Idera Pharmaceuticals

37th Annual J.P. Morgan Healthcare Conference

January 2019

Forward Looking Statements and Other Important Cautions

This presentation contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. All statements, other than statements of historical fact, included or incorporated in this presentation, including statements regarding the Company's strategy, future operations, collaborations, intellectual property, cash resources, financial position, future revenues, projected costs, prospects, plans, and objectives of management, are forward-looking statements. The words "believes," "anticipates," "estimates," "plans," "expects," "intends," "may," "could," "should," "potential," "likely," "projects," "continue," "will," and "would" and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. Idera cannot guarantee that it will actually achieve the plans, intentions or expectations disclosed in its forward-looking statements and you should not place undue reliance on the Company's forward-looking statements. There are a number of important factors that could cause Idera's actual results to differ materially from those indicated or implied by its forward-looking statements. Factors that may cause such a difference include: whether interim results from a clinical trial will be predictive of the final results of the trial, whether results obtained in preclinical studies and clinical trials will be indicative of the results that will be generated in future clinical trials, including in clinical trials in different disease indications; whether products based on Idera's technology will advance into or through the clinical trial process on a timely basis or at all and receive approval from the United States Food and Drug Administration or equivalent foreign regulatory agencies; whether, if the Company's products receive approval, they will be successfully distributed and marketed; and such other important factors as are set forth under the caption "Risk Factors" in the Company's Annual Report filed on Form 10-K for the period ended December 31, 2017 and Quarterly Report filed on Form 10-Q for the period ended June 30, 2018. Although Idera may elect to do so at some point in the future, the Company does not assume any obligation to update any forward-looking statements and it disclaims any intention or obligation to update or revise any forward-looking statement, whether as a result of new information, future events or otherwise.

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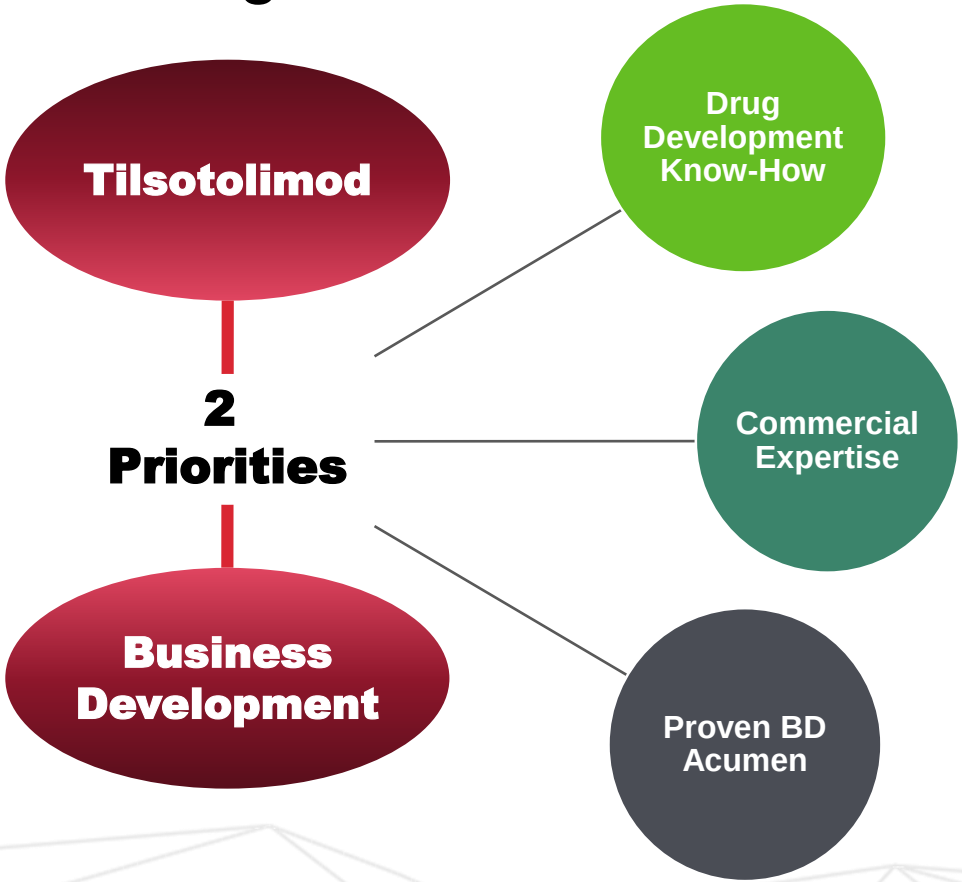
Creating the Long-term Value of Idera



Injecting a New Solution to Advance Cancer Immunotherapy

Near Term Value Growth Led by Tilsotolimod

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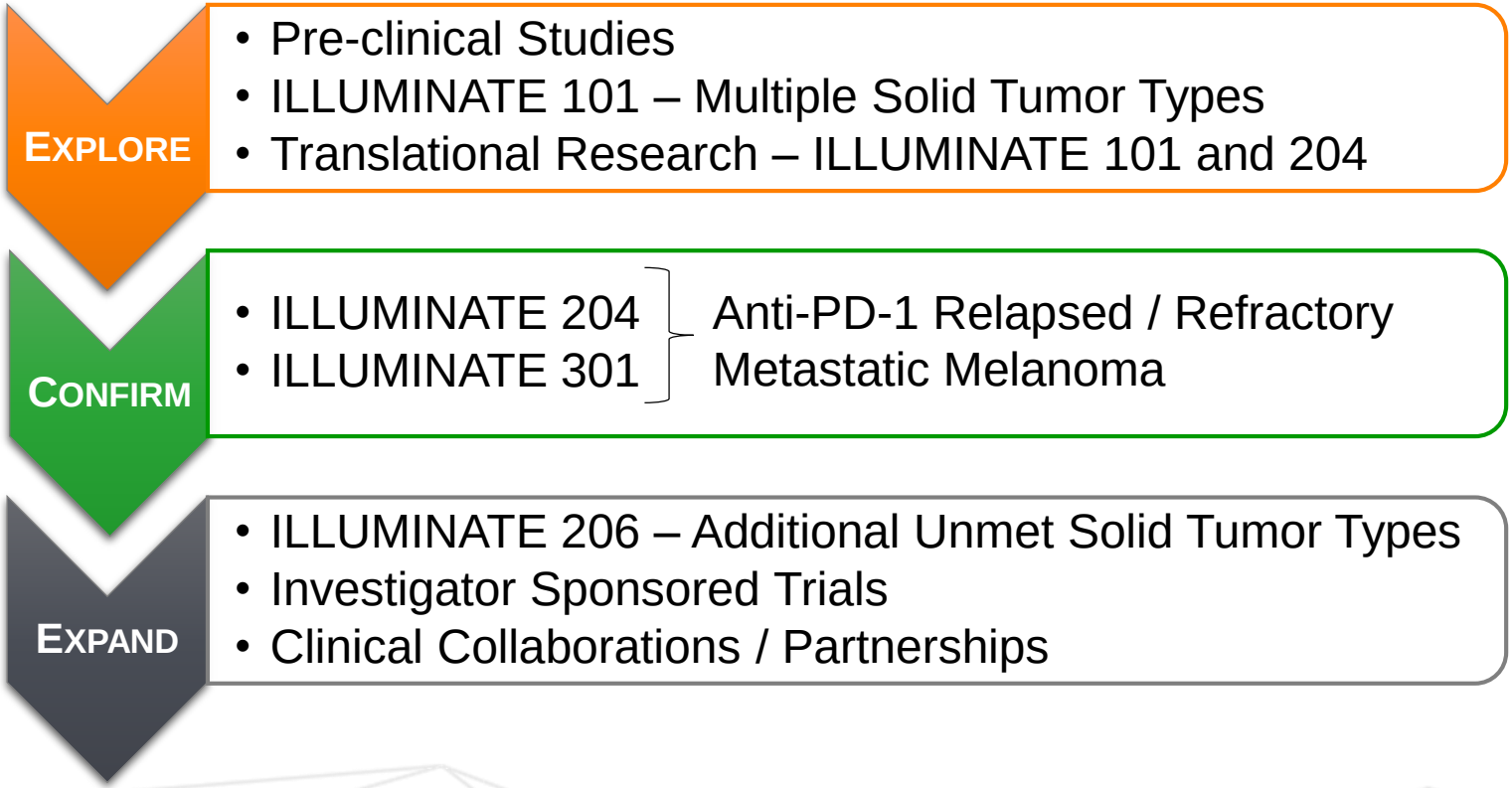
Tilsotolimod Clinical Trials

- Pursuit of Orphan Indications
- Compelling Clinical Outcomes
- Clinical Results and Expansion Pathway Bolstered by Translational Data

Tilsotolimod Strategic Development Program



EXPLORE

- Pre-clinical Studies
- ILLUMINATE 101 – Multiple Solid Tumor Types
- Translational Research – ILLUMINATE 101 and 204

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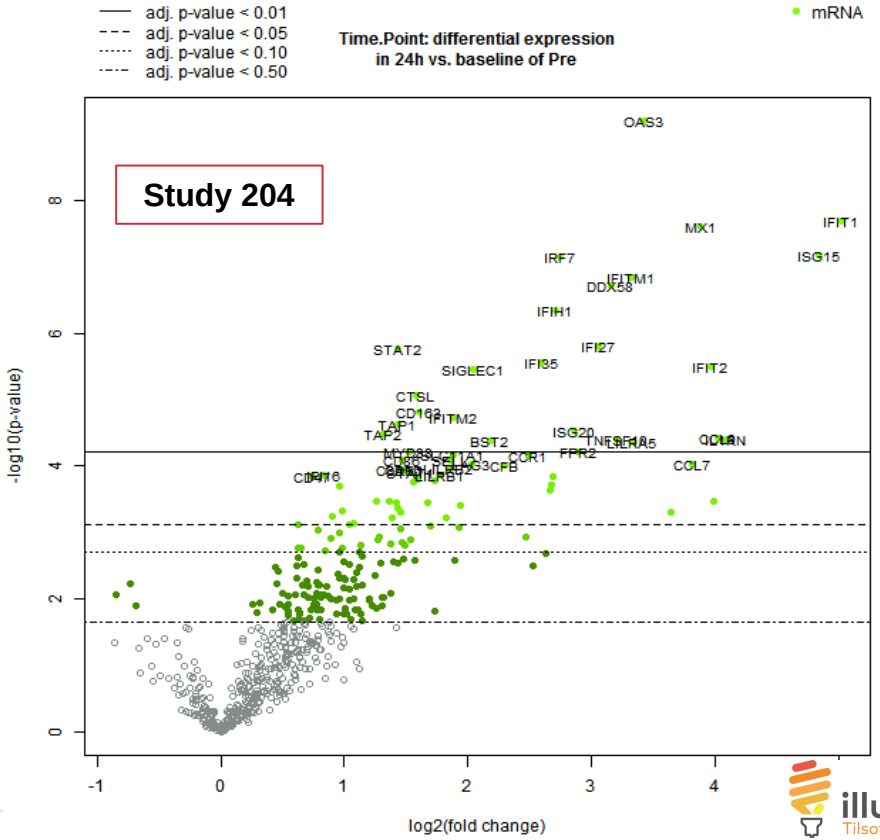
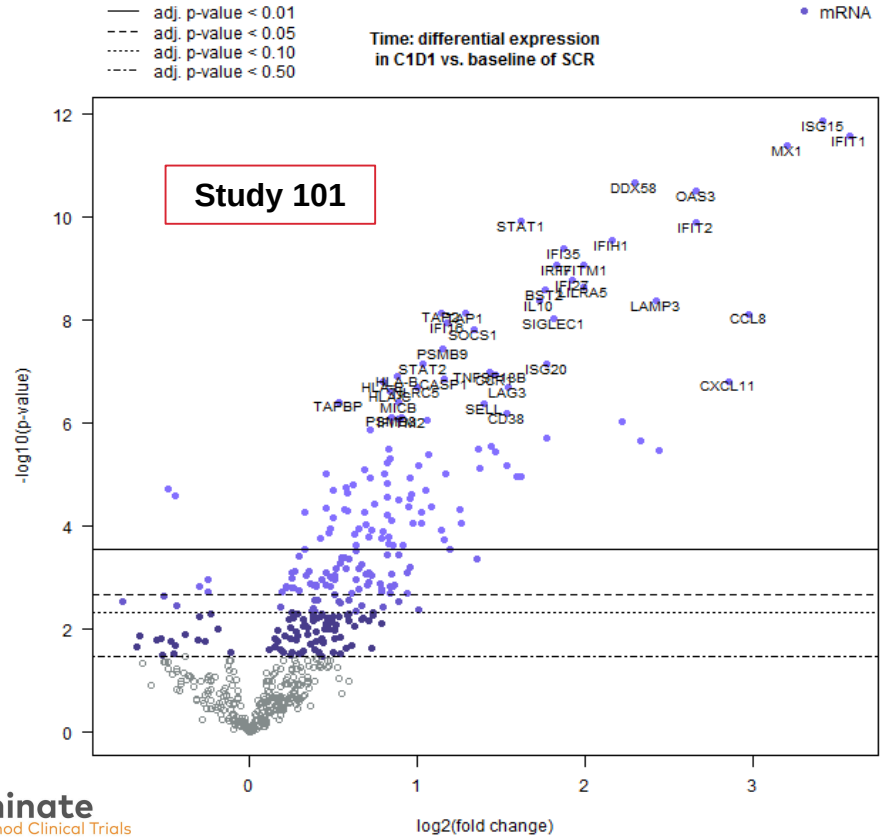
Tilsotolimod Clinical Trials

Tilsotolimod Induces Rapid Gene Expression in the Tumor Microenvironment, Paving the Way for Systemic Clinical Benefit





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Tilsotolimod Clinical Trials

Demonstrated Potential of tilsotolimod to Overcome CTLA-4 Resistance Mechanism

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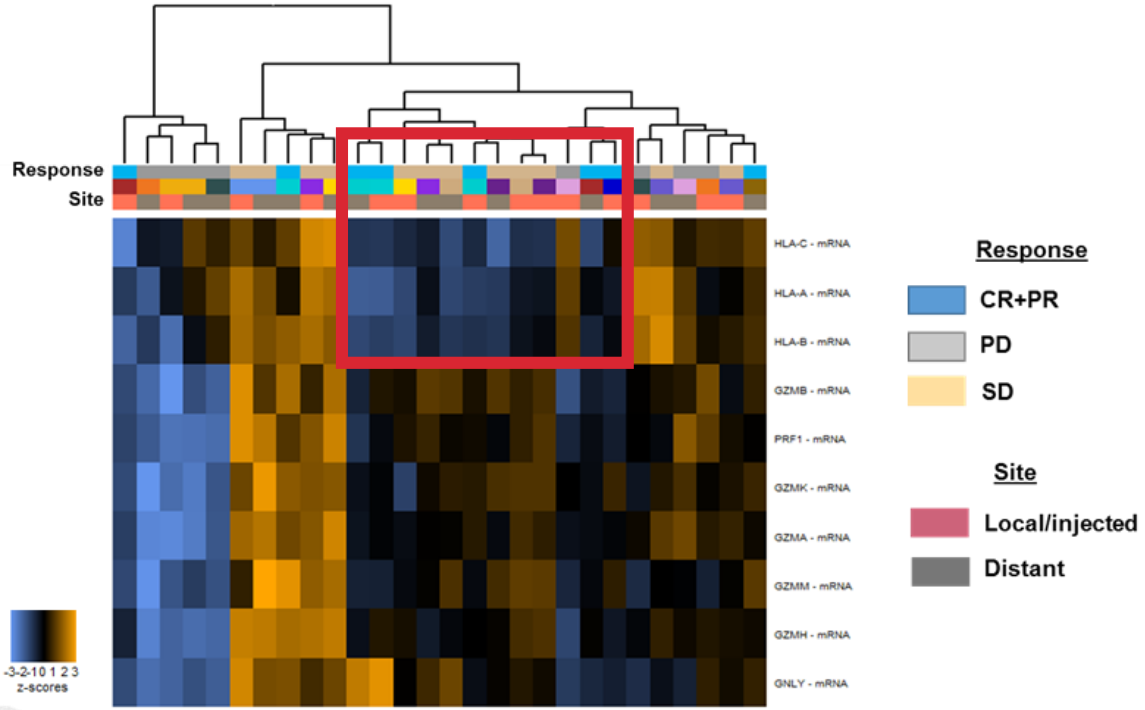
Tilsotolimod Clinical Trials

Responses seen in HLA-ABC low tumors at baseline (red box)



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ILLUMINATE 101 Monotherapy Trial Demonstrating Tumor Priming beyond Melanoma

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Tilsotolimod Clinical Trials

- Site status
  - US: 10 sites active
  - Ex-US: 4 sites active in Israel

- Dose escalation in refractory solid tumors, N= 39
  - Cancer types included: ocular, esophageal, colorectal, pancreatic, sarcoma, NSCLC, breast with skin met, urothelial
  - Majority of subjects being dosed via administration into visceral lesions – no safety concerns
  - Translational data confirms robust Type I IFN pathway activation in 24 hours

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CONFIRM

- ILLUMINATE 204
- ILLUMINATE 301

Anti-PD-1 Relapsed / Refractory Metastatic Melanoma

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204 Study: Results to Date Imply Potential for Significant Improvement Over Standard of Care

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Tilsotolimod Clinical Trials

	tilsotolimod + ipilimumab (N=34)[1]	ipilimumab monotherapy post PD-1 (N=97)[2]
Best Overall Response		
Complete Response (CR)	**5.9% (2)**	3%
Partial Response (PR)	**26.5% (9)**	10%
Stable Disease (SD)	**44.1% (15)**	32%
Progressive Disease (PD)	**23.5% (8)**	33%
Unknown	**0**	23%
Overall Response Rate (CR or PR)	**32.4% (11)**	13%
Disease Control Rate (CR, PR, or SD)	**76.5% (26)**	45%
Overall Response Rate per RECIST v1.1	**29.4% (10)[3]**	14%

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[1] 34 of 37 subjects had at least 1 post-baseline disease assessment at time of data cut
[2] Historical comparison (Long G et al. Society of Melanoma Research 2016 Congress. Boston, MA, USA: 2016)
[3] One patient with an unconfirmed PR at the end of treatment visit progressed due to a new lesion at the 3-month follow-up disease assessment

204 Study: Time To and Duration of Disease Control

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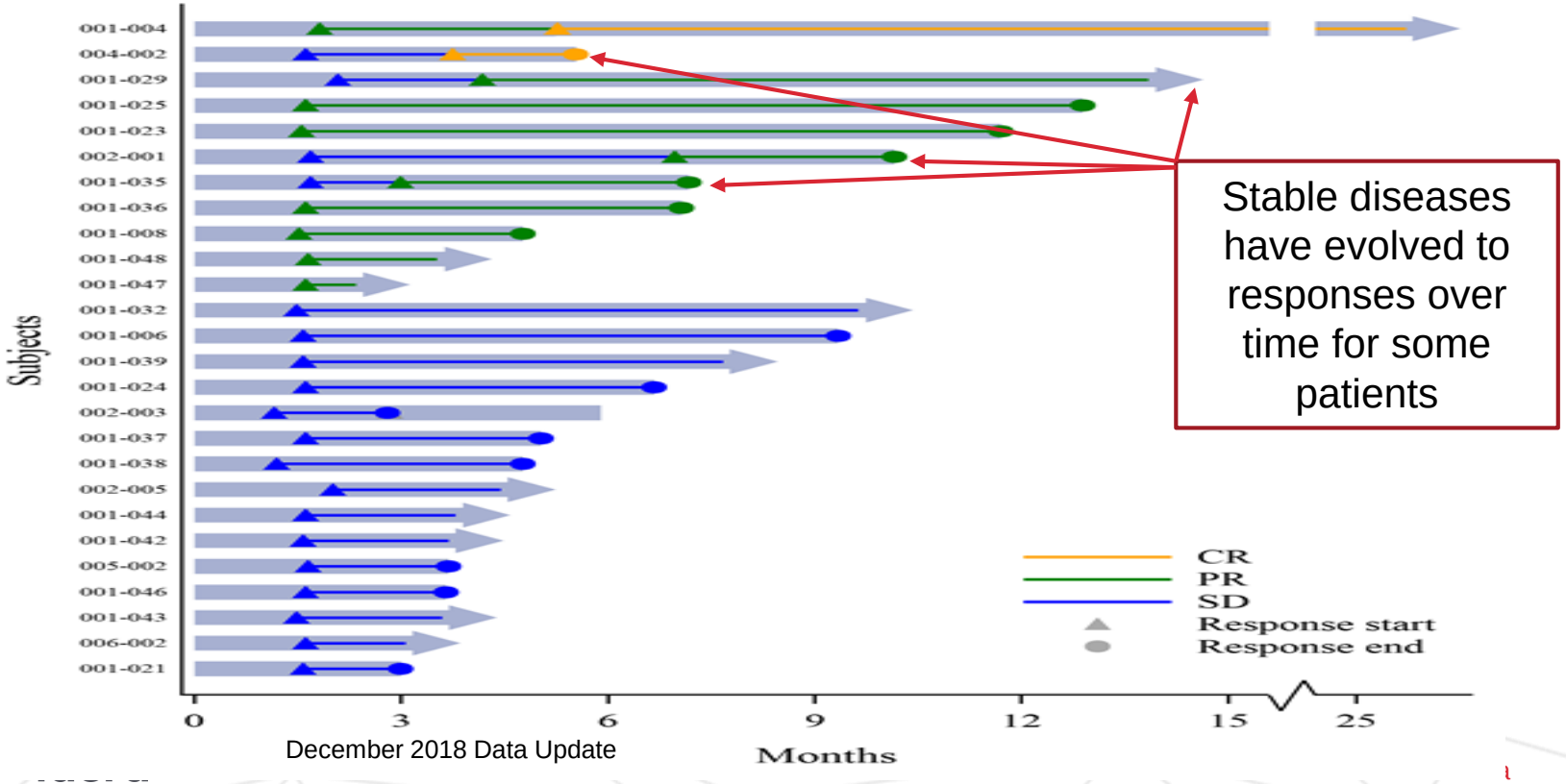
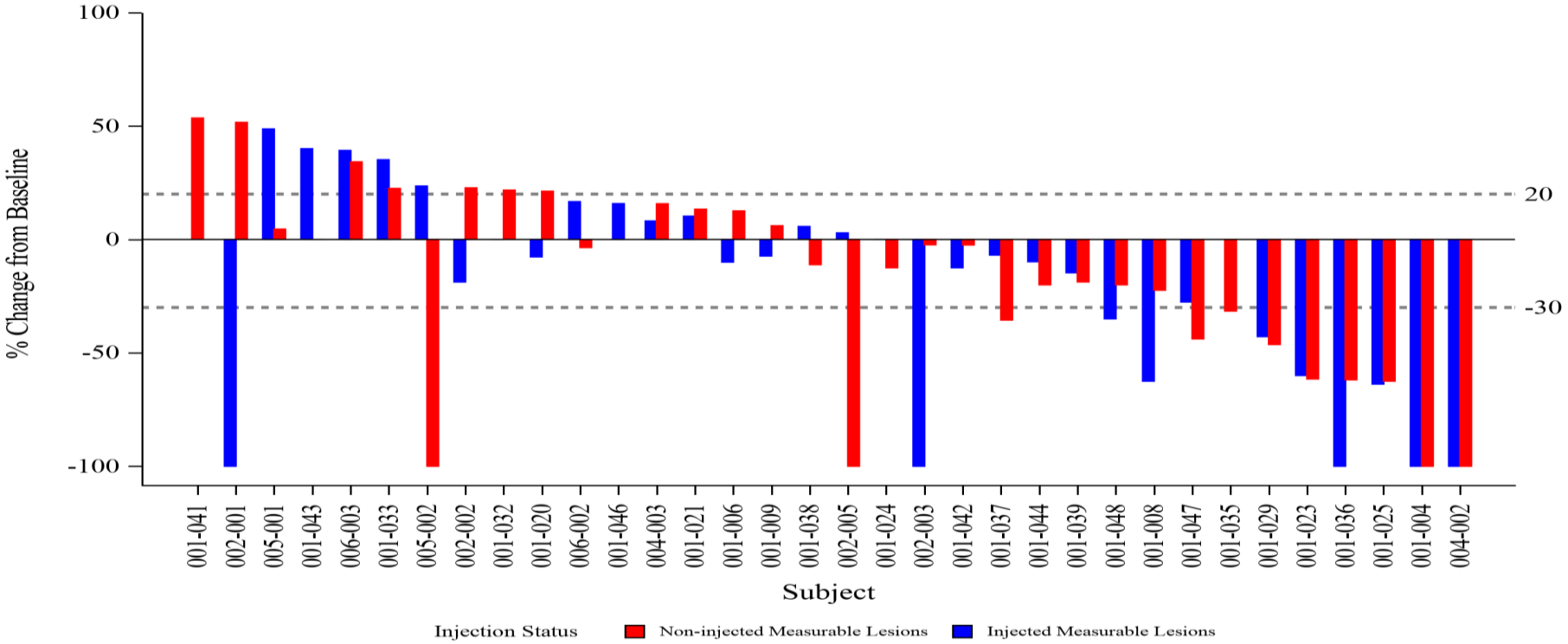
Tilsotolimod Clinical Trials

ORR of 32.4% with DCR of 76.5%



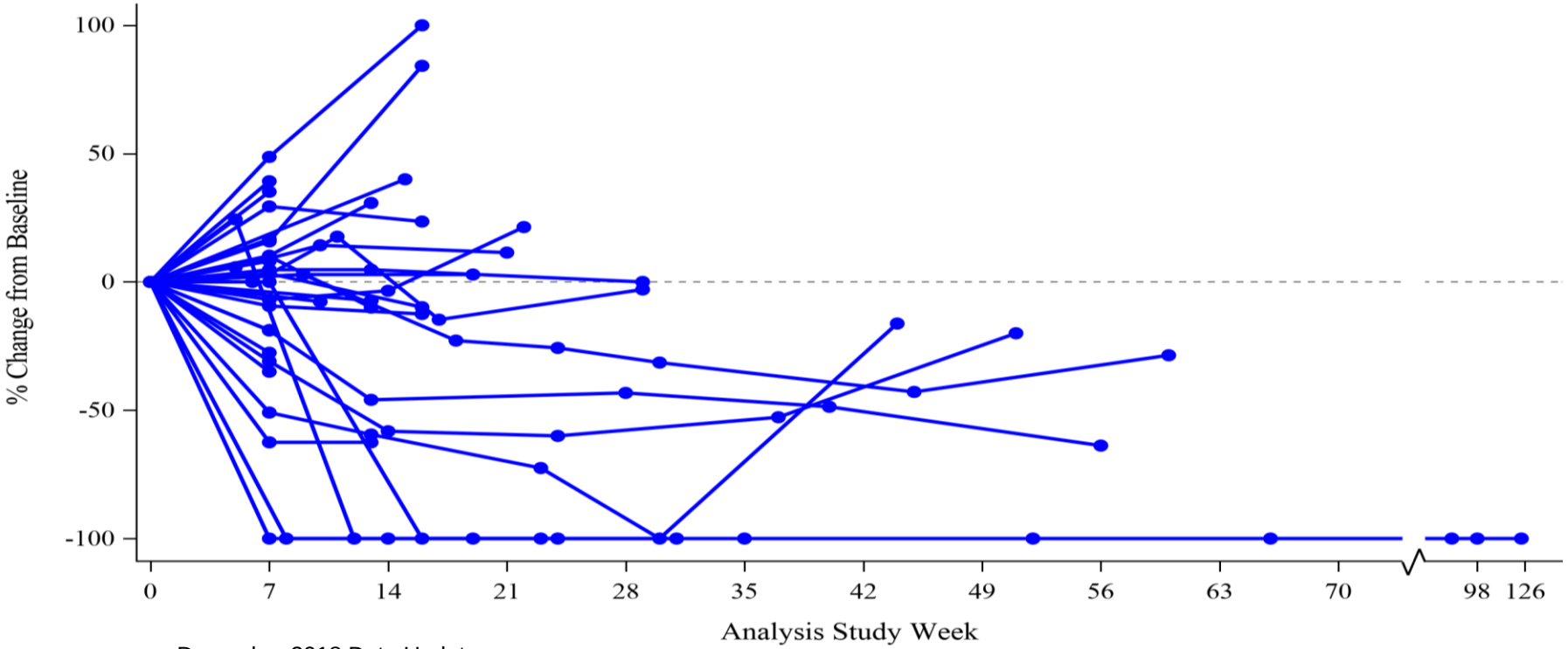
December 2018 Data Update

204 Study: Percent (%) Change from Baseline in Injected and Uninjected Lesions



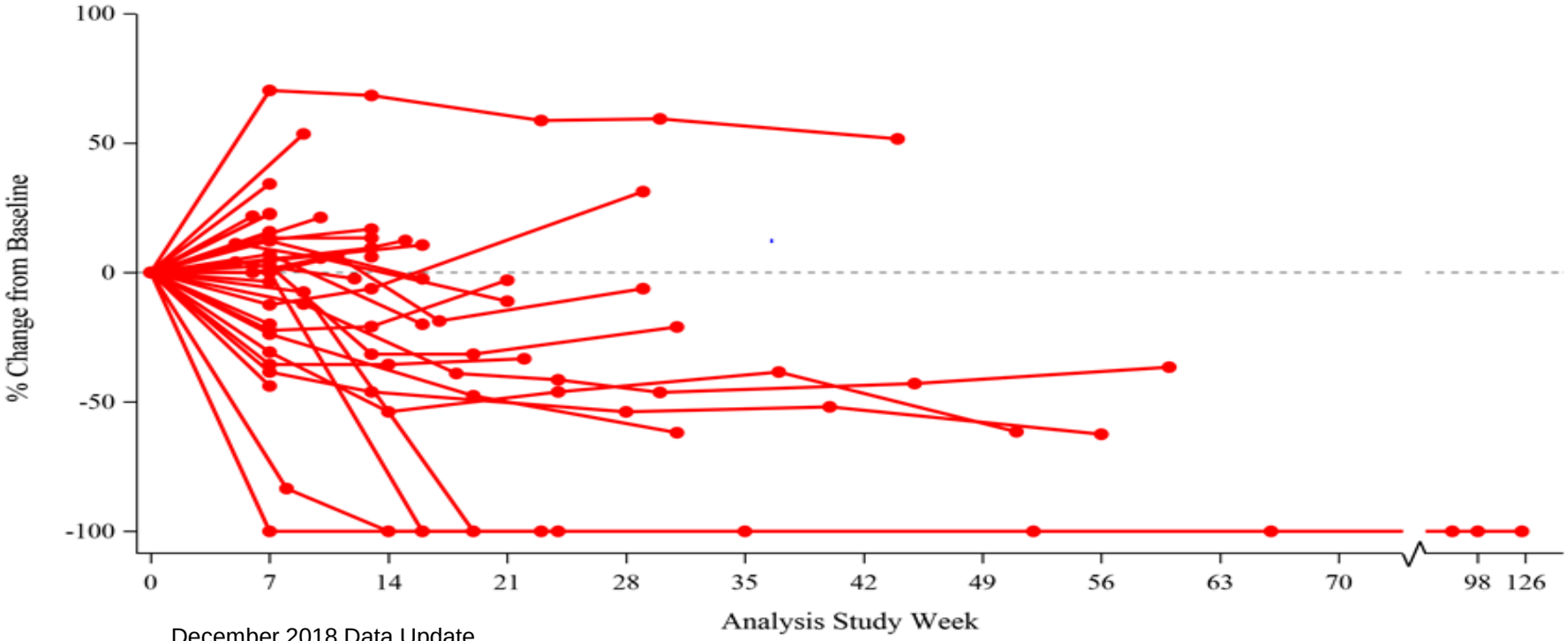
December 2018 Data Update

204 Study: Percent (%) Change from Baseline in Injected Tumors



December 2018 Data Update

204 Study: Percent (%) Change from Baseline in Uninjected Tumors Demonstrating Abscopal Effect



December 2018 Data Update

Illuminate 204 Trial Goals Achieved

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Tilsotolimod Clinical Trials

Final data expected 2nd half 2019

- Established the recommended Phase 2 dose (RP2D) of 8mg tilsotolimod in combination with ipilimumab and pembrolizumab
- Provided proof of mechanism for tilso based on translational work from Phase 1
  - Rapid, within 24 hours, induction of IFNα
  - Responses in tumors not expected to respond to ipilimumab alone based on HLA-ABC low baseline expression
- Provided clinical proof of concept with ORR ~30% vs historic control of 10-16%

Illuminate 204 Trial to be closed to enrollment end of January 2019.
42 patients currently enrolled.

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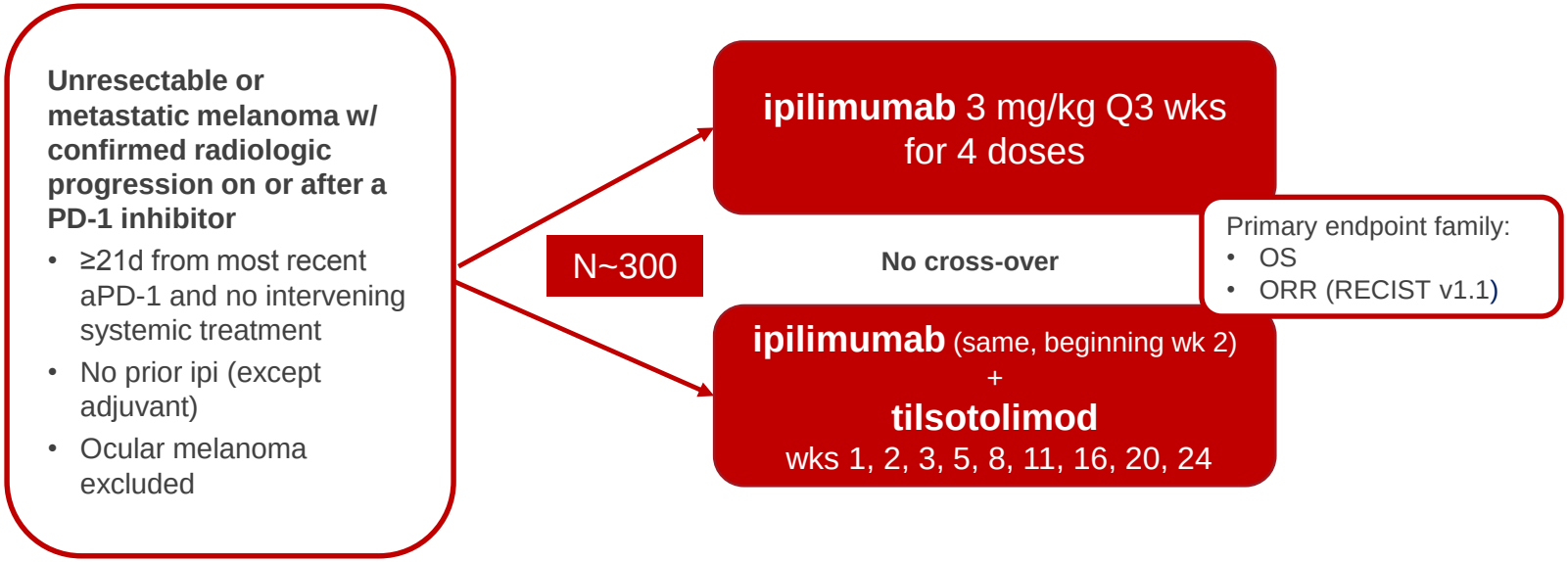
ILLUMINATE-301 Registrational Trial –

Enrollment Completion Expected YE 2019



** More information about ILLUMINATE-301 can be found at www.clinicaltrials.gov #NCT03445533*

EXPAND

- ILLUMINATE 206 – Additional Unmet Solid Tumor Types
- Investigator Sponsored Trials
- Clinical Collaborations / Partnerships

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Tilsotolimod Clinical Trials

Introduction of Intratumoral Tilsotolimod Induces Similar TME Response Across Tumor Types

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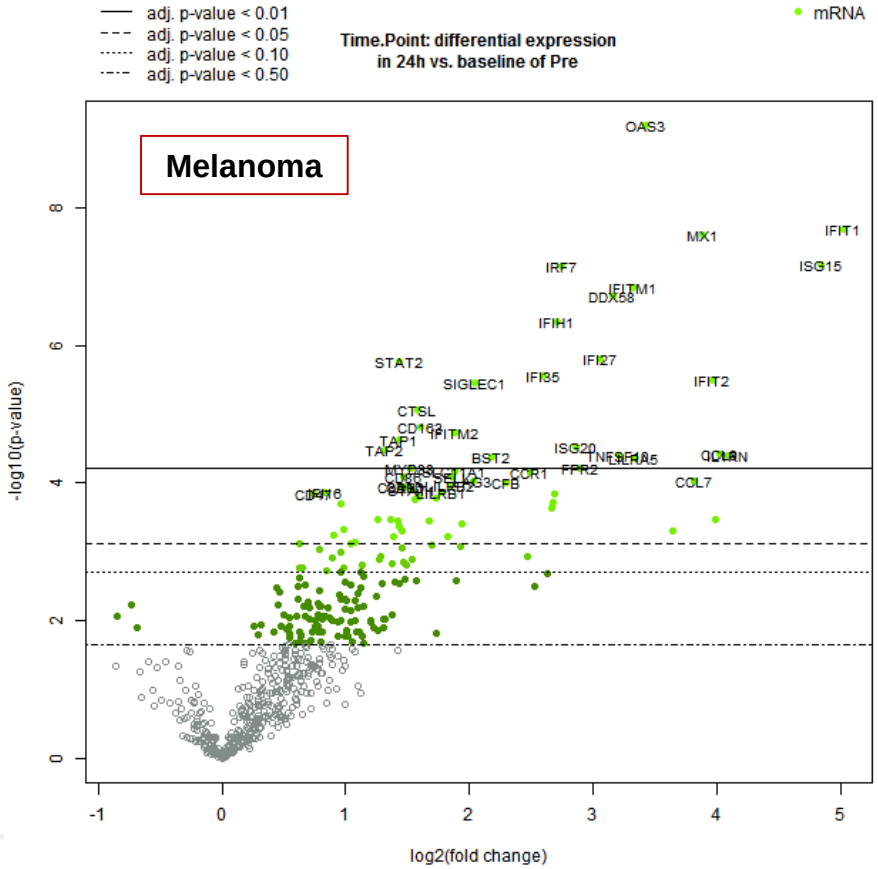
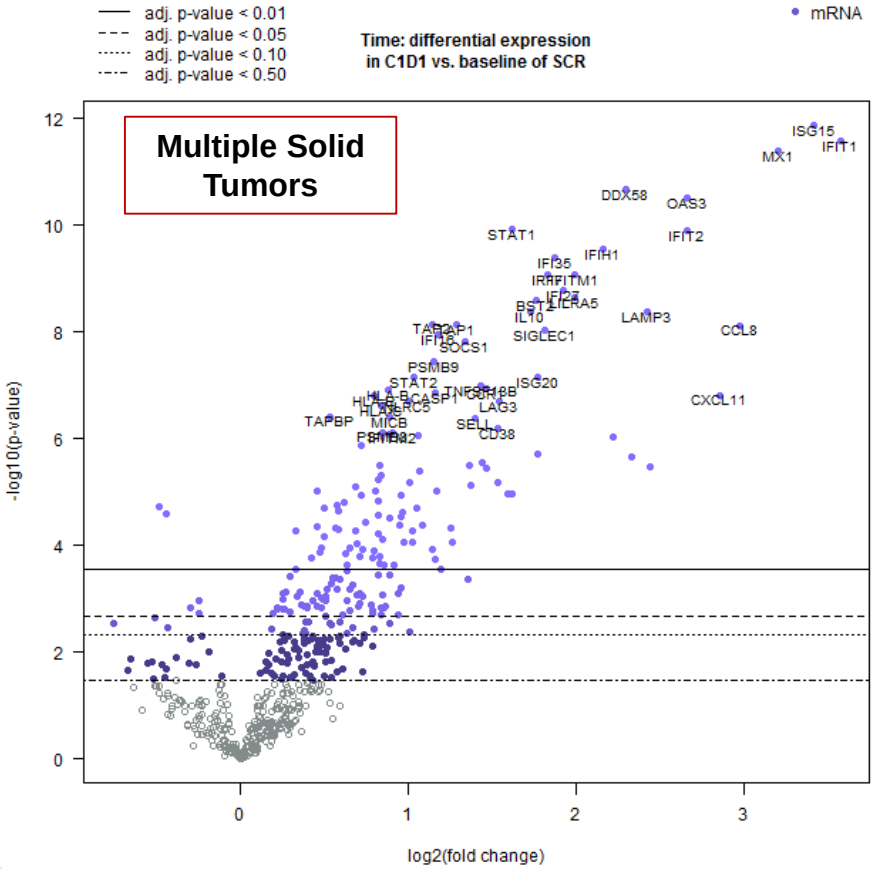
Tilsotolimod Clinical Trials



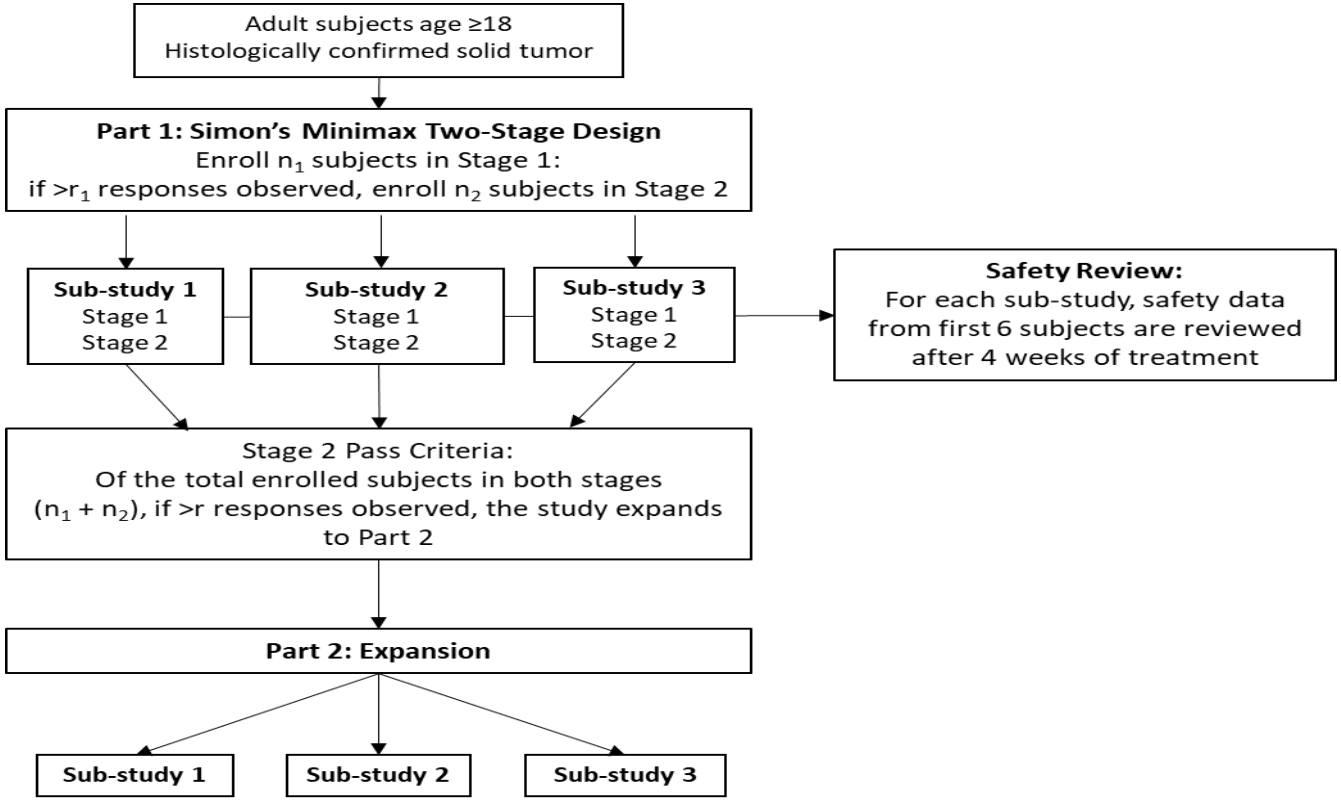


ILLUMINATE 206 – Master Protocol Basket Design

Evaluation of tilsotolimod combined with one or more immunotherapy agents for the treatment of solid tumors

- Individual sub-studies for each tumor type and combination
- Efficacy evaluation designed with 2 parts
  - Part 1: signal finding, Simon's Minimax 2-stage
  - Part 2: randomized, controlled expansion of Part 1 indications
- Mandatory sequential tumor biopsies collected in Part 1
- Safety, Blood biomarkers, PK, Immunogenicity

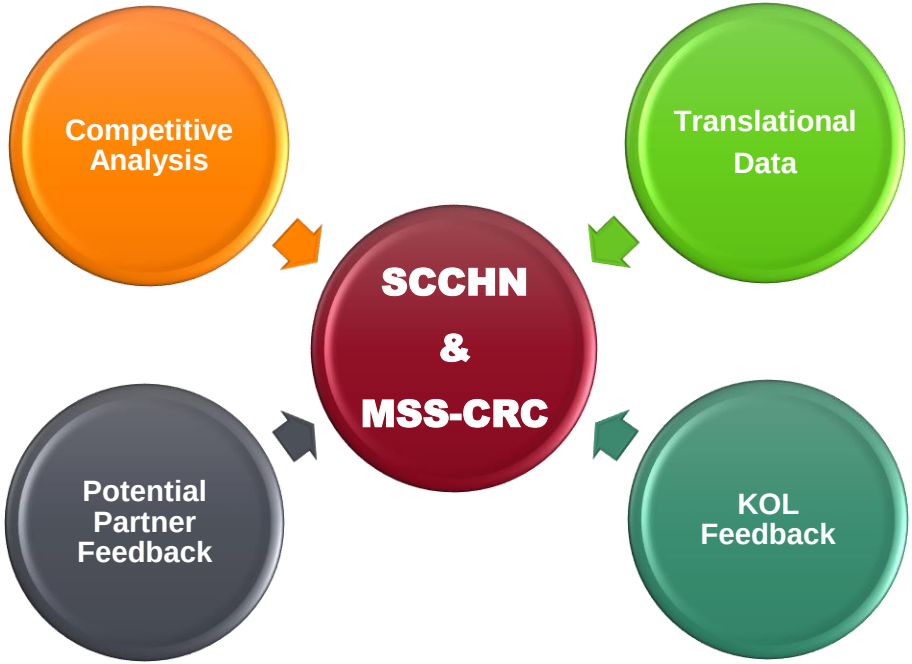
2125-MST-206 Trial Design



ILLUMINATE 206 Initial Expansion Beyond Melanoma

Broad Effort to Determine Appropriate First Tumor Types for Expansion

- Squamous Cell Carcinoma of the Head and Neck (SCCHN)



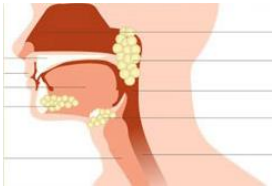
- Colorectal Cancer (MSS-CRC)

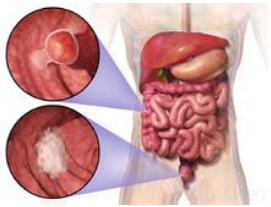
ILLUMINATE 206: Initial Expansion Beyond Melanoma

Triple Combination Therapy in Orphan Indications of Significant Unmet Need

Squamous Cell Carcinoma of the Head and Neck (SCCHN)

- ~55,000 new cases with 12,000 deaths in the US annually
  - Immunotherapy naïve SCCHN
  - Immunotherapy progressing SCCHN





Colorectal Cancer (MSS-CRC)

- ~135,500 new cases with ~50,000 deaths.
- Of total CRC cases, MSS represents 80-85% (and a higher proportion of deaths)
- MSS-CRC, Chemo refractory, immunotherapy naïve

Additional indications/I-O combinations can be added

ILLUMINATE 206

Further Advancing Tilsotolimod Into Underserved Patient Populations

Illuminate 301

- 91,000 in the US diagnosed with melanoma each year[1]
- 9,300 deaths in the US attributed to melanoma[1]
- Options following anti PD-1 therapy are limited

2019 Expansion

Illuminate 206: SCCHN

- 64,000 in the US diagnosed with SCHNC each year[1]
- 13,700 deaths in the US attributed to SCHNC[1]
- Low I/O benefit post chemotherapy

Illuminate 206: MSS-CRC

- 140,000 in the US diagnosed with CRC each year[1], 85% are MSS[2]
- 50,600 deaths in the US attributed to CRC1[1]
- No I/O options anticipated in near future

[1] ASCO 2018, Cancer.net; [2] Fightcolorectalcancer.org 2018

Building for Sustainable Growth

Leveraging Business Development to Generate Additional Growth

- Management Track Record
- Focused Screening

Leveraging Management's Track Record and Expertise

- Built ViroPharma, an international rare disease company with over $500 million in annual sales at time of being acquired
- Successfully commercialized products in the US in areas not initially well-appreciated by the investment community
- Built a multi-product European business
- Completed numerous deals, both commercial and pipeline, that shaped the foundation and the future of the company
- Demonstrated a strong track record of resilience

CINRYZE® C1 inhibitor (human)

VANCOCIN® HCl (vancomycin hydrochloride capsules, USP)

PLENADREN® Hydrocortisone modified-release tablets

BUCCOLAM™ MIDAZOLAM OROMUCOSAL SOLUTION

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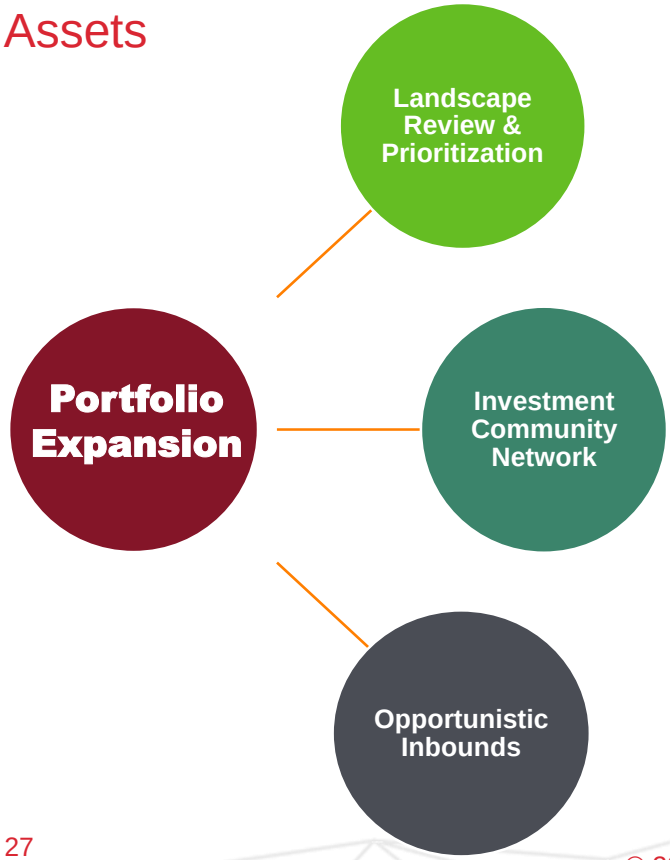
Focused Business Development Screening

Clinical or Commercial Rare Disease Assets

- Underserved rare disease patient populations
- Clinical data demonstrating proof of concept
- Efficient commercial infrastructure requirements
- Misunderstood or mismanaged commercial assets with potential for near-term cash flow



Financials and Capital Structure Updates

- Completed Q3 2018 with $82.5M cash
- Expected cash runway into Q1 2020
- Approximately 27M shares outstanding
- ATM in place to raise up to $50M

Critical Growth Catalysts in 2019

Tilsotolimod

- ILLUMINATE 204 Final Data
- ILLUMINATE 206 Initiation and Execution
- ILLUMINATE 101 Translational Data
- ILLUMINATE 301 Completion of Enrollment

Corporate

- Potential Execution of Business Development Deal
- Potential Partnerships/Collaborations - tilsotolimod