October 2019 Corporate Overview

Forward-Looking Statements & Other Important Cautions

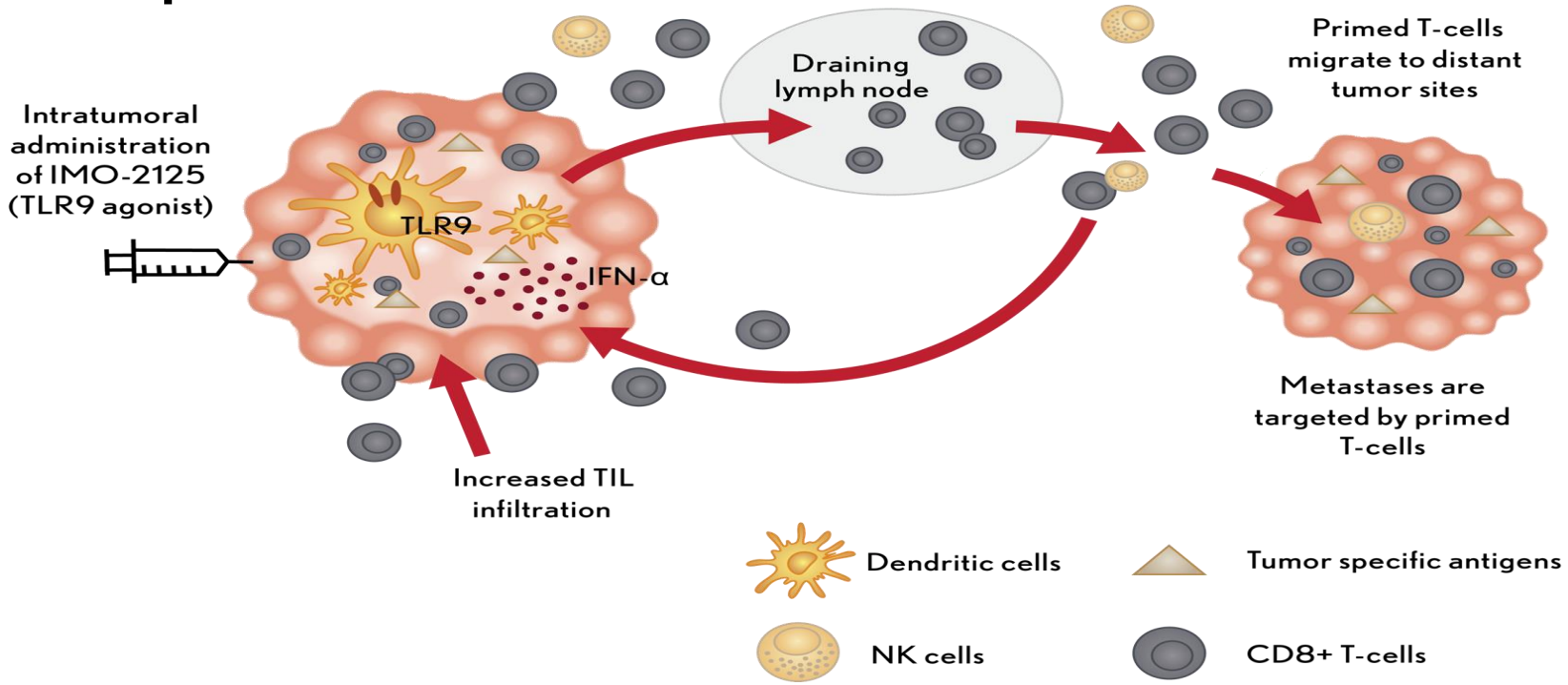
This presentation contains forward-looking statements within the meaning of safe harbor of the Private Securities Litigation Reform Act of 1995 and the Federal securities laws including statements about our expectations for, and obligations under, the content contained in this presentation. All statements, 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 U.S. 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 in the Company's filings with the Securities and Exchange Commission (SEC). While 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.

Injecting a New Solution to Advance Cancer Immunotherapy

Near Term Value Growth Driven by Tilsotolimod

- Phase 3 Trial 75% Enrolled
- Encouraging Clinical Outcomes
- Studies of Tumors Beyond Melanoma Underway
- Collaborations with BMS and AbbVie
- Strengthened Exclusivity Proposition

Designed to Stimulate the Immune System Locally to Potentially Lead to Better Systemic Patient Outcomes with Checkpoint Inhibitors



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

High unmet medical need in metastatic melanoma for patients who progress after PD-1 inhibitors

Historical Data of 321 Patients Suggest 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%)

ILLUMINATE-301 – Trial Design
PD-1 Refractory Metastatic Melanoma

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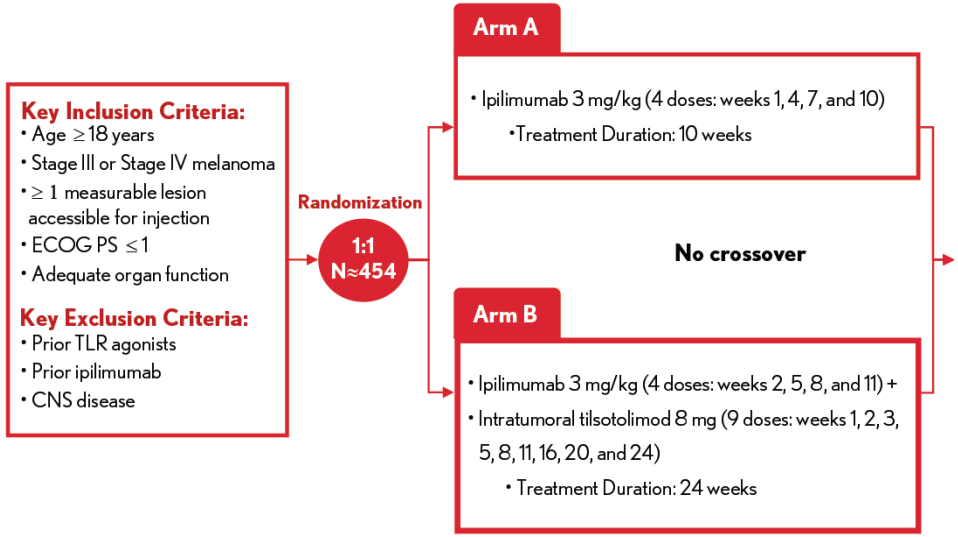
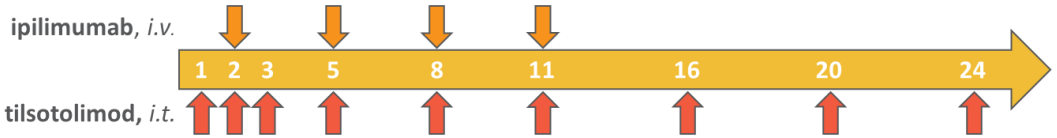
Tilsotolimod Clinical Trials

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





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,

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ILLUMINATE-301 Global Registration Trial

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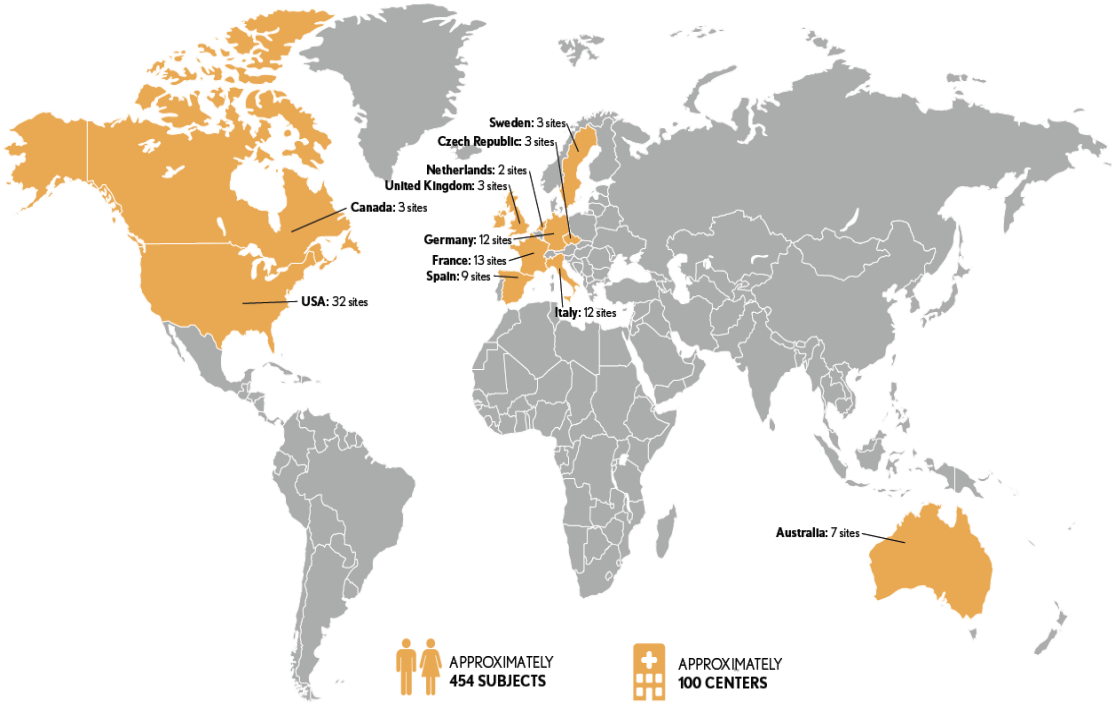
Tilsotolimod Clinical Trials



- ***342 patients enrolled;***
- ***Enrollment completion expected 1H 2020***

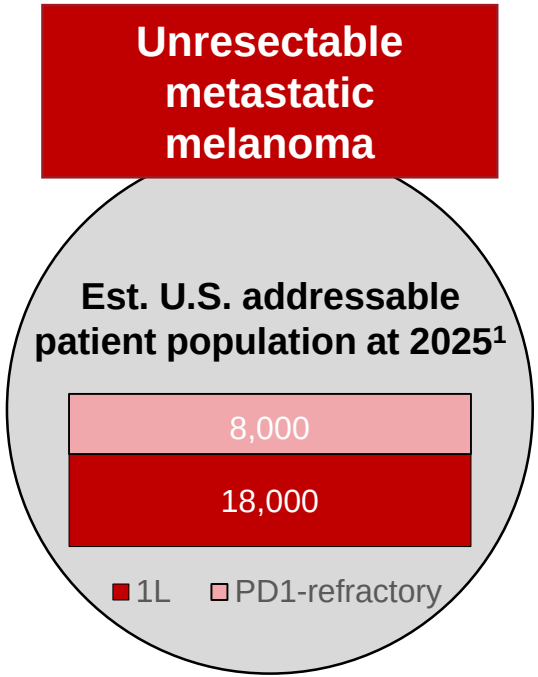
**** Enrollment Update as of 10/23/2019***

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.”*

1st Indication Commercial Opportunity



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

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

Reasons to Believe

- Encouraging Clinical Data
- Translational Data

ILLUMINATE-204

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Tilsotolimod Clinical Trials

A Phase 1/2 Study to Assess the Safety and Efficacy of Intratumoral Tilsotolimod in Combination with Ipilimumab or Pembrolizumab in Patients with Metastatic Melanoma

- Primary objectives
  - Phase 1: to determine the recommended phase 2 dose
  - Phase 2: to assess preliminary clinical activity of tilsotolimod in combination with ipilimumab at the recommended phase 2 dose in patients with metastatic melanoma that is not responsive to PD-1 inhibitor therapy, using RECIST v1.1
- Secondary objectives include:
  - Phase 2: to further assess the safety and tolerability of tilsotolimod in combination with ipilimumab or pembrolizumab (pembrolizumab combination not studied in this phase)

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

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Tilsotolimod Clinical Trials

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

[1] 49 of 53 subjects had at least 1 post-baseline disease assessment at time of October 2019 data update
[2] References available on Slide 7

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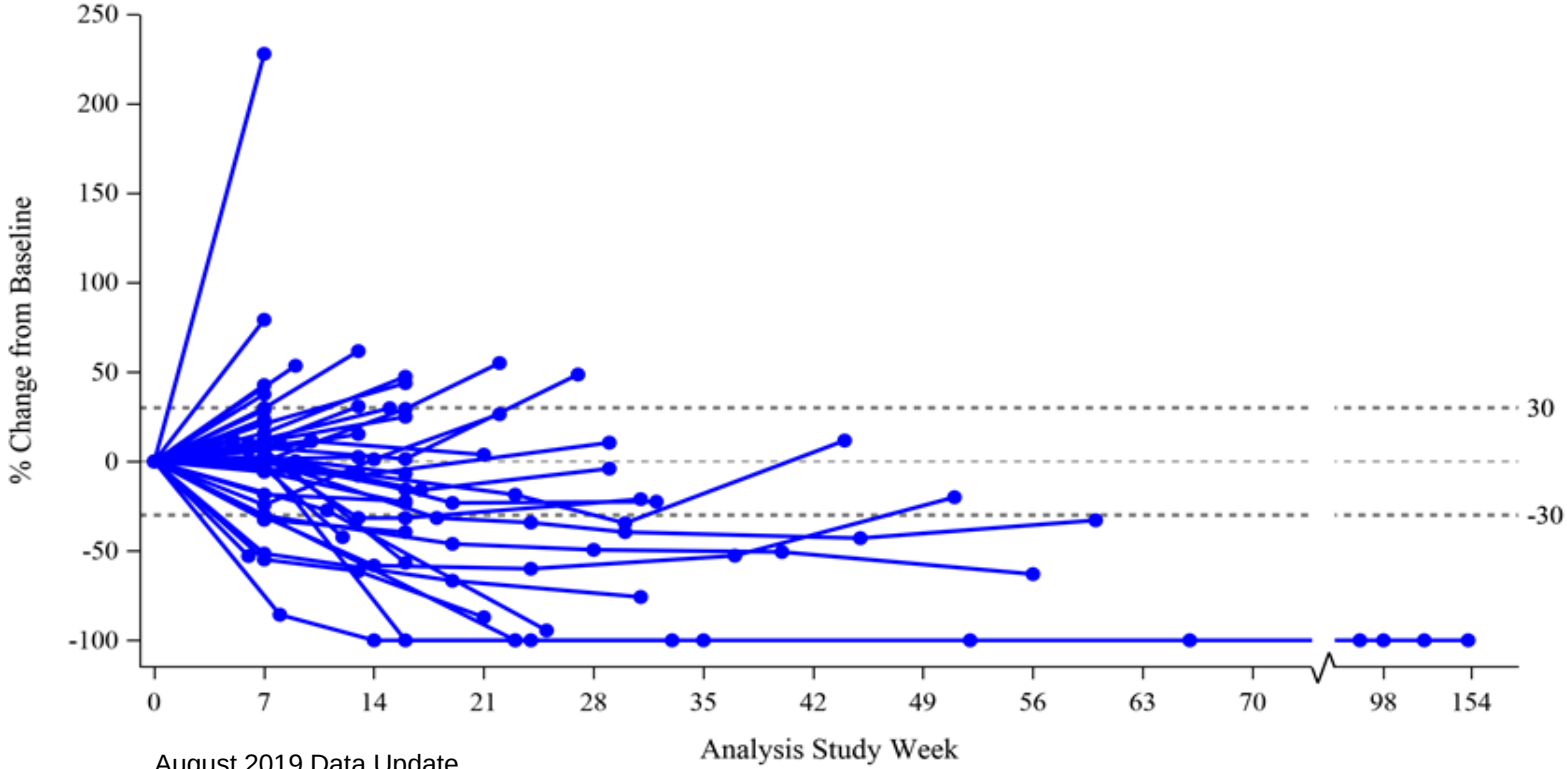
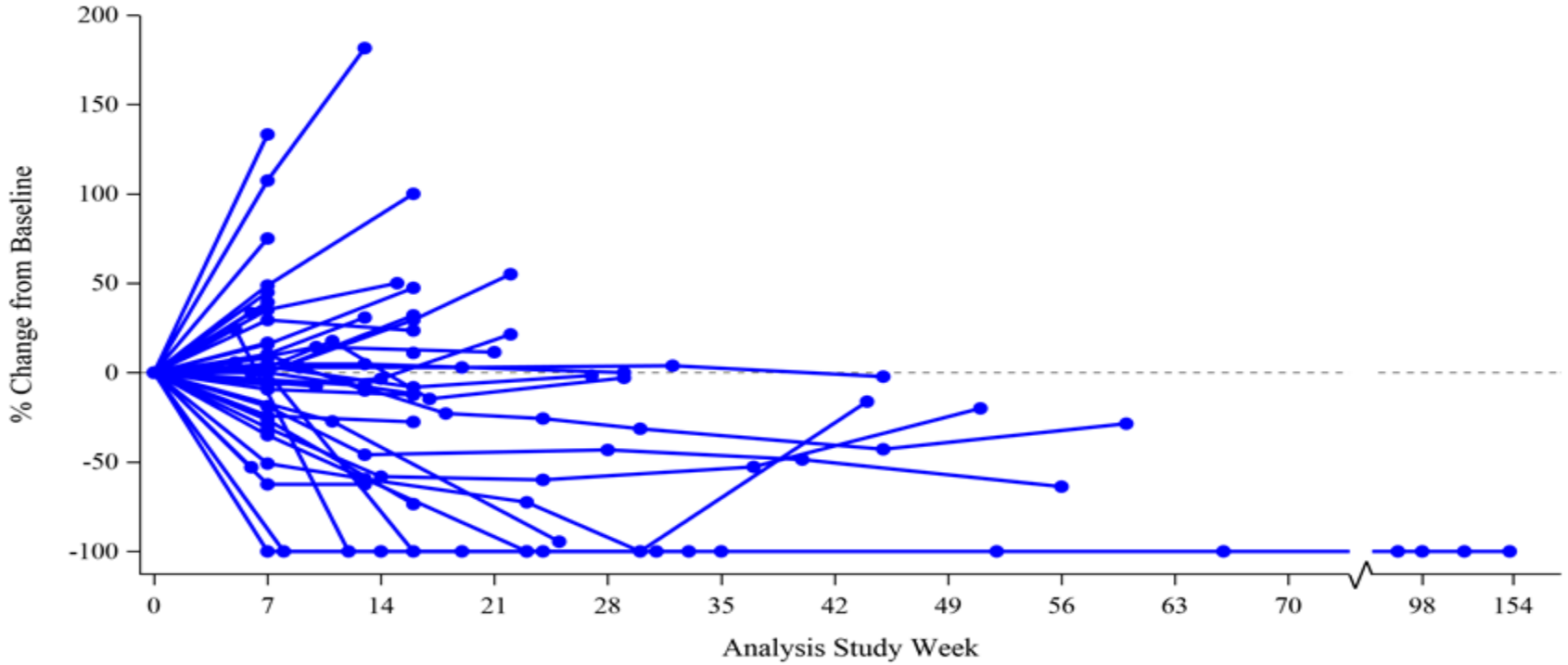
ILLUMINATE 204: Percent (%) Change from Baseline in All Target Tumors



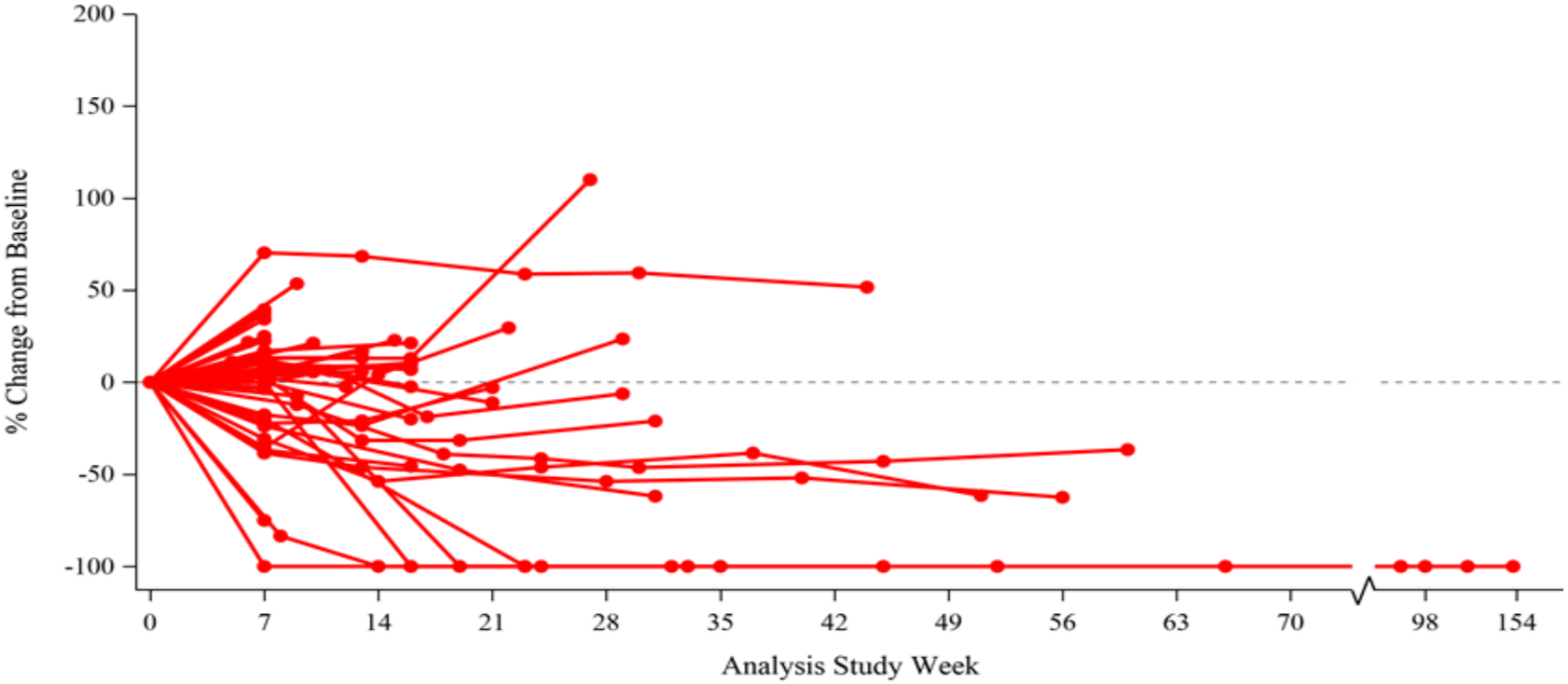
August 2019 Data Update

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



August 2019 Data Update

ILLUMINATE-204: Percent (%) Change from Baseline Uninjected Tumors Demonstrating Abscopal Effect



ILLUMINATE-204 – Safety Analysis

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Tilsotolimod Clinical Trials

	N=72	%
Subjects with at least one AE	71	98.6
Subjects with at least one SAE	27	37.5
Subjects with at least one ≥ 3 AE	36	50.0
Subjects with an AE leading to Study drug withdrawn	8	11.1
Subjects with an AE leading to Study discontinuation	1	1.4
Subjects with Death related to AE	0	0.0

Maximum Severity	N=72	%
Grade 1	14	19.4
Grade 2	21	29.2
Grade 3	29	40.3
Grade 4	7	9.7
Grade 5	0	0.0

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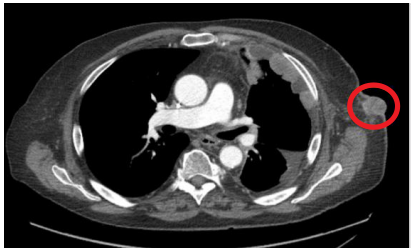
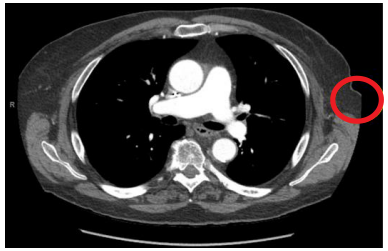
August 2019 Data Update
Includes all subjects dosed with IMO-2125

ILLUMINATE-204 Case Studies

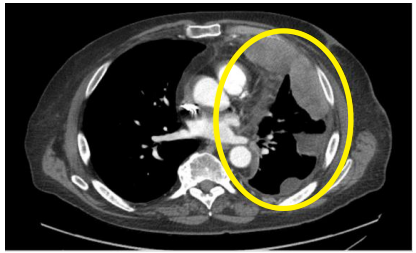
Complete response (68 years old)



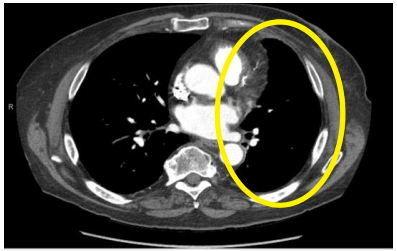
Pretreatment
Injected tumor



Posttreatment 24 weeks
Injected tumor



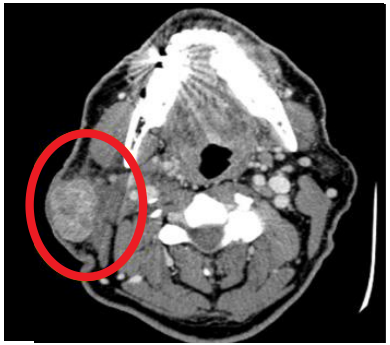
Pretreatment
Uninjected tumor



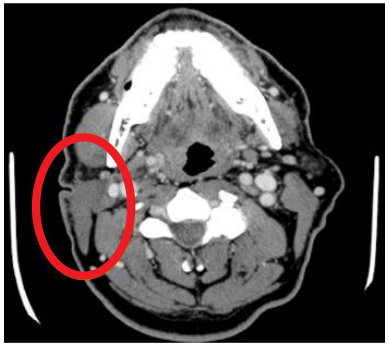
Posttreatment 24 weeks
Uninjected tumor

ILLUMINATE-204 Case Studies

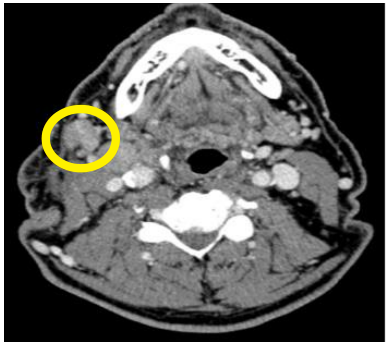
Partial response (62 years old)



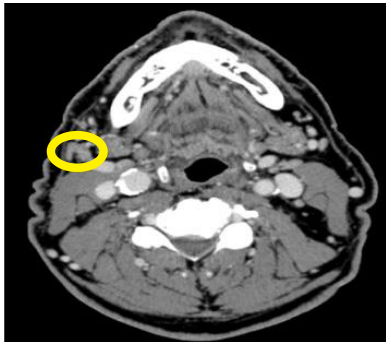
Pretreatment
Injected tumor



Posttreatment 56 weeks
Injected tumor



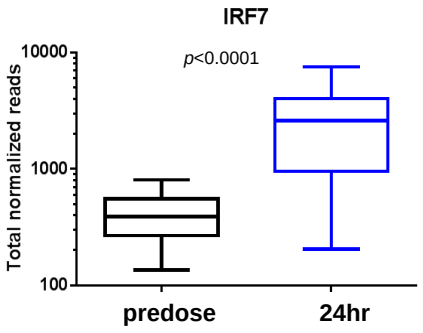
Pretreatment
Uninjected tumor



Posttreatment 56 weeks
Uninjected tumor

Tilsotolimod activates local IFNα-response gene signature and combination with ipilimumab therapy induces proliferation of T-cells in distant lesion

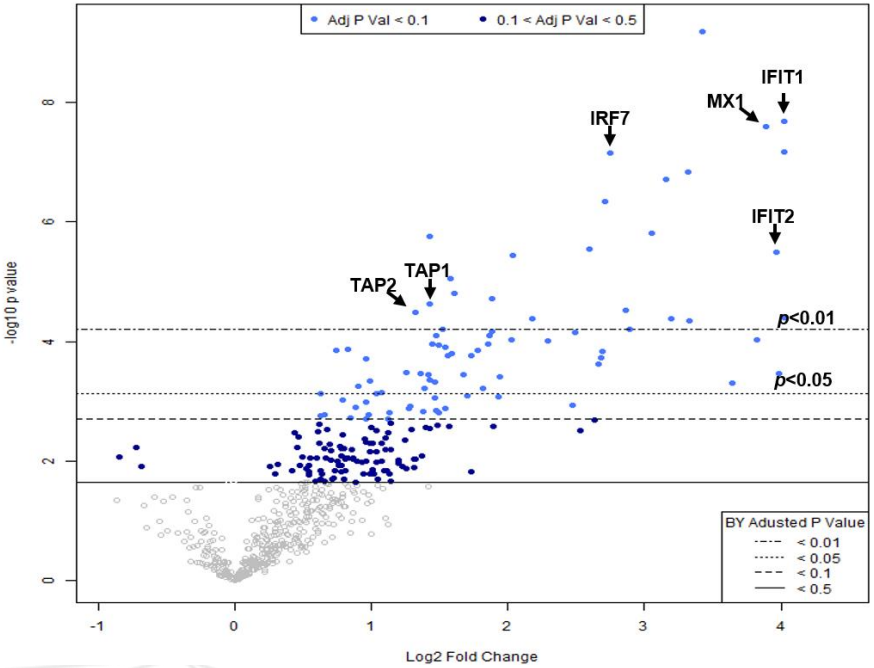
tilsotolimod only
(prior to ipilimumab)



n=15

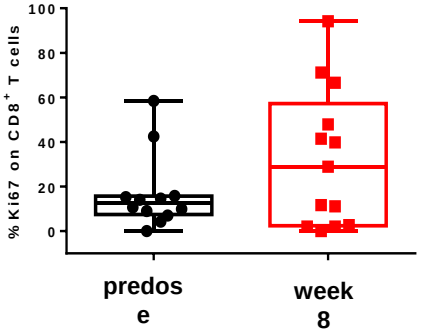
Injected Lesion

tilsotolimod only
(prior to ipilimumab)



Injected Lesion **n=15**

tilsotolimod + ipilimumab



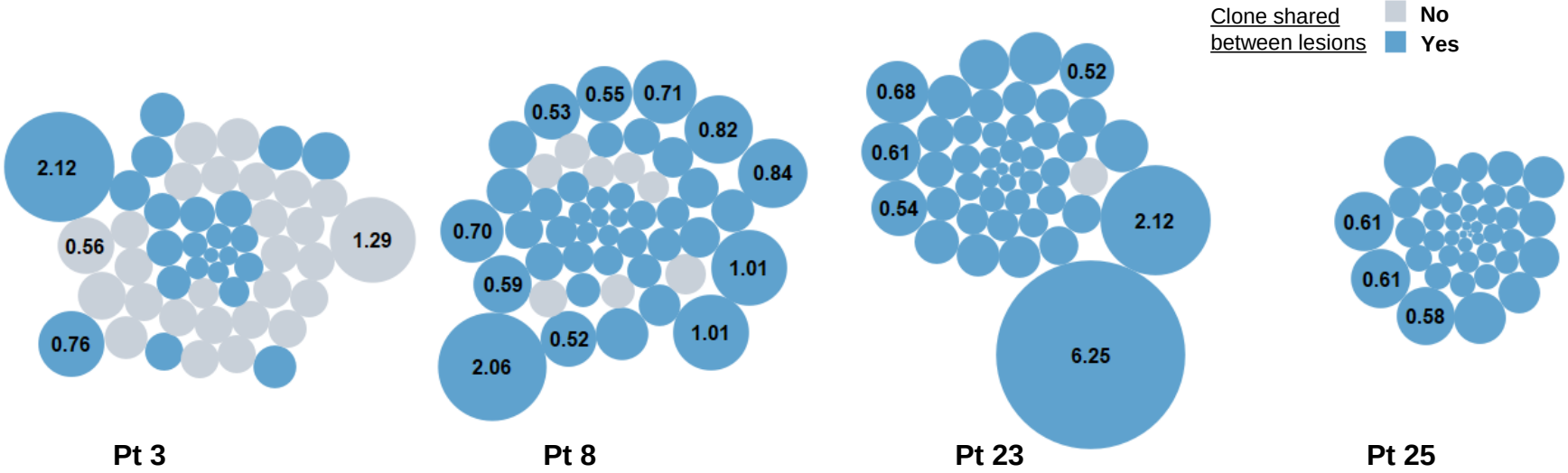
n=12

Distant Lesion

Source: SITC 2017

Expanding Clones in the Distant Lesion are Shared with the Injected Lesion

Top 50 clones in the distant lesion at C3W8 of responding patients

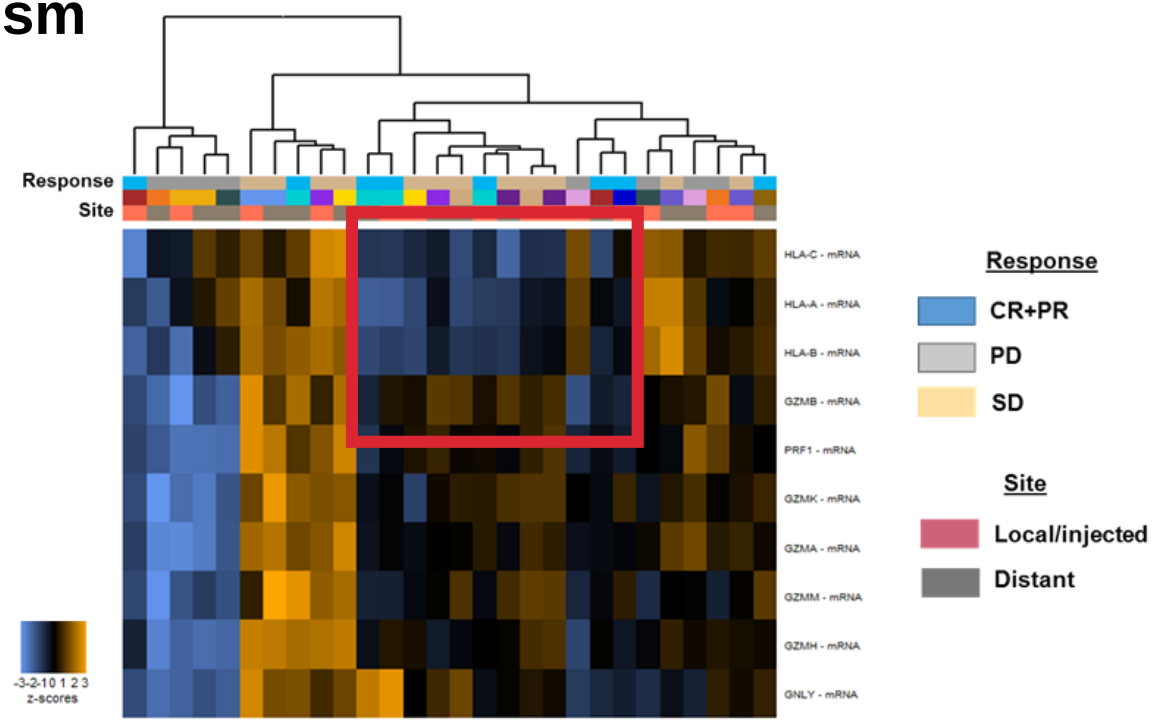


Number = clonal specific change in frequency (C3W8 – predose)
Circle size reflects the frequency of the clone relative to the other clones present

Source: SITC 2017

Demonstrated Potential of Tilsotolimod to Overcome CTLA-4 (Cytotoxic T-Lymphocyte Antigen) Resistance Mechanism

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



** HLA-ABC: human leucocyte antigen; ABC refers to three genes part of MHC class 1*

Source: SITC 2017

ILLUMINATE 204 Summary

Final data planned for major medical meeting 1H 2020

- Established the recommended Phase 2 dose (RP2D) of 8mg tilsotolimod
- Provided proof of mechanism for tilsotolimod 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
- Clinical responses rates (ORR/DCR) greater than historical control and median overall survival (OS) not yet reached

Tilsotolimod Expansion Strategy

ILLUMINATE-101

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Tilsotolimod Clinical Trials

A Phase 1B Study of Intratumoral Tilsotolimod (IMO-2125) in Patients with Refractory Solid Tumors (Data as of July 1, 2019)

- Dose-escalation cohort objectives
  - Primary: safety
  - Secondary: establish RP2D; assess clinical activity and pharmacokinetics
  - Exploratory: evaluate immunologic activity
- Dose-expansion cohort objectives
  - Primary: clinical activity of overall response rate via RECIST v1.1
  - Secondary: safety, other measures of clinical benefit, and pharmacokinetics
  - Exploratory: evaluate biomarkers for immunologic assessment and assess antidrug antibody formation

ILLUMINATE-101 Efficacy

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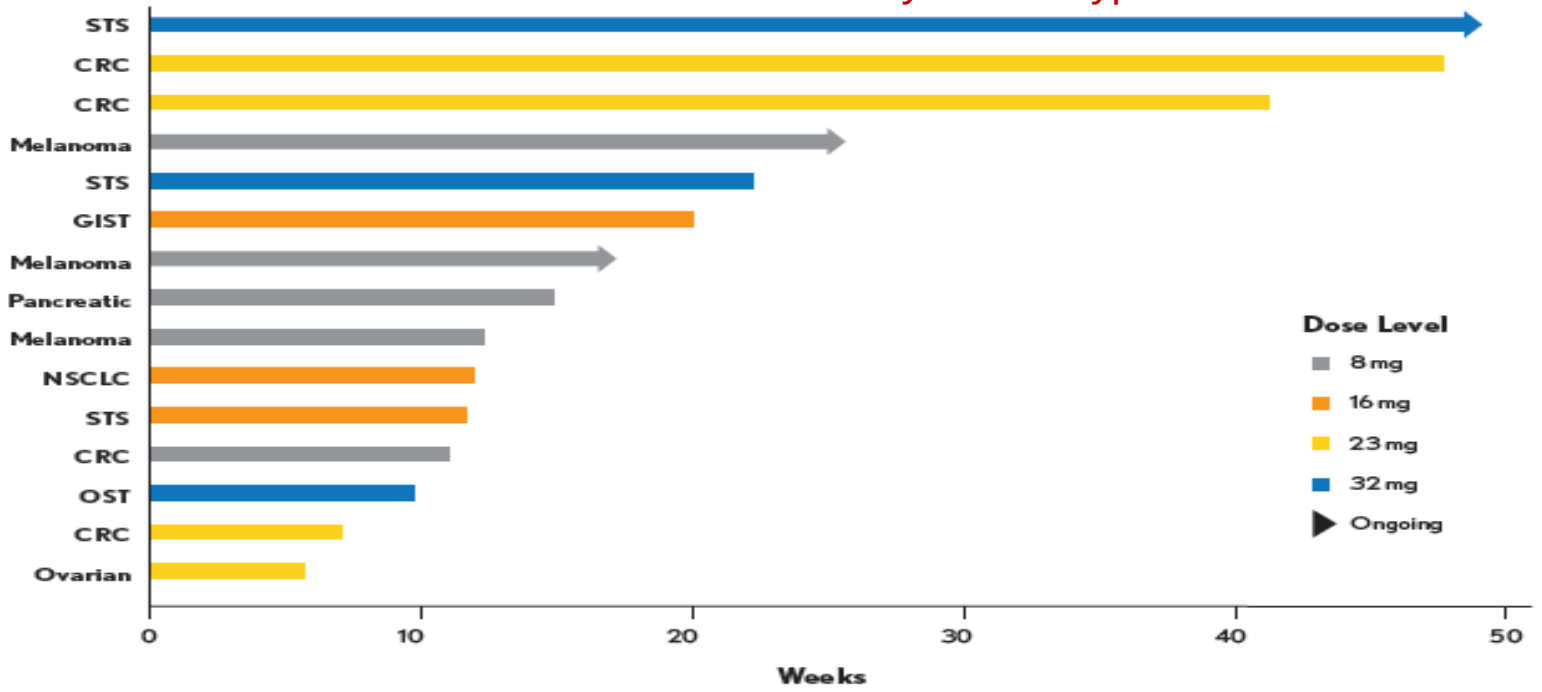
Tilsotolimod Clinical Trials

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.

ILLUMINATE-101 - Summary

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Tilsotolimod Clinical Trials

- Intratumoral injection of single-agent tilsotolimod is generally well-tolerated; preliminary evidence of clinical activity across multiple solid tumors include those traditionally unresponsive to immunotherapy
- Uninjected lesions respond similarly to injected lesions, suggesting a potential abscopal-like effect
- Tilsotolimod rapidly increases dendritic cell activation, upregulation of MHC class II, and upregulation of IFN-α signaling, is suggesting improved antigen presentation
- Tilsotolimod-induced upregulation of antigen presentation is observed across multiple tumor types; changes are consistent with those observed in a previous phase 1/2 clinical trial of patients with metastatic melanoma

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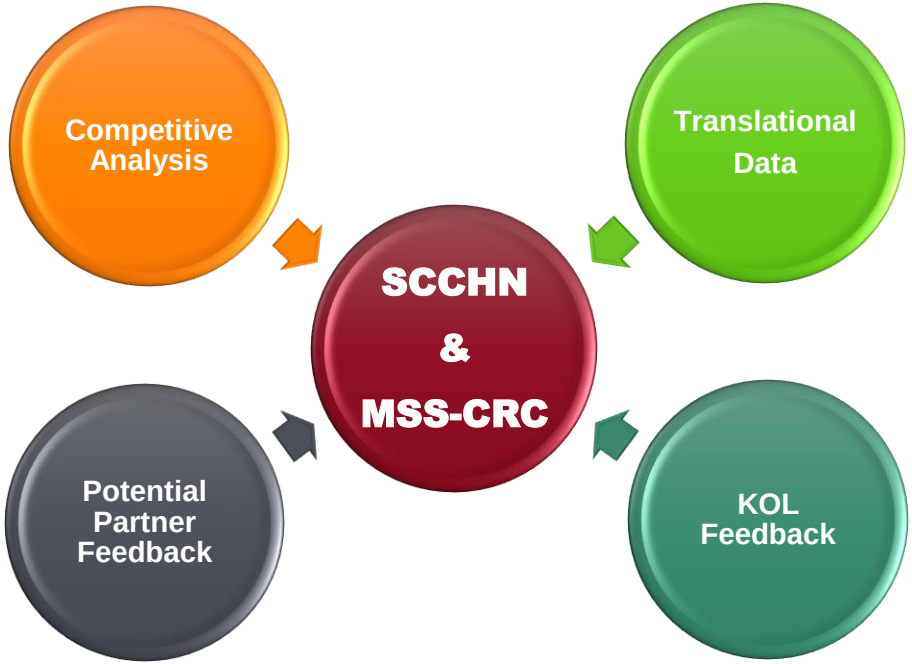
ILLUMINATE 206 Initial Expansion Beyond Melanoma

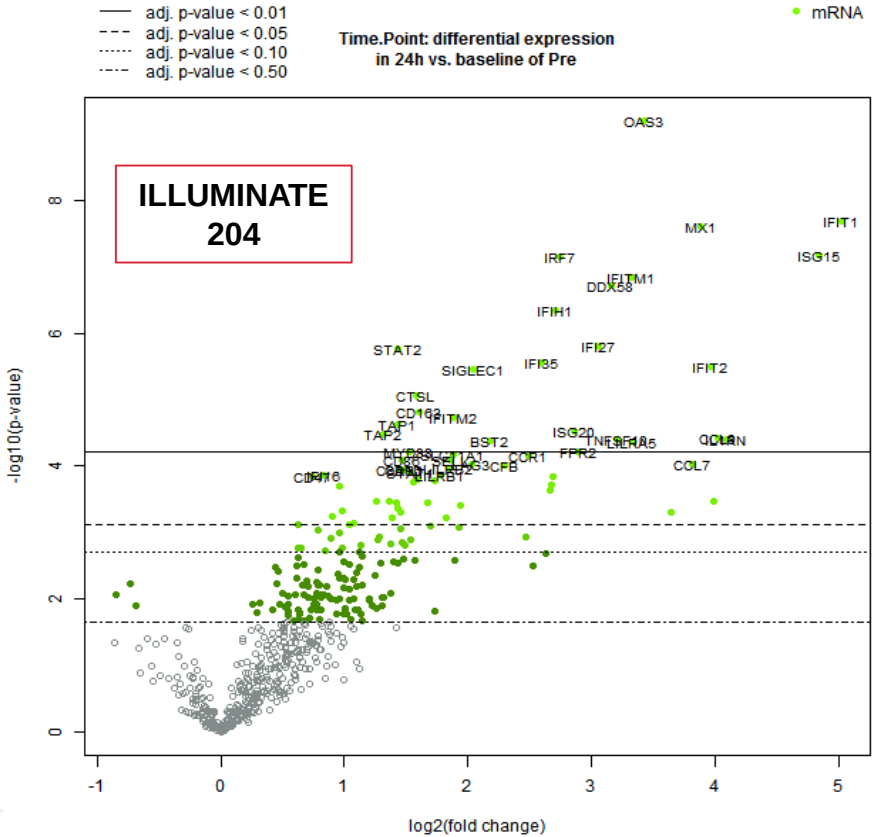
Broad Effort to Determine Appropriate First Tumor Types for Expansion

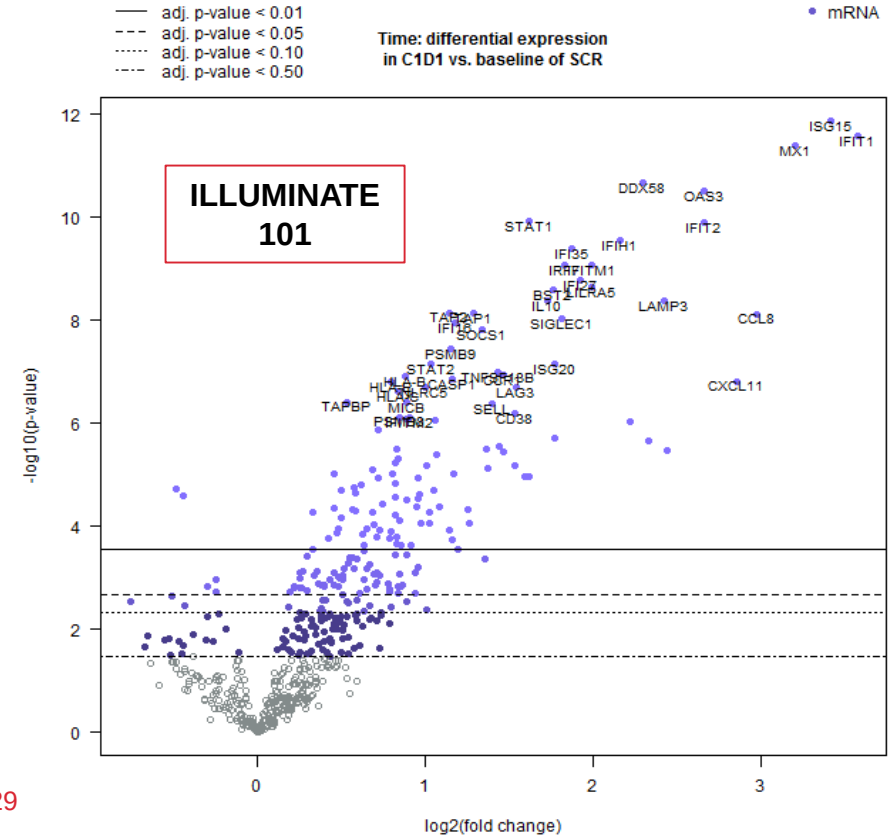
- Squamous Cell Carcinoma of the Head and Neck (SCCHN)



- Colorectal Cancer (MSS-CRC)

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





Recently Announced Clinical Collaboration with AbbVie 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.

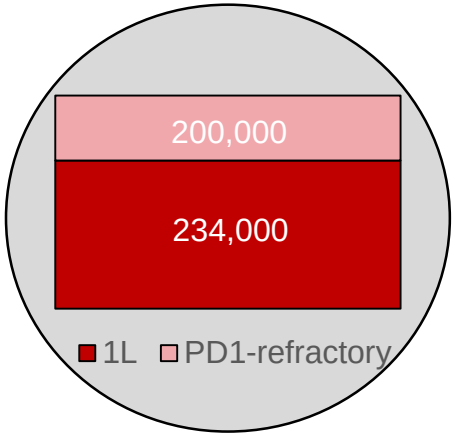
Under the terms of the agreement, Idera will provide clinical trial supply of tilsotolimod to AbbVie and AbbVie will be responsible for conduct of the study.

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

Financials and Capital Structure Updates

- Completed Q2 2019 with $52.4M cash
- Expected cash runway into Q2 2020
- Approximately 29M shares outstanding
- $35M Common Stock Purchase Agreement with Lincoln Park Capital
- $50M ATM in place

Key Milestones

illuminate
Tilsotolimod Clinical Trials

- Completion of ILLUMINATE-301 Enrollment – 1H 2020
- Topline Data from ILLUMINATE-204 – 1H 2020
- Interim Data from ILLUMINATE-206 - 2020
- ORR Data from ILLUMINATE-301 – 1H 2021