Third Quarter 2019 Financial Results

November 6, 2019

Acceleron Forward-Looking Statements

THIS PRESENTATION CONTAINS FORWARD-LOOKING STATEMENTS ABOUT THE COMPANY'S STRATEGY, FUTURE PLANS and prospects, including statements regarding the development of the Company's compounds, the timeline for clinical development and regulatory approval of the Company's compounds and the expected timing for reporting of data from ongoing clinical trials. The words "anticipate," "believe," "could," "estimate," "expect," "goal," "intend," "may," "plan," "potential," "project," "should," "target," "will," "would," and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words.

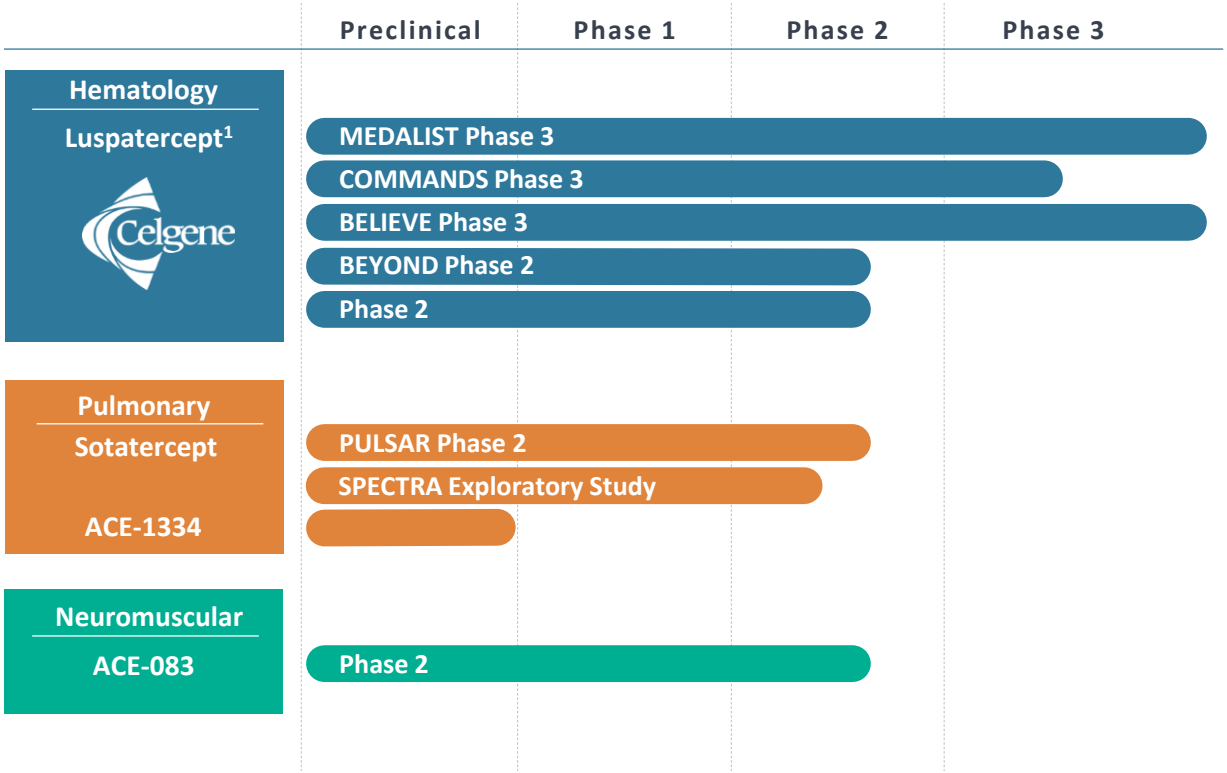
ACTUAL RESULTS COULD DIFFER MATERIALLY FROM THOSE INCLUDED IN THE FORWARD-LOOKING STATEMENTS DUE TO various factors, risks and uncertainties, including, but not limited to, that preclinical testing of the Company's compounds and data from clinical trials may not be predictive of the results or success of ongoing or later clinical trials, that the results of any clinical trial may not be predictive of the results or success of other clinical trials of the same product candidate, that the development of the Company's compounds will take longer and/or cost more than planned, that the Company will be unable to successfully complete the clinical development of the Company's compounds, that the Company may be delayed in initiating, enrolling or completing any clinical trials, and that the Company's compounds will not receive regulatory approval or become commercially successful products. These and other risks and uncertainties are identified under the heading "Risk Factors" included in the Company's most recent Annual Report on Form 10-K, and other filings that the Company has made and may make with the SEC in the future.

THE FORWARD-LOOKING STATEMENTS CONTAINED IN THIS PRESENTATION ARE BASED ON MANAGEMENT'S CURRENT views, plans, estimates, assumptions and projections with respect to future events, and the Company does not undertake and specifically disclaims any obligation to update any forward-looking statements.

Habib Dable
Chief Executive Officer

ACCELERON

Building Therapeutic Area Leadership



1. Luspatercept trials in collaboration with Celgene

U.S. and E.U. Marketing Applications Under Review

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BELIEVE

Phase 3

December 4, 2019

FDA PDUFA Target Action Date

Treatment of anemia in adult patients with beta-thalassemia, who require regular RBC transfusions

MEDALIST

Phase 3

April 4, 2020

FDA PDUFA Target Action Date

Treatment of anemia in adult patients with very low- to intermediate-risk MDS, who are RS+ and require RBC transfusions

EMA decision on MAA expected in 2H 2020

FDA PDUFA: US Food and Drug Administration Prescription Drug User Fee Act;
RS+: Ring sideroblasts; EMA: European Medicines Agency; MAA: Marketing Authorization Application

ASH 2019: Luspatercept[1] Clinical Presentations

61st ASH® Annual Meeting and Exposition
Orlando, Florida • December 7-10, 2019

MEDALIST

Assessment of Longer-Term Efficacy and Safety in the Phase 3, Randomized, Double-Blind, Placebo-Controlled Medalist Trial of Luspatercept to Treat Anemia in Patients (Pts) with Revised International Prognostic Scoring System (IPSS-R) Very Low-, Low-, or Intermediate-Risk Myelodysplastic Syndromes (MDS) with Ring Sideroblasts (RS) Who Require Red Blood Cell (RBC) Transfusions (Fenaux)

Luspatercept Significantly Reduces Red Blood Cell (RBC) Transfusion Burden, Regardless of Gene Mutation Frequency, Spectrum, and Prognostic Significance, Among Patients (Pts) with LR-MDS Enrolled in the Medalist Trial (Platzbecker)

Hematologic Improvement–Neutrophil and –Platelet in the Medalist Trial: Multilineage Data from a Phase 3, Randomized, Double-Blind, Placebo- Controlled Study of Luspatercept to Treat Anemia in Patients with Very Low-, Low-, or Intermediate-Risk Myelodysplastic Syndromes (MDS) with Ring Sideroblasts (RS) Who Require Red Blood Cell (RBC) Transfusions (Garcia-Manero)

BELIEVE

Evaluating Luspatercept Responders in the Phase 3, Randomized, Double-Blind, Placebo-Controlled Believe Trial of Luspatercept in Adult Beta-Thalassemia Patients (Pts) Who Require Regular Red Blood Cell (RBC) Transfusions (Viprakasit)

Effects of Luspatercept on Iron Overload and Impact on Responders to Luspatercept: Results from the Believe Trial (Porter)

Myelofibrosis Phase 2

A Phase 2 Study of Luspatercept in Patients with Myelofibrosis-Associated Anemia (Gerds)

1. Luspatercept trials in collaboration with Celgene

ASH 2019: Key Abstract Highlights

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MEDALIST

Session 637.
Myelodysplastic Syndromes – Clinical Studies: Lower-Risk MDS and CMML;
Monday, December 9, 4:30 p.m. ET

- 72 (47.1%) patients treated with luspatercept and 12 (15.8%) treated with placebo achieved RBC-TI ≥ 8 weeks.
- 97 patients responding to luspatercept experienced clinical benefit[1]. A median total duration of clinical benefit of 83.6 weeks or approximately 21 months for patients responding to luspatercept was observed.
- Most lower-risk MDS patients achieving RBC-TI and/or HI-E with luspatercept in the MEDALIST study had multiple periods of response with cumulative clinical benefit durability superior to that of patients receiving placebo, including those with a high baseline transfusion burden.

BELIEVE

Session 112.
Thalassemia and Globin Gene Regulation: Poster III;
Monday, December 9, 6:00 p.m. ET

- Median duration of clinical benefit[2] for luspatercept responders was 53.5 weeks. Forty-seven (21.0%) pts receiving luspatercept had no loss of response within the entire study period.
- The average number of RBC units saved over any 24 weeks in all luspatercept responders was 6.55 U (0.27 U/week) and was 8.16 U (0.34 U/week) with transfusion burden > 15 U/24 weeks, compared to baseline.

MYELOFIBROSIS Phase 2

Session 634.
Myeloproliferative Syndromes: Clinical: Emerging and Novel Targeted Therapies;
Monday, December 9, 7:00 a.m. ET

Patients with MF receiving a stable dose of ruxolitinib in combination with luspatercept treatment:

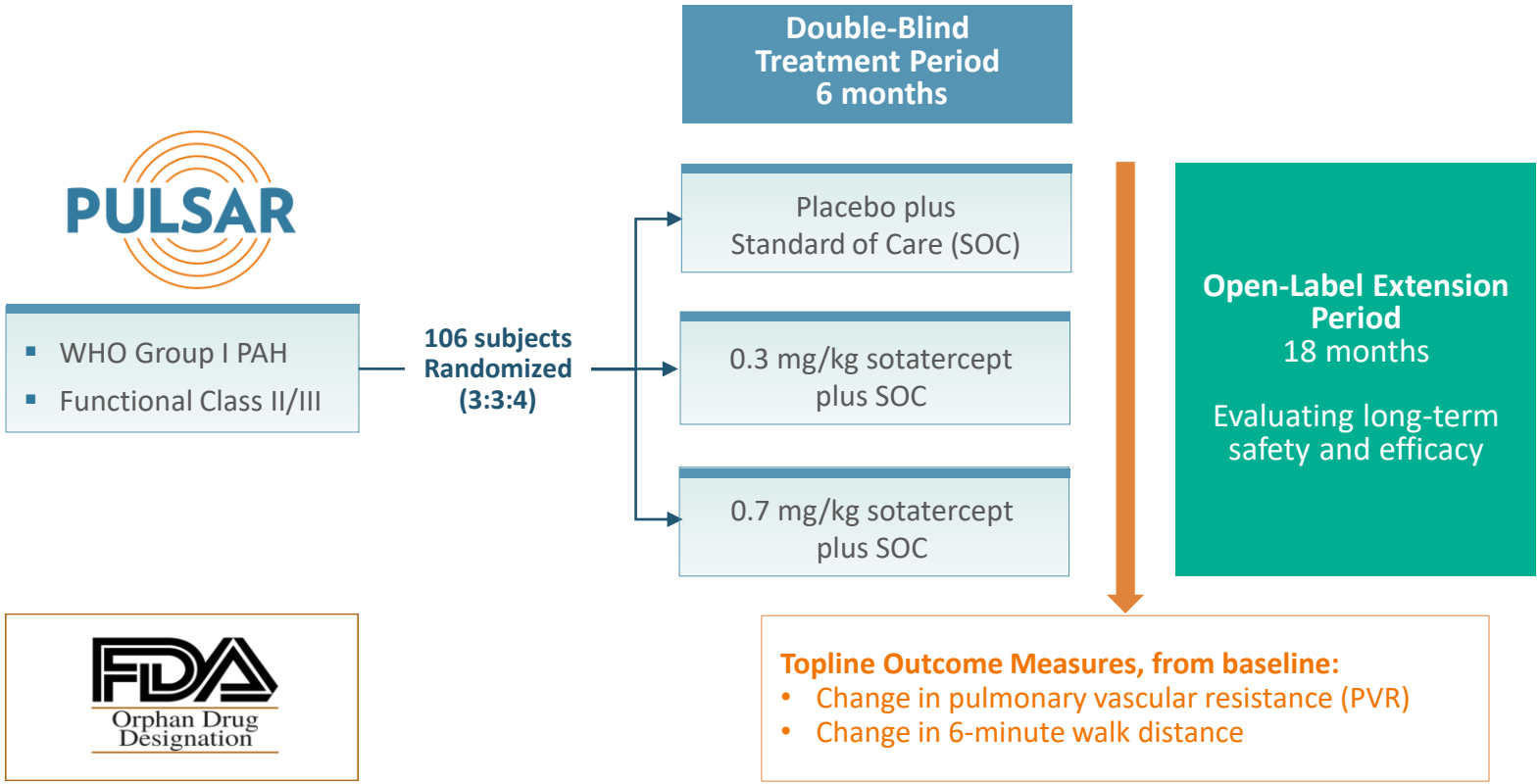
- 8 (57%) non-transfusion-dependent (NTD) patients achieved a mean hemoglobin (Hb) increase of ≥ 1.5 grams per deciliter (g/dL)
- 6 (32%) transfusion-dependent (TD) patients achieved RBC-TI over any consecutive 12 weeks
  - 10 (53%) TD patients achieved a ≥ 50% reduction in RBC transfusion burden from baseline.

Patients with MF receiving luspatercept without concomitant treatment with ruxolitinib:

- 3 (15%) NTD patients achieved a mean Hb increase of ≥ 1.5 g/dL
- 2 (10%) TD patients achieved RBC-TI over any consecutive 12 weeks

1. Clinical benefit, defined as a patient achieving red blood cell transfusion independence (RBC-TI) ≥ 8 weeks and/or modified hematologic improvement erythroid (HI-E) response per International Working Group 2006 criteria, was assessed, along with total duration of clinical benefit (time from achieving clinical benefit to discontinuation due to loss of benefit, adverse events [AEs], or other reasons).
2. Duration of clinical benefit, defined as the time of first response (≥ 33% reduction in RBC transfusion over any 24 weeks) to discontinuation due to any cause at that episode, was also assessed.

Sotatercept PULSAR Phase 2 Trial in PAH



Sotatercept is an investigational therapy that is not approved for any use in any country.

ACE-083 Part 2 of Phase 2 Trial in CMT

Part 2: Double-blind, placebo-controlled, 6-month primary treatment period

Patients with CMT1 or CMTX

ACE-083
N = 20

Randomized 1:1

Placebo
N = 20

Topline Outcome Measures:
- Percent change in muscle volume and change in fat fraction
- Percent change in functional tests
  - 6-minute walk and 10-meter walk/run
- Improvement in health-related quality of life
  - CMT-Health Index
- Safety and tolerability

CMT: Charcot-Marie-Tooth Disease

ACE-083 is an investigational therapy that is not approved for any use in any country.

Kevin McLaughlin
Chief Financial Officer

ACCELERON

Q3 2019 Financial Results

Cash	
Cash, cash equivalents and investments	$468.3M
Revenue	
Collaboration Revenue	$4.2M
Costs and Expenses	
Total Costs and Expenses	$53.1M
R&D Expenses	$37.6M
G&A Expenses	$15.5M
Net Loss	
Net Loss	$45.4M

Note: Numbers may not foot due to rounding

Q3 2019: Financial Results Q&A Session

Habib Dable	Chief Executive Officer
Kevin McLaughlin	Chief Financial Officer
John Quisel, Ph.D., J.D.	Chief Business Officer
Sujay Kango	Chief Commercial Officer
Todd James, IRC	VP, Investor Relations and Corp. Comm.

THANK YOU

www.acceleronpharma.com
NASDAQ: XLRN

Additional Slides

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Upcoming Corporate Priorities

HEMATOLOGY

- **Luspatercept**
  - FDA PDUFA target action dates:
    - Beta-thalassemia indication expected December 4, 2019
    - MDS indication expected April 4, 2020
  - Multiple clinical presentations expected at ASH 2019
  - Publication of MEDALIST and BELIEVE Phase 3 trial results
  - Potential expansion of clinical program into other indications in **1H 2020**
  - EMA decision on the MAA expected in **2H 2020**
  - BEYOND Phase 2 trial topline results expected by **YE 2020**, COMMANDS Phase 3 trial patient enrollment

PULMONARY

- **Sotatercept**
  - PULSAR Phase 2 trial topline results expected in **Q1 2020**
  - SPECTRA exploratory study preliminary results expected in **2020**

NEUROMUSCULAR

- **ACE-083**
  - CMT Part 2 of the Phase 2 trials topline results expected in **Q1 2020**