PRECISION THAT MOVES™
Staying one step ahead of disease

October 5, 2020

Linnea, living with lung cancer

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Forward-looking statements

This presentation contains forward-looking statements as defined in the Private Securities Litigation Reform Act of 1995, as amended. The words "aim," "may," "will," "could," "would," "should," "expect," "plan," "anticipate," "intend," "believe," "estimate," "predict," "project," "potential," "continue," "target" and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. In this presentation, forward-looking statements include, without limitation, statements regarding the plans, strategies, timelines and expectations of Blueprint Medicines Corporation (the "Company") for the preclinical and clinical development and commercialization of AYVAKIT™ (avapritinib), GAVRETO™ (pralsetinib) and other current or future drug candidates; plans, timing, design, initiation, enrollment, expectations and announcement of results for the Company's ongoing and planned clinical trials; plans and timelines for additional marketing applications for avapritinib and pralsetinib and, if approved, commercializing avapritinib and pralsetinib in additional geographies or for additional indications; the potential benefits of any of the Company's current or future approved drugs or drug candidates in treating patients; the potential benefits of the Company's collaboration with Roche and Genentech for pralsetinib, including anticipated milestone payments and other financial terms of the collaboration agreement; expectations regarding the Company's existing, cash, cash equivalents and investments; and the Company's strategy, goals and anticipated milestones, business plans and focus.

The Company has based these forward-looking statements on management's current expectations, assumptions, estimates and projections. While the Company believes these expectations, assumptions, estimates and projections are reasonable, such forward-looking statements are only predictions and involve known and unknown risks, uncertainties and other important factors, many of which are beyond the Company's control and may cause actual results, performance or achievements to differ materially from those expressed or implied by any forward-looking statements. These risks and uncertainties include, without limitation, risks and uncertainties related to the impact of the COVID-19 pandemic to the Company's business, operations, strategy, goals and anticipated milestones, including the Company's ongoing and planned research and discovery activities, ability to conduct ongoing and planned clinical trials, clinical supply of current or future drug candidates, commercial supply of AYVAKIT, GAVRETO or future approved drugs, and launching, marketing and selling AYVAKIT, GAVRETO or future approved drugs; the delay of any current or planned clinical trials or the development of the Company's drug candidates or any licensed drug candidate; the Company's advancement of multiple early-stage efforts; the Company's ability to successfully demonstrate the efficacy and safety of its drug candidates and gain approval of its drug candidates on a timely basis, if at all; the preclinical and clinical results for the Company's drug candidates, which may not support further development of such drug candidates; actions or decisions of regulatory agencies or authorities, which may affect the initiation, timing and progress of clinical trials or marketing applications; the Company's ability to obtain, maintain and enforce patent and other intellectual property protection for AYVAKIT, GAVRETO or any drug candidates it is developing; the Company's ability and plans for maintaining a commercial infrastructure, and successfully launching, marketing and selling AYVAKIT, GAVRETO or future approved drugs; the Company's ability to develop and commercialize companion diagnostic tests for AYVAKIT, GAVRETO or any of the Company's future approved drugs or drug candidates; and the success of the Company's current and future collaborations, partnerships and licenses, including the Company's global collaboration with Roche for the development and commercialization of pralsetinib.

These and other risks and uncertainties are described in greater detail under "Risk Factors" in the Company's filings with the Securities and Exchange Commission ("SEC"), including its most recent Annual Report on Form 10-K, as supplemented by its most recent Quarterly Report on Form 10-Q, and any other filings it has made or may make with the SEC in the future. The Company cannot guarantee future results, outcomes, levels of activity, performance, developments, or achievements, and there can be no assurance that its expectations, intentions, anticipations, beliefs, or projections will result or be achieved or accomplished. The forward-looking statements in this presentation are made only as of the date hereof, and except as required by law, the Company undertakes no obligation to update any forward-looking statements contained in this presentation as a result of new information, future events or otherwise.

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The rapid evolution of Blueprint Medicines

<table>
<thead>
<tr>
<th>IMAGINING A NEW PLATFORM</th>
<th>BUILDING THE PIPELINE</th>
<th>REALIZING THE VISION</th>
</tr>
</thead>
</table>

HIGHLY SELECTIVE KINASE MEDICINE DISCOVERY PLATFORM

RAPID CLINICAL PROOF-OF-CONCEPT ACROSS MULTIPLE PROGRAMS

Avapritinib in advanced systemic mastocytosis: change in serum tryptase


Not for promotional use.
### Clinical Development Portfolio

<table>
<thead>
<tr>
<th>DISCOVERY</th>
<th>EARLY-STAGE DEVELOPMENT</th>
<th>LATE-STAGE DEVELOPMENT</th>
<th>REGULATORY SUBMISSION</th>
<th>APPROVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avapritinib (PDGFRA &amp; KIT)</td>
<td>PDGFRA GIST(^1,2,3)</td>
<td>Advanced SM(^2)</td>
<td>NDA</td>
<td>U.S. &amp; EU</td>
</tr>
<tr>
<td>Pralsetinib (RET)</td>
<td>RET+ NSCLC(^1,2,4,6)</td>
<td>EGFR+ NSCLC (+osimertinib)(^1,2,4)</td>
<td>RET+ MTC(^1,2,4)</td>
<td>RET+ thyroid cancer(^1,2,4)</td>
</tr>
<tr>
<td>Fisogatinib (FGFR4)</td>
<td>Advanced HCC(^2)</td>
<td>Advanced HCC (+CS1001)(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLU-263 (KIT)</td>
<td>Indolent SM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BLU-945 (EGFR+ triple mutant)</td>
<td>EGFR+ NSCLC(^1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(EGFR+ double mutant)</td>
<td>EGFR+ NSCLC(^1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2 undisclosed targets)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(MAP4K1)(^6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3 undisclosed immunokinase targets)(^6)</td>
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</tr>
</tbody>
</table>

**Notes:**

1. Unresectable or metastatic disease.
2. CStone Pharmaceuticals has exclusive rights to develop and commercialize avapritinib, pralsetinib and fsgatinib in Mainland China, Hong Kong, Macau and Taiwan. 3. Approved in the U.S. for the treatment of adults with unresectable or metastatic GIST harboring a PDGFRA exon 18 mutation, including PDGFRA D842V mutations. Received conditional marketing authorization in Europe for the treatment of adults with unresectable or metastatic GIST harboring the PDGFRA D842V mutation. 4. In collaboration with Roche, Blueprint Medicines and Roche have co-exclusive rights to develop and commercialize pralsetinib in the U.S. and Roche has exclusive rights to develop and commercialize pralsetinib outside the U.S., excluding the CStone territory. 5. Received accelerated approval in the U.S. for the treatment of adults with metastatic RET fusion-positive NSCLC. Continued approval may be contingent on a confirmatory trial. The proposed indication for the MAA is locally advanced or metastatic RET fusion-positive NSCLC previously treated with platinum-based chemotherapy. 6. In collaboration with Roche, Blueprint Medicines has U.S. commercial rights for up to two programs. Roche has worldwide commercialization rights for up to two programs and six U.S. commercialization rights for up to two programs. GIST, gastrointestinal stromal tumors; HCC, hepatocellular carcinoma; MAA, marketing authorization application; MTC, medullary thyroid cancer; NDA, new drug application; NSCLC, non-small cell lung cancer; SM, systemic mastocytosis.

**Updated as of September 25, 2020.**
**Pralsetinib: a precision therapy for RET-altered cancers**

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<table>
<thead>
<tr>
<th>RET+ NSCLC</th>
<th>APPROVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RET+ thyroid cancer</td>
<td>NDA accepted</td>
</tr>
<tr>
<td>Other RET+ solid tumors</td>
<td></td>
</tr>
</tbody>
</table>

**PRALSETINIB**

POTENT AND HIGHLY SELECTIVE RET INHIBITOR
GAVRETO is indicated for the treatment of adult patients with metastatic RET fusion-positive non-small cell lung cancer (NSCLC) as detected by an FDA approved test.

This indication is approved under accelerated approval based on overall response rate and duration of response. Continued approval for this indication may be contingent upon verification and description of clinical benefit in a confirmatory trial. FDA, U.S. Food and Drug Administration; RET, rearranged during transfection.

GAVRETO is a precision therapy that can transform NSCLC patients’ lives now approved in the United States.

- Selective and potent mechanism of action inhibiting RET fusions and mutations
- Deep and durable responses regardless of patient baseline characteristics
- Predictable and manageable safety profile that is familiar to oncologists
- Once-daily dosing format that optimizes adherence and ease of dose modification

GAVRETO is indicated for the treatment of adult patients with metastatic RET fusion-positive non-small cell lung cancer (NSCLC) as detected by an FDA approved test. This indication is approved under accelerated approval based on overall response rate and duration of response. Continued approval for this indication may be contingent upon verification and description of clinical benefit in a confirmatory trial. FDA, U.S. Food and Drug Administration; RET, rearranged during transfection.

Not for promotional use.
Accelerated approval of GAVRETO based on Phase 1/2 ARROW trial in patients with RET fusion+ NSCLC

<table>
<thead>
<tr>
<th>EFFICACY PARAMETER</th>
<th>TREATMENT NAÏVE (N=27)</th>
<th>PRIOR PLATINUM (N=87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall response rate (95% confidence interval)</td>
<td>70% (50%, 86%)</td>
<td>57% (46%, 68%)</td>
</tr>
<tr>
<td>Complete response</td>
<td>11%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Partial response</td>
<td>59%</td>
<td>52%</td>
</tr>
<tr>
<td>Duration of response</td>
<td>n=19</td>
<td>N=50</td>
</tr>
<tr>
<td>Median in months (range)</td>
<td>9 (6.3, NE)</td>
<td>NE (15.2, NE)</td>
</tr>
<tr>
<td>Patients with DOR ≥ 6-mo (%)</td>
<td>58%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Full prescribing information is available at [www.GAVRETO.com](http://www.GAVRETO.com), DOR, duration of response; NE, not evaluable.

Not for promotional use.
Safety highlights from GAVRETO prescribing information

MOST COMMON ADVERSE REACTIONS (≥25%; ANY GRADE):¹

- Fatigue, constipation, musculoskeletal pain and hypertension

MOST COMMON LABORATORY ABNORMALITIES (≥2%; GRADE 3-4):¹

- Decreased lymphocytes, decreased neutrophils, decreased phosphate, decreased hemoglobin, decreased sodium, decreased calcium (corrected) and increased alanine aminotransferase (ALT)

WARNINGS AND PRECAUTIONS:

- Interstitial Lung Disease (ILD)/Pneumonitis
- Hypertension
- Hepatotoxicity
- Hemorrhagic Events
- Risk of Impaired Wound Healing
- Embryo-Fetal Toxicity

Important safety information and full prescribing information are available at www.GAVRETO.com. ¹ Adverse reactions in 220 patients with metastatic RET fusion-positive NSCLC who received GAVRETO at 400 mg orally once daily.

Not for promotional use.
High response rates in treatment-naïve NSCLC populations consistent with real-world patients

OVERALL RESPONSE RATE

88%

Eligible for standard therapy (n=32)

TREATMENT-NAÏVE PATIENTS

Target population for actively enrolling AcceleRET Lung Phase 3 trial in treatment-naïve NSCLC

TUMOR SHRINKAGE PER INVESTIGATOR ASSESSMENTS

Maximum Reduction - Sum of Diameter Change from Baseline, %

0 10 20 30

PR

SD

PD

Patient


Not for promotional use.
Robust clinical activity in MTC patients regardless of prior therapy

Tumor shrinkage in 99% of patients regardless of prior therapy


Not for promotional use.
Prolonged duration of response in patients with previously treated MTC


DURATION OF RESPONSE PER CENTRAL RADIOLOGY

Median DOR
(95% CI: NE-NE)

6-month DOR
96%

# at risk:
31 28 20 17 7 3 2 1 0

Duration of response (%)

Months from first documented response

Prior Cabo./Vand. Treatment
Censored


Not for promotional use.
Deep and durable responses in patients with RET fusion+ thyroid cancer

TUMOR SHRINKAGE PER CENTRAL RADIOLOGY

RET FUSION+ THYROID CANCER
ALL DOSES (N=11)

91% (95% CI: 59-100%)

100%

6-month DOR

10/11 PATIENTS PREVIOUSLY TREATED WITH SYSTEMIC THERAPY


Not for promotional use.
Blueprint Medicines and Roche: a transformative partnership for pralsetinib

STRATEGIC IMPERATIVES

1. Bring pralsetinib faster to more patients globally

2. Continue to build best-in-class precision medicine capabilities

3. Transform Blueprint Medicines with path to financial independence

COLLABORATION STRUCTURE & IMPACT

• Co-commercialize pralsetinib in the U.S., equally sharing responsibilities, profits and losses

• Roche granted exclusive license to commercialize pralsetinib outside of the U.S., excluding Greater China¹

• Co-develop pralsetinib globally, expanding into new treatment settings

• Explore co-development of a next-generation selective RET inhibitor

• Reduce reliance on capital markets to finance company

• Expand investment in systemic mastocytosis and pipeline programs

1. Greater China comprises Mainland China, Hong Kong, Macau and Taiwan.

Not for promotional use.
Summary of financial terms

2ND LARGEST BIOPHARMACEUTICAL COLLABORATION IN 2020 TO DATE\(^1\)

<table>
<thead>
<tr>
<th><strong>UPFRONT</strong></th>
<th>$775M, with $675M in cash and $100M equity investment at $96.57 per share</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MILESTONES</strong></td>
<td>Up to $927M in contingent payments, with approximately $90M in potential near-term milestones(^2)</td>
</tr>
<tr>
<td><strong>ROYALTIES</strong></td>
<td>Tiered high-teens to mid-twenties on aggregate net sales outside U.S.</td>
</tr>
<tr>
<td><strong>U.S. P&amp;L</strong></td>
<td>Companies to equally share profits and losses</td>
</tr>
<tr>
<td><strong>DEVELOPMENT</strong></td>
<td>Costs shared 45% Blueprint / 55% Roche up to pre-specified limit, then % reduction for Blueprint</td>
</tr>
</tbody>
</table>

1. Based on upfront payment. Source: company information, third party press releases and SEC filings. 2. Blueprint Medicines will receive $40.0 million in specified regulatory and commercialization milestones under the Roche collaboration as a result of FDA approval of GAVRETO (pralsetinib).

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Avapritinib: a precision therapy with broad potential

**LATE CLINICAL DEVELOPMENT**

**PDGFRA exon 18 mutant GIST**

**APPROVED**

**Advanced SM**

**Q4 2020**

**Indolent and smoldering SM**

**U.S. REGULATORY SUBMISSION STATUS**

**AVAPRITINIB**

POTENT AND HIGHLY SELECTIVE KIT AND PDGFRA INHIBITOR

Received European Commission approval for PDGFRA D842V GIST on September 25, 2020

1. Approved in the U.S. for the treatment of adults with unresectable or metastatic GIST harboring a PDGFRA exon 18 mutation, including PDGFRA D842V mutations. Received conditional marketing authorization in Europe for the treatment of adults with unresectable or metastatic GIST harboring the PDGFRA D842V mutation.

* Planned supplemental NDA submission. Kinome illustration reproduced courtesy of Cell Signaling Technology, Inc. (www.cellsignal.com) (CSTI). The foregoing website is maintained by CSTI, and Blueprint Medicines is not responsible for its content. CHMP, EMA Committee for Medicinal Products for Human Use.

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AYVAKIT launch has established a strong foundation for Blueprint Medicines’ commercial execution

- Establish Blueprint Medicines with key centers of excellence
- Drive broad access to therapy quickly
- Support patients to start and stay on therapy
- Strong field engagement to identify new prescribers and drive patient demand

$5.7M in Q2 2020 sales ($9.1M since launch)
Systemic mastocytosis is one disease driven by KIT D816V

Advanced SM

Non-advanced SM
(Indolent and smoldering)

Debilitating symptoms

Significant organ involvement

Requirement of high intensity treatment

Requirement for life-long chronic treatment

~75,000 patients in major markets

Patient numbers in major markets based on estimated prevalence for advanced, indolent and smoldering systemic mastocytosis in the US, EU5 and Japan.

Not for promotional use.
Significant initial target patient population with additional growth potential

~75,000 Patients in major markets

Estimated prevalence:
- ~5% advanced SM
- ~95% non-advanced SM

~1/3 Diagnosed
~1/3 Cutaneous SM
~1/3 Undiagnosed Non-advanced

Estimated addressable patients (extrapolated from U.S. claims data and market research analyses)

Initial opportunity
Growth opportunity
Comprehensive development program designed to support avapritinib registration in advanced systemic mastocytosis

EXPLORER
PHASE 1 TRIAL
AdvSM
Open-label
N= ~80
DOSE ESCALATION
30-400 mg QD
300 mg QD
200 mg QD
EXPANSION

PATHFINDER
PHASE 2 TRIAL
AdvSM
Open-label
N= ~100
200 mg QD


Not for promotional use.
Planned avapritinib sNDA submission for advanced SM to include pooled data from the EXPLORER and PATHFINDER trials

<table>
<thead>
<tr>
<th></th>
<th>EXPLORER</th>
<th>PATHFINDER</th>
<th>POOLED GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolled</td>
<td>86 patients</td>
<td>62 patients</td>
<td>81 patients</td>
</tr>
<tr>
<td>200 mg QD mIWG evaluable</td>
<td>13 patients</td>
<td>31 patients</td>
<td>44 patients</td>
</tr>
<tr>
<td>All doses mIWG evaluable</td>
<td>53 patients</td>
<td>32 patients</td>
<td></td>
</tr>
<tr>
<td>Prior midostaurin</td>
<td>32%</td>
<td>53%</td>
<td></td>
</tr>
</tbody>
</table>

Top-line EXPLORER and PATHFINDER data presented in September 2020. Data cutoff: May 27, 2020 for EXPLORER and June 23, 2020 for PATHFINDER, with response assessments per central review completed in September 2020. sNDA, supplemental NDA.

Not for promotional use.
### Consistently high ORRs and prolonged duration of response across trials

#### EXPLORER

<table>
<thead>
<tr>
<th>Response Metric</th>
<th>ORR (CR+CRh+PR+CI)</th>
<th>CR+CRh</th>
<th>mDOR (months)</th>
<th>mOS (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ORR</strong></td>
<td>75.5% (61.7 - 86.2)</td>
<td>35.8%</td>
<td>38.3 (21.7 - NE)</td>
<td>NE (46.9 - NE)</td>
</tr>
<tr>
<td><strong>CR+CRh</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>mDOR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>mOS</strong></td>
<td></td>
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</table>

**Median follow up:**
- EXPLORER: 27.3 months
- PATHFINDER: 10.4 months

#### PATHFINDER

<table>
<thead>
<tr>
<th>Response Metric</th>
<th>ORR (CR+CRh+PR+CI)</th>
<th>CR+CRh</th>
<th>mDOR (months)</th>
<th>mOS (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ORR</strong></td>
<td>75.0 (56.6 – 88.5)</td>
<td>18.8%</td>
<td>NE (NE - NE)</td>
<td>NE</td>
</tr>
<tr>
<td><strong>CR+CRh</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>mDOR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>mOS</strong></td>
<td></td>
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</tbody>
</table>

**Median follow up:**
- PATHFINDER: 10.4 months

**200 MG QD POOLED GROUP**

<table>
<thead>
<tr>
<th>Response Metric</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ORR</strong></td>
<td>68.2%</td>
</tr>
<tr>
<td><strong>CR+CRh</strong></td>
<td>18.2%</td>
</tr>
</tbody>
</table>

**PATHFINDER interim analysis was positive (p-value=0.0000000016)**

---


CR, complete remission; CRh, CR with partial hematologic recovery; CI, clinical improvement; mDOR, median duration of response; mOS, median overall survival; PR, partial remission.

Not for promotional use.
EXPLORER and PATHFINDER response kinetics are similar, with deepening responses over time with longer-term follow up.


PD, progressive disease; SD, stable disease.

Not for promotional use.
Consistent impact on objective measures of mast cell burden across trials


Not for promotional use.
Avapritinib demonstrated improved tolerability at 200 mg QD

<table>
<thead>
<tr>
<th>Treatment Emergent AEs ≥ 20%, All Grades*</th>
<th>200 mg n=81 (%)</th>
<th>All doses N=148 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral Edema</td>
<td>39 (48.1)</td>
<td>65 (43.9)</td>
</tr>
<tr>
<td>Periorbital Edema</td>
<td>32 (39.5)</td>
<td>81 (54.7)</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>28 (34.6)</td>
<td>55 (37.2)</td>
</tr>
<tr>
<td>Anemia</td>
<td>26 (32.1)</td>
<td>65 (43.9)</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>23 (28.4)</td>
<td>53 (35.8)</td>
</tr>
<tr>
<td>Nausea</td>
<td>20 (24.7)</td>
<td>49 (33.1)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>15 (18.5)</td>
<td>44 (29.7)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>15 (18.5)</td>
<td>42 (28.4)</td>
</tr>
</tbody>
</table>

* Most common AEs in patients treated at 200mg in EXPLORER and PATHFINDER

- Overall, 8.1% of patients discontinued treatment due to treatment-related AEs
- ICB risk mitigations implemented
  - Starting dose of 200 mg QD
  - Exclusion criteria for pre-existing severe thrombocytopenia
  - Increased platelet monitoring
  - Mandatory dose interruption for severe thrombocytopenia
- ICB events in patients without pre-existing severe thrombocytopenia
  - Pooled 200 mg group (n=76): 2 (2.6%)†
  - PATHFINDER (n=57): 0‡


† Both ICB events in EXPLORER patients were Grade 1 and asymptomatic. ‡ 1 ICB event occurred in a PATHFINDER patient with pre-existing severe thrombocytopenia prior to exclusion of such patients for 1/62 (1.6%) overall. AE, adverse event; ICB, intracranial bleed.

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Summary of top-line EXPLORER and PATHFINDER trial results

1. Consistently high IWG response rates across trials and at the proposed labeled 200 mg QD dose, with prolonged overall survival in EXPLORER.

2. Avapritinib was generally well-tolerated, with improved safety at 200 mg QD and with platelet management.

3. Detailed results expected to be presented at a future scientific congress.

4. Plan to submit sNDA to FDA for avapritinib for advanced SM in Q4 2020.


Not for promotional use.
Registration-enabling PIONEER Part 2 clinical trial ongoing in non-advance/indolent systemic mastocytosis

**PIONEER REGISTRATION-ENABLING PART 2**

**Design:** Randomized, double-blind, placebo-controlled treatment period, followed by open-label expansion

**Key endpoints:** Response rate defined as ≥30% reduction in ISM-SAF total symptom score (primary), measures of mast cell burden, quality of life, concomitant medications

**Duration:** 24 weeks
Avapritinib 25 mg QD reduces symptoms and mast cell burden in indolent SM

**Part 2 primary endpoint**
≥30% reduction in ISM-SAF Total Symptom Score at 24 weeks

Response rate:
- Placebo (n=9): 0%
- Avapritinib 25 mg (n=10): 60%

**Part 2 first key secondary endpoint**
≥50% tryptase reduction at 24 weeks*

- Placebo (n=9): 0%
- Avapritinib 25 mg (n=10): 70%

*24 weeks or last assessment before, if 24 weeks not available. EAACI, European Academy of Allergy and Clinical Immunology.

Safety results for avapritinib 25mg QD are similar to placebo at 16 weeks


### AE in >15% of placebo or avapritinib arms

<table>
<thead>
<tr>
<th>Preferred term</th>
<th>Placebo n=9</th>
<th>avapritinib 25 mg n=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of subjects with ≥1 AE</td>
<td>any grade</td>
<td>grade 3</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>22</td>
</tr>
<tr>
<td>Nausea</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>Dizziness</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>Headache</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Fatigue</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Face edema</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Peripheral edema</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Periorbital edema</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bone Pain</td>
<td>22</td>
<td>0</td>
</tr>
</tbody>
</table>

**AVAPRITINIB 25 MG QD**

- No patients had serious AEs
  - 2 patients treated with placebo had serious AEs, 1 with psychogenic seizure and 1 with diffuse cutaneous mastocytosis
- No patients had dose modifications
- No patients discontinued due to AEs

Follow up at 24 weeks showed no ≥grade 3 AEs or discontinuations due to AEs for avapritinib 25 mg QD


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Avapritinib is the only clinically validated, highly potent inhibitor of KIT D816V, the genetic driver of SM.


Safety profile enables tailored dosing based on patient need.

BLU-945 is the first of two 4th-gen inhibitors in development targeting EGFR-driven NSCLC

Comprehensive program targeting osimertinib-resistant EGFRm NSCLC
- Multiple research programs targeting the most common on-target resistance mutations

BLU-945 is a potent and selective inhibitor of triple mutant EGFRm NSCLC
- Excellent wild-type and kinome selectivity
- Preclinical single agent and combination activity
- Preclinical CNS activity

Plan to nominate double mutant EGFR development candidate in fourth quarter 2020

Rationale for development of BLU-945 targeting EGFR+/T790M/C797S

BLU-945 showed significant tumor regression alone and in combination with osimertinib or gefitinib

BID, twice daily; EGFR, epidermal growth factor receptor; NSCLC, non-small cell lung cancer; QD, once daily; PDX, patient-derived xenograft; SEM, standard error of the mean.

Not for promotional use.
## Second quarter 2020 financial results

### Statement of Operations (unaudited)

<table>
<thead>
<tr>
<th></th>
<th>Three Months Ended 6/30/2020</th>
<th>Three Months Ended 6/30/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue</td>
<td>$8.3M</td>
<td>$5.1M</td>
</tr>
<tr>
<td>Collaboration revenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AYVKIT net sales</td>
<td>$2.6M</td>
<td>$5.1M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$5.7M</td>
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<tr>
<td>Cost of sales</td>
<td>$0.1M</td>
<td>--</td>
</tr>
<tr>
<td>Research &amp; development expense&lt;sup&gt;1&lt;/sup&gt;</td>
<td>$91.1M</td>
<td>$87.1M</td>
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<tr>
<td>Selling, general &amp; administrative expense&lt;sup&gt;2&lt;/sup&gt;</td>
<td>$42.2M</td>
<td>$21.9M</td>
</tr>
<tr>
<td>Net loss</td>
<td>$(123.5)M</td>
<td>$(99.7)M</td>
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</tbody>
</table>

### Balance Sheet (unaudited)

<table>
<thead>
<tr>
<th></th>
<th>6/30/2020</th>
<th>12/31/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash, cash equivalents and investments</td>
<td>$650.3M&lt;sup&gt;3&lt;/sup&gt;</td>
<td>$548.0M</td>
</tr>
</tbody>
</table>

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Received $775M in payments under Roche collaboration in Q3 2020

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1. Includes stock-based compensation expense of $8.7M in 2020 and $7.5M in 2019. 2. Includes stock-based compensation expense of $10.8M in 2020 and $6.2M in 2019. 3. Does not include $775.0M in upfront payments received under the Roche collaboration for pralsetinib in Q3 2020 or $40.0 million in specified regulatory and commercialization milestones that Blueprint Medicines will receive under the Roche collaboration as a result of FDA approval of GAVRETO (pralsetinib).

Not for promotional use.
Significant progress across portfolio in 2H 2020

ADVANCE REGISTRATION PROGRAMS FOR SM

- Report Part 1 PIONEER data in ISM and select recommended Part 2 dose
- Initiate registration-enabling Part 2 of PIONEER trial of avapritinib in ISM
- Report top-line data for avapritinib in advSM
  - Submit sNDA to FDA for avapritinib for advSM in Q4 2020

BUILD COMMERCIAL MOMENTUM

- Enter global collaboration with Roche to develop and commercialize GAVRETO
- Obtain U.S. approval of GAVRETO for RET+ NSCLC
- Obtain EU approval for avapritinib for PDGFRA D842V GIST in Q3 2020
  - Obtain U.S. approval of GAVRETO for RET+ thyroid cancers in Q1 2021

STRENGTHEN PIPELINE WITH NEW PROGRAMS

- Present preclinical data for BLU-945 at ESMO 2020 Congress
  - Nominate up to two additional development candidates in Q4 2020
  - Complete Phase 1 healthy volunteer trial of BLU-263 in Q4 2020

1. Full prescribing information is available at www.GAVRETO.com. ESMO, European Society of Medical Oncology.

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