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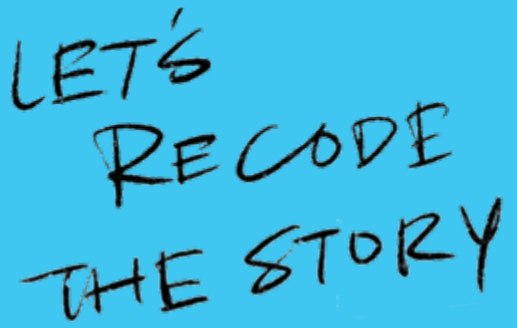
bluebird bio 2Q results and corporate updates

August 9, 2021



NASDAQ: BLUE

forward-looking statements

These slides and the accompanying oral presentation contain forward-looking statements and information. The use of words such as “may,” “might,” “will,” “should,” “expect,” “plan,” “anticipate,” “believe,” “estimate,” “project,” “intend,” “future,” “potential,” or “continue,” and other similar expressions are intended to identify forward-looking statements. For example, all statements we make regarding the initiation, timing, progress and results of our preclinical and clinical studies and our research and development programs, our financial guidance, our ability to advance product candidates into, and successfully complete, clinical studies, the timing or likelihood of regulatory filings and approvals, and our financial projections are forward looking. All forward-looking statements are based on estimates and assumptions by our management that, although we believe to be reasonable, are inherently uncertain. All forward-looking statements are subject to risks and uncertainties that may cause actual results to differ materially from those that we expected. These statements are also subject to a number of material risks and uncertainties that are described in our most recent quarterly report on Form 10-Q, as well as our subsequent filings with the Securities and Exchange Commission. Any forward-looking statement speaks only as of the date on which it was made. We undertake no obligation to publicly update or revise any forward-looking statement, whether as a result of new information, future events or otherwise, except as required by law.

LET'S RECODE THE SYSTEM

today's agenda

Introduction	**Nick Leschly** *chief bluebird*
SGD Updates	**Andrew Obenshain** *president, SGD* **Philip Gregory** *chief scientific officer*
Oncology News and Roadmap to Separation	**Chip Baird** *chief financial officer*
Q&A	Joined by: **Rich Colvin** *interim chief medical officer* **Tom Klima** *chief commercial officer, SGD* **Cintia Piccina** *commercial lead, oncology*

Must Beat the Odds.

Period.

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Building momentum into launching two companies in strong position

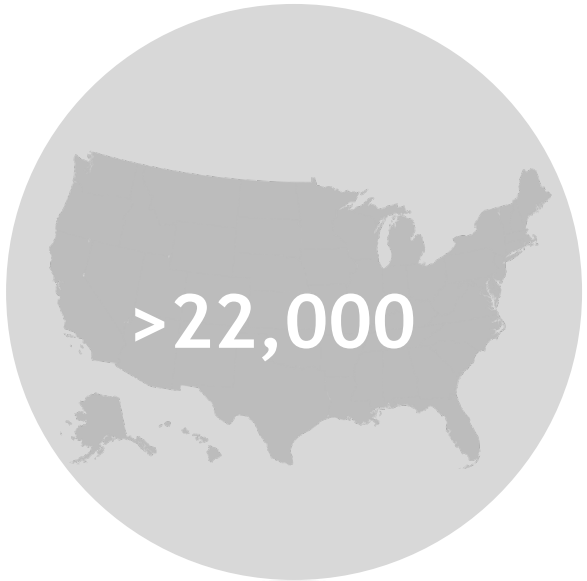
	bluebird bio	2seventy bio
✓ *Strategy + Vision*	• Clinical and commercial execution: delivering TDT, CALD, and SCD for patients • U.S. focus	• Deliver ABECMA commercially and expand to earlier lines • Innovation focus: 1-2 next-gen products entering clinic each yr.
✓ *Products that Matter*	• TDT BLA on track for 3Q 2021 • CALD BLA by end of 2021* • SCD off hold and moving forward	• ABECMA launch exceeding plan • 1-2 new INDs in 2021
✓ *Leadership Team*	• Management and BoD members to be announced	• Management and BoD members to be announced
✓ *Funding + Financial*	• Significant cost savings since early 2020	• Resilience collaboration accrues $25m+ savings/year

**Pending resolution of clinical hold*

Anticipate ~$900m on hand at time of split, both businesses to launch with 24 months of runway

In the near term, the SGD business will be focused on delivering potentially curative therapies to ~22,000 patients in the U.S.

Majority of U.S. opportunity driven by the enormous unmet need in Severe SCD



Addressable patients for bluebird bio gene therapy in the United States

~20,000

Patients living with Severe Sickle Cell Disease (SCD)[1,2]

~1,500

Patients living with Transfusion-dependent ß-Thalassemia (TDT)[3]

~50

Annual patients with Cerebral Adreno-leukodystrophy (CALD)[4,5]

1. *Hassell KL. Population estimates of sickle cell disease in the U.S. Am J Prev Med. 2010;38(4 Suppl):S512 521*
2. *Jul '21 bbb analysis of Komodo patient-level claims data (Apr '20 - Mar '21), IQVIA patient-level claims data (Aug '18 - Jul '19)*
3. *Hulihan, Mary M., et al. State-based surveillance for selected hemoglobinopathies. Genetics in Medicine 17.2 (2015): 125-130.*
4. *Bezman L, et al. Adrenoleukodystrophy: Incidence, new mutation rate, and results of extended family screening. Ann Neurol. 2001;49:512-517*
5. *Moser HW, Mahmood A, Raymond GV. X-linked adrenoleukodystrophy. Nature Clin Pract Neurol. 2007;3(3):140-51*

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elivaldogene autotemcel (eli-cel, Lenti-D™) clinical program safety update

a patient living with CALD treated with eli-cel in the Phase 3 ALD-104 study was diagnosed with myelodysplastic syndrome (MDS)

- Patient is stable and under the care of the treating physician
- This case of MDS was likely mediated by Lenti-D LVV insertion
- Specific design features of the Lenti-D LVV may have contributed

clinical trials of eli-cel on hold

- We believe the benefit:risk profile for eli-cel remains positive
- Working closely with FDA to resolve clinical hold
- Continue to anticipate completion of rolling BLA by end of 2021

other LVV gene therapies, including those using bb305 vector, are not impacted and studies remain open

- Each treatment is custom-designed to address a specific severe genetic disease
- Lenti-D LVV was designed for broad tissue activity and high expression, and thus uses MNDU3 promoter
- No other LVV-HSC program employs this design

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bluebird bio 2021 milestones

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SCD | TDT | CALD | Pipeline

- TDT BLA on track for 3Q 2021
- CALD BLA planned by end of 2021*
- Update on SCD regulatory path by year-end
- HGB-206 data at ASH

Pending resolution of clinical hold

Roadmap to Separation

- Top tier management team hires and BoD members to be announced
- Planned investor events: additional detail on commercial plans, pipeline and separation

Oncology: ABECMA launch update

- Strong and fast uptake, illustrating high unmet need and confidence in the unprecedented efficacy of ABECMA
- Over 65 sites activated in the US, first patient apheresed the week after launch
- Expanded capacity significantly since launch, maxing out every month and continuing to increase
- Strong access and reimbursement, very few patients face payer denials

US ABECMA Revenue of $24M* in 2Q

*US ABECMA profit shared 50/50 between bluebird and BMS as part of the collaboration agreement

Strategic manufacturing collaboration with Resilience a win-win

Scientific Validation

- External validation of sLVV technology – with continued access for BLUE/2seventy
- Retains highly skilled technical staff of 100+ employees

Increased Focus

- Streamlined operations for BLUE and 2seventy as stand-alone businesses following separation
- Plans for commercial supply of sLVV for ABECMA unchanged
- Maintains clinical supply for BLUE and 2seventy portfolio
- Finalizing agreement for a shared-risk collaboration to drive innovation in manufacturing for 2seventy programs

Financial Impact

- $110M upfront at closing
- Reduction in operating expenses - $25m+/year
- Revenue share from sLVV license

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2seventy bio 2021 milestones

2seventy bio

2121/7 | NextGen MM | NHL | AML | Solids

- Continued support for launch of ABECMA and studies in earlier lines advancing
- bb21217 data at ASH
- 1-2 INDs per year starting in 2021

Roadmap to Separation

- Top tier management team hires and BoD members to be announced
- Planned investor events: additional detail on pipeline and separation

Launching each business with planned 2 years of runway

- **Ended quarter with $942M in cash, cash equivalents and marketable securities**
- **Significant strategic and operational focus**
  - Resilience Collaboration: proceeds of $110M upon closing plus expected $25m+/year of cost savings (2seventy bio)
  - Streamlining expense structure for both businesses: ~$400M of expense savings in past 18 months
  - Additional savings anticipated through planned orderly wind down of Europe
- **ABECMA outperformance provides tailwind heading into separation**
- **On separation expecting ~$900M in cash, cash equivalents and marketable securities**
- **Intend for BLUE and 2seventy to launch with sufficient capital to fund a dynamic 24 months of significant milestones for our medicines and potential products**

Both business expected to launch with sufficient capital to execute strategy and achieve value-creating milestones

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Q&A

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