



38th Annual J.P. Morgan Healthcare Conference

Jean-Jacques Bienaimé
Chairman and Chief Executive Officer

January 13, 2020

Safe Harbor Statement

This non-confidential presentation contains 'forward-looking statements' about the business prospects of BioMarin Pharmaceutical Inc., including potential future products in different areas of therapeutic research and development. Results may differ materially depending on the progress of BioMarin's product programs, actions of regulatory authorities, availability of capital, future actions in the pharmaceutical market and developments by competitors, and those factors detailed in BioMarin's filings with the Securities and Exchange Commission such as 10-Q, 10-K and 8-K reports.

Our Mission:

We develop therapeutics that have a real impact for patients who live with ***serious*** and ***life-threatening rare genetic diseases***

We remain committed to bringing new treatments to market that will provide a ***meaningful benefit*** to ***small and medium-sized patient populations***



BioMarin's Portfolio of Products Targeting Rare Genetic Disorders

Commercialized Products

ALDURAZYME
(LARONIDASE)

KUVAN
(sapropterin dihydrochloride) Tablets

VIMIZIM
(elosulfase alfa)

Palynziq
(pegvaliase-pqpz) Injection

Naglazyme
(GALSULFASE)

FIRDAPSE
amifampridine

Brineura
(cerliponase alfa)

Products under Development

Product	Indication	Preclinical	Phase 1	Phase 2	Phase 3	Anticipated 2020 Milestones
Vosoritide	Achondroplasia					Submit Applications
Vosoritide	Dominantly Inherited Short Stature (DISS)*					Initiate Phase 2 Study
Gene Therapy						
Valoctocogene Roxaparvovec	Hemophilia A					Approval/launch
BMN 307	Phenylketonuria					Initiate Phase 1/2 Study
BMN 331	Hereditary Angioedema					IND-enabling studies

*Under development as part of a research collaboration with Children's General

2019 Key Achievements

Vosoritide: Achondroplasia

- ✓ Reported positive Phase 3 data demonstrating 1.6cm/year placebo-adjusted AGV enhancement
- ✓ 54-month Phase 2 data demonstrating 9.0cm cumulative added height gained vs. Natural History

Valoctocogene Roxaparvovec: Hemophilia A

- ✓ Achieved pre-specified Phase 3 clinical criteria for expedited review in the U.S. and Europe
- ✓ Submitted BLA to the U.S. Food and Drug Administration
- ✓ Marketing Authorization Application validated by the European Medicines Agency

R&D Engine

- ✓ Submitted IND and CTA for BMN 307 for Phenylketonuria with the FDA and MHRA
- ✓ Announced new gene therapy candidate in hereditary angioedema

Commercial/ Financial

- ✓ 2019 Revenue of ~ 1.7B
- ✓ Non-GAAP Income increased 65% year/year from \$91M ('18 FY actual) to \$150M FY19E*

* Low end of 2019 full-year non-GAAP income guidance

2020 Key Milestones

Valoctocogene Roxaparvovec: Hemophilia A

- ☐ LAUNCH VALROX IN HEMOPHILIA A!

Vosoritide: Achondroplasia

- ☐ Submit Global Marketing Applications for Review
- ☐ Complete enrollment of Phase 2 “206” Study with 0-5 year-olds

Commercial/ Financial

- ☐ ~\$2B in revenue
- ☐ Break-even or better GAAP Net Income with valrox

R&D Engine

- ✓ US IND and UK CTA cleared for BMN 307 gene therapy for phenylketonuria
- ☐ Commence Phase 1/2 Study with BMN 307 gene therapy for phenylketonuria

Wholly Owned Manufacturing Capabilities Support Rapid Drug Development and Commercialization

Biologics Facilities



- 1999: Novato, California facility opened
- Footprint: 80,000ft²
- Manufactures: Aldurazyme, Naglazyme, Palynziq, Vimizim, Vosoritide



- 2011: Shanbally, Ireland facility acquired
- Footprint: 200,000ft²
- Manufactures: Brineura, Vimizim

Gene Therapy Facility



News Today!
Potential to manufacture 10,000 GT doses annually, depending on dose and product mix*

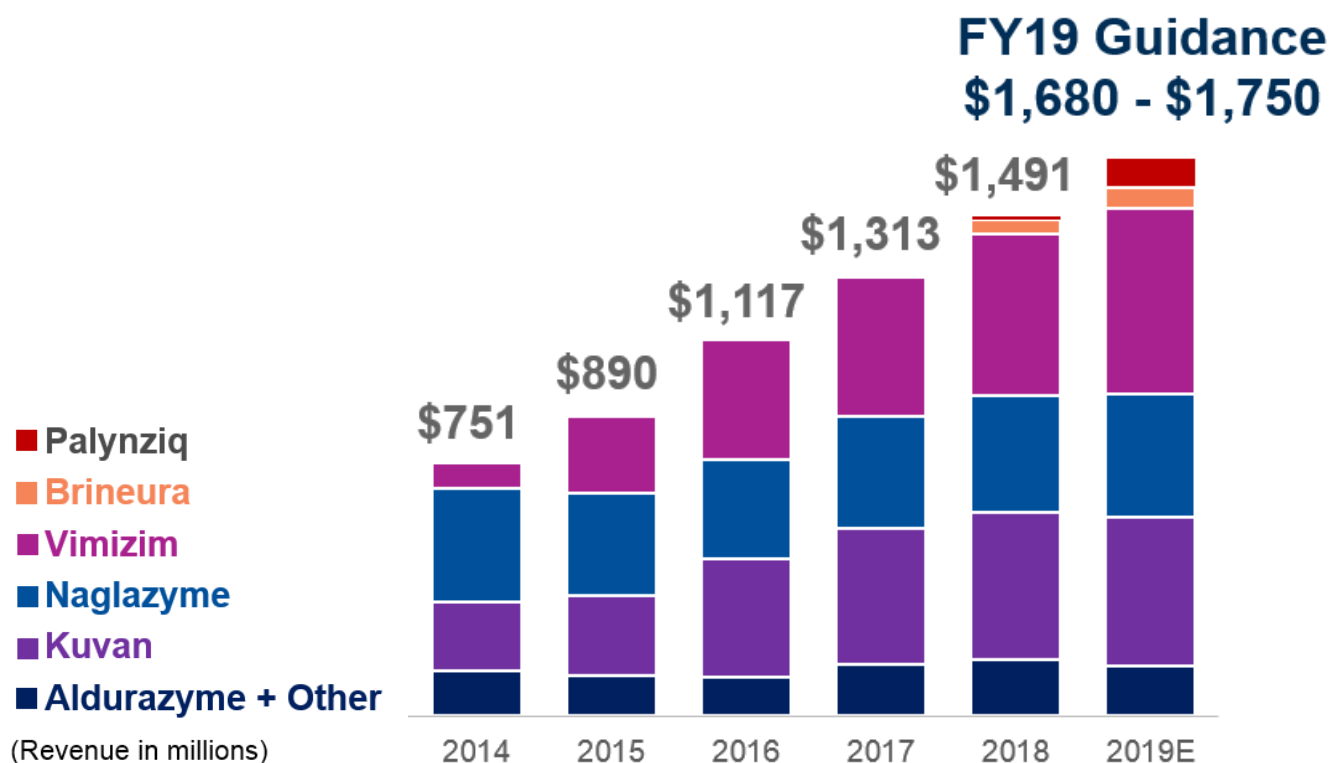
- 2017: Novato, California facility commissioned
- Footprint: 50,000ft²
- Manufactures: Valrox, BMN 307 PKU GT
- Manufacturing at 2000L Bioreactor Scale

Substantial track record of inspections and cGMP compliance

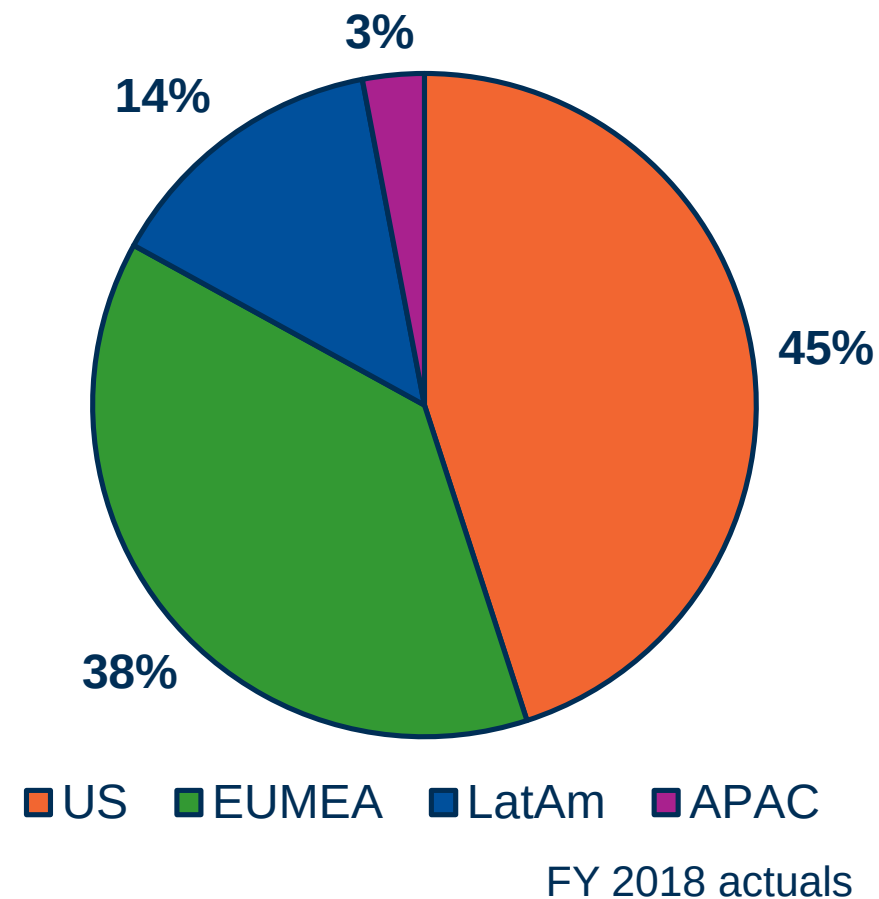
* Projected annual capacity assuming 6e13 vg/kg dose for both valrox and BMN 307

Diversified Global Business in over 75 Countries to Drive ~\$2B in 2020

Currently Approved Products Continue
to Drive Steady Revenue Growth

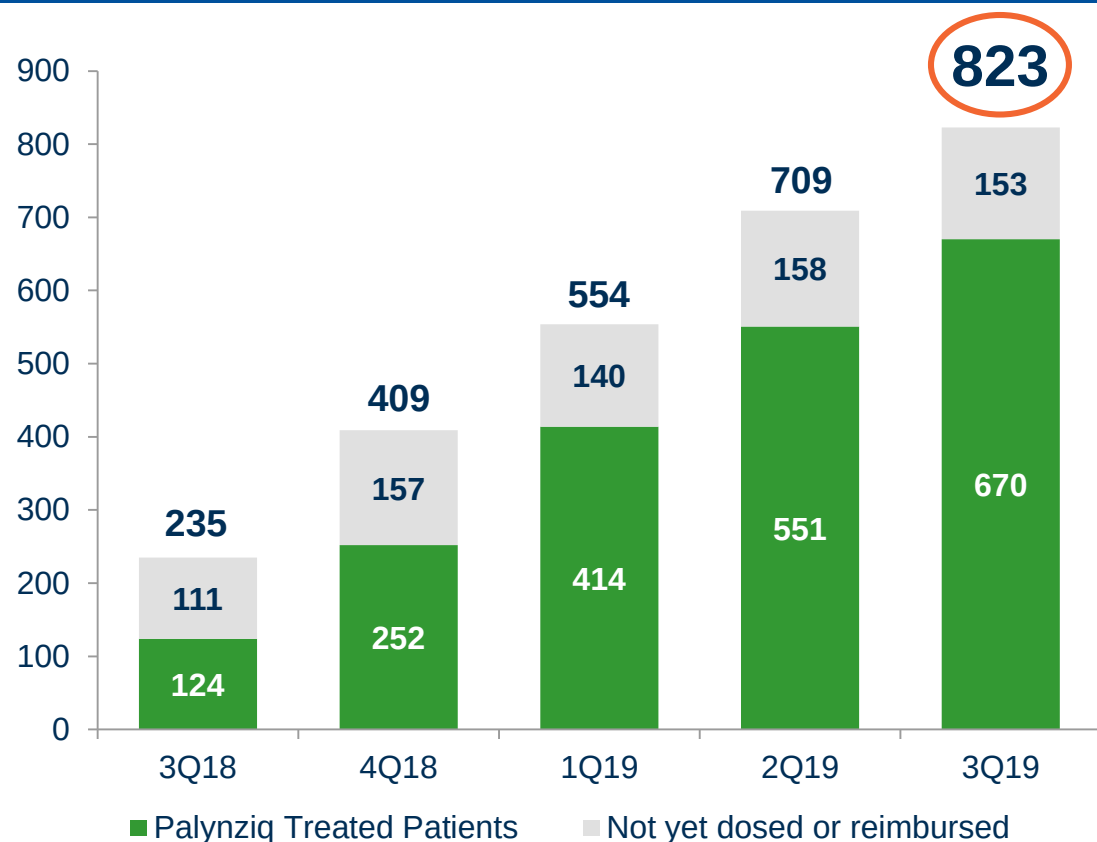


Global Revenue Contributions for
BMRN Marketed Products



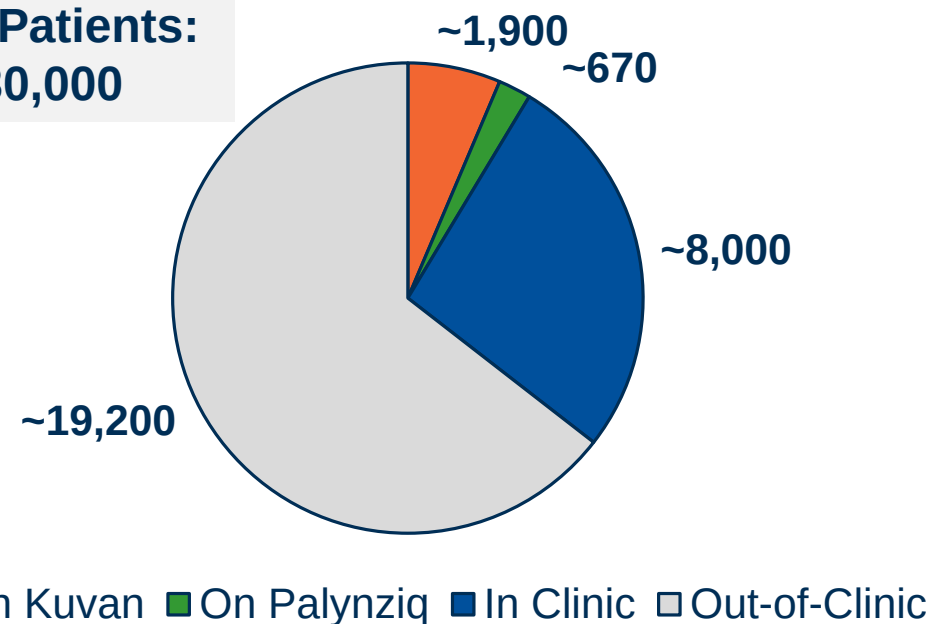
Strong Palynziq Launch to Drive Estimated \$80M-\$100M in FY2019 Revenue; Anticipate Approximately \$200M in FY2020 Revenue

Patients in the U.S. Being Treated or Awaiting Treatment with Palynziq as of 3Q19



U.S. and EUMEA Addressable Adult PKU Patients*

Total Patients:
~30,000



Significant growth opportunity for Palynziq:
~800/30,000 people treated as of 3Q19 update
Palynziq and Kuvan are the only approved products to treat PKU

*Patients addressable for Palynziq include people with PKU ≥ 16 y/o in EUMEA and ≥ 18 y/o in U.S. PKU patients defined as patients diagnosed through newborn screening. Out-of-clinic patients are those who have been diagnosed, but have not returned to clinic in at least 2 years

valoctocogene roxaparvovec for hemophilia A

Expected 2020

LAUNCH!

Confidence in Valrox based on Demonstrated Clinical Benefit

Marketing Application Submitted to FDA and EMA; Validated by EMA; Potential Approval in 3Q20

Executed and planned milestones

- Accelerated Assessment granted by EMA; MAA validated and under review with PRIME designation
- BLA submitted with review expected to commence in February under Breakthrough Therapy designation
- Four years of Phase 2 clinical data expected prior to commercial launch
- **2020 product approval and launch anticipated**

Phase 3 (301) Study Interim results

- Strong evidence of bleed control and elimination of FVIII usage across study population
- FVIII expression reasonably likely to predict favorable bleeding outcomes
- **Global applications submitted** based on criteria met for expedited assessment

Phase 1/2 (201) Study

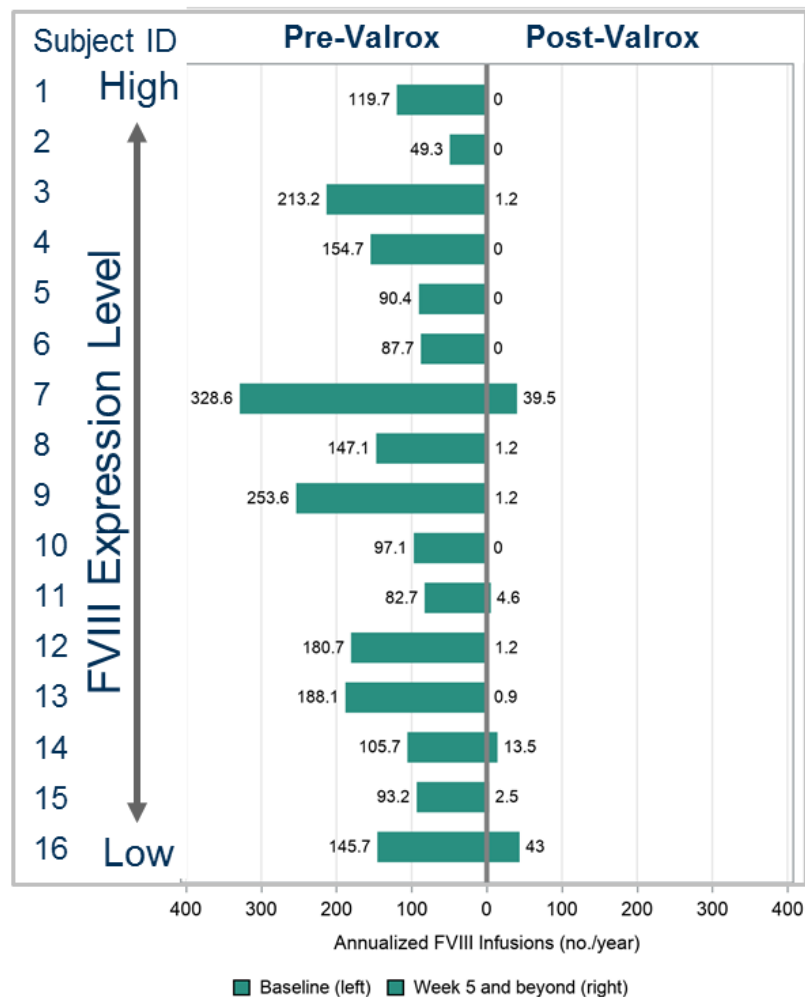
- **Bleed control superior to SOC out to 3 years** with 6e13 vg/kg dose and 2 years with 4e13 vg/kg dose
- 4 year 6e13 vg/kg dose and 3 year 4e13 vg/kg dose updates expected mid-year 2020

Full Phase 3 (301) Study

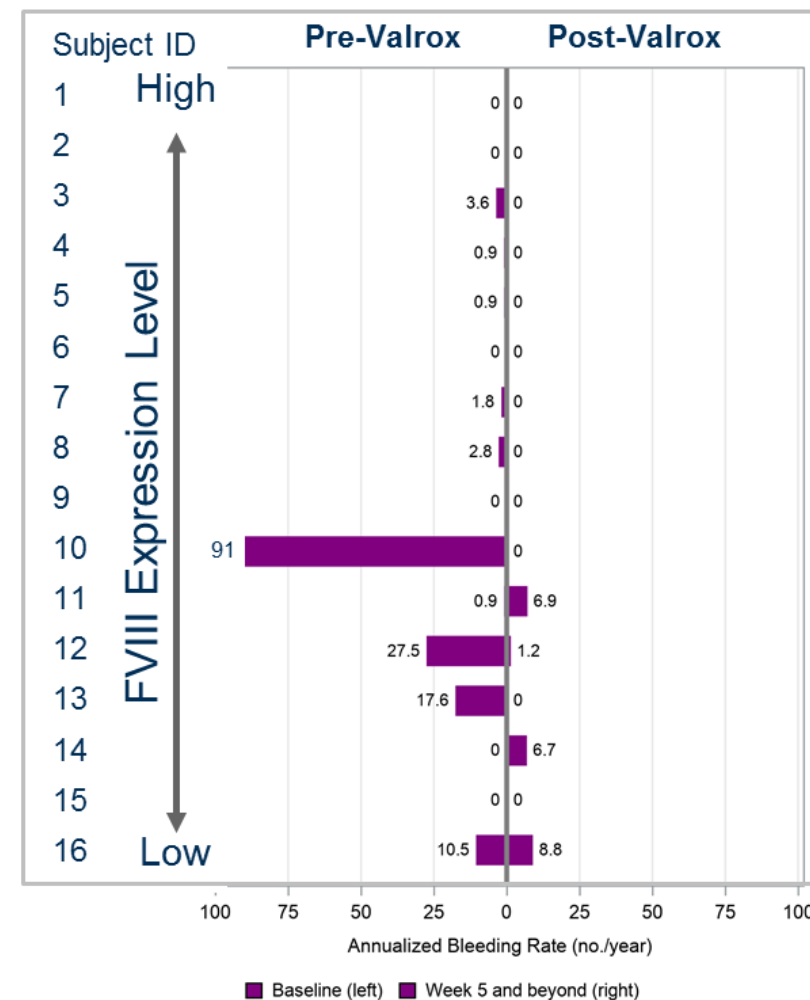
- Study adequately **powered for ABR to demonstrate superiority over Standard of Care**
- Steroid management enhanced
- Study fully enrolled - **130 patients dosed!**
- Data expected 4Q20/1Q21

Initial Phase 3 Results: Physiologic Correction of Hemophilia A with Valrox Treatment, Bleed Control After Eliminating Prophylactic FVIII Infusions

FVIII Infusions

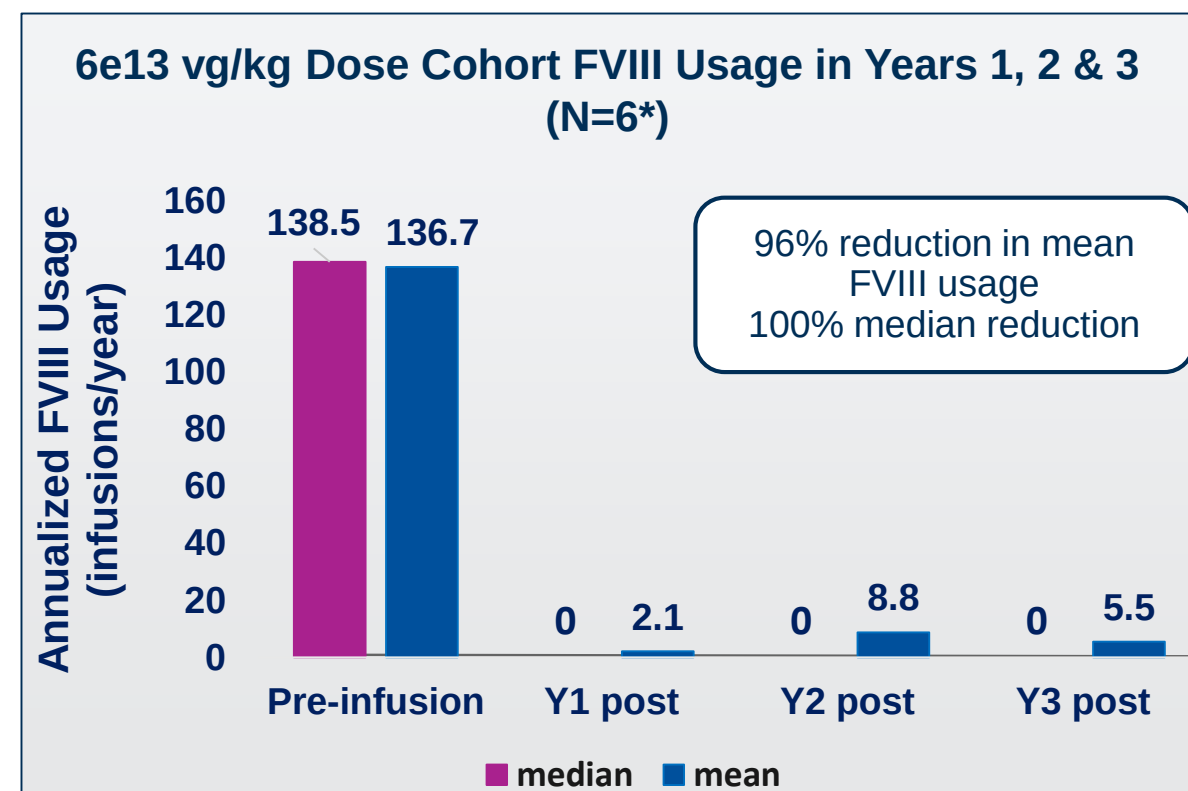
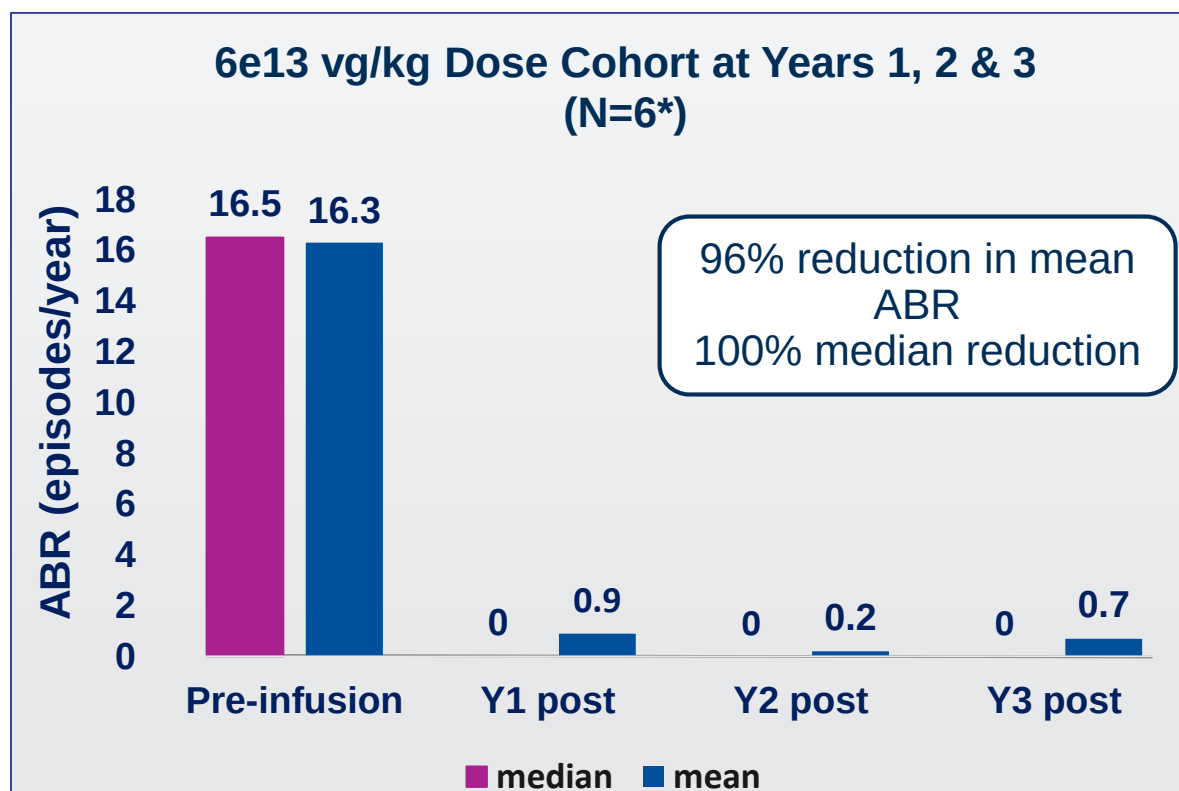


Treated Bleeds



Phase 2 at Three Years: Substantial Sustained Reduction in Treated ABRs and FVIII Usage

Median bleeds: Zero in years 1, 2 & 3 post valrox treatment



* The one subject treated with on demand rFVIII pre-infusion was excluded; ** N=7 and includes the one subject treated with on demand rFVIII pre-infusion

January 2020: 2nd NEJM Article Highlighting Valrox LT Bleed Control

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Multiyear Follow-up of AAV5-hFVIII-SQ Gene Therapy for Hemophilia A

N ENGL J MED 382;1 NEJM.ORG JANUARY 2, 2020

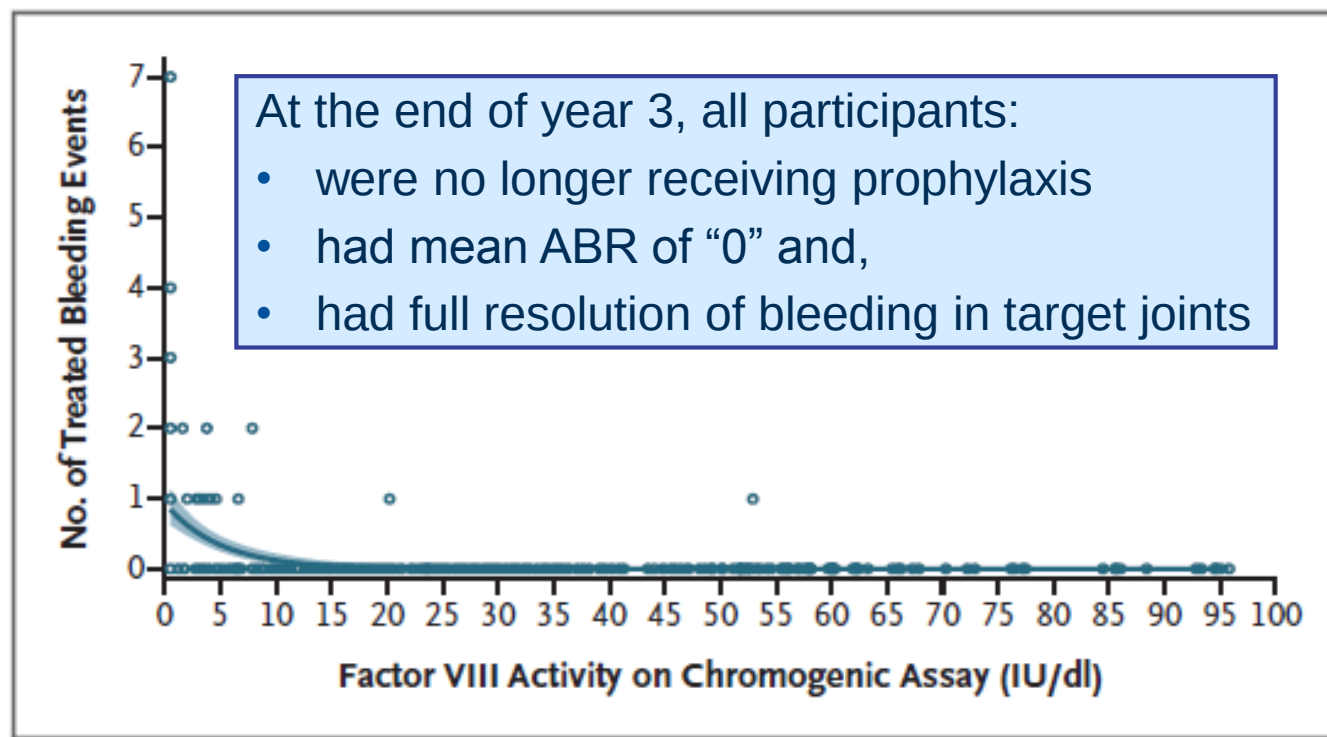


Figure 4. Number of Observed and Predicted Bleeding Events, According to FVIII Activity Level

Valrox has the Largest Patient Eligibility based on Seroprevalence Rates in the Hemophilia A Population

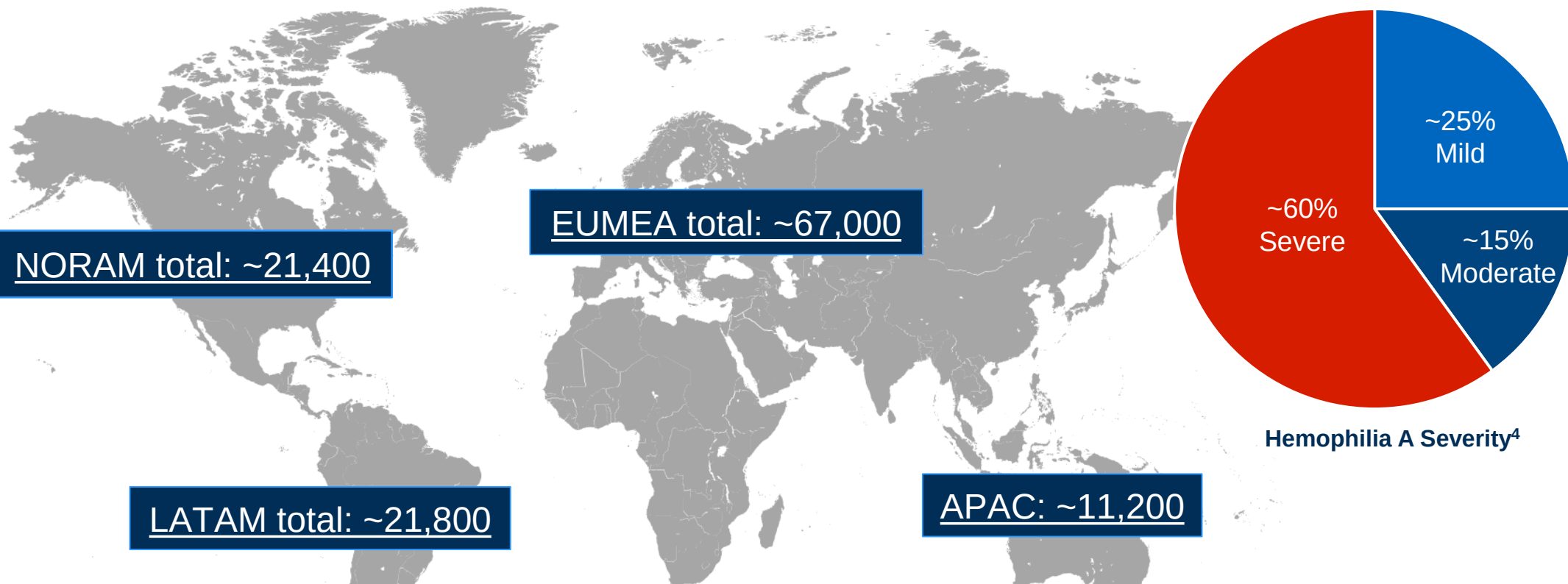
- AAV5 has the lowest prevalence of pre-existing immunity compared to other serotypes
- ~70% of Hemophilia A patients in BioMarin global territories estimated to be negative for antibodies to AAV5

% of Hem A patients eligible (AAV5-) for valrox treatment

	AAV5	AAV2	AAV6	AAV8	AAVrh10
USA	79%	55%	67%	72%	65%
Global Hem A weighted average	69%	49%	58%	61%	58%

Global Hemophilia A Market in 2019 was \$9.7B¹

*Estimated WAC pricing for Hemlibra in non-inhibitor adult patients is between \$600K-\$800K per year²
Fully-compliant, WAC pricing for FVIII replacement in adults is \$403K-\$674K per year³*

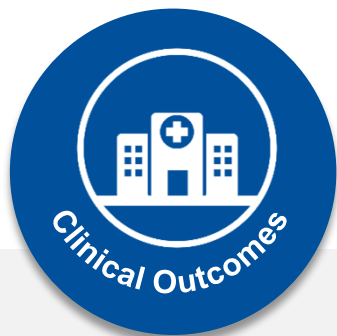


An Estimated ~121K Hemophilia A Patients in BioMarin Territories⁵

1. Evaluate Pharma 2020; 2. PriceRx IHA Global insight Oct. 2015-Oct. 2016 (WAC price reflects cost of Factor VIII replacement for an adult on prophylaxis); 3. Based on WAC price of \$99.20 per mg \$482K/year for a 58 kg subject; Centers for Disease Control and Prevention (CDC) estimates the average adult American male weighs >90 kg; 4. EPI Data from 2018 WFH Annual Survey; NHF website: <http://www.hemophilia.org/Bleeding-Disorders/Types-of-Bleeding-Disorders/Hemophilia-A>; 5. 2018 WFH and CDC Community counts

Significant Unmet Need in Severe Hemophilia A Places Major Burden on Patients, Caregivers and Society

Significant Impact on Quality of Life and Costs to the Healthcare System



Severe patients (<1% FVIII in blood) experience frequent spontaneous and **recurrent bleeding episodes**, often **deteriorating joints** and muscles



Current treatments include **chronic, burdensome 1-3x weekly infusions** and **limited physical activity** which can still result in hospital stays and lost time at school / work



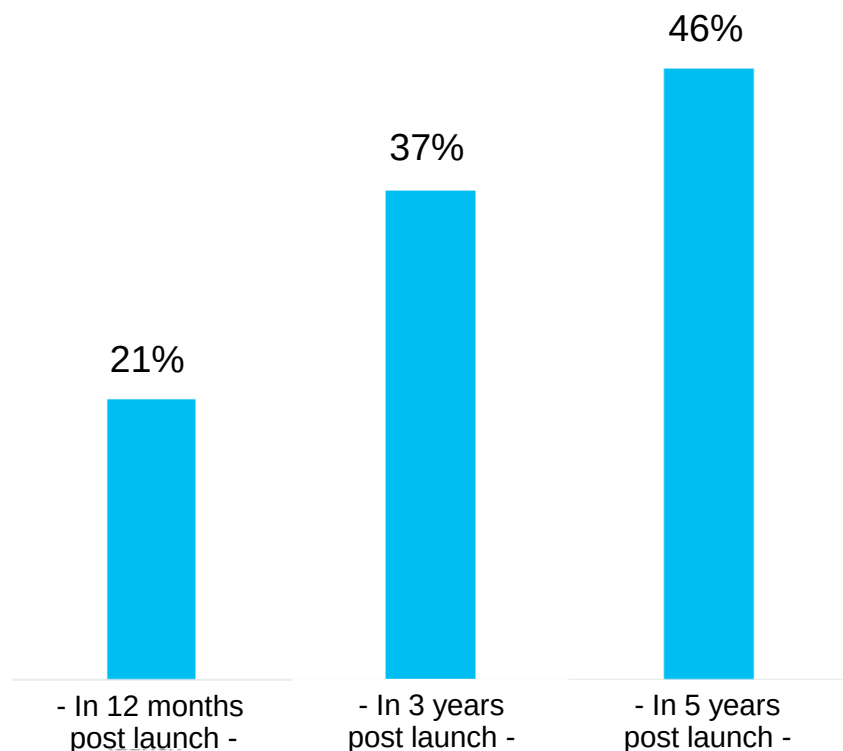
Prophylaxis therapy costs **~\$700,000¹** annually per patient with severe Hemophilia A, and treatment of a **single bleed** can cost over **\$50,000**

¹Croteau SE, Cheng D, Cohen AJ, et al. Regional variation and cost implications of prescribed extended half-life factor concentrates among U.S. Haemophilia Treatment Centres for patients with moderate and severe haemophilia. *Haemophilia*. 2019.

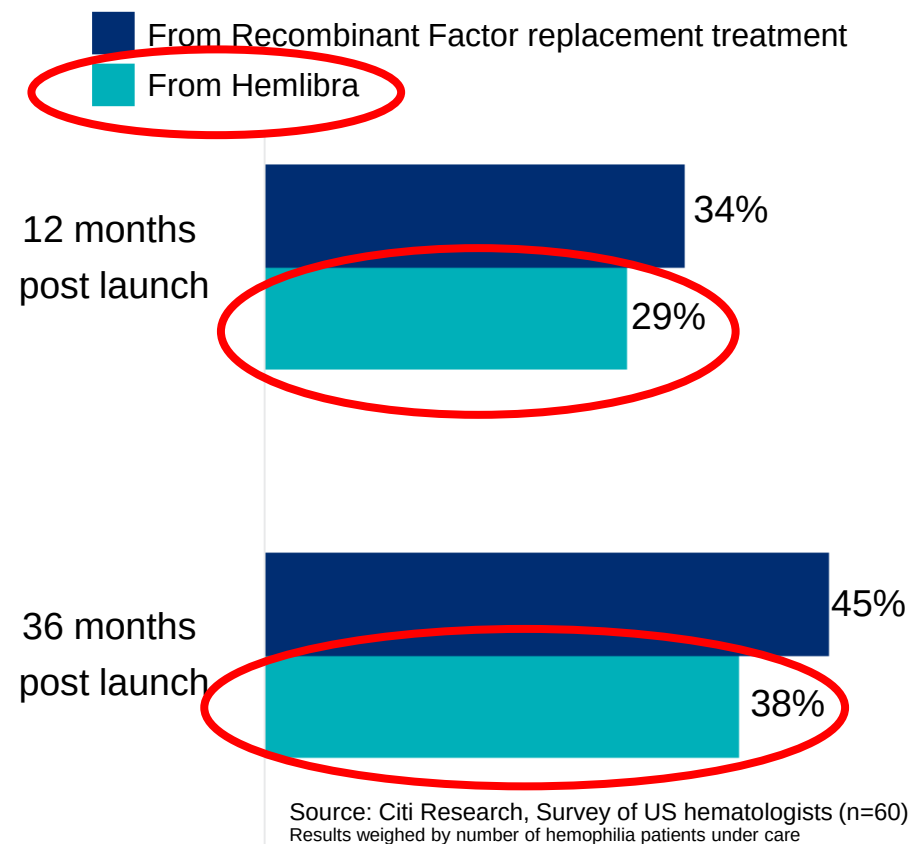
Recent Physician Survey Predicts Robust Valrox Prescribing Behavior in Hemophilia A

Share for gene therapy could reach ~50% by year 5 with rFVIII therapies ceding most share

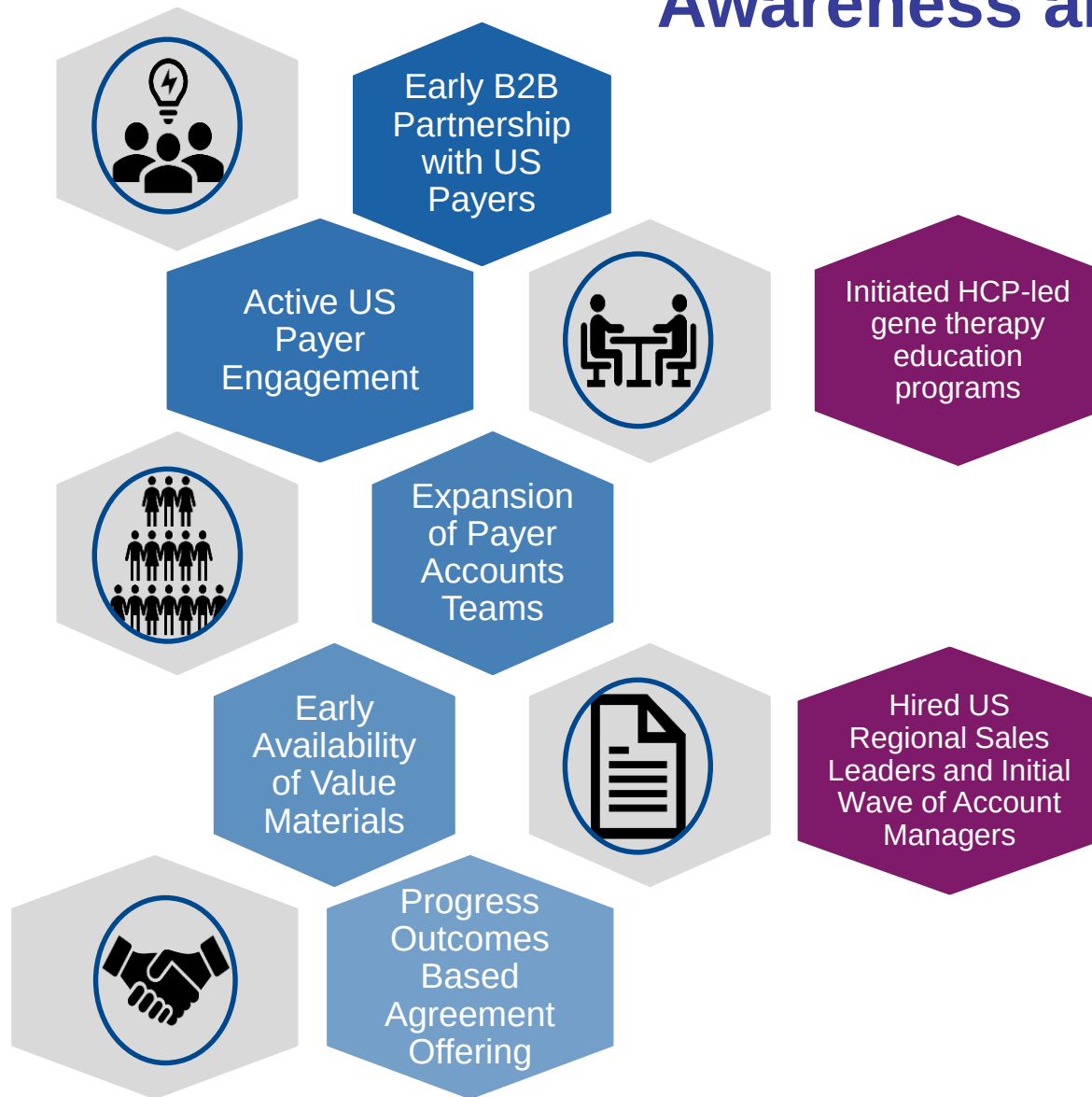
Share of Gene Therapy in Hemophilia A
mean % of patients



Switching to Gene Therapy
mean % of patients



Multi-pronged Commercial Readiness Plans Launched in 2017 Driving Awareness and Enthusiasm



- ✓ Hired, trained and launched Managed Market Teams
- ✓ Held key payer engagement representing 220 million covered lives
- ✓ Initiated Gene Therapy (GT) Education Programs led by trained HCP speakers
- ✓ Received hundreds of hemophilia community opt-ins for our GT educational programs
- ✓ Increased global patient interest through our digital platform, Hemdifferently.com
- ✓ Hired experienced Field Leadership and Account Managers

High-value Attributed to Physiologic Correction of Hemophilia A by Payers

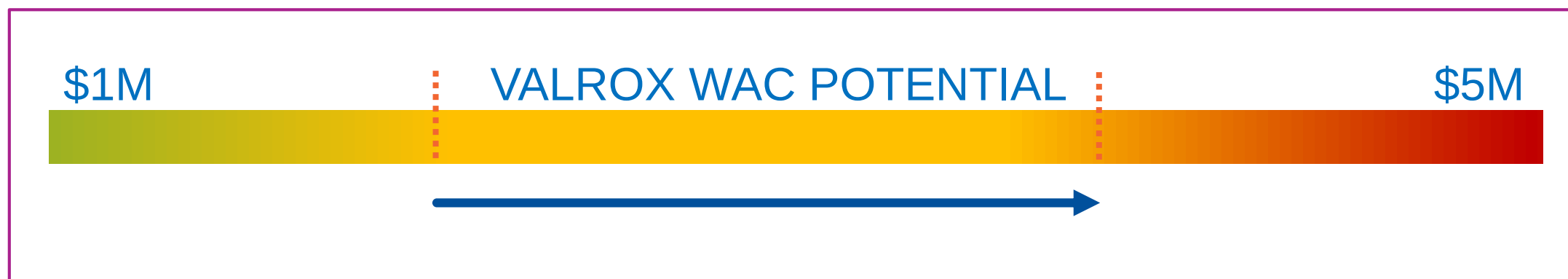
Increasing understanding among payers of Hem A patient care underscores the potential value of valrox

Attributes of positive payer value perception*

Increase in and Stability of FVIII levels

Reduction in FVIII utilization

Reduction in Bleeds





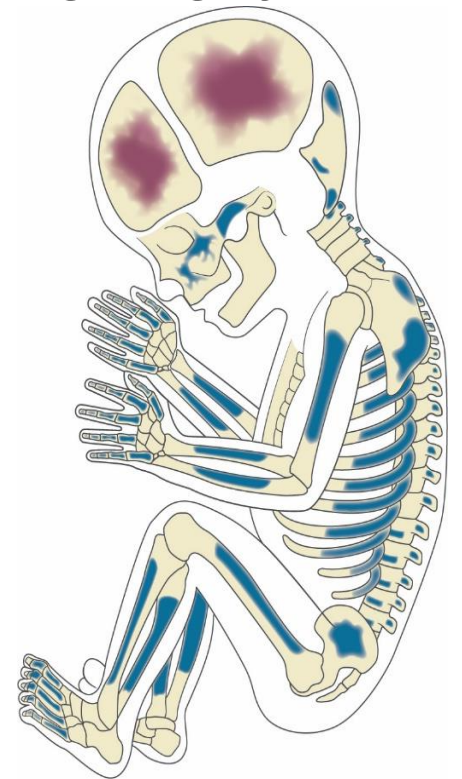
vosoritide for achondroplasia

**2021 Expected
Vosoritide Launch**

Achondroplasia: The Most Common Form of Dwarfism

No Approved Medical Therapies; only Treatment Available is Limb-Lengthening Surgery

- Caused by a mutation in the fibroblast growth receptor 3 gene (FGFR3), a negative regulator of bone growth
 - 80% of cases occur from parents of average stature (due to spontaneous mutation in FGFR3)
- In addition to short stature, serious medical manifestations include:
 - Foramen magnum compression, Sleep apnea, Bowed legs, Permanent sway of the lower back, Spinal stenosis & Obesity
- Most common skeletal dysplasia - 1:25,000 birth worldwide
 - ~22,000 children with achondroplasia in BioMarin global territories



**Endochondral
bone (in blue)**

Global 4-pronged Program Focuses on Efficacy, Safety, Durability and Importance of Early Treatment

Phase 3 Study results: Proven Efficacy

- Primary endpoint result $p < 0.0001$
- N=121, (5–18 years) pivotal for initial registration
- Randomized, placebo-controlled and stratified by age group and puberty

Natural History Data: Age and Gender Matched Comparator Population

- Comparative analyses by age and gender matched ($N \geq 600$) against trial data
- Ready for NDA / MAA filings in 2020

Phase 2 Studies: Durability of Effect

- 54-month Phase 2 Clinical Data and Natural History Analyses
 - Sustained efficacy and counting
- 42-month data now published in NEJM

Phase 2 Studies: 0–5 years Benefits of Early Treatment

- 3 cohorts: C1 (2–5 years); C2 (6mo–2years); C3 (0–6mos)
- First Cohort 3 sentinels now enrolled – aged <6M

Phase 3 Results: Data Demonstrates Strong Increase in Growth Velocity Across Broad Study Population

Significant Improvement in Annualized Growth Velocity Observed after 1 Year

Primary endpoint result:

- **1.6 cm/year** ($p < 0.0001$) placebo-adjusted added increase from baseline in growth velocity after 1 year of treatment with vosoritide

Phase 3 and Phase 2 have similar patient populations:

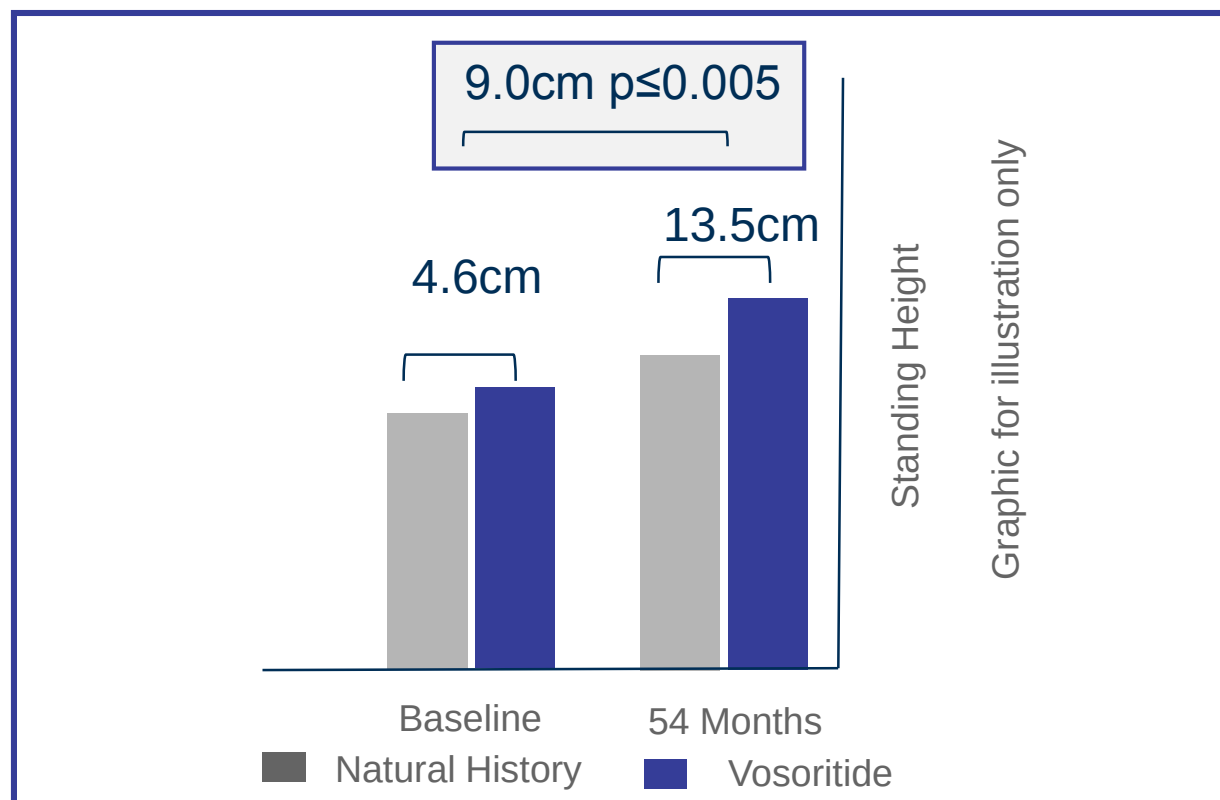
	Phase 2 C3 (5–14 years eligible)	Phase 3 (5–18 years eligible)
Baseline AGV	4.0cm/yr	4.2cm/yr
Mean Age (Range Enrolled)	8.0 (6–11)	8.7 (5–14)
Tanner 1 vs >1	100% vs 0.0%	79.3% vs 20.7%
Male vs Female	40.0% vs 60.0%	52.9% vs 47.1%

Safety:

- Vosoritide was generally well tolerated, the majority of adverse events (AEs) were mild
- No serious adverse events were reported as study drug-related

Phase 2 54-month Results: Continuous Treatment Increases Vosoritide Cumulative Benefit Compared to Natural History

9.0cm Cumulative Additional Height Gained vs. Natural History over 54 Months



- Preliminary Analysis with 15 μ /kg dose vosoritide vs. Natural History
- Phase 2 C3 n=10 subjects matched to NH data at baseline and at 54 months by age and gender (n=619)
- Cross Sectional Analysis comparing standing height at baseline vs. standing height at 54 months

Expanding Vosoritide Patient Population to Include Infants and Toddlers Ages 0–5 Years to Provide Maximum Benefit

Phase 2 Study (206) 3 Cohorts: C1 (2–5 years) Fully Enrolled; C2 (6 months–2 years) all Subjects Dosed/In Screening; C3 (0–6 months) Enrolling

- Sentinels enrolled to evaluate PK – likely impacted by age / weight
- Trial designed to evaluate dose adjustments required as children get older
- Short acting once-daily avoids risk of drug accumulation / overdose
 - Cohort 1 (aged 2–5 years): dosed at 15 μ /kg
 - Cohort 2 (aged 6 months–2 years): dosed at 30 μ /kg
 - Cohort 3 (aged <6 months): under evaluation
- Safety and tolerability in infants and children remains consistent with what has been observed in Phase 2

Summary: Sustained Growth Effects of Vosoritide Through 54 Months, Multi-pronged Global Program Progressing Rapidly

Comprehensive Global Program Progressing Rapidly

- Phase 3 demonstrated 1.6 cm/year ($p < 0.0001$) placebo-adjusted additional increase from baseline in growth velocity after 1 year of treatment
- Large contemporaneous Natural History Dataset to support NDA/MAA
- At 54 months, sustained drug effect and additional cumulative height gained of 9.0cm compared to Natural History data
- Now dosing infants <6 months to evaluate PK / safe dosing
- No significant cardiovascular effects

Next Step

Pre-submission meetings with Health Authorities planned for 1H20 to discuss Marketing Applications



News Today!
US and UK Clear Path to
Start Clinical Trial

Next Gene Therapy Product to Enter the Clinic

BMN 307: Gene Therapy for the treatment of PKU

Potential 3rd Therapy to treat PKU in BioMarin's Franchise

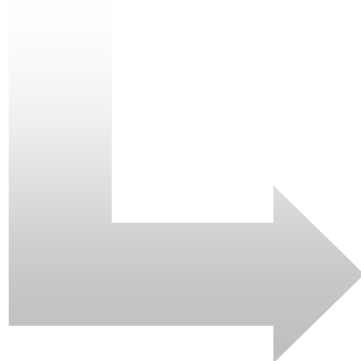
BMN 307: With CTA & IND Active, First Subject to be Enrolled 1Q20



902 PHEnom

Observational Study in Patients with PKU

Measure markers of disease and clinical outcomes over time in PKU patients



201 PHEarless

Gene Therapy Interventional Study

Determine the safety, efficacy and tolerability of a single administration of BMN 307 in PKU patients

- Part A: dose selection / Part B: dose expansion
- CTA accepted & IND Active

Next Step

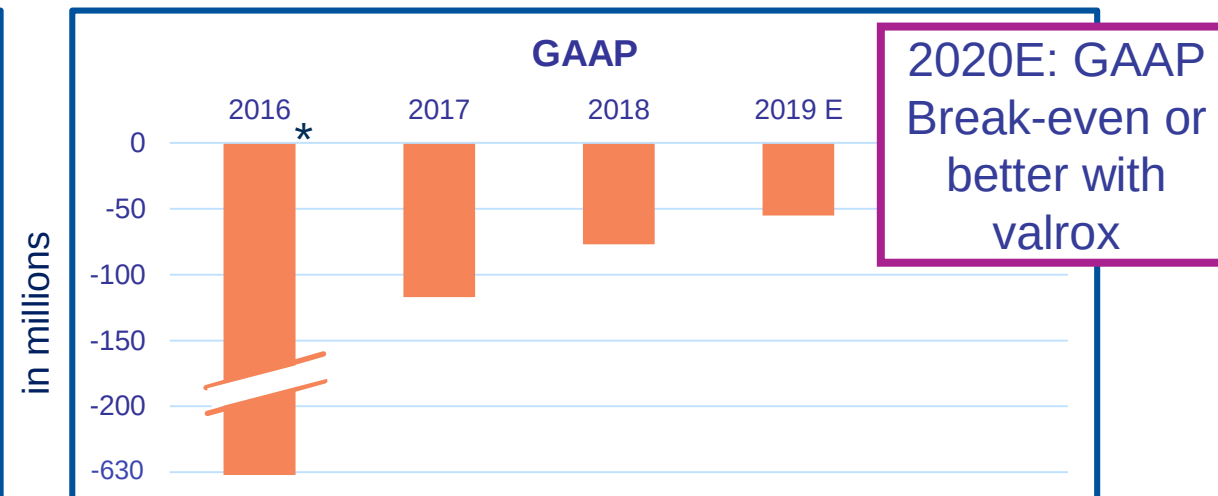
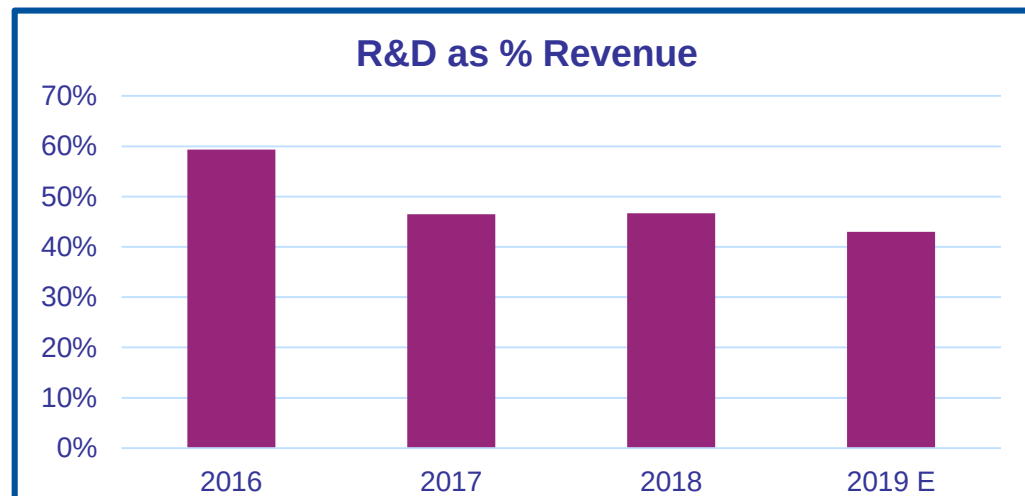
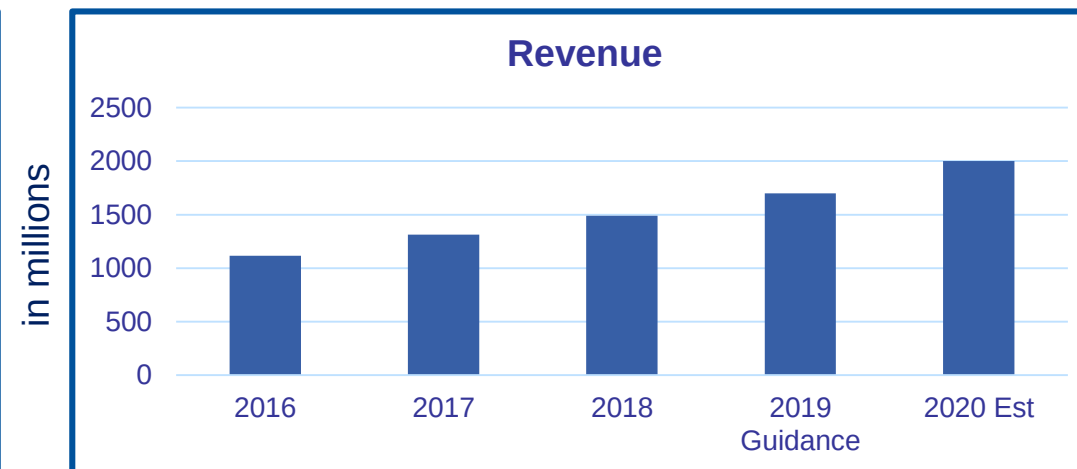
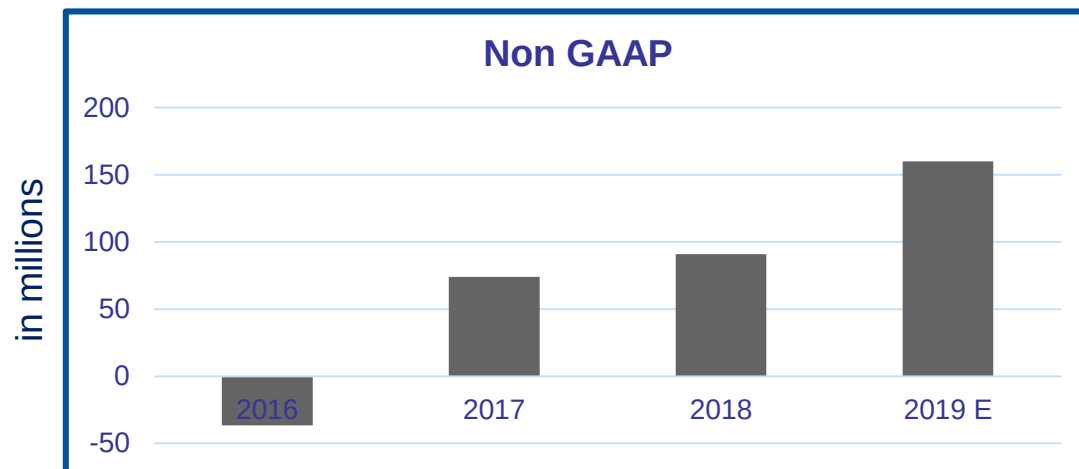
Initiate **potential registration-enabling Phase 1/2 study**, with commercial scale material, in 1Q20



Financial Outlook and Key 2020 Milestones

Continually Improving our Financial Performance

BioMarin Results – 2016 to Date



*GAAP loss in 2016 was (\$630.1M) due to a one-time write-off of Prosensa

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THANK YOU

BIOMARIN