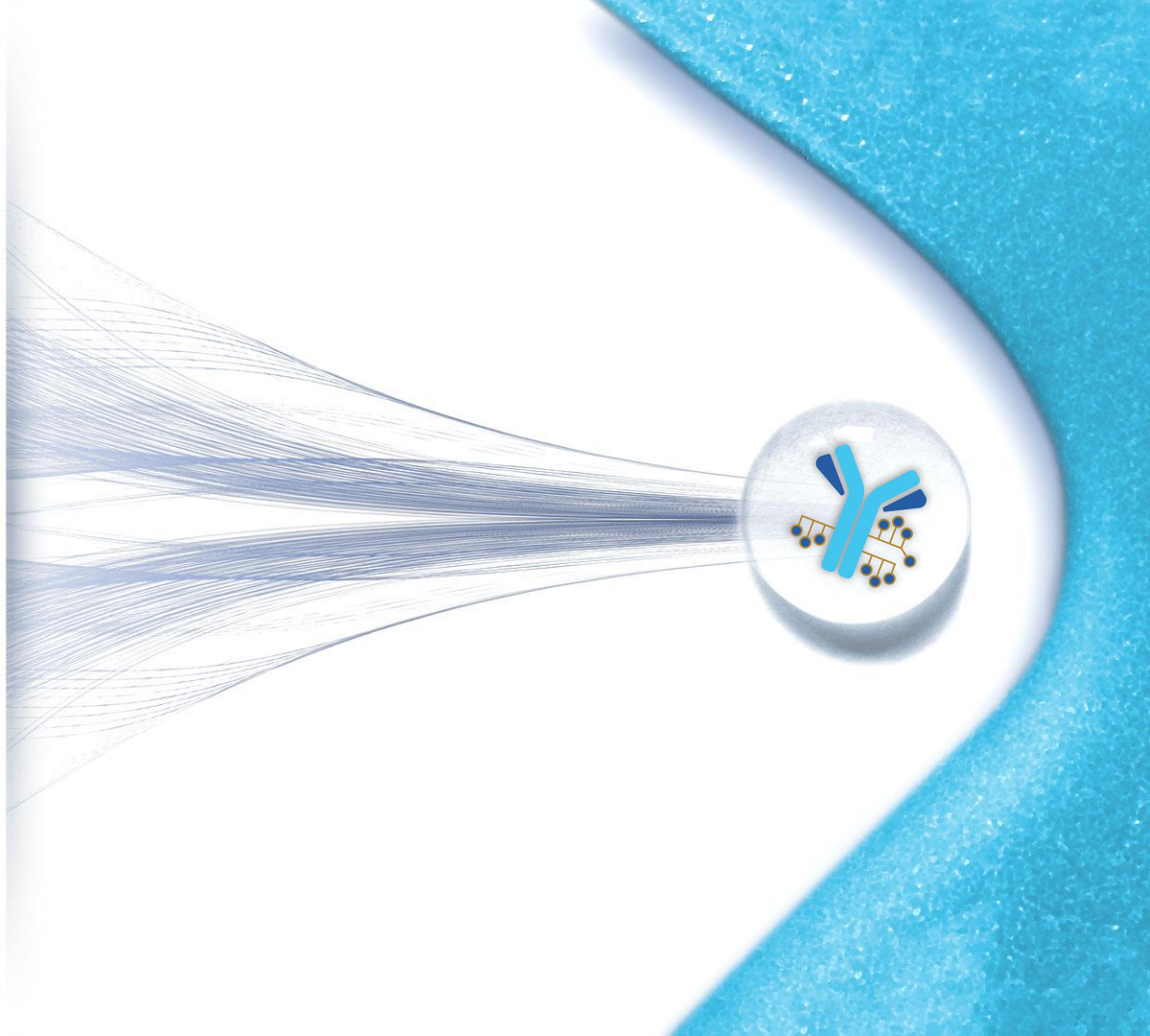
Mersana THERAPEUTICS

UpRi (NaPi2b) Diagnostic Development Path

April 16, 2021



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, the ability of the single-arm UPLIFT cohort to enable registration, expectations regarding future clinical trial results based on data achieved to date, and the sufficiency of the Company’s cash on hand.

Forward-looking statements generally can be identified by terms such as “aims,” “anticipates,” “believes,” “contemplates,” “continues,” “could,” “estimates,” “expects,” “goal,” “hypothesis,” “intends,” “may,” “on track,” “opportunity,” “plans,” “poised for,” “possible,” “potential,” “predicts,” “projects,” “promises to be,” “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 preclinical or clinical trials, regulatory changes, particularly with respect to the change in the U.S. presidential administration, the FDA’s review of the protocol for our study of the single-arm UPLIFT cohort, and that the development and testing of the Company’s product candidates and new platforms will take longer and/or cost more than planned, and that our clinical studies may not be initiated or completed on schedule, if at all, 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 26, 2021 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.

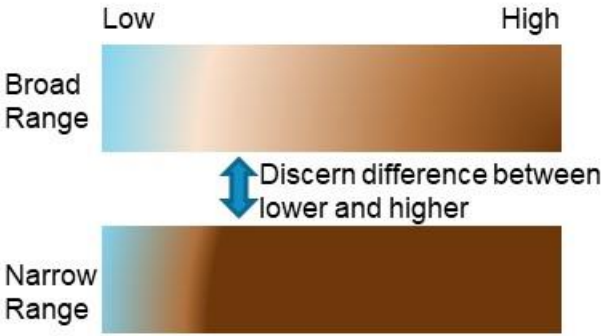
Today's Agenda

1. Background – Characteristics of an Optimal Immunohistochemistry (IHC) Diagnostic Assay
2. RoadMap to Commercial Dx Assay – Start with a Clinical Research Assay Evaluating Multiple Scoring Methods and Determine Predictive Ability of Biomarker
3. Selection of Scoring Method Optimal for Commercialization
4. Transition to a Commercial Assay in UPLIFT to Support Launch

The Optimal Diagnostic Assay is Robust, Predictive and Reproducible

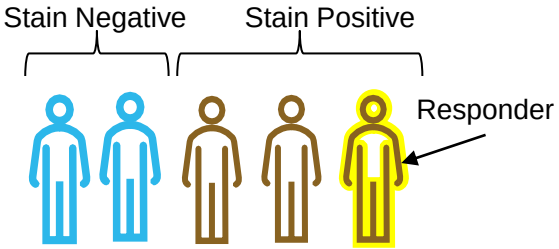
Robust

- Dynamic range allows for distinctions to be made between lower and higher expressors



Predictive

- Biomarker positive patients enriched for response



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20% Respond without Biomarker

Reproducible

- Clear guidelines on how to read assay
- Can be performed outside of a central lab
- Reads the same regardless of lab

Reads the Same in

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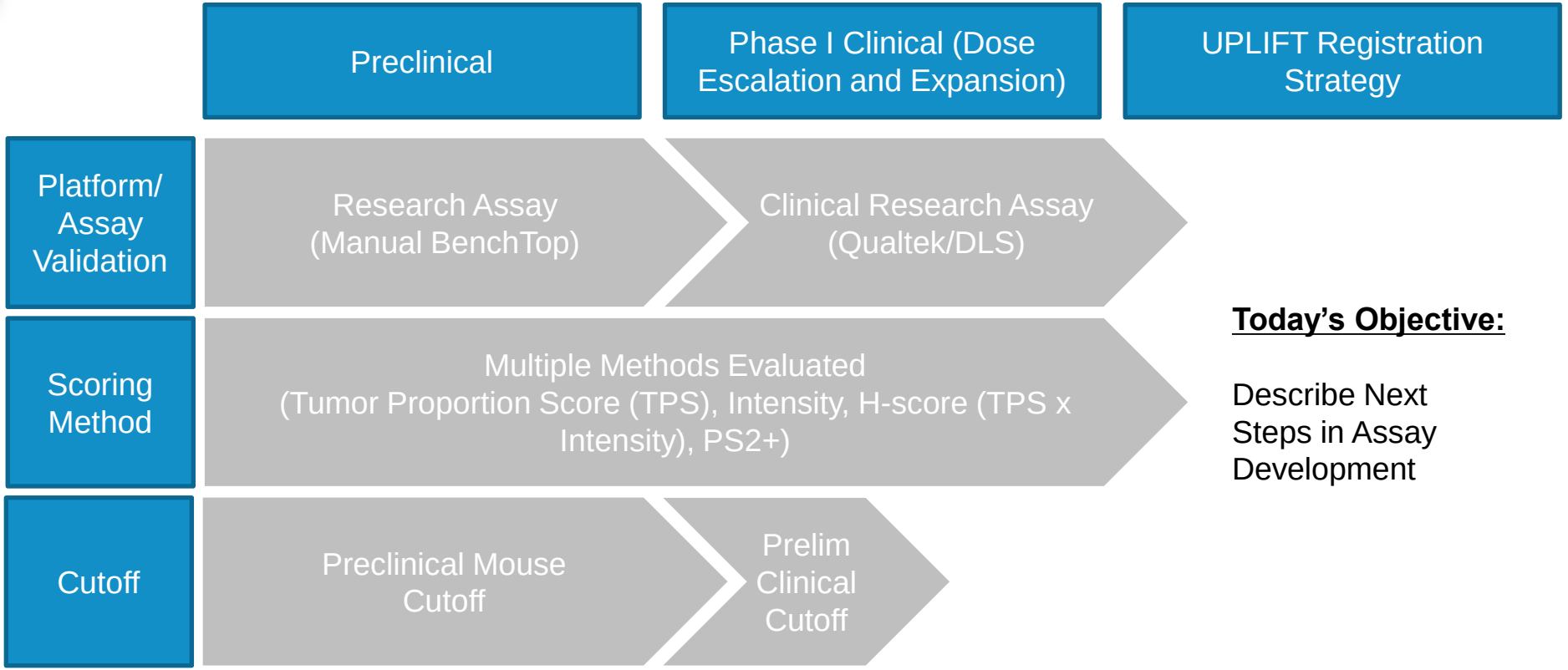
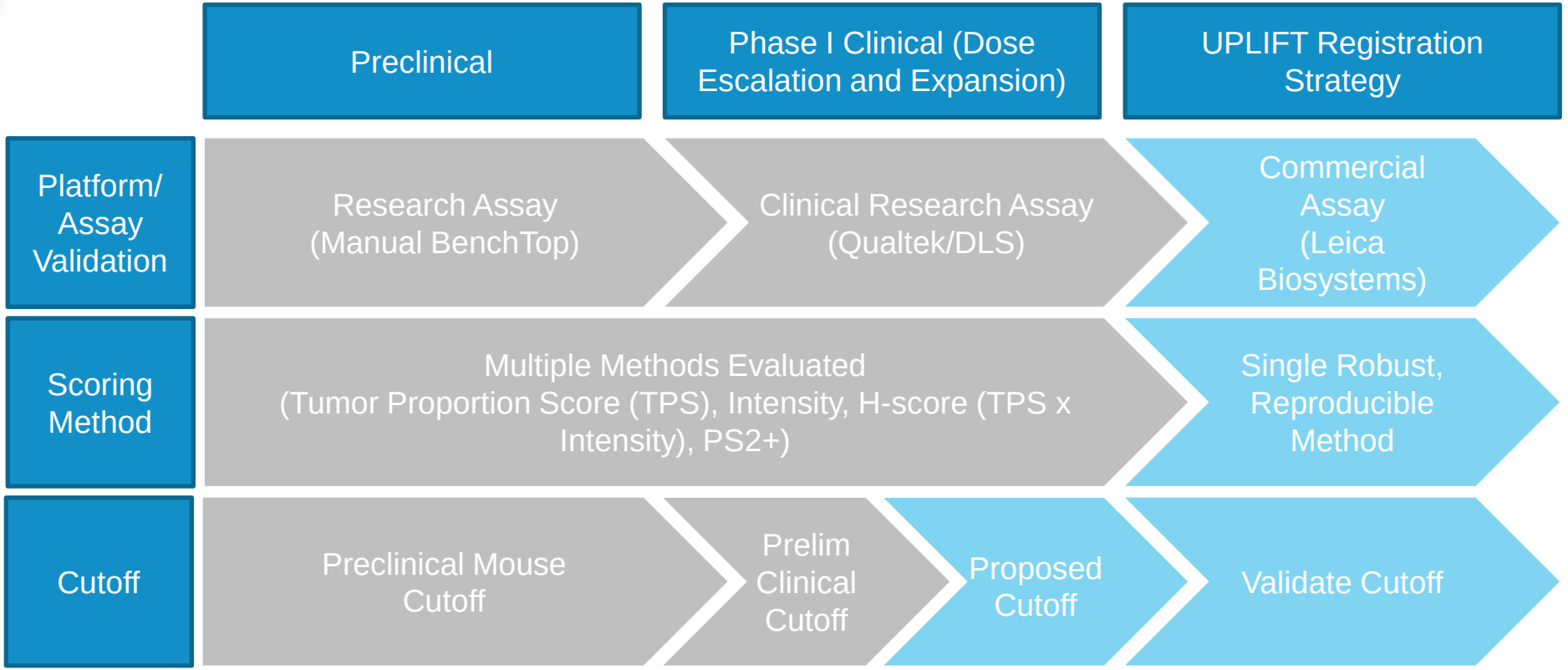
Strategy Designed to Deliver a Robust, Predictive and Reproducible Commercial Diagnostic Assay



Today's Objective:

Describe Next Steps in Assay Development

Strategy Designed to Deliver a Robust, Predictive and Reproducible Commercial Diagnostic Assay



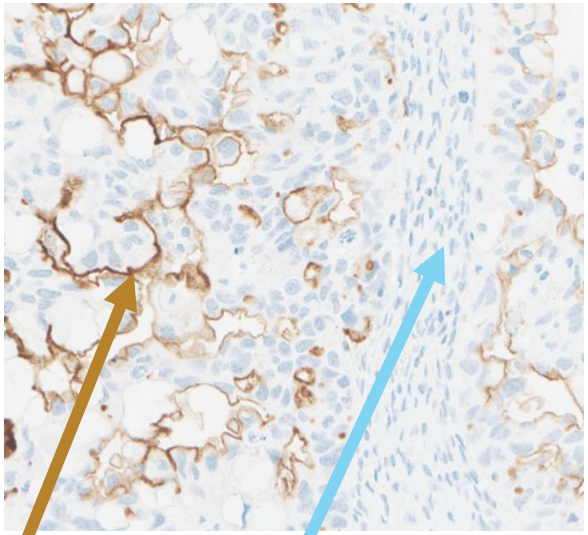
An IHC Assay is Comprised of a Sample, a Platform, a Stain, and a Scoring Method

Sample

Platform

QualTek TechMate

Stain



Brown Stain (DAB) Visualizes Target Protein

Blue Counterstain Delineates (Acidic) Cell Structures

Scoring Method

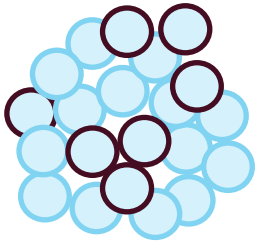
- IHC readout:
  - % cells expressing at a given intensity of 1+ or 2+ or 3+

Different Scoring Methods (H-score, TPS, PS2+) Combine Tumor Proportion and Intensity in Different Ways

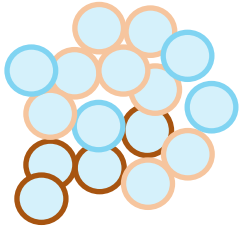
H = (1 x percent “1+”) + (2 x percent “2+”) + (3 x percent “3+”) → Accounts for intensity and proportion

TPS = Percent “1+” + Percent “2+” + Percent “3+” → Accounts for proportion with any intensity above 0

PS2+ = Percent “2+” + Percent “3+” → Accounts for proportion of only higher Intensity



33% 3+
H ~100
TPS = 33%
PS2+ = 33%



25% 2+, 50% 1+
H = 100
TPS = 75%
PS2+ = 25%

100% 1+
H = 100
TPS = 100%
PS2+ = 0%

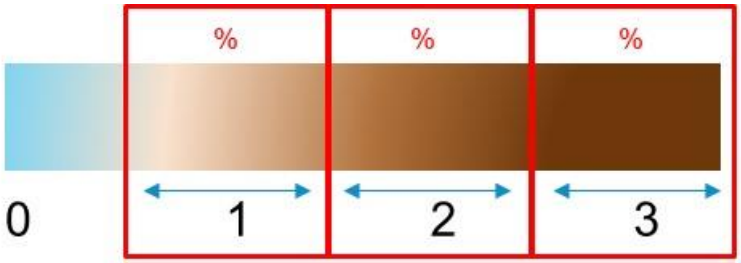
We Have Been Exploring Scoring Methods to Understand What Matters Most: Proportion, Intensity or the Combination?

Scoring Method Affects Reproducibility Across Readers and Labs

Numerical values are assigned according to brown intensity, but the reader is required to cut the data along a continuum

H-Score

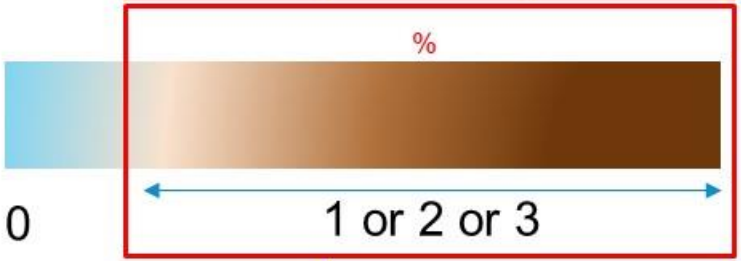
H =
(1 x percent “1+”) +
(2 x percent “2+”) +
(3 x percent “3+”)



Reader Must Distinguish Blue from Beige from Tan from Brown

Tumor Proportion Score

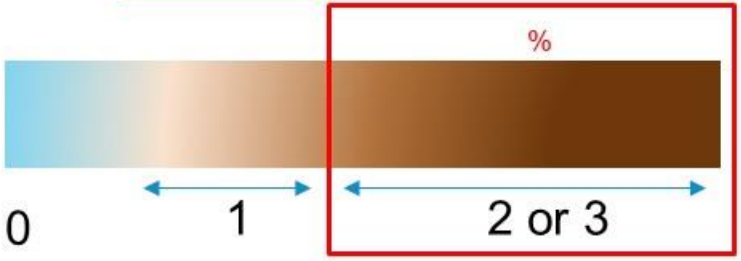
TPS =
Percent “1+” +
Percent “2+” +
Percent “3+”



Reader Must Distinguish Blue from any Brown

Tumor Proportion Score 2+ (PS2+)

PS2+ =
Percent “2+” +
Percent “3+”



Reader Must Distinguish Tan from Beige

IHC Companion Diagnostic Assays are Common and Use Different Scoring Methods

Examples of Approved Diagnostics

Scored by Tumor Proportion Score

PD-L1
TPS >1%
TPS >50%

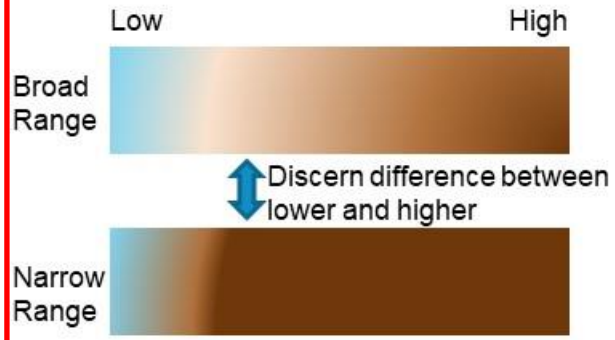
Scored Based on Intensity

HER-2/neu
1+, 2+, 3+

The Optimal Diagnostic Assay is Robust, Predictive and Reproducible

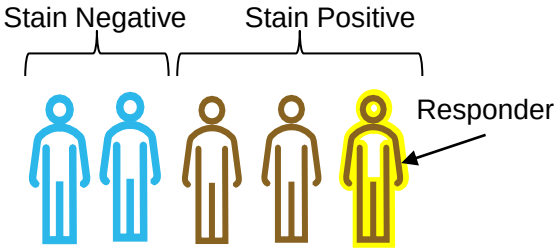
Robust

- Dynamic range allows for distinctions to be made between lower and higher expressors



Predictive

- Biomarker positive patients enriched for response



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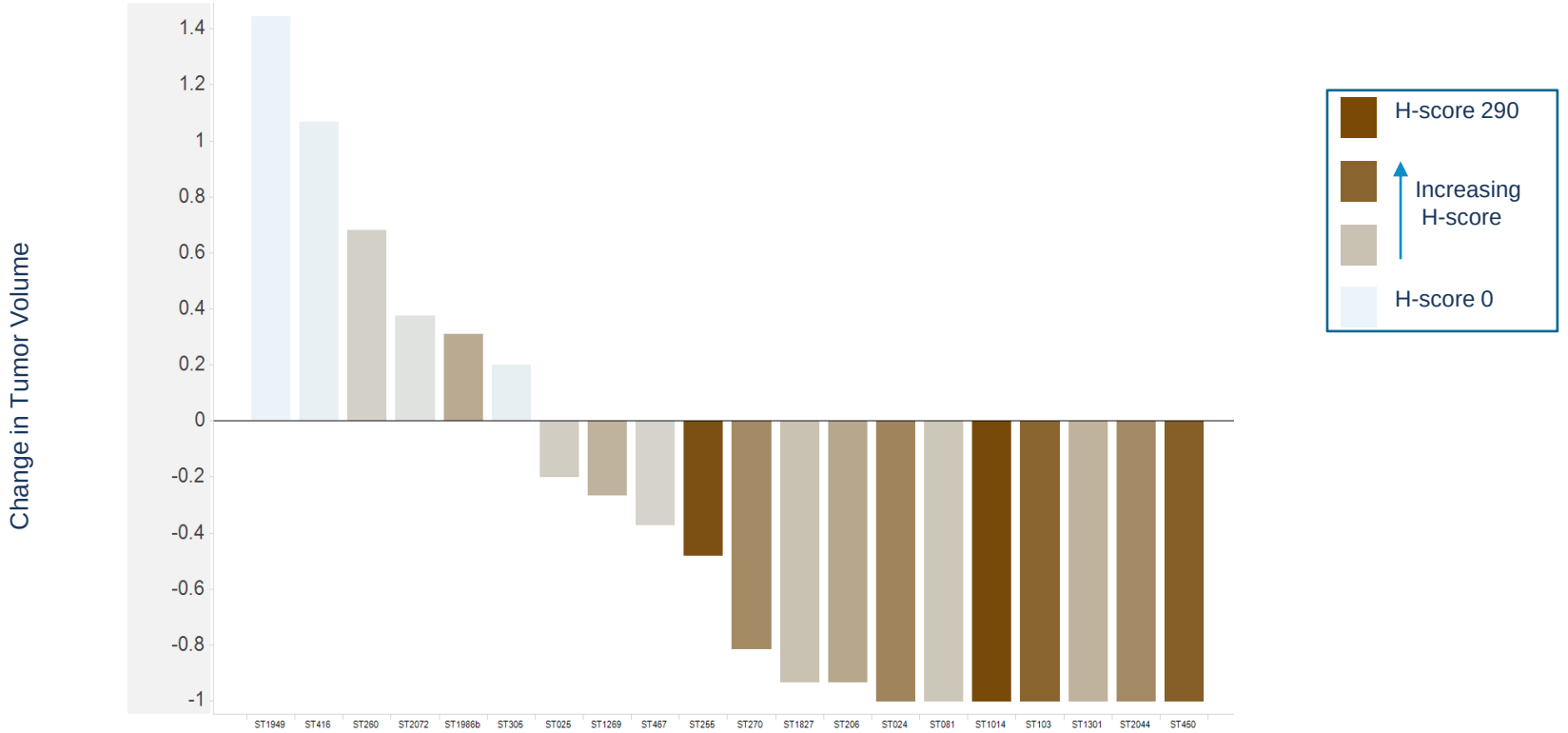
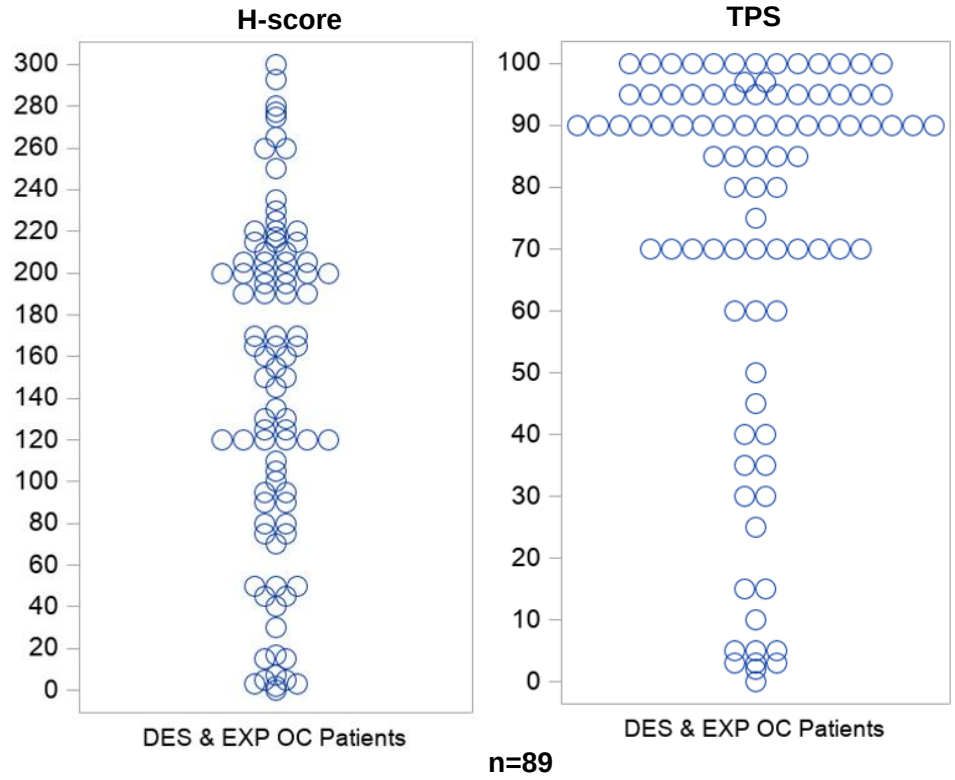
Mouse PDX Models Used to Calibrate NaPi2b Research Assay with Broad Dynamic Range

Robust



Our NaPi2b Assay Has a Broad Dynamic Range Across Clinical Samples Using H-score or TPS

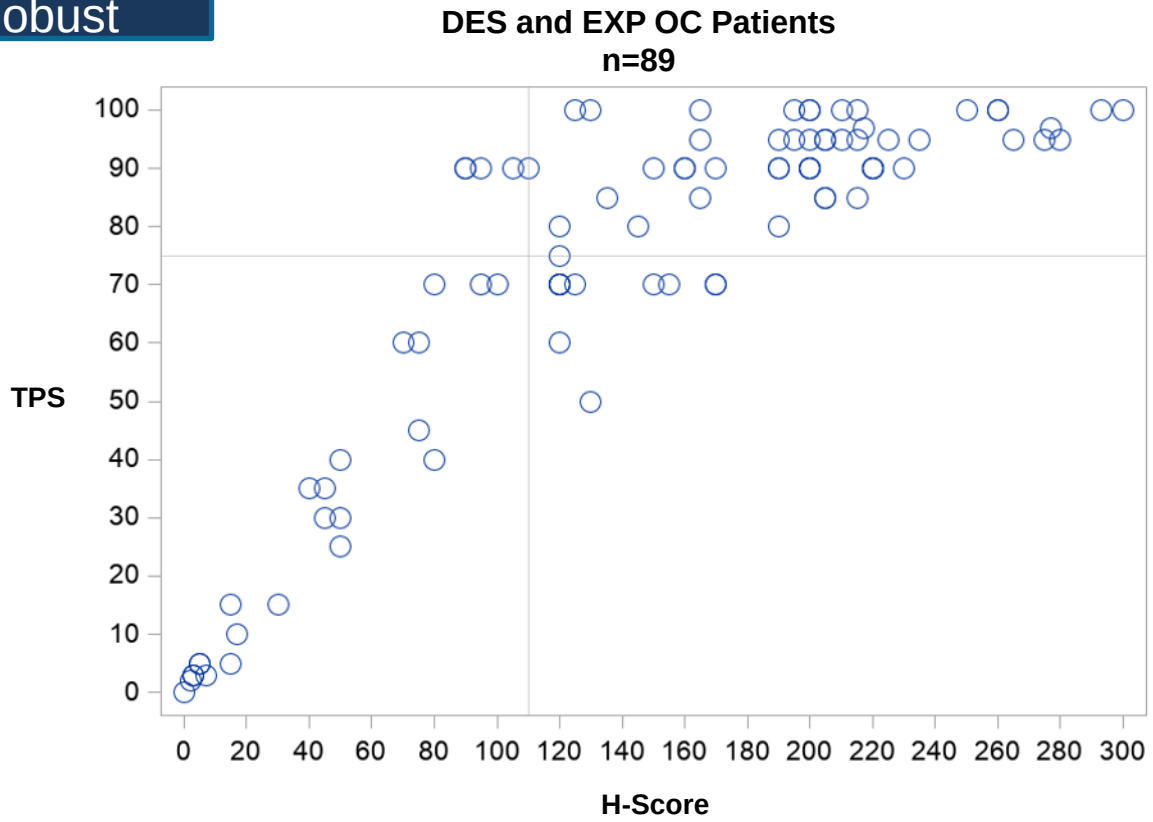
Robust



- Patients enrolled in the UpRi Phase I study have a broad range of NaPi2b expression levels
- Only a few have zero NaPi2b expression, consistent with lineage marker
- Tissue bank samples demonstrate similar broad dynamic range
- Broad dynamic range allows the assay to distinguish high expression from low expression using either H-score or TPS

TPS is a Component of H-Score, is Correlated with H-Score and Offers Similar Prevalence

Robust



TPS ≥ 75% is 62% of samples tested

H-score ≥ 110 is 68% of samples tested

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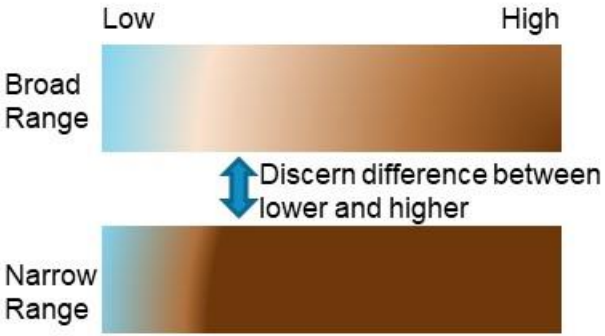
Robust

- Dynamic range allows for distinctions to be made between lower and higher expressors



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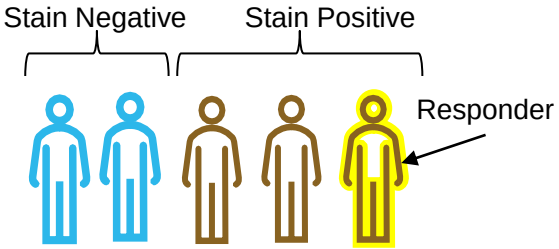

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In the Clinic, Higher NaPi2b Expression by H-Score Selected for Enhanced Response

Predictive

Best Response in Evaluable Patients with Ovarian Cancer (n = 47)				
	All (n = 47)	**Higher NaPi2b (n = 31)**	**Lower NaPi2b (n = 13)**	**NaPi2b Not Yet Determined (n = 3)**
CR; n(%)	2 (4)	2 (6)	0	0
PR; n(%)	11 (23)	8 (26)	2 (15)	1 (33)
SD; n(%)	19 (40)	13 (42)	5 (38)	1 (33)
ORR; n (%)	**13 (28)**	**10 (32)**	**2 (15)**	**1 (33)**
DCR; n (%)	**32 (68)**	**23 (74)**	**7 (54)**	**2 (67)**

- Higher NaPi2b Expression defined as at or above the lowest H-score at which response was observed in dose escalation (H-110)

Data as of December 3, 2020

TPS>=75 Selects for Enhanced Response as Well as H-score 110

Predictive

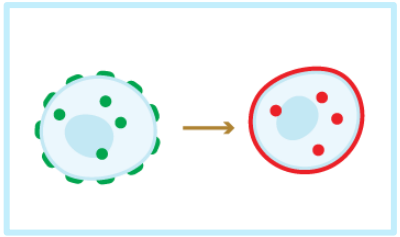
Best Response in Evaluable Patients with Ovarian Cancer (n = 47)				
	All (n = 47)	**High NaPi2b (n = 26) TPS>=75**	**Low NaPi2b (n = 18) TPS<75**	**NaPi2b Not Yet Determined (n = 3)**
CR; n(%)	2 (4)	2 (8)	0	0
PR; n(%)	11 (23)	8 (31)	2 (11)	1 (33)
SD; n(%)	19 (40)	11 (42)	7 (39)	1 (33)
ORR; n (%)	**13 (28)**	**10 (39)**	**2 (11)**	**1 (33)**
DCR; n (%)	**32 (68)**	**21 (81)**	**9 (50)**	**2 (67)**

Data Cutoff: December 3, 2020

Unique Advantages of Dolaflexin Platform have Implications for Scoring Methodology

Predictive

- High DAR means each internalization delivers more payload. Therefore, intensity of expression may be less important than proportion of expression



- Controlled Bystander effect means not all cells need to express

Based on Our ADC Technology, Tumor Proportion Score (TPS) is Similarly Predictive of Enriched Response

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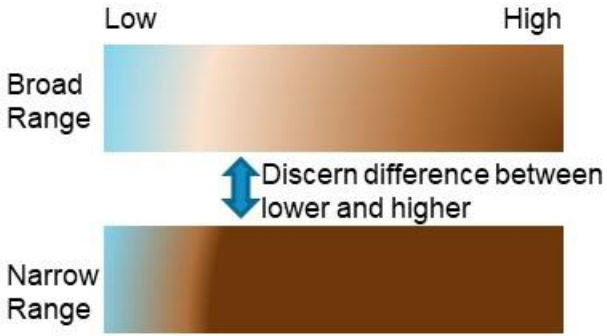

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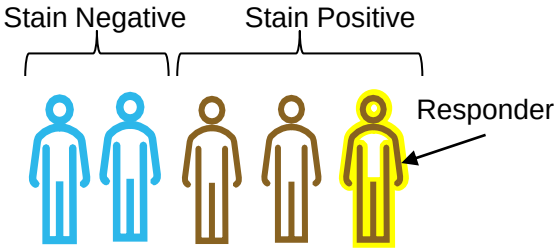

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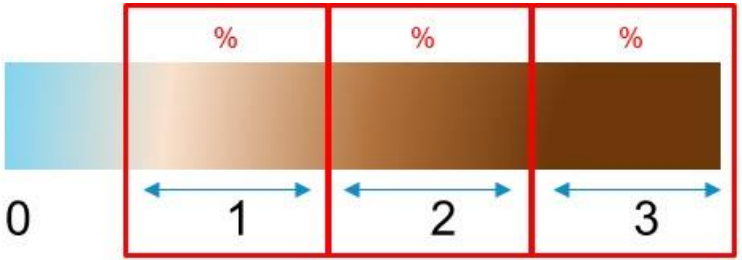

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Tumor Proportion Score

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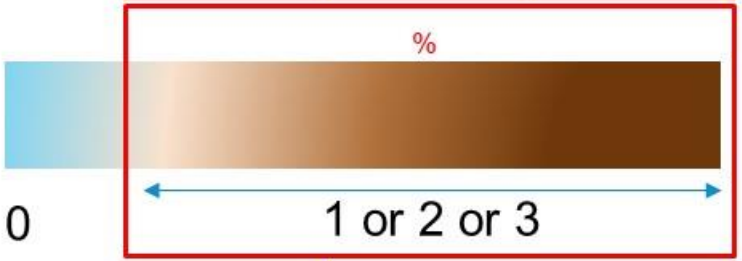
Percent “2+” +
Percent “3+”



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Tumor Proportion Score 2+ (PS2+)

PS2+ =
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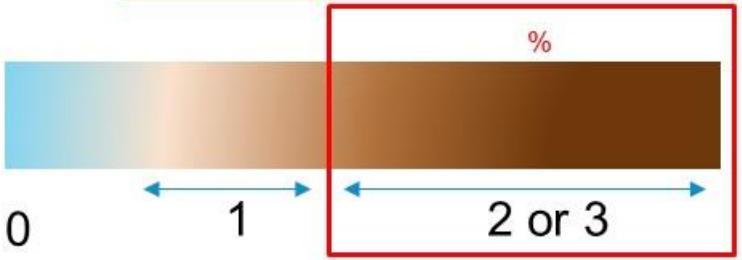
Percent “3+”



Reader Must Distinguish Tan from Beige

Leica Biosystems is our Commercial Diagnostic Partner

Reproducible

- ~5000 clinical BOND instruments placed globally
- 2nd largest automated stainer installed base worldwide
- Presence in major IHC reference labs and top 50 cancer centers
- Clinical Portfolio
  - >400 IVD products
  - >190 CE mark in Europe
  - ~150 FDA registered/cleared/approved
  - PMA-approved HER2 Oracle CDx
  - ~ 50 IVD in China

Advancing Cancer Diagnostics
Improving Lives

UPLIFT: Single-Arm Registration Strategy in Platinum-Resistant Ovarian Cancer

Patient Population:

Enrolling Regardless of NaPi2b Expression

Inclusion Criteria:
Platinum-Resistant Ovarian Cancer
1 – 4 Prior Lines
Patients with Baseline Peripheral Neuropathy

Exclusion Criteria:
1 – 2 Prior Lines Bev-naïve
Primary Platinum-Refractory Disease

Global:
US, Europe,
Australia, Canada

Dose:
43 mg/m^2 q4w

Amendment to
Current
Protocol

Primary Endpoint:
Confirmed ORR in high NaPi2b
(N = ~100)

Key Secondary Endpoint:
Confirmed ORR in overall population
(N = up to 180 including 100 high NaPi2b)

Other Secondary Endpoints:
- Duration of Response
- Safety

Prospectively-defined retrospective analysis seeks to validate NaPi2b biomarker cutoff with proposed commercial assay

Summary

- Followed a roadmap to establish a robust, predictive and reproducible commercial diagnostic assay
- Established a clinical research assay with a broad dynamic range that demonstrated that selection by NaPi2b expression enhanced response
  - H-Score is a combination of Tumor Proportion Score (TPS) and Intensity Score
  - NaPi2b Expression by H-Score $\geq$ 110 and by TPS $\geq$ 75 similarly enrich for response
- To support launch, a commercial assay has been developed using the TPS methodology
  - Robust, reproducible platform widely available in hospital and reference labs
  - UPLIFT is designed to validate predictiveness of proposed commercial diagnostic assay

Goals and Anticipated Milestones for 2021

Upifitamab Rilsodotin UpRi (XMT-1536)	• Q1 2021: Initiate UPLIFT single-arm registration strategy as amendment • Q3 2021: Initiate UPGRADE combination dose escalation umbrella study • 2H 2021: Report updated interim data from NSCLC expansion cohort
XMT-1592	• 2H 2021: Report dose escalation data • Q4 2021: Outline further development path
XMT-1660	• Q4 2021: Complete IND-enabling studies to initiate Phase I dose escalation in 2022
XMT-2056	• Q4 2021: Complete IND-enabling studies to initiate Phase I dose escalation in 2022 • Q4 2021: Disclose target
Corporate	• Continue to leverage proprietary platforms to expand pipeline • Proactively evaluate potential for collaborations that maximize value

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Accelerating ADC Innovation

…because patients are waiting