



DEFEATING
CANCER:
The Challenge.
Our Mission.

May 2020

Disclaimer

This presentation has been prepared by Deciphera Pharmaceuticals, Inc. for informational purposes only and not for any other purpose. Nothing contained in this presentation is, or should be construed as, a recommendation, promise or representation by Deciphera Pharmaceuticals, Inc. or any director, employee, agent, or adviser of Deciphera Pharmaceuticals, Inc. This presentation does not purport to be all-inclusive or to contain all of the information you may desire.

Certain information contained in this presentation relates to or is based on studies, publications, surveys and other data obtained from third-party sources and Deciphera Pharmaceuticals, Inc.'s own internal estimates and research. While Deciphera Pharmaceuticals, Inc. believes these third-party sources to be reliable as of the date of this presentation, it has not independently verified, and makes no representation as to the adequacy, fairness, accuracy or completeness of, any information obtained from third-party sources. While Deciphera Pharmaceuticals, Inc. believes its internal research is reliable, such research has not been verified by any independent source.

Forward-Looking Statements

This presentation may contain forward-looking statements that are based on our current expectations, estimates and projections about our industry as well as management's beliefs and assumptions. Words such as "anticipates," "expects," "intends," "plans," "believes," "seeks," "estimates," "may," "will," and variations of these words or similar expressions are intended to identify forward-looking statements. These statements include statements regarding the impact of COVID-19, and statements regarding our business strategy, commercial expectations for QINLOCK, including U.S. launch of QINLOCK, prospective products, clinical trial results, NDA filings, IND filing expectations, product approvals, breakthrough therapy designation (BTD), Real-Time Oncology Review (RTOR) and Project Orbis programs, timing and likelihood of success, plans and objectives of management for future operations, expectation regarding clinical candidates, future results of anticipated products, expectations on estimated patient populations, the market opportunity for our drug and drug candidates and business guidance, including discovery, clinical, regulatory and commercial milestones, as well as cash guidance, and speak only at the time this presentation was prepared. Such statements are based upon the information available to us now and are subject to change. We will not necessarily inform you of such changes. These statements are not guarantees of future performance and are subject to certain risks, uncertainties and assumptions that are difficult to predict. Therefore, actual results could differ materially and adversely from those expressed in any forward-looking statements as a result of

various factors. Factors which could cause actual results to differ materially from those in the forward-looking statements include, among others, the uncertainty around the severity and duration of the impact of COVID-19 on our business and operations, our ability to successfully commercialize QINLOCK, our history of significant losses since inception, our ability to obtain necessary capital when needed on acceptable terms, the timing and results from ongoing or future clinical and non-clinical studies, the possibility preliminary or top-line data may not be indicative of final data, unexpected adverse events, our ability to obtain regulatory approval of our drug candidates, our ability to manage third party drug substance and drug product contract manufacturers, actions of regulatory agencies, our ability to obtain and maintain reimbursement for any approved products and the extent to which patient assistance programs are utilized, any or all of which may affect the initiation, timing and progress of clinical studies and the timing of and our ability to obtain regulatory approval and make QINLOCK and any investigational drugs that may receive approval, available to patients, the fact we may not receive the benefits of designations like BTD or of the RTOR or Orbis programs, our ability to plan for potential commercialization of our product candidates, and, if approved, execute on our marketing plans, the inherent uncertainty in estimates of patient populations and incidence and prevalence estimates, our ability to comply with healthcare regulations and laws, competition from other products or procedures, our reliance on third-parties to conduct our clinical and non-

clinical trials, our reliance on single-source third-party suppliers to manufacture clinical, non-clinical and any future commercial supplies of our drug substance and drug product candidates and our ability to obtain, maintain and enforce our intellectual property rights. New risk factors and uncertainties may emerge from time to time, and it is not possible to predict all risk factors and uncertainties. There can be no assurance that the opportunity will meet your investment objectives, that you will receive a return of all or part of such investment. Investment results may vary significantly over any given time period. The appropriateness of a particular investment or strategy will depend on an investor's individual circumstances and objectives. Deciphera recommends that investors independently evaluate specific investments and strategies. For further information regarding these risks, uncertainties and other factors, you should read the "Risk Factors" section of Deciphera's Quarterly Report on Form 10-Q for the quarter ended March 31, 2020 filed with the Securities and Exchange Commission (the "SEC"), and Deciphera's other SEC filings.

Deciphera Pharmaceuticals 2020. Deciphera, Deciphera Pharmaceuticals, the Deciphera Logo, QINLOCK and the QINLOCK logo are trademarks of Deciphera Pharmaceuticals, LLC. This presentation may contain trade names, trademarks or service marks of other companies. Deciphera does not intend the use or display of other parties' trade names, trademarks or service marks to imply a relationship with, or endorsement or sponsorship of, these other parties.

Executing on Our Mission

At Deciphera, we are focused on discovering, developing, and bringing important new medicines to patients for the treatment of cancer.



Successfully **launch** QINLOCK™ (riporetinib) in the U.S.



Continued development of QINLOCK in **additional indications**

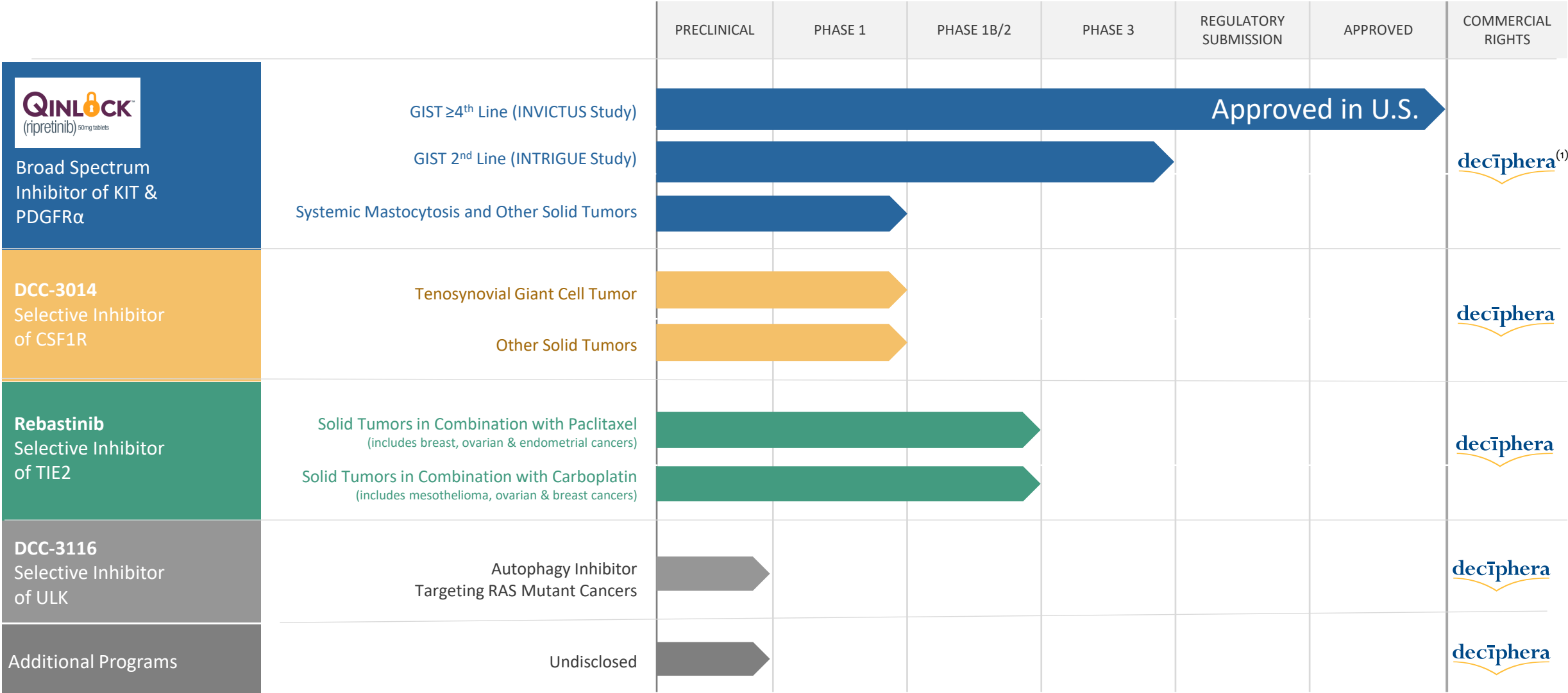


Rapidly advancing wholly-owned clinical-stage portfolio⁽¹⁾



Novel switch control kinase inhibitor discovery platform **fuels the pipeline**

Robust Clinical Stage Oncology Pipeline of Novel Kinase Inhibitors



Notes: KIT=KIT proto-oncogene receptor tyrosine kinase; PDGFR α =platelet-derived growth factor receptor α ; CSF1R=colony stimulating factor 1 receptor; TIE2=TEK tyrosine kinase; (1) Development and commercialization exclusive license with Zai Lab in Greater China.

2020

Expected Milestones for the Year Ahead

QINLOCK
(ripretinib) 50mg tablets

- ✓ FDA approval and U.S. commercial launch in 4th line GIST
- Submit EU Marketing Authorisation Application to EMA
- Complete enrollment in the INTRIGUE Phase 3 study in 2nd line GIST
- Present Phase 1 study expansion data

DCC-3014

- Select Phase 2 dose for tenosynovial giant cell tumor (TGCT) and initiate the expansion portion of study
- Update Phase 1 data in TGCT patients

Rebastinib

- ✓ Selected Phase 2 dose and activate Part 2 of Phase 1b/2 study in combination with carboplatin
- ✓ Present Phase 1b/2 data in combination with paclitaxel
- Present Phase 1b/2 data in combination with carboplatin

DCC-3116

- Submit IND application to FDA

QINLOCK™: Potential to Change Practice in Advanced GIST



Novel TKI designed to inhibit broad range of mutations in KIT and PDGFR α



Strong efficacy and safety data from randomized Phase 3 INVICTUS study



FDA approved for 4th line GIST



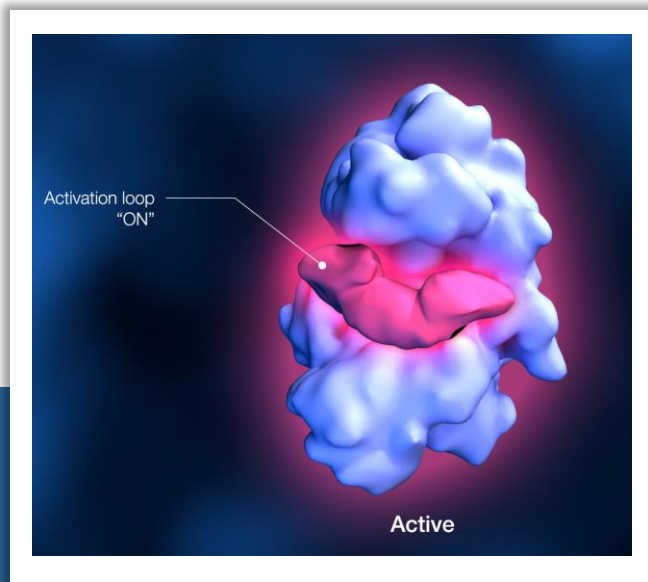
- Received approval ~3 months early
- Breakthrough Therapy Designation
- Reviewed under FDA Real-Time Oncology Review (pilot program)



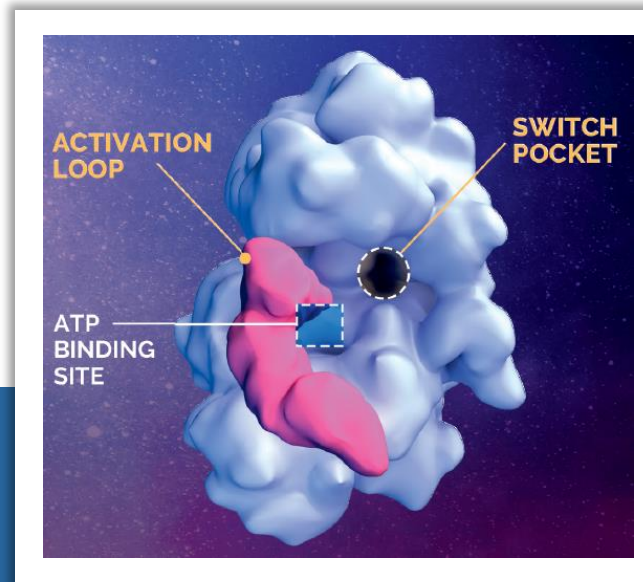
Marketing applications submitted to Health Canada and Australian Therapeutic Goods Administration for advanced GIST and are being reviewed under FDA Project Orbis (initiative)

QINLOCK™: A Novel Kinase Switch Control Inhibitor

Switched on: Kinase active



Switched off: Kinase inactive



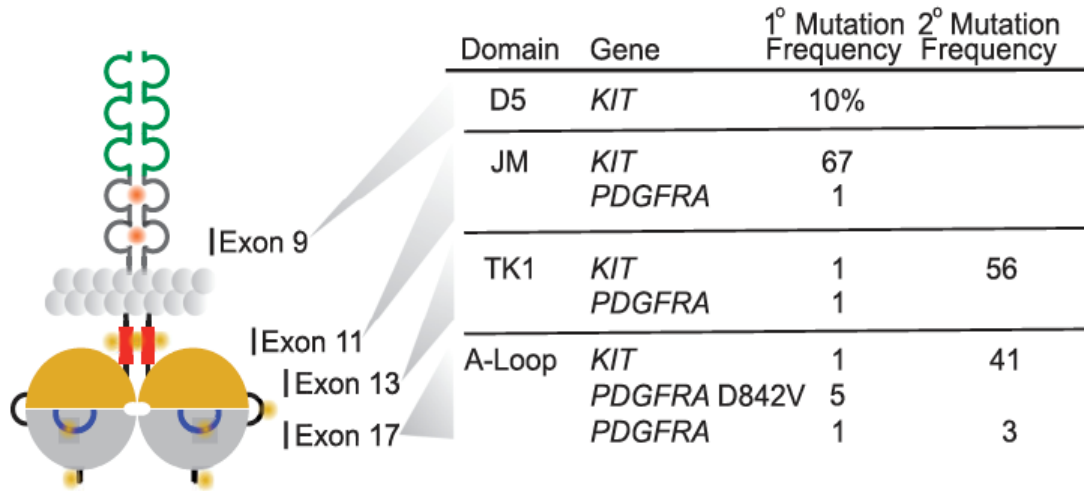
Achieving switch control prevents downstream signaling and cell proliferation to potentially overcome the mechanisms of resistance associated with progressing GIST

A unique dual mechanism of action that regulates the kinase switch pocket and activation loop

- Prevents the activation loop from binding to the switch pocket
- Locks the kinase in the inactive ("off") state

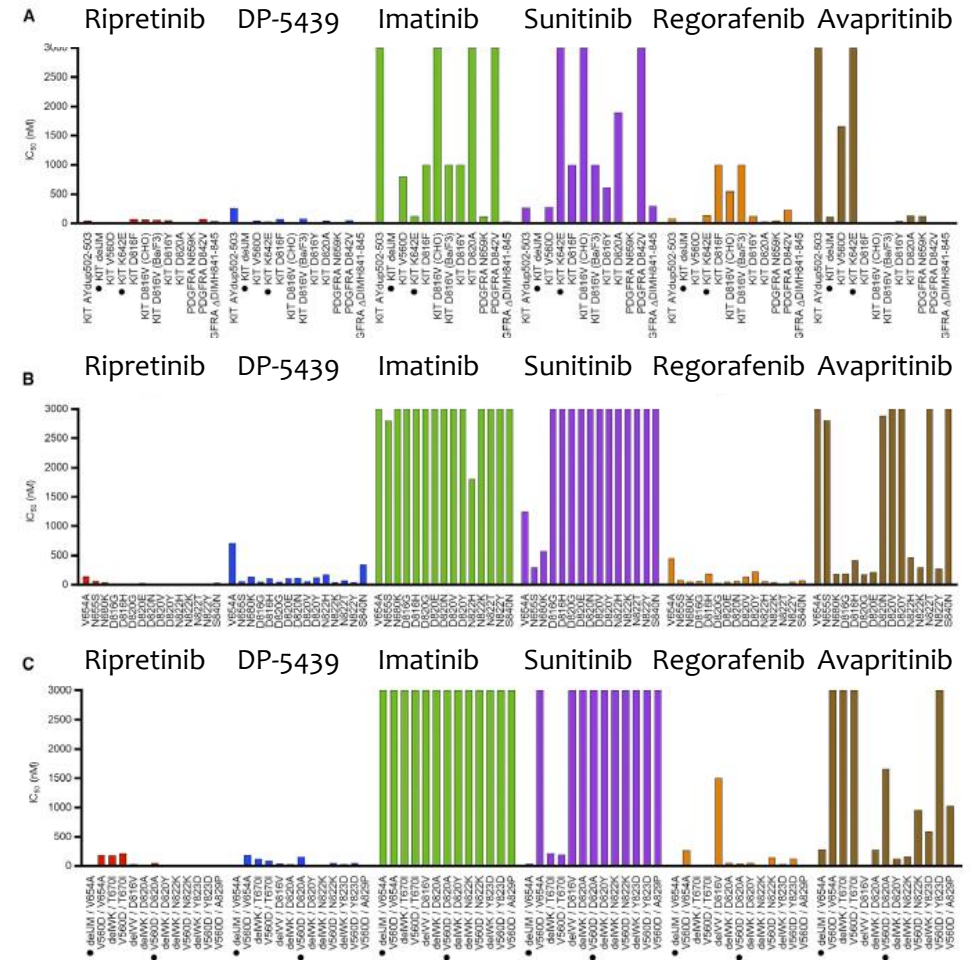
QINLOCK™: Designed to Address a Broad Range of Mutations in GIST

KIT Mutations Drive ~80% of GIST



Source: Hemming M et al. Translational insights into gastrointestinal stromal tumors and current clinical advances. *Annals of Oncology*; 29: 2037-2045, 2018.

Ripretinib: Broad Mutational Coverage in KIT and PDGFR α



Notes: (A) GIST primary mutations; or imatinib-resistant KIT mutations with (B) exon 9 or (C) exon 11 primary mutations.

QINLOCK™: U.S. Prescribing Information Overview



INDICATION

QINLOCK is a kinase inhibitor indicated for the treatment of adult patients with advanced gastrointestinal stromal tumor (GIST) who have received prior treatment with 3 or more kinase inhibitors, including imatinib.

RECOMMENDED DOSE

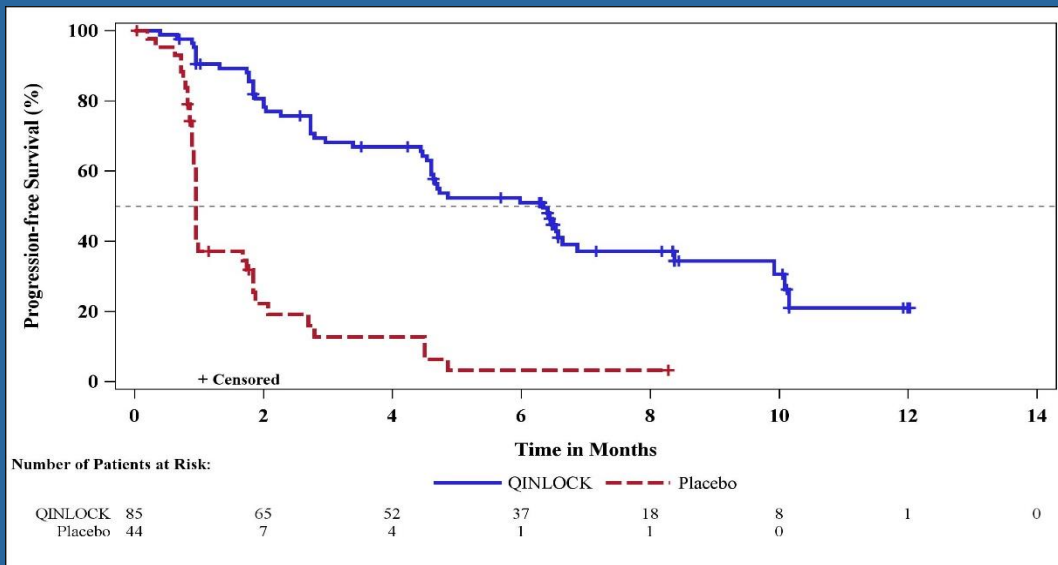
150 mg orally once daily with or without food.

QINLOCK is the first approved TKI designed specifically for GIST regardless of patients' mutational status

QINLOCK™: A Potential Best-In-Class Treatment for Advanced GIST

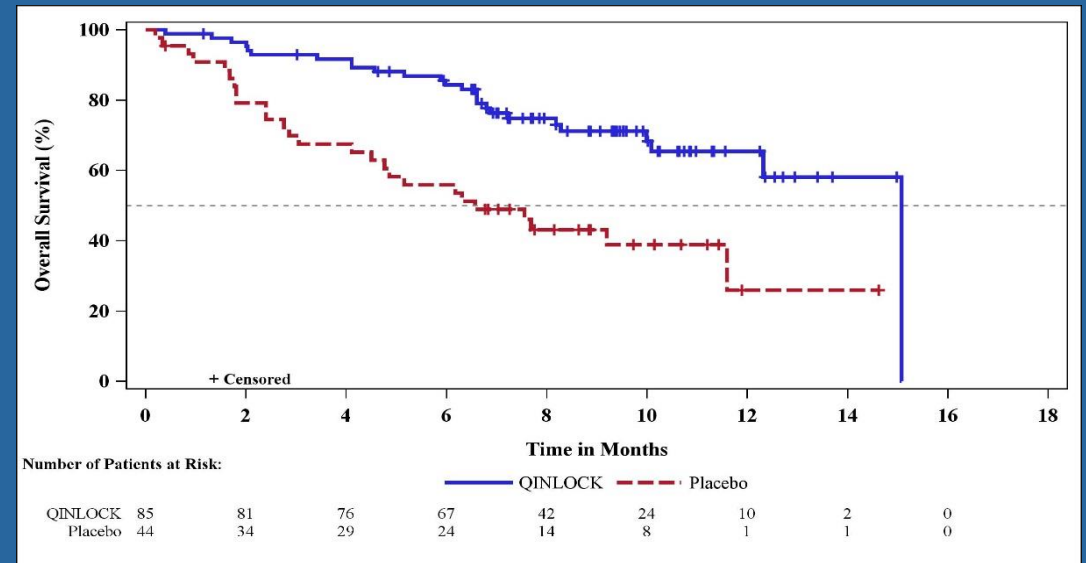
QINLOCK significantly improved **progression free survival** vs. placebo, reducing the risk of progression or death by **85%**

(median PFS of 6.3 months vs. 1.0 month; HR=0.15, 95% CI (0.09-0.25), $P<0.0001$)



QINLOCK showed a clinically meaningful benefit in **overall survival** vs. placebo, reducing the risk of death by **64%**

(median OS of 15.1 months vs. 6.6 months; HR=0.36, 95% CI (0.21-0.62))



Key secondary endpoint of objective response rate was 9.4% compared with 0% for placebo ($P=0.0504$)

QINLOCK™: Safety Highlights from the Prescribing Information

Most Common Adverse Reactions (≥20%; Any Grade)

- Alopecia, fatigue, nausea, abdominal pain, constipation, myalgia, diarrhea, decreased appetite, palmar-plantar erythrodysesthesia syndrome, and vomiting

Warnings and Precautions

- Palmar-plantar erythrodysesthesia syndrome
- New primary cutaneous malignancies
- Hypertension
- Cardiac dysfunction
- Risk of impaired wound healing
- Embryo-fetal toxicity

Dose Modifications from INVICTUS Phase 3 Study⁽¹⁾

Any adverse reaction leading to...	RIPRETINIB (n=85)	PLACEBO (n=43) ⁽²⁾
Treatment discontinuation	7 (8%)	5 (12%)
Dose interruption	20 (24%)	9 (21%)
Dose reduction	6 (7%)	1 (2%)

Significant Unmet Medical Need Post-Imatinib

Estimated Incidence of GIST: U.S. 4,000-6,000⁽¹⁾

2nd Line Treatment: Sunitinib

- mPFS=5.6 months; HR=0.33⁽²⁾
- mOS=17.0 months; HR=0.83⁽³⁾

3rd Line Treatment: Regorafenib

- mPFS=4.8 months; HR=0.27⁽⁴⁾
- mOS=17.4 months; HR=0.91⁽⁴⁾

4th Line Treatment:

QINLOCK[™]

- mPFS: 6.3 months; HR=0.15⁽⁵⁾
- mOS=15.1 months; HR=0.36⁽⁵⁾



Avapritinib is approved in the U.S. for GIST patients with PDGFRA exon 18 mutations only, which are harbored by an estimated ~6% of patients with newly diagnosed GIST.

QINLOCK™: 4 Strategic Objectives For Launch

1	Educate and raise awareness	<ul style="list-style-type: none">• Extensive mutational heterogeneity drives resistance to established therapies
2	Differentiate QINLOCK™	<ul style="list-style-type: none">• Novel switch control mechanism of action• Potent inhibition of broad spectrum of mutations in vitro• Potentially practice-changing efficacy• Favorable tolerability with low dose modifications due to AEs
3	Reach and impact GIST prescribers	<ul style="list-style-type: none">• Academic centers of excellence• Community practices
4	Optimize patient access	<ul style="list-style-type: none">• Deciphera AccessPoint™• Comprehensive patient support programs and resources

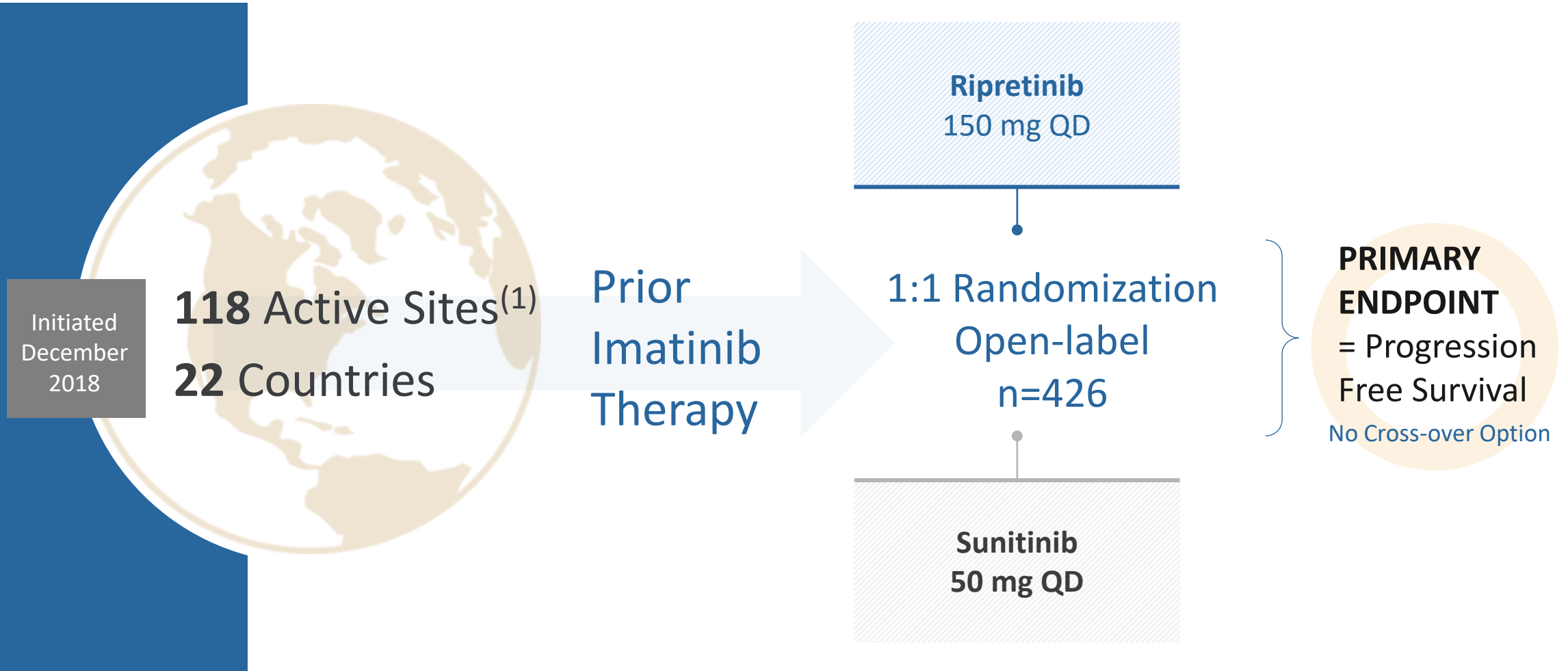
QINLOCK™: Phase 1 GIST Cohorts

Positive Updated Results Across All Lines of Treatment

Line of Therapy ⁽¹⁾	2 nd Line (n=31)	3 rd Line (n=28)	≥4 th Line (n=83)
Median Progression Free Survival	46 weeks	36 weeks	24 weeks
Objective Response Rate (confirmed responses only)	19%	14%	7%
Median Duration of Response	80 weeks	NE	76 weeks
Mean Treatment Duration ⁽²⁾	56 weeks	58 weeks	45 weeks

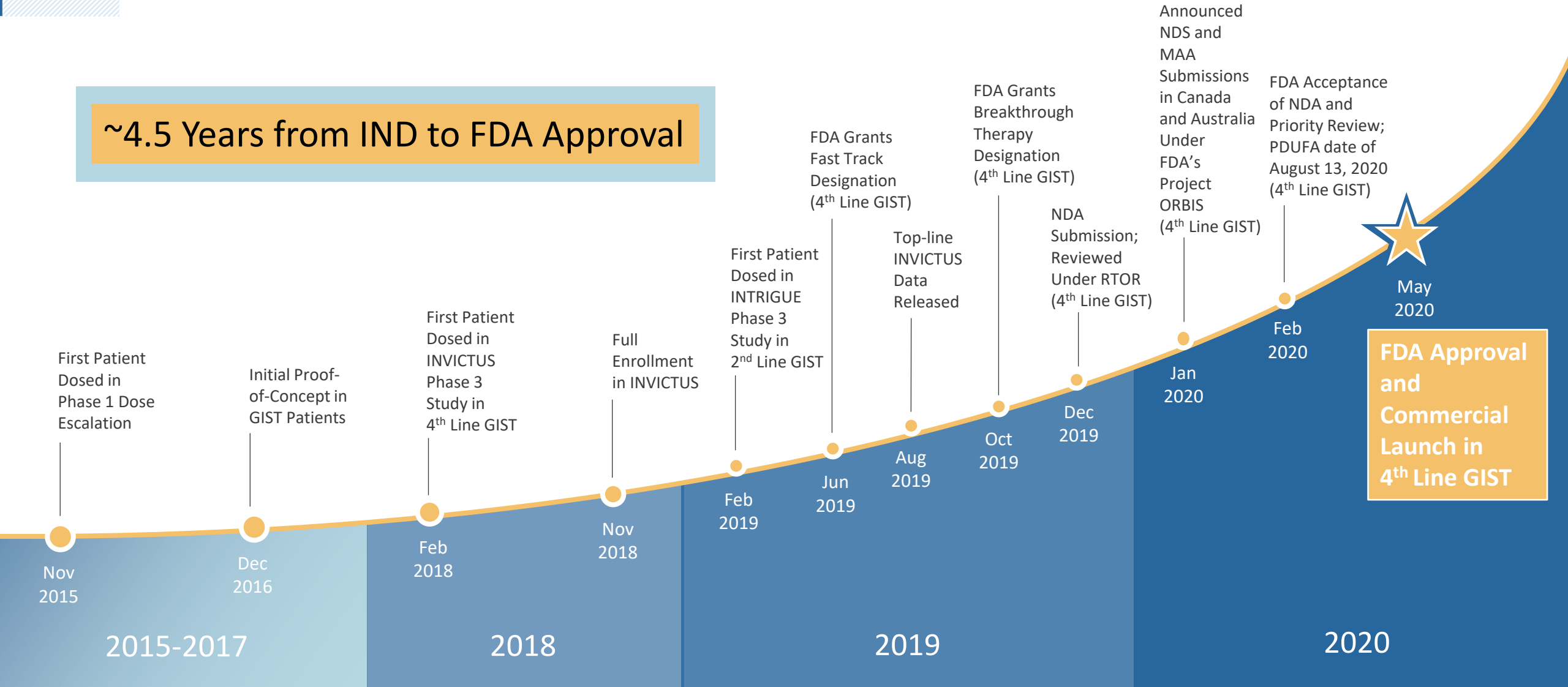
Ripretinib 150 mg QD (n=142)

intrigue > Ongoing Global Pivotal Phase 3 Study in 2nd Line GIST



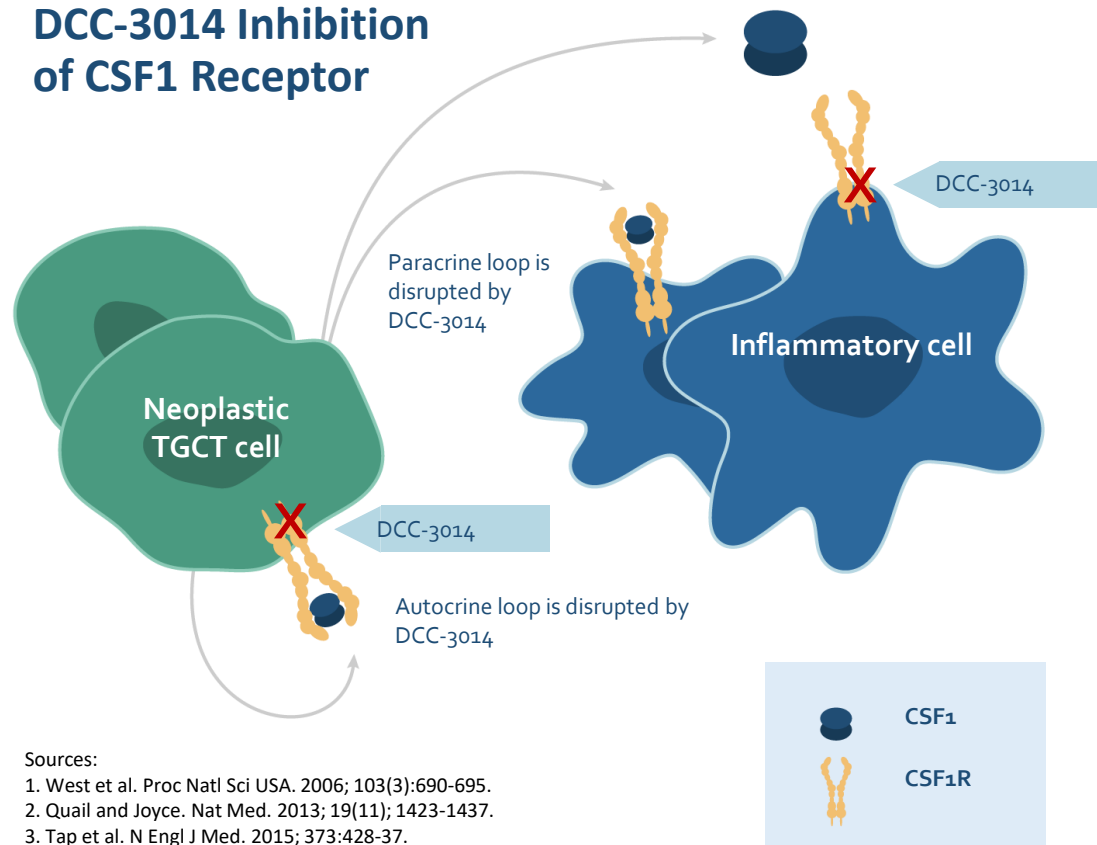
QINLOCK™: Rapid Clinical Development to Approval

~4.5 Years from IND to FDA Approval



DCC-3014: A Highly Selective and Potent CSF1R Inhibitor

DCC-3014 Inhibition of CSF1 Receptor

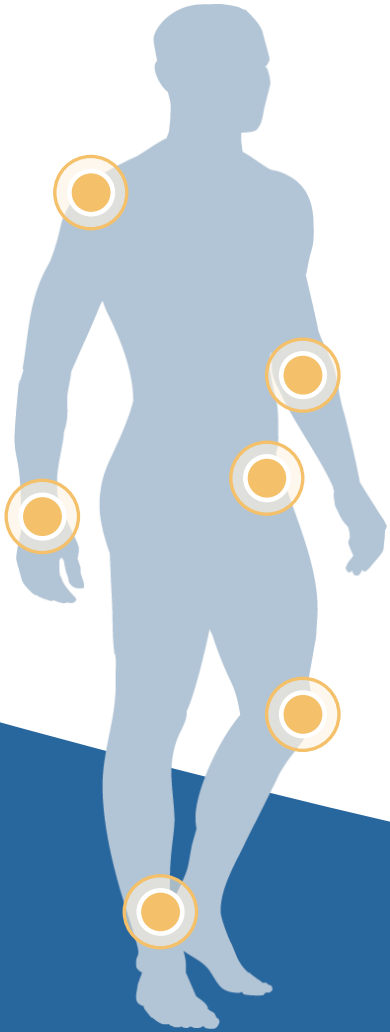


Sources:

1. West et al. Proc Natl Sci USA. 2006; 103(3):690-695.
2. Quail and Joyce. Nat Med. 2013; 19(11); 1423-1437.
3. Tap et al. N Engl J Med. 2015; 373:428-37.
4. Cannarile et al. J Immunother Cancer. 2017; 5(1): 53.

- Phase 1 dose escalation study ongoing
- Generally well tolerated in patients at doses of up to 50 mg receiving three-day loading, followed by 20 mg QD maintenance regimen
- Initial proof-of-concept in three patients with diffuse-type tenosynovial giant cell tumor (TGCT) with preliminary anti-tumor activity
 - Potential for favorable tolerability profile when considering challenges of existing approved therapy

Unmet Medical Need in Tenosynovial Giant Cell Tumor (TGCT)



Symptoms

- Rare, locally aggressive tumors
- Genetic translocation causes overproduction of CSF-1, triggering migration of inflammatory cells to tumor sites

Two Types of TGCT

1. Localized TGCT

- Affects fingers, toes, knee, wrist and ankle
- Annual incidence of new cases in the U.S.: ~13,000⁽¹⁾

2. Diffuse TGCT

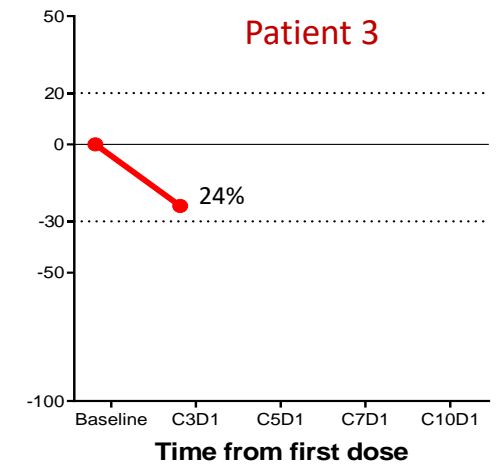
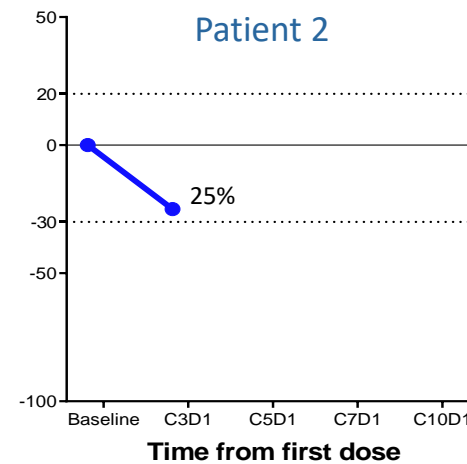
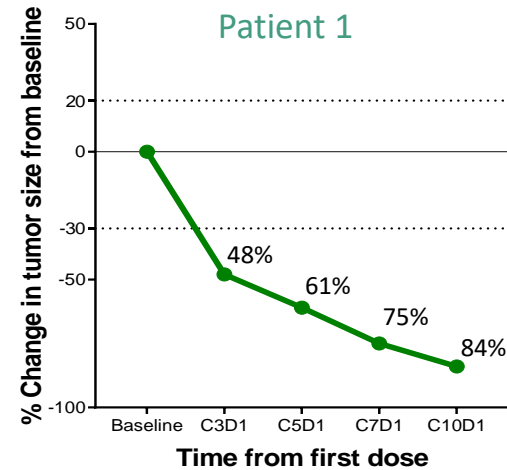
- Most commonly affects the knee, as well as hip, ankle, elbow and shoulder
- Annual incidence of new cases in the U.S.: ~1,300⁽¹⁾

Unmet Medical Need

- Surgical resection is standard treatment
- High rate of recurrence in diffuse TGCT
- CSF1R inhibition has demonstrated clinical benefit in diffuse TGCT
- Pexidartinib received FDA approval in August 2019
 - REMS and intensive monitoring required due to hepatotoxicity concerns (off-target)
- Unmet medical need for effective CSF1R inhibitor with favorable safety/tolerability profile for TGCT patients

DCC-3014: Preliminary Phase 1 Data in Initial TGCT Patients

Clinical Proof-of-Concept
in TGCT Patients



Changes from baseline in tumor size assessed by investigator per RECIST version 1.1

DCC-3014 was generally well tolerated in initial three patients with diffuse-type TGCT

No grade ≥ 3 TEAEs observed

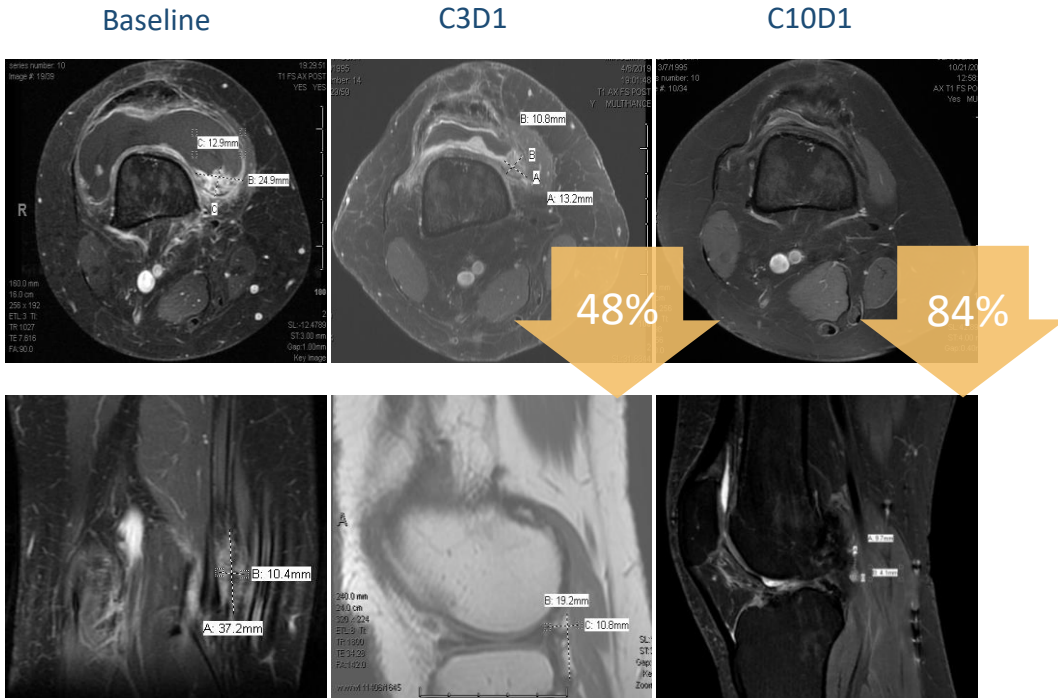
Preliminary anti-tumor activity and symptomatic improvement

Symptomatic improvements in mobility and reduced pain were observed in all three patients based on investigator notes

Dose-escalation evaluation is ongoing to determine the recommended Phase 2 dose

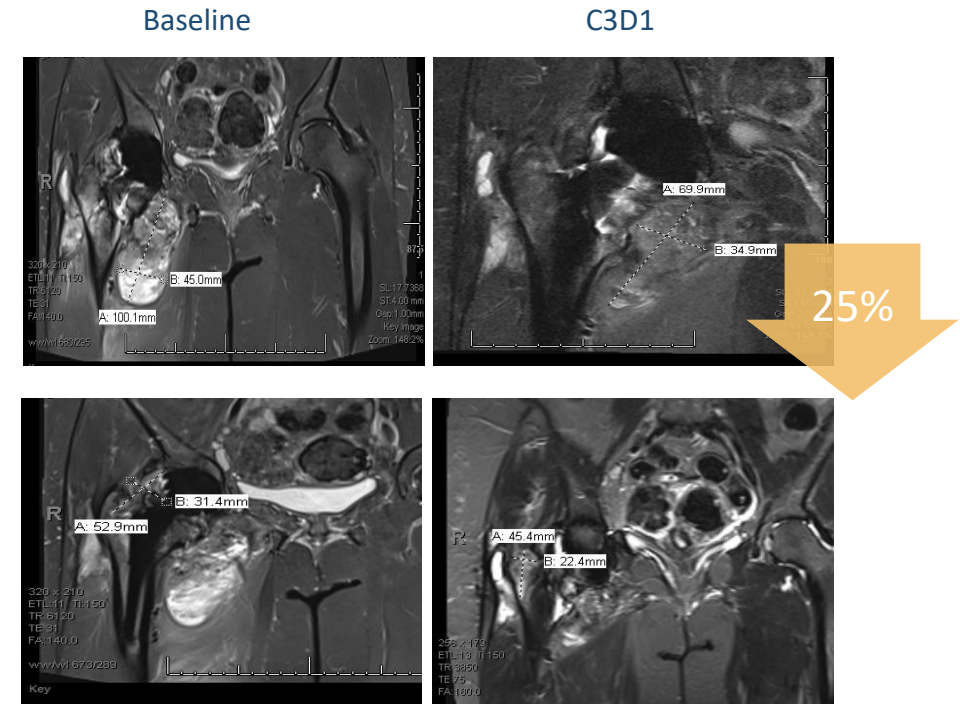
DCC-3014: TGCT Case Studies from the Phase 1

Patient 1



- 24-year-old female patient diagnosed with diffuse-type TGCT (right posterior knee) in June 2016, three prior surgeries, and recurrence/progression on MRI by December 2018
- Active in Cycle 10 as of data cut-off

Patient 2

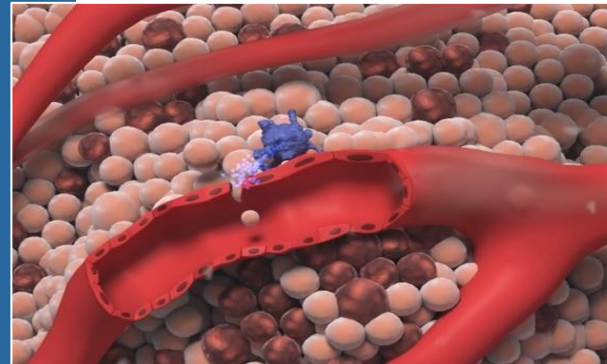


- 57-year-old female patient diagnosed with diffuse-type TGCT (right hip) in 2014, six prior surgeries, and recurrent disease on MRI by February 2019
- Active in Cycle 5 as of data cut-off

Rebastinib: A Highly Potent and Selective TIE2 Inhibitor

Potential Benefits in Combination with Chemotherapy

- Chemotherapy leads to recruitment of pro-tumoral M2 macrophages from the bone marrow
- M2 macrophages serve as pumps for tumor cell intravasation and metastasis
- Rebastinib is designed to inhibit chemotherapy-induced recruitment of M2 macrophages to tumors
- Rebastinib is designed to block rebound angiogenesis and inhibit M2 macrophages



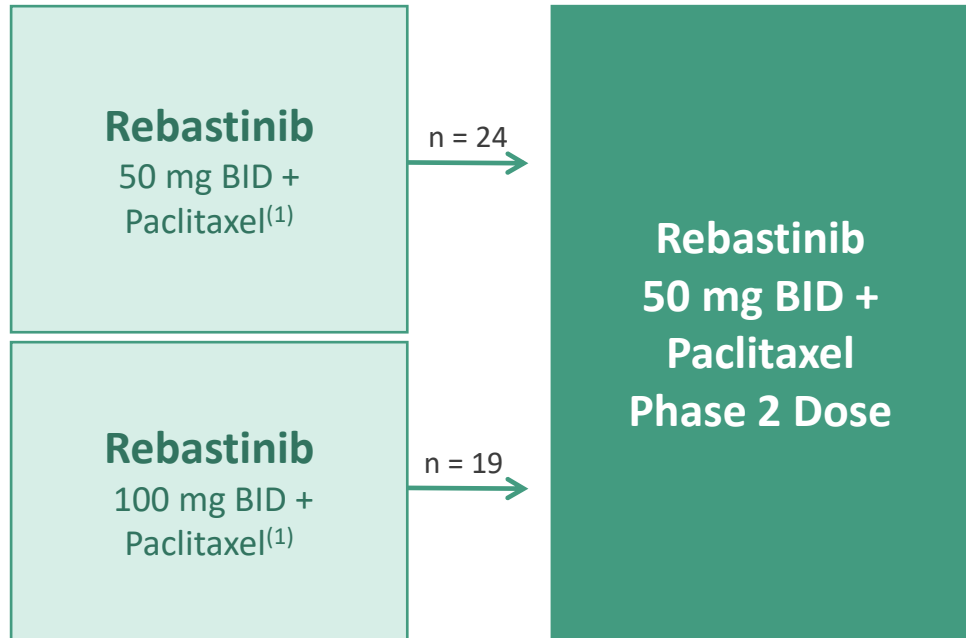
- Potent, small molecule inhibitor of TIE2
- Targets TIE2 expressing macrophages (TEMs) and endothelial cells in tumor environment
- Combination of rebastinib with chemotherapy may increase tumor killing through multiple mechanisms
 - Tumor vascularization, dissemination, metastasis, immunotolerance

Development status

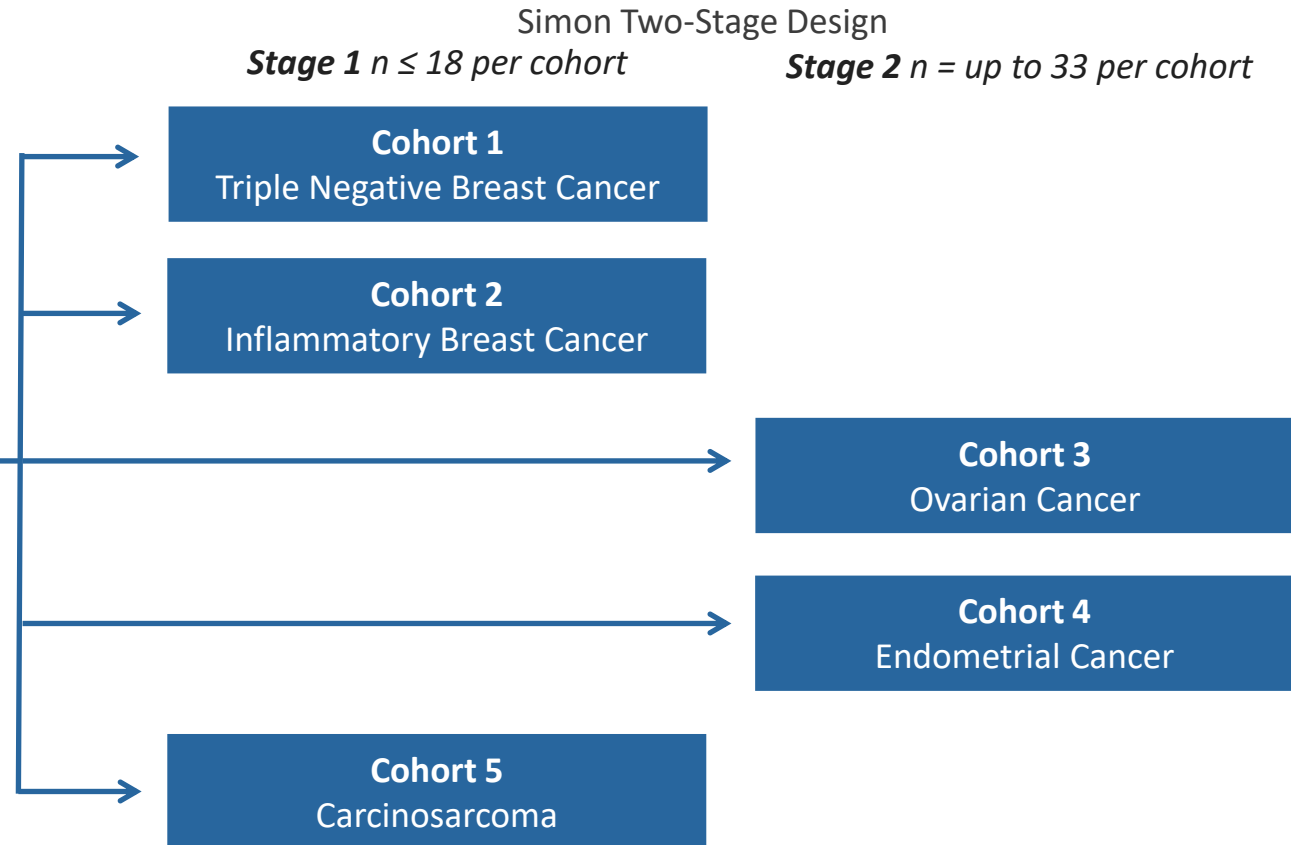
- Two ongoing studies in combination with paclitaxel or carboplatin
- Encouraging preliminary results from Part 1 of the Phase 1b/2 study in combination with paclitaxel presented in October 2019
- Selected Phase 2 dose and activated Part 2 of the Phase 1b/2 study in combination with carboplatin in January 2020

Rebastinib: Phase 1b/2 Study in Combination with Paclitaxel

Part 1

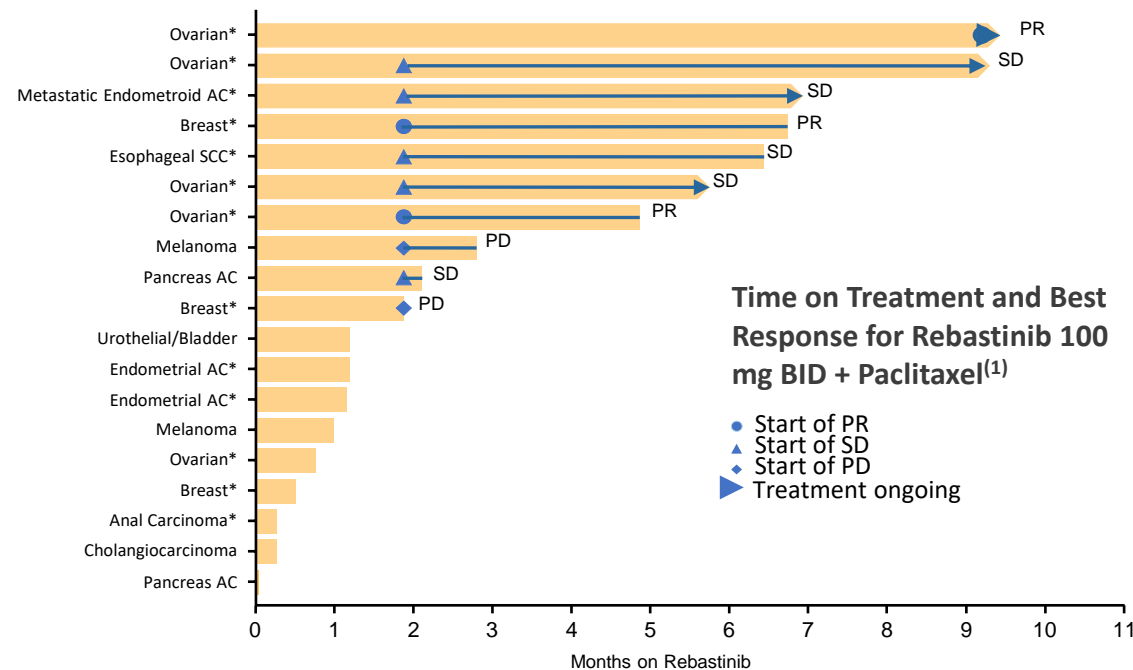
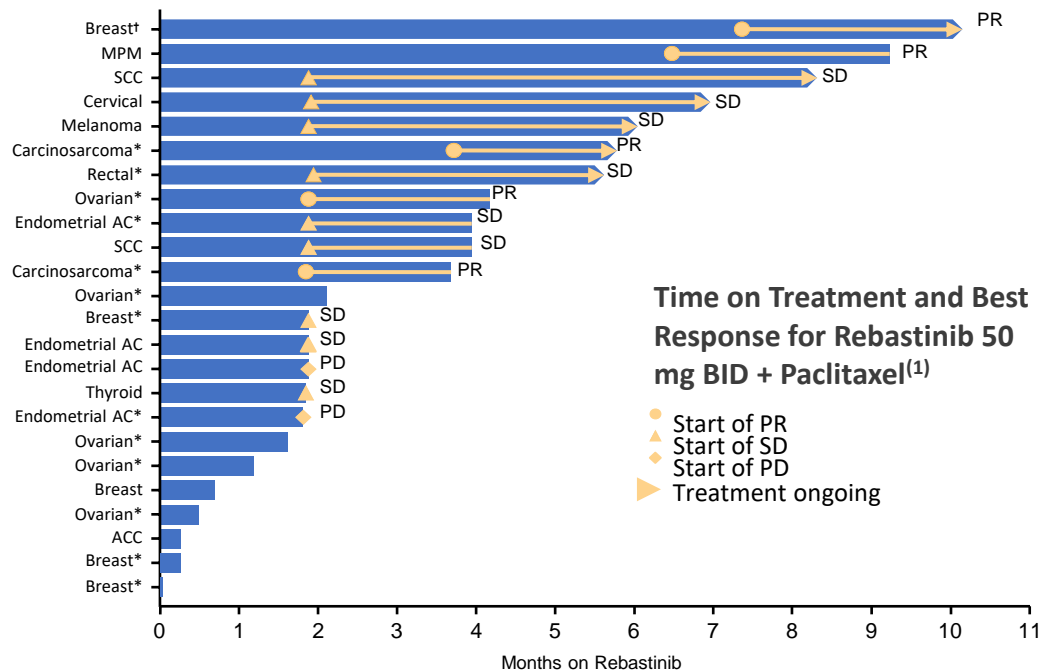


Part 2

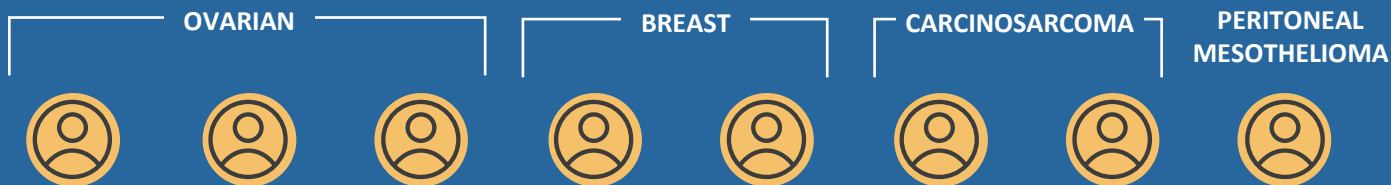


If >4 responses in Stage 1, enroll additional patients in Stage 2 (up to 33 per cohort)
If ≤4 responses, discontinue the cohort

Rebastinib: Part 1 of Phase 1b/2 Study in Combination with Paclitaxel Shows Encouraging Preliminary Anti-tumor Activity



Objective responses



Rebastinib: Part 1 Data of the Phase 1b/2 Study Showed the Combination with Paclitaxel Was Generally Well Tolerated

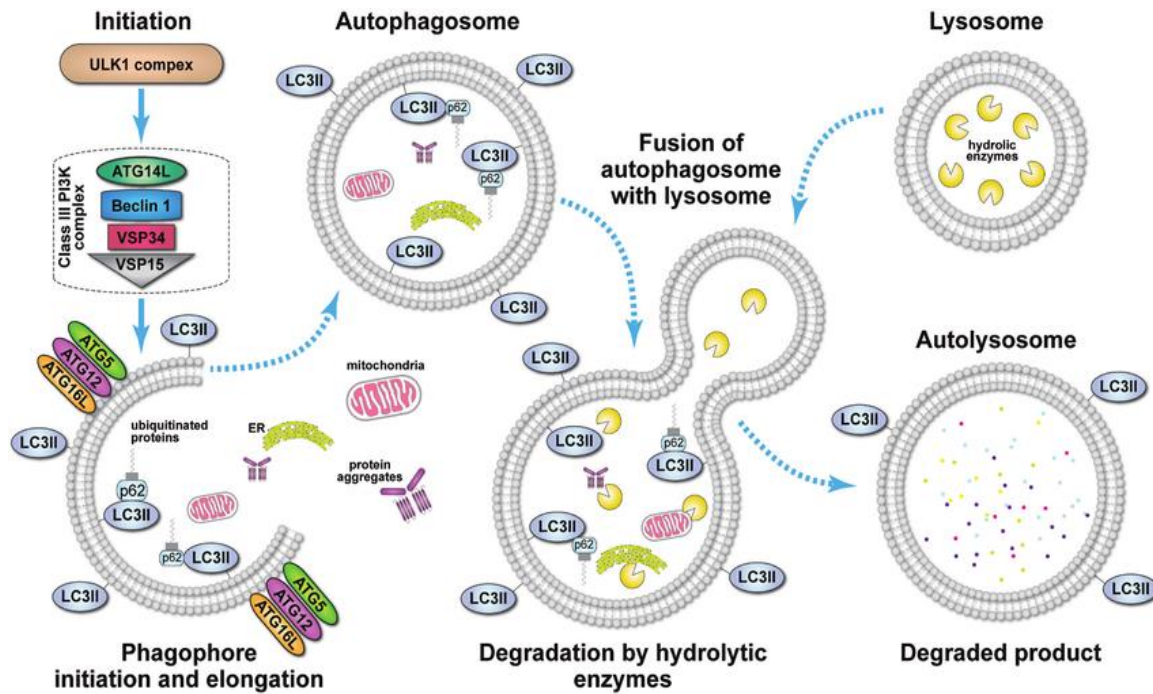
TEAEs ≥ 10% regardless of relatedness

Preferred Term	50 mg BID (n=24)		100 mg BID (n= 19)		Total (n=43)	
	Any grade	Grade ≥ 3	Any grade	Grade ≥ 3	Any grade	Grade ≥ 3
Fatigue	8 (33%)	1 (4%)	5 (26%)	0	13 (30%)	1 (2%)
Constipation	3 (13%)	0	6 (32%)	0	9 (21%)	0
Diarrhea	2 (8%)	0	7 (37%)	0	9 (21%)	0
Dry mouth	6 (25%)	0	3 (16%)	0	9 (21%)	0
Alopecia	4 (17%)	0	4 (21%)	0	8 (19%)	0
Anemia	4 (17%)	2 (8%)	4 (21%)	2 (11%)	8 (19%)	4 (9%)
Dyspnea	4 (17%)	0	4 (21%)	0	8 (19%)	0
Nausea	6 (25%)	1 (4%)	2 (11%)	0	8 (19%)	1 (2%)
Peripheral sensory neuropathy	2 (8%)	0	6 (32%)	0	8 (19%)	0
Dizziness	3 (13%)	0	4 (21%)	0	7 (16%)	0
Hypokalemia	4 (17%)	1 (4%)	3 (16%)	0	7 (16%)	1 (2%)
Urinary tract infection	3 (13%)	1 (4%)	4 (21%)	0	7 (16%)	1 (2%)
Hypomagnesemia	3 (13%)	0	3 (16%)	0	6 (14%)	0
Onychomadesis	3 (13%)	0	3 (16%)	0	6 (14%)	0
Sepsis	2 (8%)	2 (8%)	4 (21%)	4 (21%)	6 (14%)	6 (14%)
ALT increased	5 (21%)	0	0	0	5 (12%)	0
Decreased appetite	3 (13%)	0	2 (11%)	0	5 (12%)	0
Dysgeusia	3 (13%)	0	2 (11%)	0	5 (12%)	0
Headache	1 (4%)	1 (4%)	4 (21%)	0	5 (12%)	1 (2%)
Rash	3 (13%)	0	2 (11%)	0	5 (12%)	0
Stomatitis	4 (17%)	1 (4%)	1 (5%)	0	5 (12%)	1 (2%)
Vomiting	4 (17%)	1 (4%)	1 (5%)	0	5 (12%)	1 (2%)

- Frequencies of TEAEs were similar between 50 mg and 100 mg BID
- One patient experienced a rebastinib-related SAE (grade 2 muscular weakness) and 4 patients had an SAE related to paclitaxel and rebastinib (5 events: grade 3 pneumonia [n=2], grade 3 nausea [n=1], grade 3 vomiting [n=1], and grade 2 myocardial ischemia [n=1])
- Two patients experienced muscular weakness (one grade 1 at 50 mg BID and remains on treatment, and one grade 2 at 100 mg BID and discontinued treatment)

DCC-3116 is a Potent & Selective ULK Inhibitor Designed to Inhibit Autophagy

ULK: Initiating Factor for Autophagy



Adapted from: Ndoye A and Weeraratna AT. Autophagy- An emerging target for melanoma therapy [version 1]. F1000Research 2016, 5:1888.



First-in-class opportunity for new therapeutic in RAS mutant cancers

- RAS mutant cancers have high basal levels of autophagy
- DCC-3116 observed preclinically to durably and potently inhibit autophagy in RAS mutant cancer cell lines through the inhibition of ULK kinase
- Combination of DCC-3116 and MAPK pathway inhibitors have been observed to synergize to block RAS mutant cancers *in vivo*



Highly potent and selective (IC_{50} at 1 mM ATP)

- ULK1 4.7 nM and ULK2 35 nM
- No off-target kinases within 30-fold of ULK1/ 5 kinases within 100-fold of ULK1

Designed to avoid CNS exposure

IND submission expected in 2H 2020

Financial Highlights

As of March 31, 2020

Shares
Outstanding

55.7 MM (basic)
63.4 MM (fully-diluted)

Cash Expected to Fund Operating
Expenses and CapEx into the Second
Half of 2022

Cash, Cash
Equivalents
& Marketable
Securities

\$692 MM

Significant Expected 2020 Milestones Across the Pipeline



DCC-3014

Rebastinib

DCC-3116

- FDA approval and U.S. commercial launch in 4th line GIST (2Q20)
- Submit EU Marketing Authorization Application to EMA (2H20)
- Complete enrollment in the INTRIGUE Phase 3 study in 2nd line GIST (2H20)
- Present Phase 1 study expansion data (2H20)

- Select Phase 2 dose for TGCT and initiate the expansion portion of study (2H20)
- Update Phase 1 data in TGCT patients (2H20)

- Select Phase 2 dose and activate Part 2 of Phase 1b/2 study in combination with carboplatin (1Q20)
- Present Phase 1b/2 data in combination with paclitaxel (2Q20)
- Present Phase 1b/2 data in combination with carboplatin (2H20)

- Submit IND application to FDA (2H20)

THANK YOU

