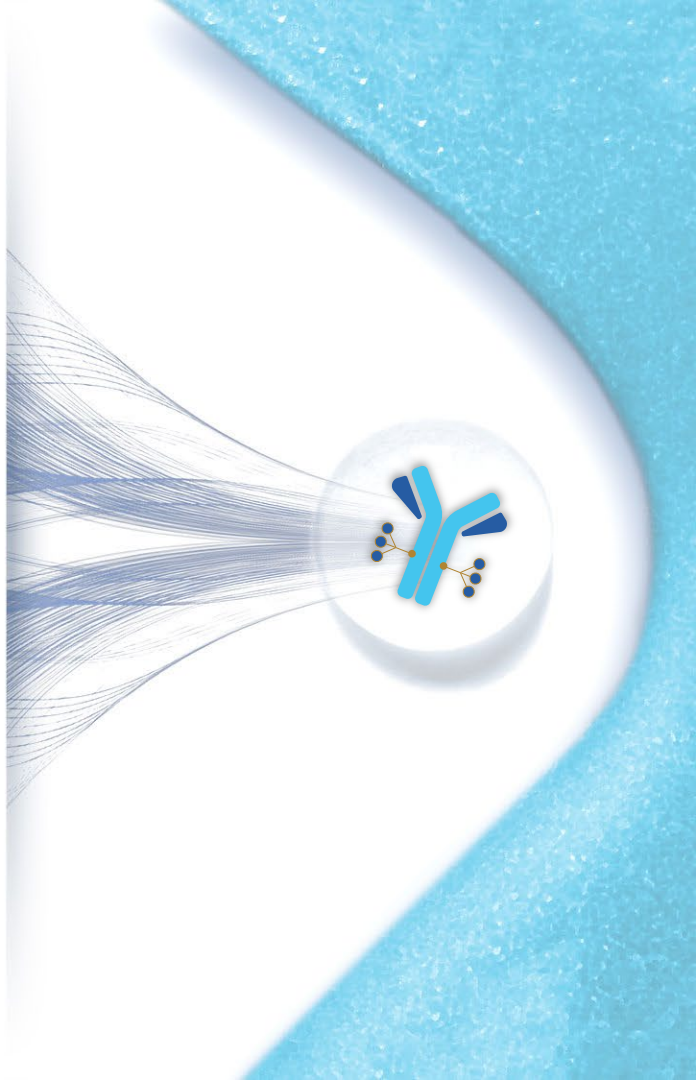
4X Greater Activity in Lung PDX

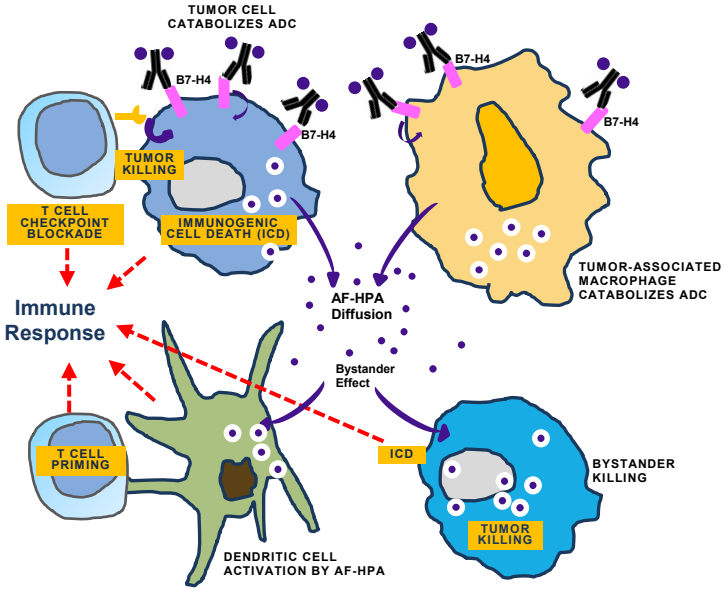


2020	File IND Application	✓
	Initiate Dose Escalation	✓
	Achieve MTD	
2021	Clinical Proof of Differentiation	
	Inform Product Engine	

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



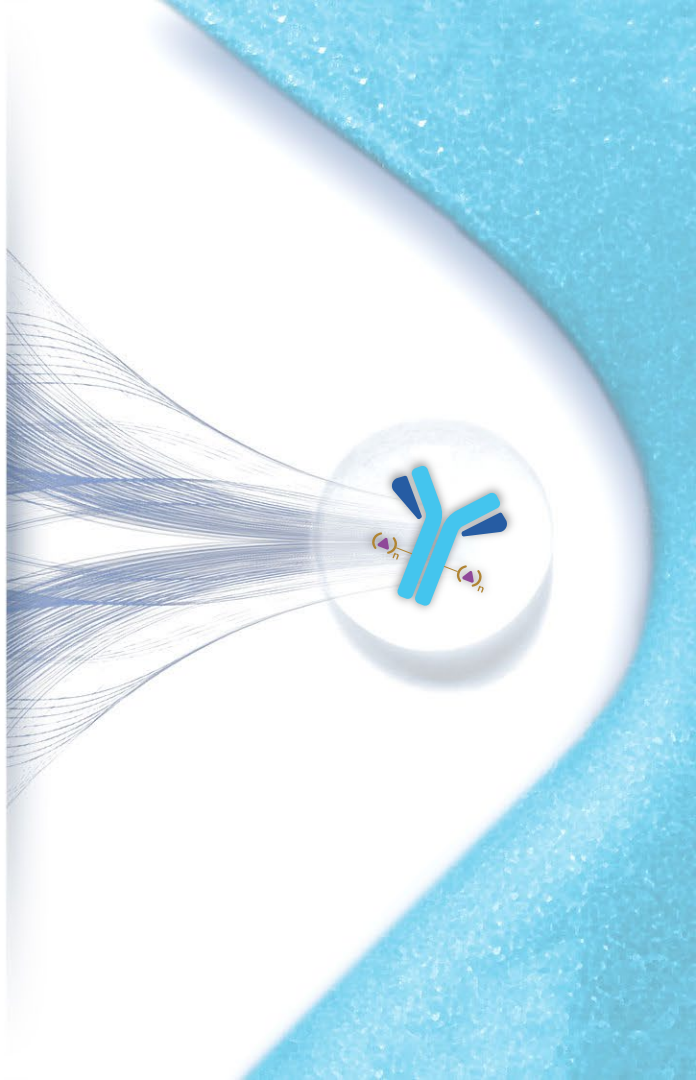
B7-H4 Expression Ideally Suited for a DolaLock ADC



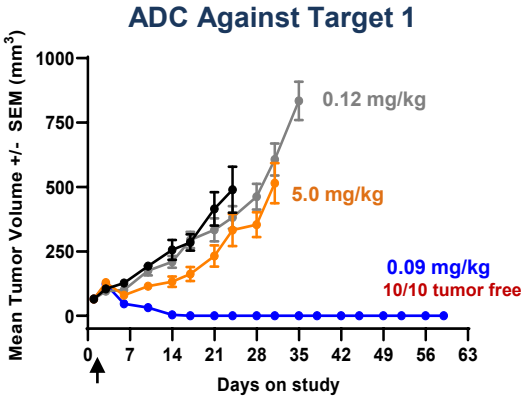
- B7-H4 is expressed on both tumor cells and immunosuppressive tumor-associated macrophages (TAMs)
  - Limited expression in normal tissues
- A DolaLock ADC targeting B7-H4 can exert its effect through multiple mechanisms of action:
  - Uptake by tumor cells and direct cytotoxicity
  - Uptake by TAMs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

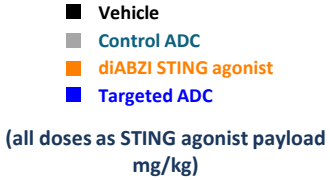
IND-enabling studies in 2020

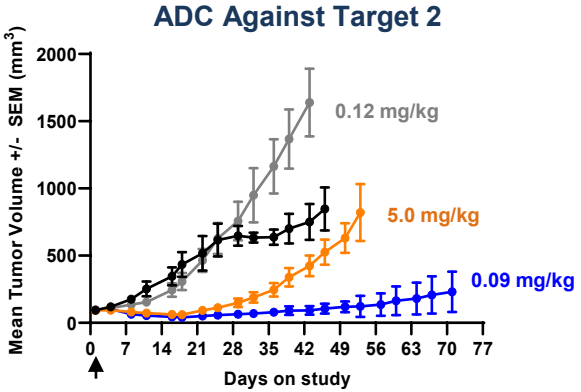
Immunosynthen Development Candidate in 2020

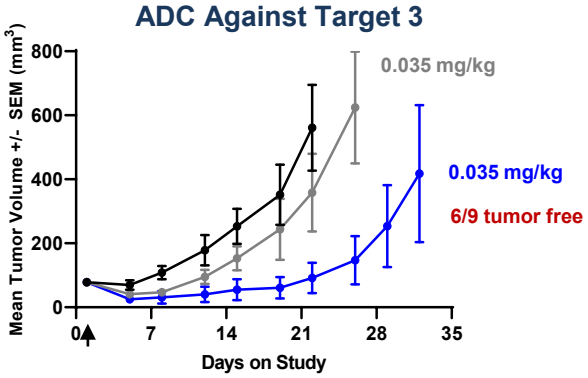


Immunosynthen ADCs Show *In Vivo* Activity Against Multiple Targets and Immune Memory

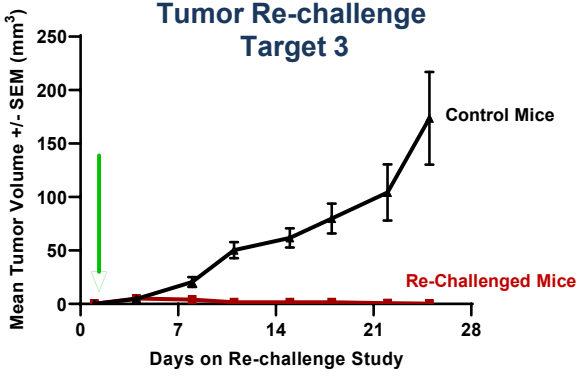








Tumor re-challenge of 6 tumor-free mice



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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