Fourth Quarter and Full Year 2017 Financial and Operational Results

February 27, 2018

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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 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 development of the Company's compounds will take longer and/or cost more than planned, that the Company or its collaboration partner, Celgene, will be unable to successfully complete the clinical development of the Company's compounds, that the Company or Celgene 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.

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Habib Dable
Chief Executive Officer

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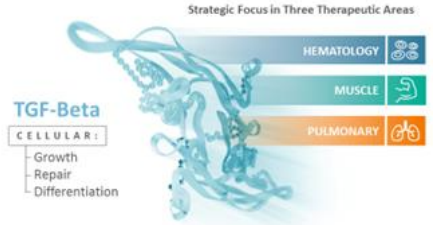
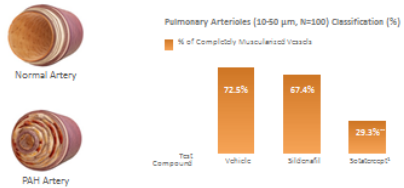
2017 Corporate Progress

R&D Day

STRATEGY



SOTATERCEPT IN PAH



VISION

COMMITMENT

Year-end 2020

- Luspatercept MEDALIST and BELIEVE Phase 3 trials fully enrolled
- ACE-083 Phase 2 trial advancement in FSHD and CMT
- Successfully regained rights to sotatercept for pulmonary hypertension indications
- $215.8M net proceeds from follow-on offering

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Luspatercept Phase 3 Trials Ongoing and Planned

Lower-risk MDS	Beta-thalassemia
RS+ ESA Refractory / Ineligible	Transfusion-Dependent
MEDALIST	BELIEVE
Top-line Results Expected Mid-Year	

Lower-risk MDS
First-line / ESA Naive
COMMANDS
1H:18 Trial Initiation

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New Luspatercept Phase 2 Trials Initiated

Beta-thalassemia

BEYOND

Non-Transfusion-Dependent

(N = 150)

48-week, double-blind, Phase 2 trial

Key Endpoints:

- % of patients w/ continuous increase of ≥ 1.0 g/dL in hemoglobin during weeks 13 to 24 and 37 to 48

Myelofibrosis

Monotherapy / Combination Therapy

(N = 70)

24-week, open-label, Phase 2 trial

Key Endpoints:

- ≥ increase of 1.5 g/dL in hemoglobin or red blood cell transfusion independence (RBC-TI) for ≥ 12 weeks rolling

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ASH 2017: MDS and MF IST Phase 2 Updates

Luspatercept Phase 2 in MDS

- Clinically meaningful erythroid response (IWG HI-E) in over 50%[1] of patients
- RBC transfusion independence (RBC-TI) achieved in over 40%[2] of patients
- Multiple patients out to 34 months[3] of treatment achieving meaningful benefit
- > 1,200 patient-months (or 100 patient-years) of Phase 2 lower-risk MDS patient experience

Sotatercept Phase 2 IST in Myelofibrosis

- Anemia response in over 30%[4] of patients (monotherapy and combo therapy)

ASH 2017: Mutational Profile and Analysis of Lower-Risk Myelodysplastic Syndromes (MDS) Patients Treated with Luspatercept: Phase 2 PACE-MDS Study, All Patients Treated at Dose Levels ≥ 0.75 mg/kg:
[1] IWG HI-E = 52/99 or 53%, [2.] RBC-TI = 29/67 or 43% [3.] Increase in Mean Hemoglobin in Low Transfusion Burden Patients (N=6)
ASH 2017: Sotatercept (ACE-011) Alone and with Ruxolitinib in Patients with MPN-associated Myelofibrosis (MF) and Anemia:
[4] Anemia responders - monotherapy = 7/18 or 39% and combination therapy = 3/10 or 30%

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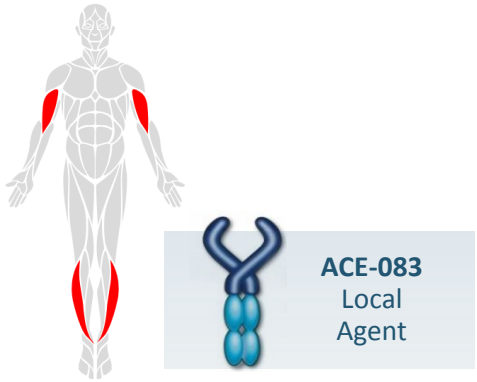
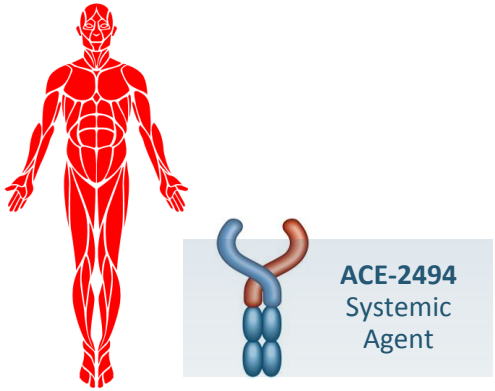
ACE-083 and ACE-2494 Two Myostatin+ Agents



ACE-083
Local
Agent

- Mean total muscle volume increases of over 12%[1] in both muscle cohorts in FSHD Part 1
- Improvements in fat fraction[1]
- Safe and well-tolerated[2]



ACE-2494
Systemic
Agent

- Randomized, double-blind, placebo-controlled, dose-ranging Phase 1 healthy volunteer trial initiated
- Two-part: single-ascending (N=24) and multiple-ascending dose (N=36)

[1]Tibialis Anterior (TA, n=11) and Biceps Brachii (BB, n=12) Part 1 Cohorts (150 mg/200 mg pooled) Preliminary Results: The TA cohorts generated a mean total muscle volume increase of 12.6% and a mean decrease or improvement in muscle fat fraction of 5.3%. The BB cohorts generated a mean total muscle volume increase of 13.2% and a mean decrease or improvement in muscle fat fraction of 0.6%.

[2]Part 1 Preliminary Safety Results (n=25): There were no serious adverse events reported. The most common adverse events were injection site related and grades 1-2. One patient experienced a related grade 3 non-serious adverse event of lower leg intramuscular swelling. This patient fully recovered and was discontinued from the study.

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Sotatercept AHA Preclinical Presentation in PAH

- A majority of PAH patients exhibit deficient BMP pathway signaling
- Sotatercept MOA: Restores BMP pathway activity by inhibiting activin/TGF-beta signaling
- Sotatercept (RAP-011) outperforms standard of care in preclinical models
  - Decreases vessel muscularization
  - Improves pulmonary arterial pressures
  - Decreases indicators of right heart failure

AHA 2017: ACTRIIA-Fc rebalances BMP and activin/TGF-β signaling to attenuate experimental pulmonary hypertension

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Kevin McLaughlin
Chief Financial Officer

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FY 2017 Financial Results

Cash	
Cash, cash equivalents and investments	$372.9M
Revenue	
Collaboration Revenue	$13.5M
Costs, Expenses and Other Income	
Total Costs and Expenses	$123.5M
R&D Expenses	$89.7M
G&A Expenses	$33.7M
Net Loss	
Net Loss	$108.5M

Current cash, cash equivalents and investments provide sufficient funding into **2021**

Note: Numbers may not foot due to rounding

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Upcoming Corporate Priorities

HEMATOLOGY

- **Luspatercept**
  - MEDALIST and BELIEVE Phase 3 trial top-line results expected in **mid-2018**
  - Initiate the COMMANDS Phase 3 trial in **1H 2018**

NEUROMUSCULAR

- **ACE-083**
  - FSHD and CMT Part 1 of Phase 2 trial preliminary results from all dose-escalation cohorts in **2H 2018**
  - Initiate FSHD Part 2 of Phase 2 trial **Q2 2018**
  - Initiate CMT Part 2 of Phase 2 trial **YE 2018**

- **ACE-2494**
  - Phase 1 healthy volunteer trial results in **1H 2019**

PULMONARY

- **Sotatercept**
  - Initiate Phase 2 trial in PAH in **1H 2018**
  - PAH and Phase 2 trial design webinar coming soon in **1H 2018**

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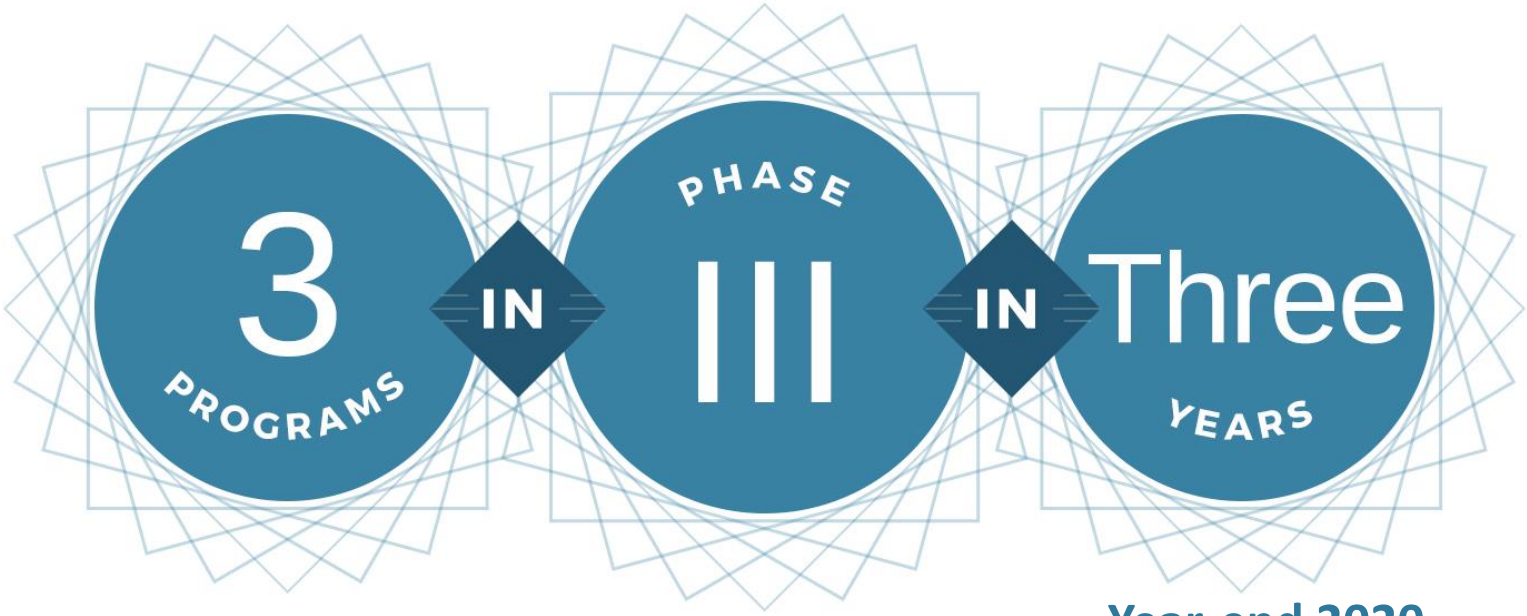
Our Commitment to Late-Stage Milestones



Year-end 2020

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Q4 and FY 2017: Financial Results Q&A Session

Habib Dable	Chief Executive Officer
Kevin McLaughlin	Chief Financial Officer
Matthew Sherman, M.D.	Chief Medical Officer
John Quisel, Ph.D., J.D.	SVP, Corporate Development
Chris Rovaldi	SVP, Operations and Program Management
Todd James, IRC	VP, Investor Relations and Corp. Comm.

THANK YOU

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