38th Annual JP Morgan Healthcare Conference

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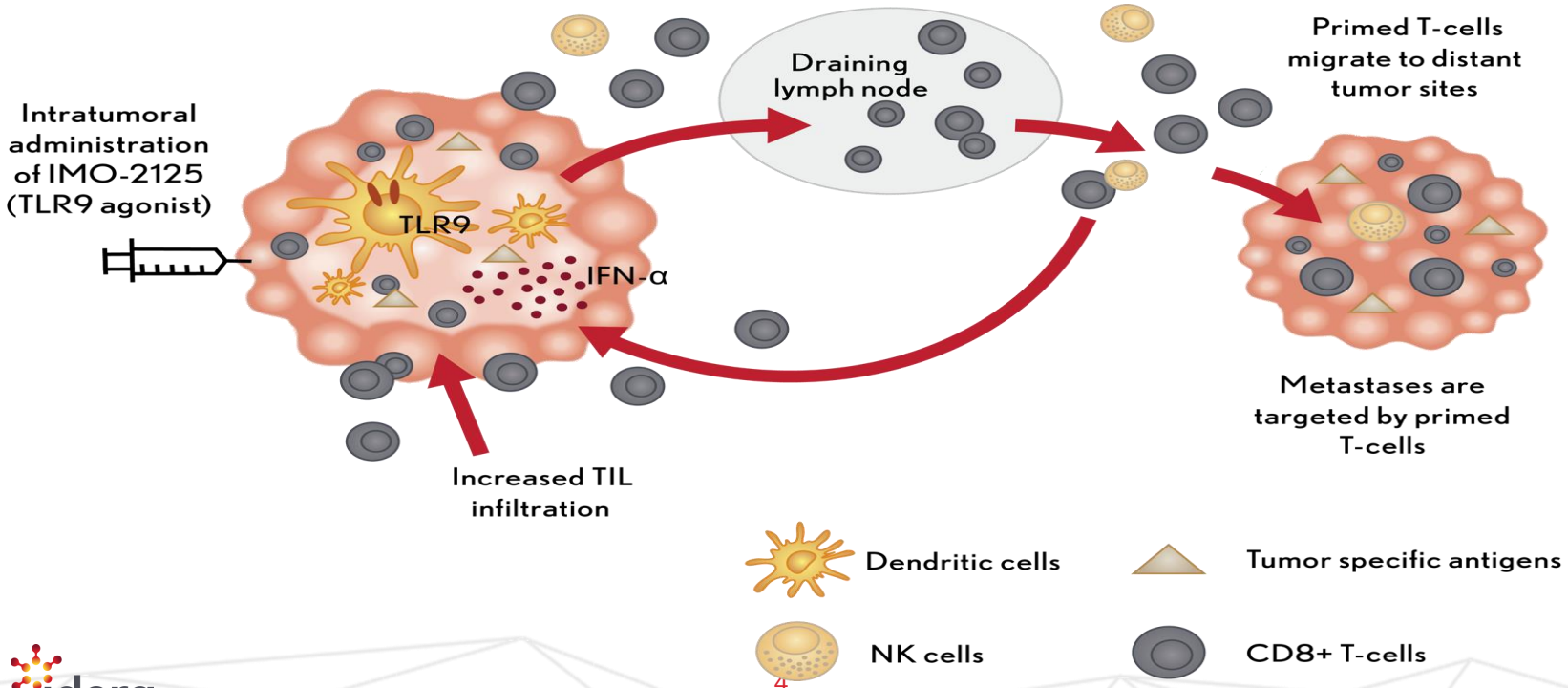
Injecting a New Solution to Advance Cancer Immunotherapy

Near Term Value Growth Driven by Tilsotolimod

- Phase 3 Trial at 94% of Target Enrollment
- MSS-CRC Cohort Underway
- Collaborations with BMS and AbbVie
- Strong Exclusivity Proposition
- Financial Flexibility Secured

Tilsotolimod is designed to stimulate the immune system

Administered locally, this potentially will lead to better systemic patient outcomes with checkpoint inhibitors



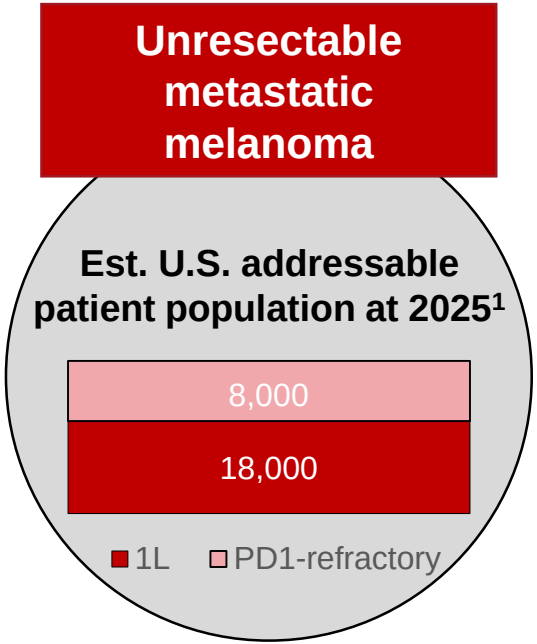
High Unmet Medical Need in Metastatic Melanoma for Patients who Progress after PD-1 Inhibitors

Historical Data of 321 Patients Suggest ipilimumab Monotherapy ORR Range of 4-16%*

N=	ORR	References
97	13%	Long, et al., Presentation at Society for Melanoma Research 2016 Congress, 2016 (post-hoc analysis of KEYNOTE-006 patients who received ipilimumab monotherapy following failure of pembrolizumab)
60	4%	Fujisawa, et al., Retrospective study of advanced melanoma patients treated with ipilimumab after nivolumab: Analysis of 60 Japanese patients, J. Dermatol. Sci. 2018 Jan ; 89(1): 60-66
47	4%	Weichenthal, et al., Presentation at the 2019 ASCO Annual Meeting, Salvage Therapy after Failure From Anti PD-1 Single Agent Treatment, A Study by the German ADOReg Melanoma Registry
47	16%	Zimmer, et al., Ipilimumab alone or in combination with nivolumab after progression on anti PD-1 therapy in advanced melanoma, Eur. J. Cancer 2017; 75-47-55
40	10%	Bowyer, et al., Efficacy and toxicity of treatment with the anti-CTLA-4 antibody ipilimumab in patients with metastatic melanoma after prior anti-PD-1 therapy. Br. J. Cancer. 2016;114(10):1084–1089.
30	7%	Muto, et al., Investigation of clinical factors associated with longer overall survival in advanced melanoma patients treated with sequential ipilimumab, J. Dermatology, 2019; 46; 498-506

* There are three additional studies of n=9, n=8, n=7 respectively: *Aya, et al.*, Future Oncol. 2016; 12(23):2683-2688 (ORR=22%); *Jacobsoone-Ulrich et al.*, Melanoma Research 2016, 26:2 (2016) (ORR=50%); Saijo, et al., Tohoku J. Exp. Med., 2019, 248, 37-43 (ORR=0%)

Heading Towards our First Commercial Opportunity



- High unmet need in anti-PD1-refractory patients
- **U.S. Peak year sales estimate > $500 million, if approved** [2]

[1] Proprietary Idera Commercial Research
[2] Based on current company forecast through 2030

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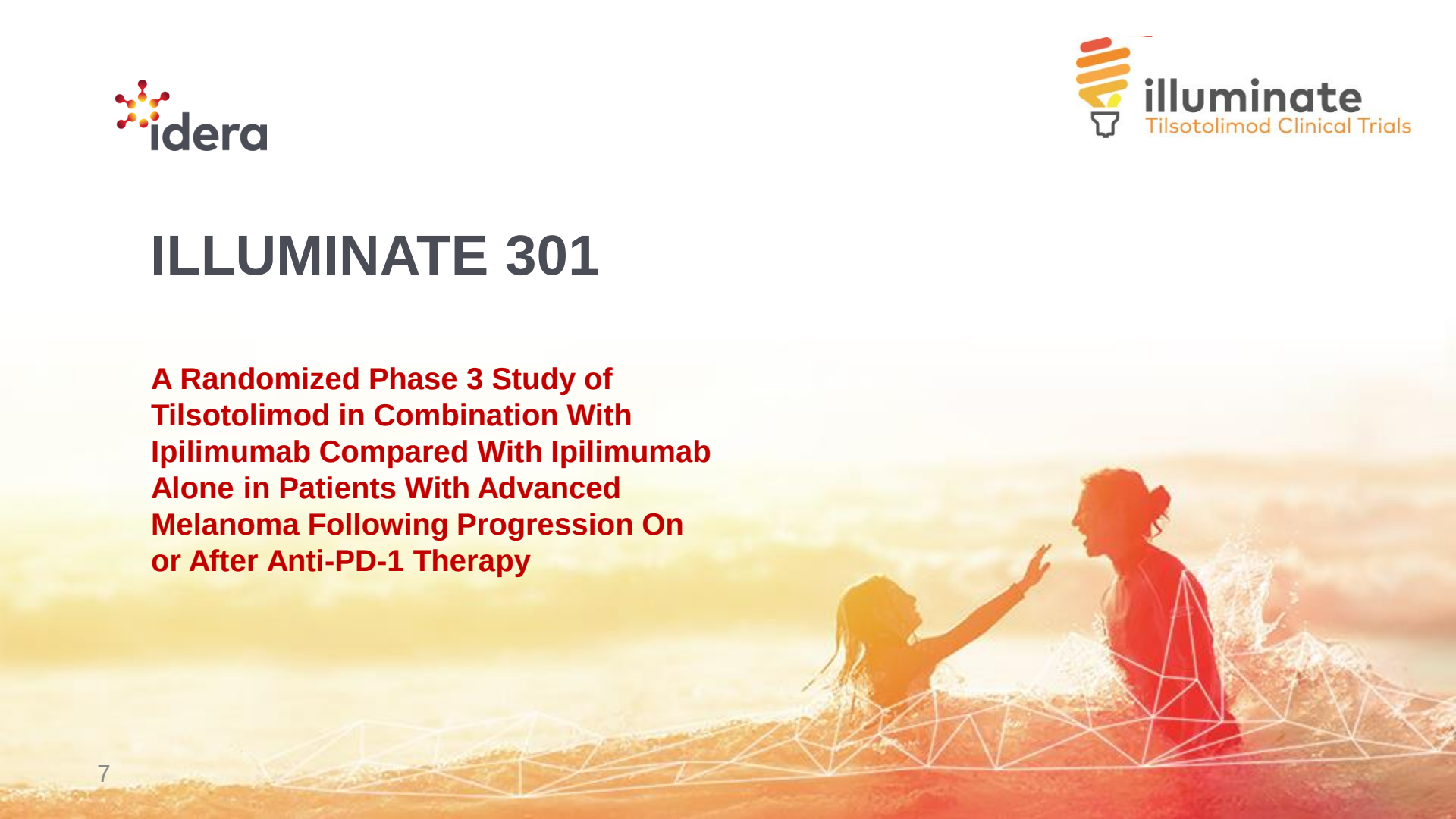
Tilsotolimod Clinical Trials

ILLUMINATE 301

A Randomized Phase 3 Study of Tilsotolimod in Combination With Ipilimumab Compared With Ipilimumab Alone in Patients With Advanced Melanoma Following Progression On or After Anti-PD-1 Therapy



ILLUMINATE-301

Randomized Trial Design

Patient Stratification

- Duration of prior anti-PD-1 therapy (<12 or ≥12 weeks)
- Metastasis stage (M1c or other)
- BRAF mutation status and prior targeted therapy
  - BRAF wild type, mutation positive with, or without prior targeted therapy

Key Inclusion Criteria:
- Age ≥18 years
- Stage III or Stage IV melanoma
- ≥ 1 measurable lesion accessible for injection
- ECOG PS ≤1
- Adequate organ function

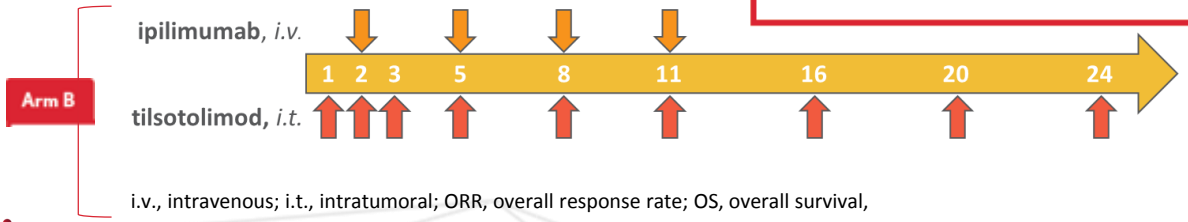
Key Exclusion Criteria:
- Prior TLR agonists
- Prior ipilimumab
- CNS disease

Randomization
1:1
N≈454

Arm A
- Ipilimumab 3 mg/kg (4 doses: weeks 1, 4, 7, and 10)
- Treatment Duration: 10 weeks

No crossover

Arm B
- Ipilimumab 3 mg/kg (4 doses: weeks 2, 5, 8, and 11) +
- Intratumoral tilsotolimod 8 mg (9 doses: weeks 1, 2, 3, 5, 8, 11, 16, 20, and 24)
- Treatment Duration: 24 weeks



Endpoints

Primary endpoint family
- ORR by independent review per RECIST v1.1
- OS

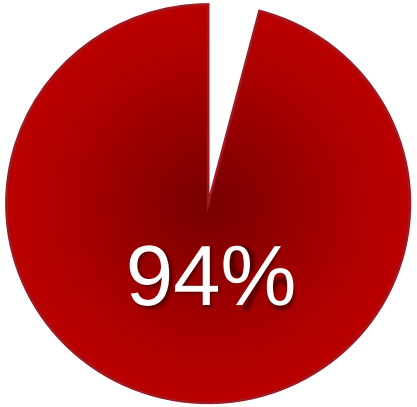
Key secondary endpoints
- Durable response rate
- Time to response
- Progression-free survival
- Patient-reported outcomes
- Safety

i.v., intravenous; i.t., intratumoral; ORR, overall response rate; OS, overall survival,

ILLUMINATE-301

Progress Update

- **427 of 454** patients randomized
  - **94%** of target enrollment
- Enrollment completion expected **Q1 2020**
- Data expected **Q4 2020/Q1 2021**



* Enrollment Update as of 1/13/2020

Strong Exclusivity

Three Sources of Exclusivity for Tilsotolimod

- Composition of Matter Patent Exclusivity
  - Provides exclusivity until 2030 (estimated), inclusive of patent term extension
- Method-of-Use Patent
  - Covers certain melanoma treatments in combination with therapies targeting CTLA-4, PD-1, or PD-L1
  - Estimated expiration in September 2037
- Orphan Drug Designation
  - Granted *“for treatment of melanoma Stages IIb to IV.”*

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Reasons to Believe

- Encouraging Clinical Data
- Translational Data

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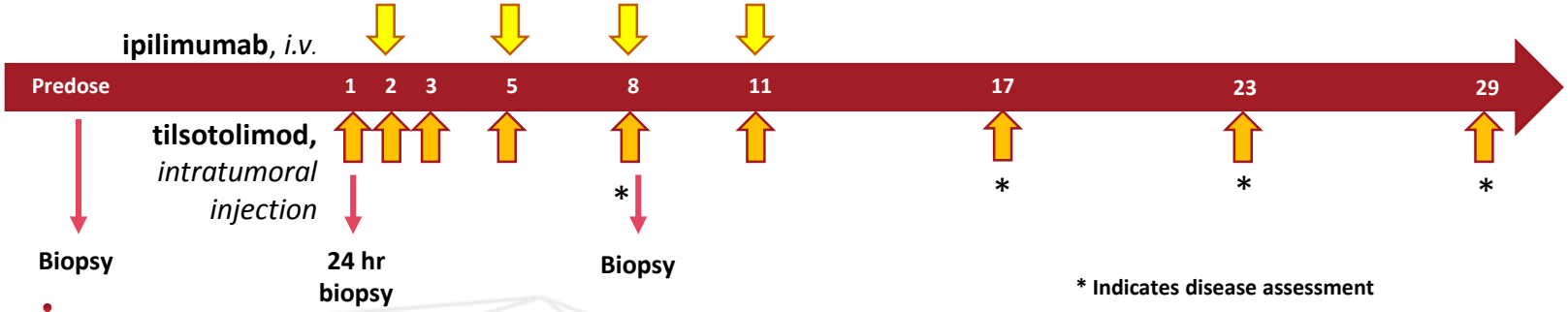
A Prelude to 301

Patients:
Adults with unresectable or metastatic melanoma

- Radiologic (RECIST v1.1) or symptomatic progression on or after a PD-1 inhibitor
- ≥21d from most recent aPD-1
- Prior ipilimumab allowed
- BRAFwt: 2 lines systemic therapy
- $BRAF^{v600}$: 3 lines systemic therapy
- Ocular melanoma excluded

Phase 1 dose-finding (n=18)
tilsotolimod (4, 8, 16, 32 mg) + ipilimumab

Phase 2 (n ≈ 52)
tilsotolimod 8mg + ipilimumab



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ILLUMINATE-204 Results to Date Imply Potential for Clinically Meaningful Benefit

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Best Overall Response	tilsotolimod + ipilimumab (N=49)[1]	ipilimumab monotherapy post PD-1 (N=321)[2] *(pooled post-hoc analysis of six studies)*
Overall Response Rate (CR or PR)	**24% (12)**	4-16%
Disease Control Rate (CR, PR, or SD)	**71% (35)**	17-45%

- 11 of 12 responses confirmed per RECIST v1.1
  - 3 Confirmed Complete Responses (CR)
- 5 of 10 RECIST v1.1 responses evaluable for durability (>6 mos.) to date
- Median OS (overall survival) not yet reached (min/max: 1.6 – 35 mos.)
- Safety profile observed consistent with previously reported results

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[1] 49 of 52 subjects had at least 1 post-baseline disease assessment at time of August data update further updated in October 2019 for confirmed responses.
[2] References available on Slide 5

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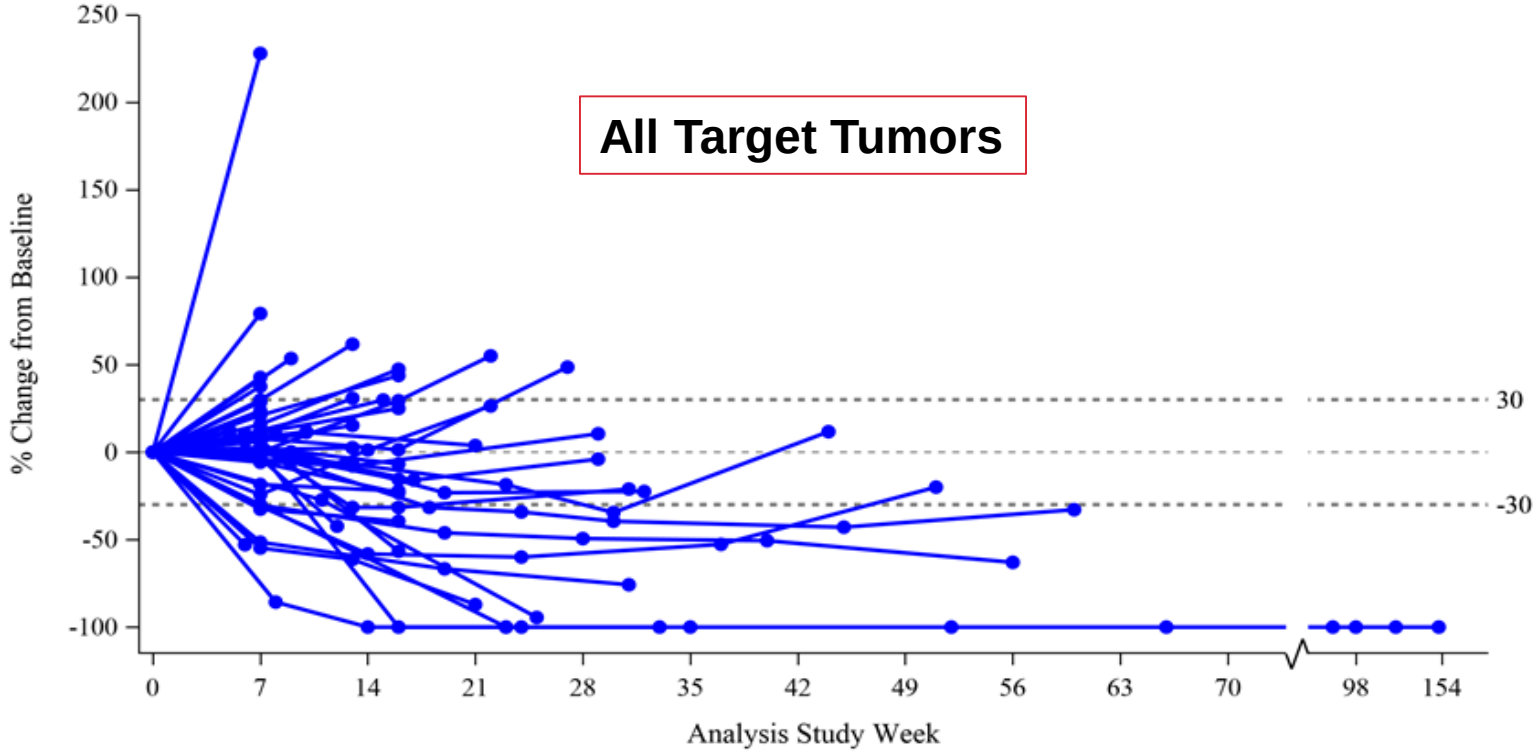
Percent (%) Change from Baseline



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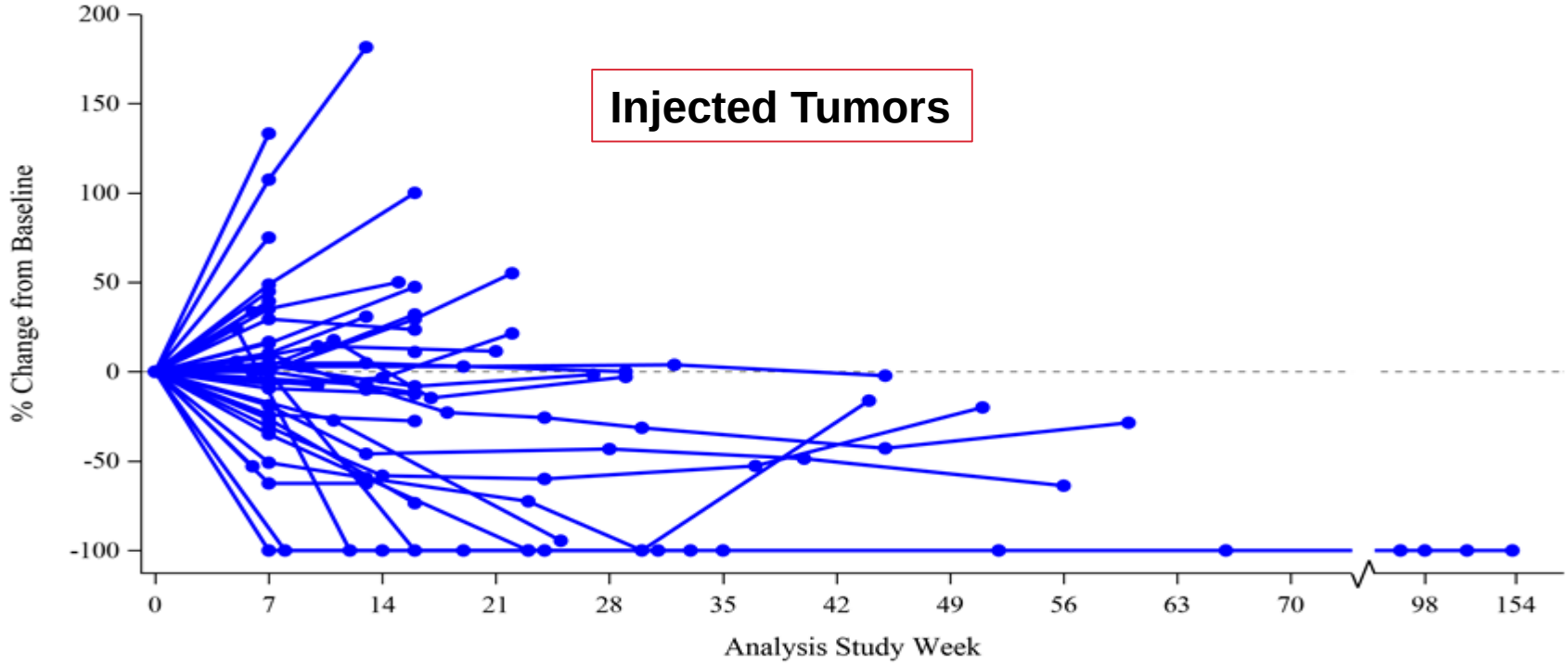
Percent (%) Change from Baseline



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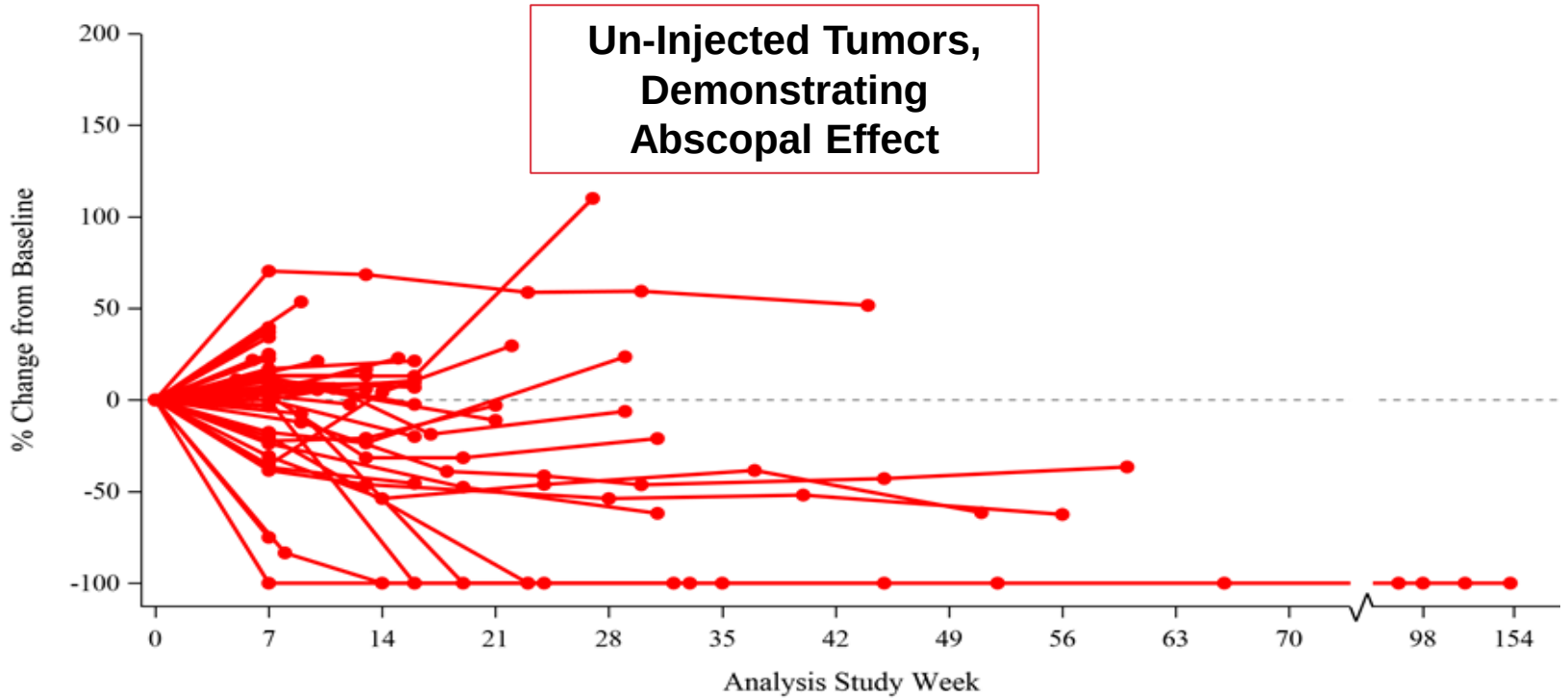
Percent (%) Change from Baseline



ILLUMINATE 204 Summary

Final Data Planned for Q2 2020

- As of the latest data update:[1]
  - Response rates (ORR/DCR) are greater than historical control
  - Median overall survival (OS) is not yet reached
- Translational data demonstrated proof of mechanism for tilsotolimod:
  - Rapid induction of IFNα (within 24 hours)
  - Responses observed in tumors not expected to respond to ipilimumab alone based on HLA-ABC low baseline expression

Final 204 Data to include Safety, ORR, Median OS and Durability

[1] ***August 28, 2019 Data Update from ILLUMINATE-204, Form 8K***

Tilsotolimod Expansion Opportunity

Beyond Melanoma

ILLUMINATE-101 Monotherapy Study

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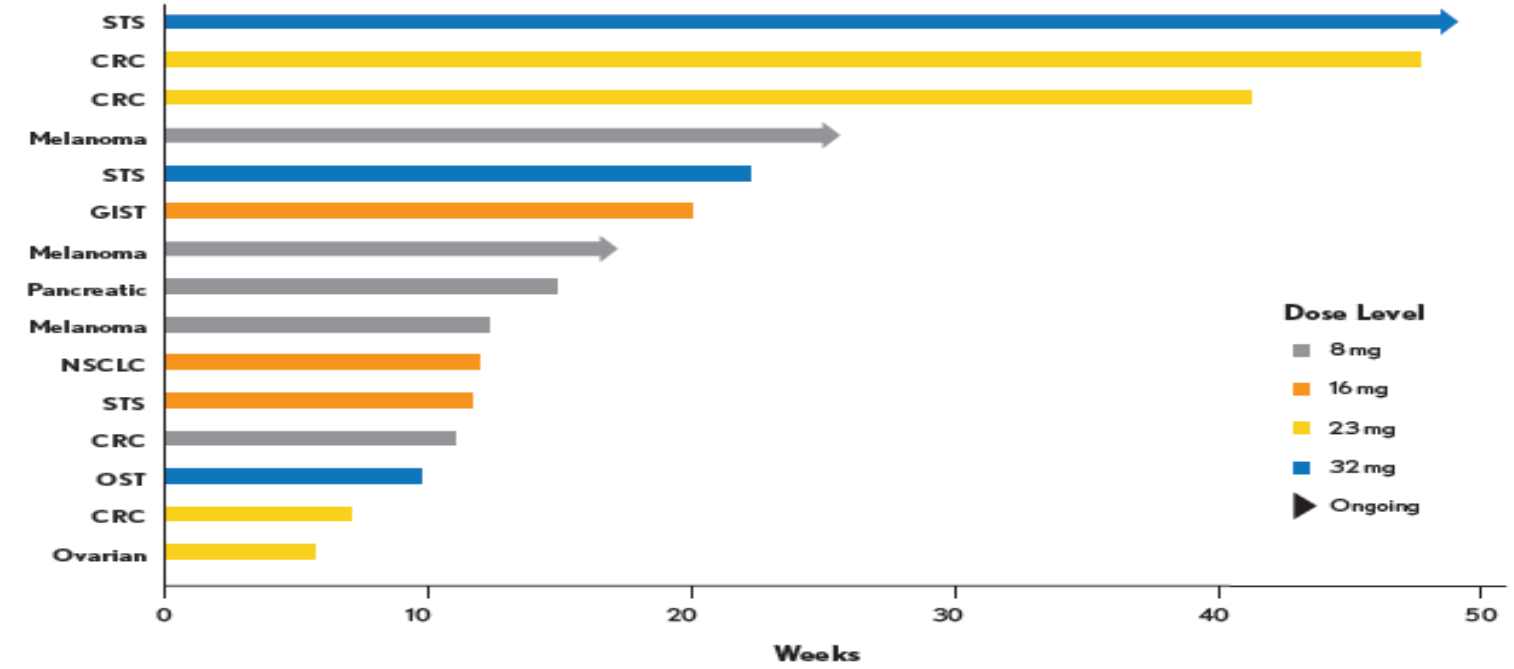
Tilsotolimod Clinical Trials

Duration of Stable Disease By Tumor Type



CRC, colorectal cancer; GIST, gasotrointestinal stromal tumor; NSCLC, non-small cell lung cancer; OST, osteosarcoma; STS, soft tissue sarcoma.

Tilsotolimod Induces Rapid Gene Expression in the Tumor Microenvironment, Regardless of Tumor Type

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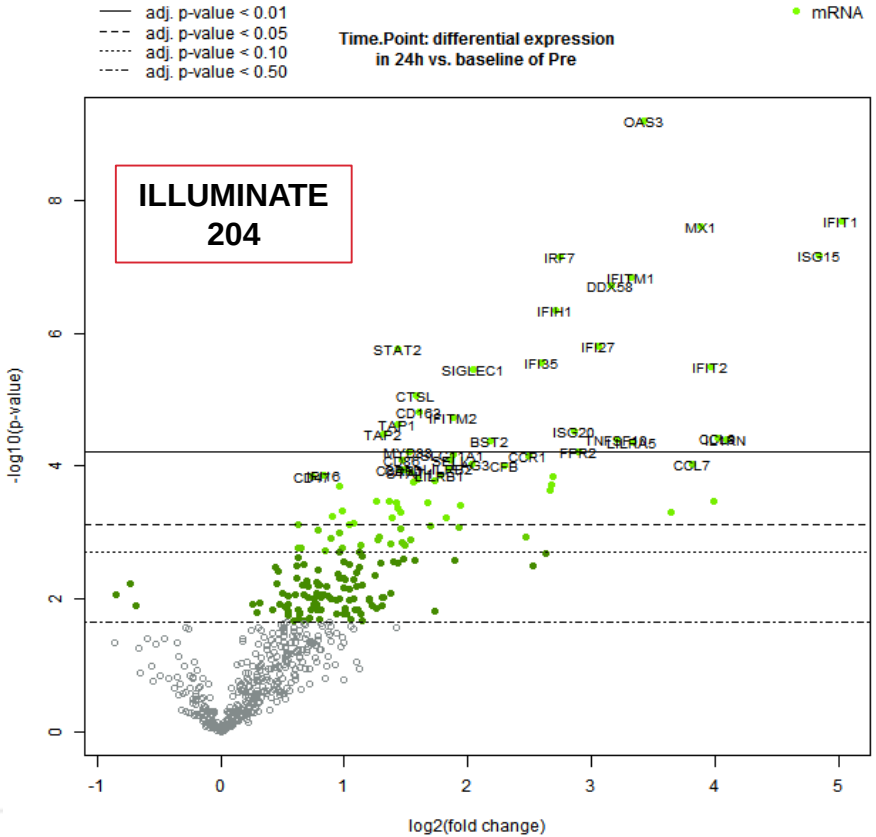

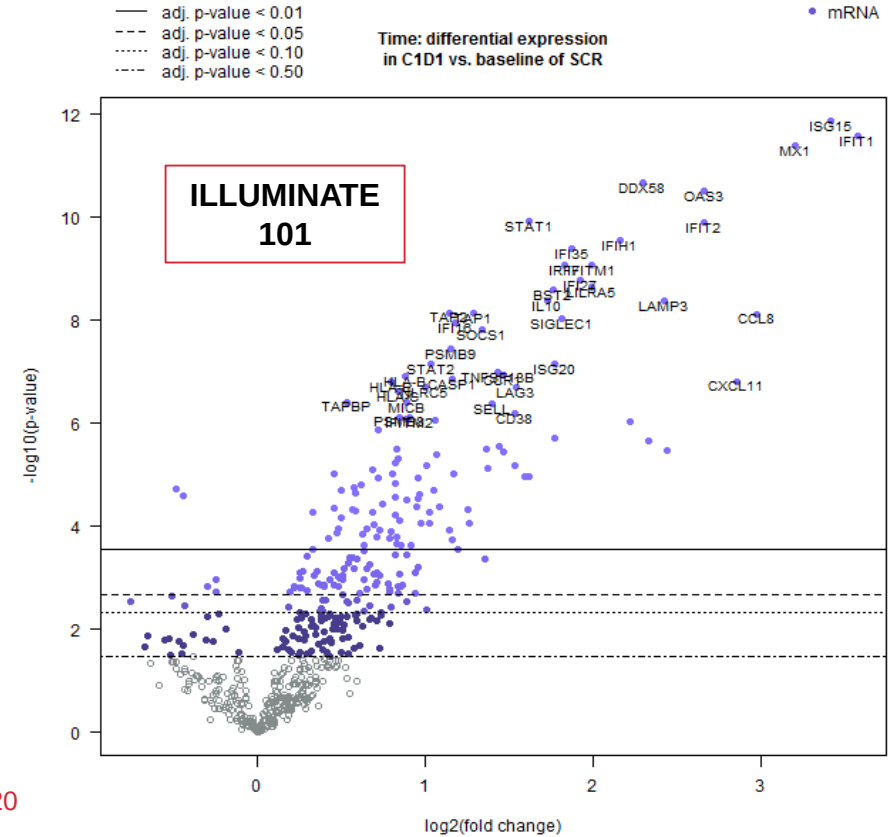

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Evaluation of Tilsotolimod Combined with Immunotherapy Agents for the Treatment of Solid Tumors

- **Phase 2 multicohort protocol design**
  - Individual cohorts for each tumor type and combination
  - Cohorts designed with 2 parts
    - Part 1: Safety, signal finding
    - Part 2: Randomized, controlled expansion of Part 1 indications

First Indication

- MSS CRC cohort; tilso + nivo + ipi
- 1st 10 Patients Enrolled, Safety and initial ORR data expected Q2 2020

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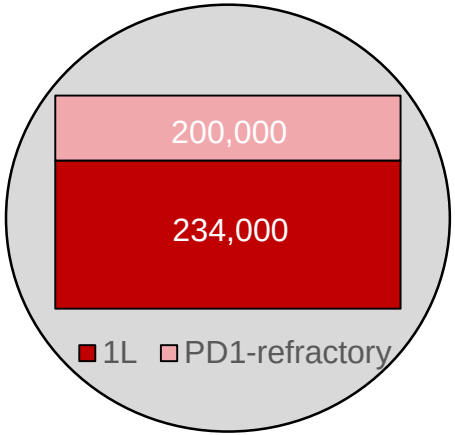
Expanding Potential Growth Opportunities

Emerging I/O addressable tumors

- Moderate response to cornerstone anti-PD1
- Goal to increase number of approved settings

Est. U.S. addressable patient population at 2025[1,2]



"Cold" tumors unaddressable with current I/O

- Significant opportunity in tumors with:
  - Low mutation load
  - Low dendritic cell infiltration
- Bioinformatics research ongoing to identify attractive tumor targets

[1] Proprietary Idera Commercial Research
[2] NSCLC, head and neck, colorectal, bladder and gastric

Clinical Collaboration with AbbVie

Further Broadens Expansion Efforts

Idera Pharmaceuticals Announces Immuno-Oncology Clinical Research Collaboration with AbbVie

Exton, PA. September 4, 2019 —Idera Pharmaceuticals, Inc. (NASDAQ: IDRA) announced today that they have entered into an immuno-oncology clinical research collaboration with AbbVie, a global, research-based biopharmaceutical company. The purpose of the collaboration is to conduct a clinical study evaluating whether combinations of an OX40 agonist (ABBV-368), a TLR-9 agonist (tilsotolimod), chemotherapy (nab-paclitaxel) and/or an anti-programmed cell death 1 (PD-1) antagonist (ABBV-181) stimulate the immune system resulting in anti-tumor responses.

This Phase 1b, multi-center, open-label study is designed to determine the safety, tolerability, pharmacokinetics and preliminary efficacy of combinations of ABBV-368 plus tilsotolimod in subjects with recurrent or metastatic head and neck squamous cell carcinoma (HNSCC).

The study will test three separate treatment arms:

- ABBV-368 plus tilsotolimod;
- ABBV-368 plus tilsotolimod and nab-paclitaxel; and
- ABBV-368 plus tilsotolimod, nab-paclitaxel and ABBV-181.

Under the terms of the agreement, Idera will provide clinical trial supply of tilsotolimod to AbbVie and AbbVie will be responsible for conduct of the study.

Financials

- Recently completed private placement for up to $97.7M ($10.1M received at closing);
- Including initial recent proceeds, cash runway anticipated into Q1 2021; and
- Financing provides financial resources for critical upcoming catalyst and potentially beyond.

2020: Turning A “Cold” Company “Hot”?

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- Completion of ILLUMINATE-301 Enrollment – 1Q 2020
- Interim Data (First 10 MSS-CRC patients) from ILLUMINATE-206 – 2Q 2020
- Topline Data from ILLUMINATE-204 – 2Q 2020
- Data from ILLUMINATE-301 – Q4 2020/Q1 2021