Santhera Pharmaceuticals

Developing medicines to meet the needs of patients living with rare diseases

Corporate Presentation

March 2023

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Santhera Pharmaceuticals Corporate Snapshot

1

SIX Swiss Exchange listed company (SANN)

Global headquarters near Basel (Switzerland) with internationally experienced leadership team

North American headquarters near Boston (USA) with team growing under new leadership

2

Regulatory filings completed for vamorolone in Duchenne muscular dystrophy

NDA submission accepted by FDA with target action date set to Oct 26, 2023

MAA submission under review by EMA with expected CHMP opinion in late Q3-2023

MAA submitted to MHRA in the UK in Feb-2023

Positive study supports vamorolone as foundational therapy as alternative to standard of care

Steroid-like efficacy with differentiated safety profile addresses needs across broad patient segments

Potential as alternative to steroids in broad range of therapeutic indications

3

Neutrophil elastase inhibitor lonodelestat Phase 2 ready in pulmonary indications

Successful multiple ascending dose study in cystic fibrosis patients completed

Novel anti-inflammatory agent for neutrophil associated pulmonary disorders in general

4

Recent financing activities

Feb-2023 share placement and financing facility providing up to CHF 22.2 million

Idorsia increases holding to 17.7 % on Jan 10, 2023

Cash runway into Q4-2023 (PDUFA date)

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Santhera pipeline offers an attractive investment opportunity

Two assets with broad therapeutic potential and opportunities beyond current active programs

Vamorolone foundational therapy in Duchenne MD

- US NDA and EU MAA accepted and under review for potential approval in Q4-2023; MAA submitted in the UK in Feb-2023
- Positive pivotal data in Phase 2b as well as long-term extension study
- Peak potential > USD 500 million in DMD (US,EU4,UK)[1]
- Own commercialization in US and EU4+UK and/or through partnerships
- Geographical partnerships outside US and top 5 European markets

Lonodelestat targeting inflammation pulmonary disease

- Positive MAD Phase 1b trial in cystic fibrosis
- Safe dose regimen; effect on biomarker
- Program Phase 2 ready in CF and ARDS, development currently paused by Santhera
- Potential in other inflammatory lung diseases with neutrophil involvement, both for acute and chronic application

Worldwide rights for all indications for both assets[2]

MD: Muscular Dystrophy; MAD: Multiple Ascending Dose; CF: Cystic Fibrosis; ARDS: Acute Respiratory Distress Syndrome;
1: Santhera estimate; 2:Vamorolone out licensed in China to Sperogenix.

Pipeline offers promising therapeutic options in rare disease areas

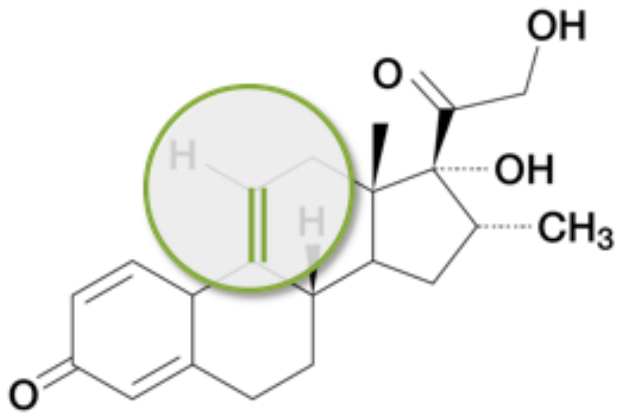
US NDA and EU MAA, both accepted and under review for potential approval in Q4-2023

Molecule	Indication	IND Ph 1 PoC Pivotal Filing Market	Milestones and remarks
Vamorolone • dissociative steroid • oral suspension	**Duchenne muscular dystrophy**	VISION-DMD	Oct-22: MAA filing validated by EMA Jan-23: NDA filing accepted by FDA Feb-23: MAA submitted to MHRA (UK)
	Becker muscular dystrophy		Aug-22: Start Phase 2a FDA grant to partner ReveraGen BioPharma
	Steroid alternative in multiple pediatric rare indications		New IND applications in planning
Lonodelestat • hNE inhibitor • via nebulizer	**Cystic fibrosis**		Phase 2 ready for CF and ARDS (currently paused)
	Multiple respiratory conditions with high hNE activity		New IND applications in planning

Vamorolone worldwide license from ReveraGen in Sep 2020; Lonodelestat worldwide license from Polyphor (now Spexis) in Feb 2018; Lonodelestat was formerly known as POL6014

hNE: Human Neutrophil Elastase; PoC: Proof of Concept; IND: Investigational new drug; NDA: New Drug Application; FDA: Food and Drug Administration; ARDS: Acute Respiratory Distress Syndrome.; MAA: Marketing Authorization Application

Vamorolone in Duchenne muscular dystrophy and potentially other inflammatory disorders



DMD offers attractive opportunity in well-defined orphan disease market

DMD market with few current treatment options, projected to be worth > USD 4 billion by 2023*

- Approx. 30,000 – 35,000 patients in US and Europe combined
- Well defined standard of care with corticosteroids as lead chronic treatment in established guidelines
- Patients diagnosed at early age and accessible
- Limited number of specialized centers
- Well organized and influential patient advocacy groups
- Newer therapies likely to be used in combination with corticosteroids

Small teams needed to cover entire market in EU and US

DMD	Centers	HCPs
US	~90	~450
EU4+UK	~180	~750

Current approved therapies command high price with intrinsic limitations to serve addressable market

- Exon skippers and read through therapies serve niche segments based on genetic mutation
- Gene therapies deliver micro-dystrophin partially restoring function with re-dosing challenges
- Deflazacort (corticosteroid) is approved in US (Emflaza®), achieves attractive margins

* Grand View Research Inc., Research & Markets, Decision Resources

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The need for a better foundational steroid therapy in DMD

EFFICACY OF STEROIDS

Classical corticosteroids demonstrate efficacy with delay in disease progression.

They are used on top of exon skipping and read-through drugs or gene therapies under development

ESTABLISHED FOUNDATIONAL THERAPY

SAFETY ISSUES WITH STEROIDS

Classical corticosteroids are associated with significant side effect burden.

This leads to hesitance starting therapy in young boys, to underdosing and to early discontinuation.

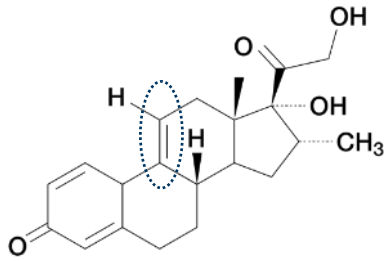
TOO LATE
TOO LITTLE
TOO SHORT

VAMOROLONE OFFERING

Subtle difference in steroid ring structure leads to dissociative properties.

Maintained anti-inflammatory efficacy with improved safety profile has been established.

NEW DISSOCIATIVE STEROID CLASS



Differential profile covered in clinical section

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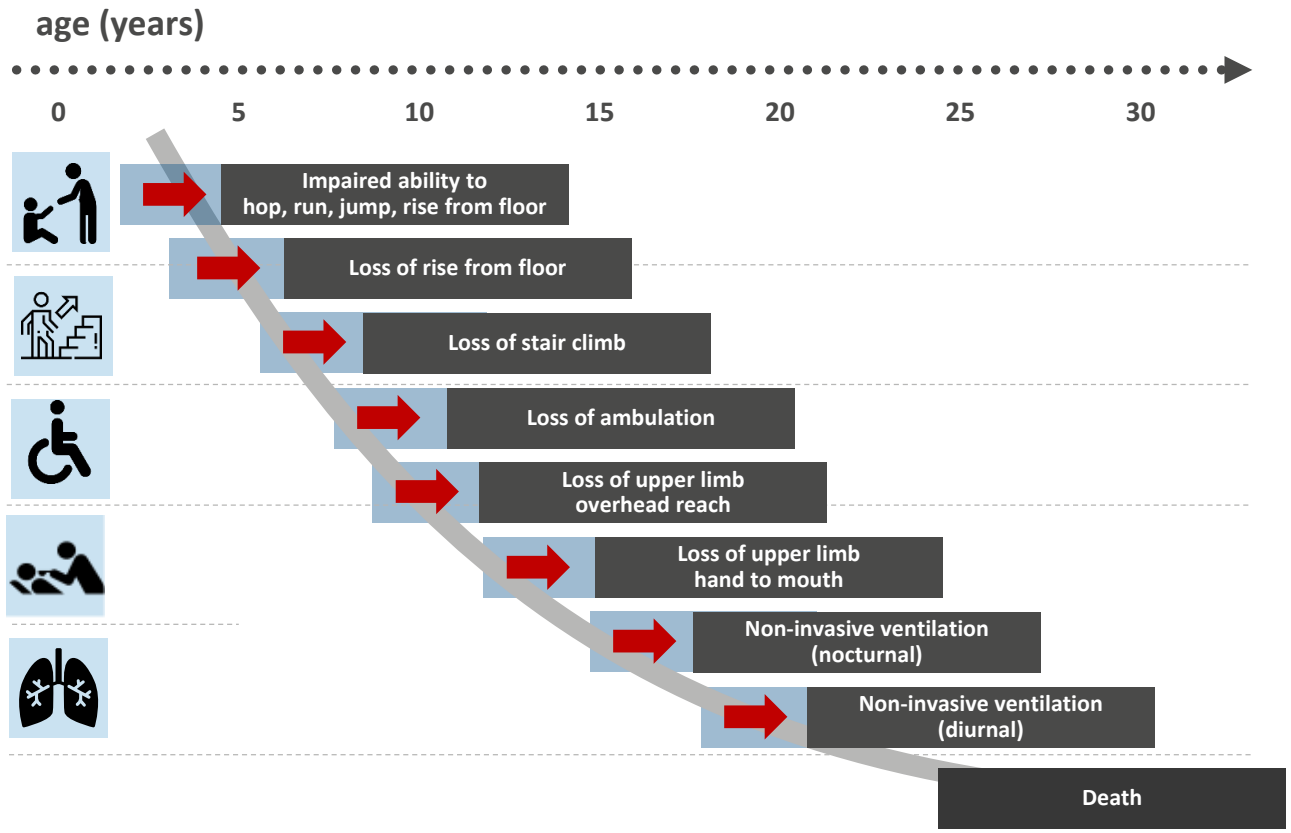
Corticosteroids delay disease progression in DMD by 2 – 3 years[4,6]

Established endpoints and consistent evidence base through several clinical studies



Corticosteroids are the standard of care

- DMD progression is sequential, non-linear and irreversible[1-4]
- Early initiation of corticosteroids preserves muscle function and strength, delaying time to loss of functional milestones by 2 – 3 years[4,6]
- Steroid treatment associated with a reduction in all-cause mortality, new onset and progressive cardiomyopathy[5]

1. Birnkrant et al. (2018) Lancet Neurology, 1474; 2. Cowen et al. BMC; Neurology (2019) 19:84; 3. Asher et al. (2020) Exp. Opin. Bio. Therapy, 20:3, 263; 4. McDonald CM et al., Lancet 2018, 3391 (10119):451-461; 5. Schram et al; PCL Cochrane Database of Systematic Reviews (2013), 61(9);948-54; 6. Matthews et al Cochrane Database of Systematic Reviews (2016)

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Corticosteroid treatment is associated with well-defined toxicities

…up to 65% of DMD patients discontinue treatment early due to adverse events[1-3]

37%  Growth failure/delay[2,3]

37%  Behavioral changes[3]

30%  Bone changes or fractures[2,3]

55%  Cushingoid appearance[3]

65%  Weight gain[3]

31%  Excessive hair growth[2,3]

19%  Cataracts[2]

1. Cowen L, et al. BMC Neurol. 2019;19:84; 2. Wong B, et al. Treatment Pediatr. 2017;182:296–303;
3. Bello L, et al. Neurology. 2015;85:1048–1055;

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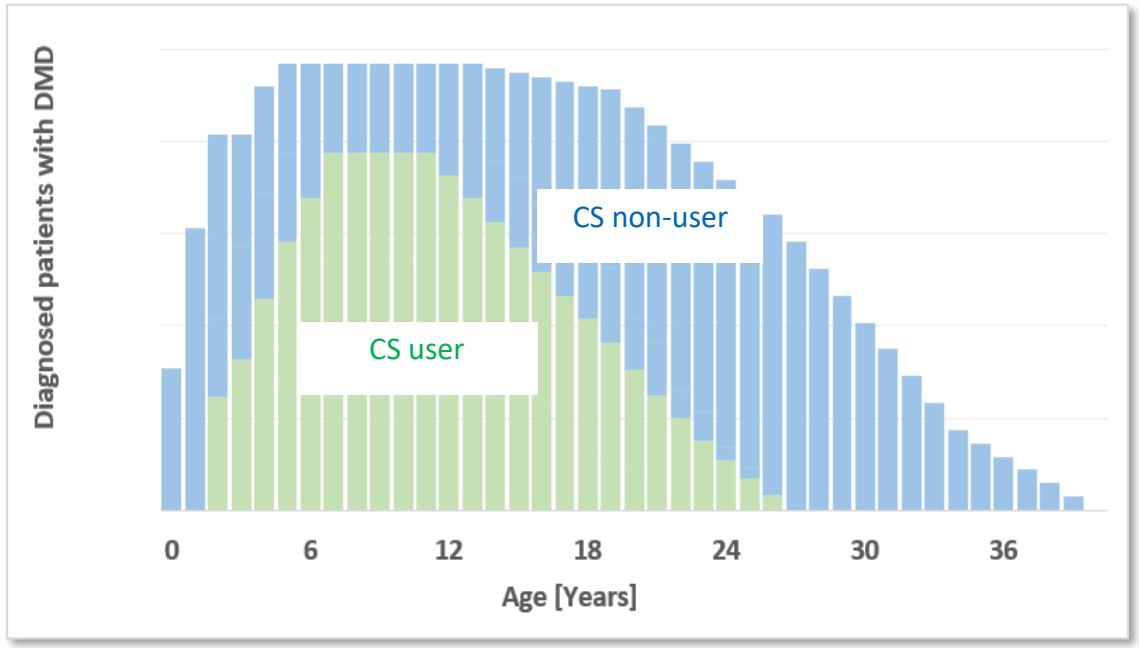
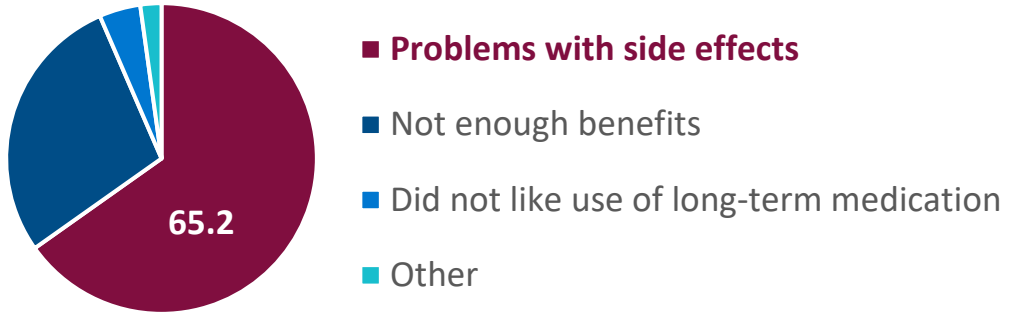
Corticosteroid use is limited due to known side effect profile

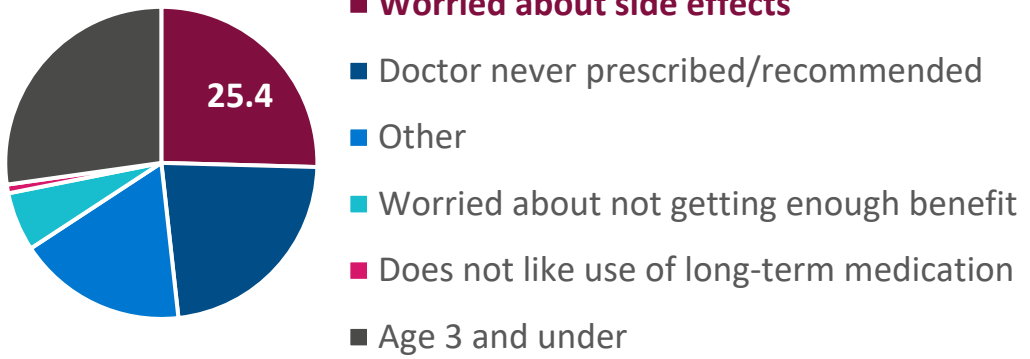
Use of corticosteroids in DMD is high, particularly in ambulatory patients, but declines with age[1-4]



Reasons (%) for Discontinuing Steroid Treatment[4]



Reasons (%) for not Initiating Steroid Treatment[4]



1: McDonald Lancet 2017; 2: Goemans Lancet 2018; 3:McDonald Mucle&Nerve 2020 ; 4: Cowen BMC Neurology 2019;

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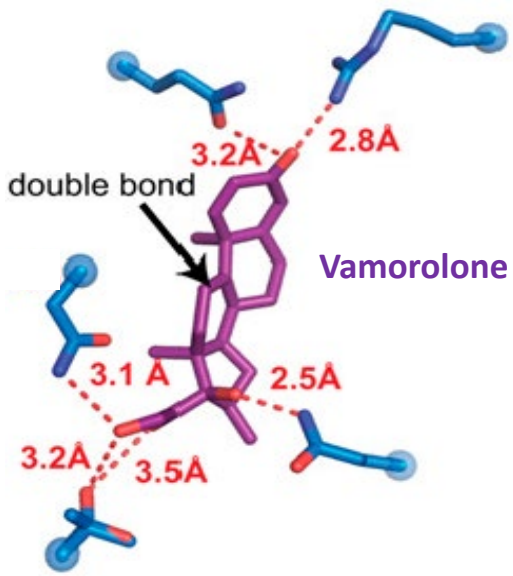
Vamorolone retains benefits of steroids with fewer side effects[1-3]

Glucocorticoid Receptor Ligand Binding Domain



Double bond in vamorolone chemical structure attenuates GC receptor binding and ultimately leads to less activation of genes responsible for side effects[4-5]

Like corticosteroids[4-5]

- Inhibition of NF-κB pro-inflammatory transcription factors

Retained efficacy due to potent anti-inflammatory action

Unlike corticosteroids[4-5]

- Not a substrate of hydroxysteroid dehydrogenase
- Less activation of genes responsible for side effects
- Potent mineralocorticoid antagonist (eplerenone-like)
- Membrane stabilizer

Potential for significant reduction of steroid-associated side effects

NF-κB=nuclear factor kappa B., 1. Smith et al. PLOS Medicine. (2020); 2. Dang et al. MDA Abstr. #47 (2021) 3. Guglieri M Poster EP 524 WMS 2021, 4. Heier CR, et al. EMBO Mol Med. 2013;5:1569-1585, 5. Liu X, Proc Natl Acad Sci U S A. 2020 Sep 29;117(39)

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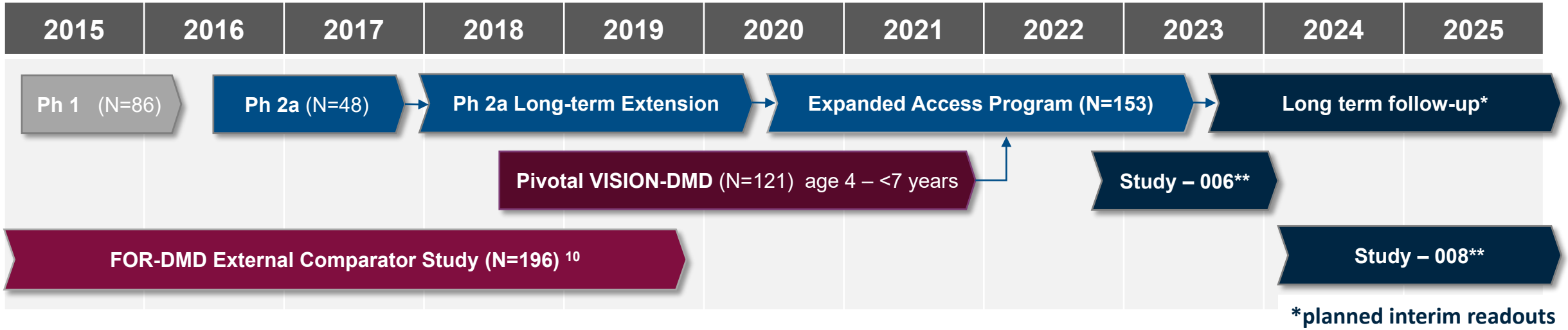
Comprehensive vamorolone development [2-9]

200 patient-years exposure in 160 DMD boys treated with vamorolone for up to 6 years [1]



*planned interim readouts

Pivotal study
establishes efficacy vs placebo and comparable to prednisone (at week 24), maintenance of effect (at week 48) and safety differentiation

External comparison
of pivotal study with matched patients from steroid use (prednisone and deflazacort) study strengthens safety differentiation at week 48

2.5 year comparison
study with matched patients from steroid use (prednisone and deflazacort) study demonstrates safety differentiation in the long term

Supportive Data
Study-006:
supportive data in patients 2-18 years of age
Study-008:
effectiveness in 7-18 year old ambulatory / non-ambulatory switchers

1. Data on File VAM-2021-001, 2. Hoffman et al. Steroids (2018); 3. Conklin et al. Ph. Res. (2018); 4. Hoffman et al. Neurology. (2019); 5. Smith et al. PLOS Med. (2020); 6. Mah et al, JAMA Open Network 2022; 7. Mavroudis et al. J. Clin. Ph. (2019); 8. Li et al. J. Clin Ph. (2020); 9. Liu et al. PNAS (2020), 10. Guglieri et al JAMA 2020; * Santhera Data on File; ** Studies as part of pediatric investigational plan (PIP)

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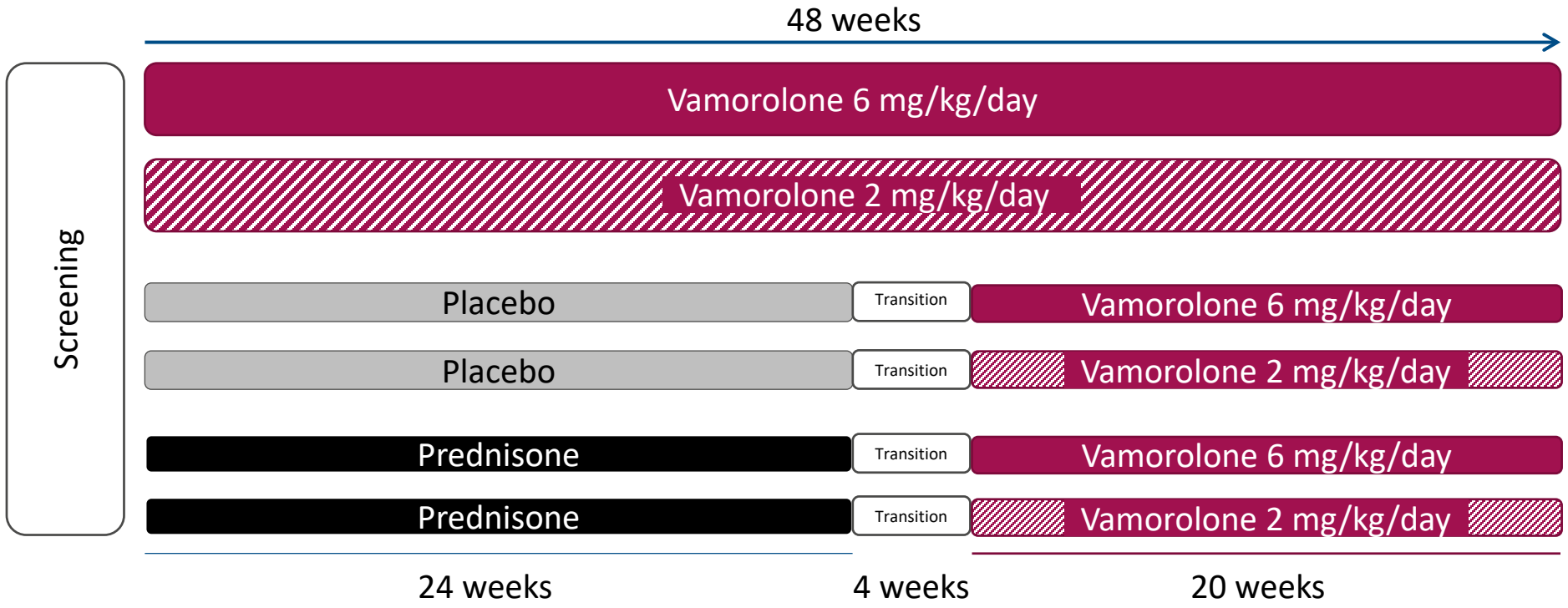
Pivotal VISION-DMD: Study design

Randomized, double-blind, placebo and active control trial in 121 steroid-naive patients, aged 4 – <7 yrs.



Outcome measures

Primary efficacy outcome measure: TTSTAND velocity vs placebo at 24 weeks

Key secondary outcome measures: 6MWT, TTRW, TTCLIMB, NSAA, safety and tolerability

Time to Stand (TTSTAND), 6 Minute Walk Test (6MWT), Time to Run/Walk 10m (TTRW), Time to Climb 4 Stairs (TTCLIMB), North Star Ambulatory Assessment (NSAA)

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Primary endpoint met with high statistical significance at 24 weeks

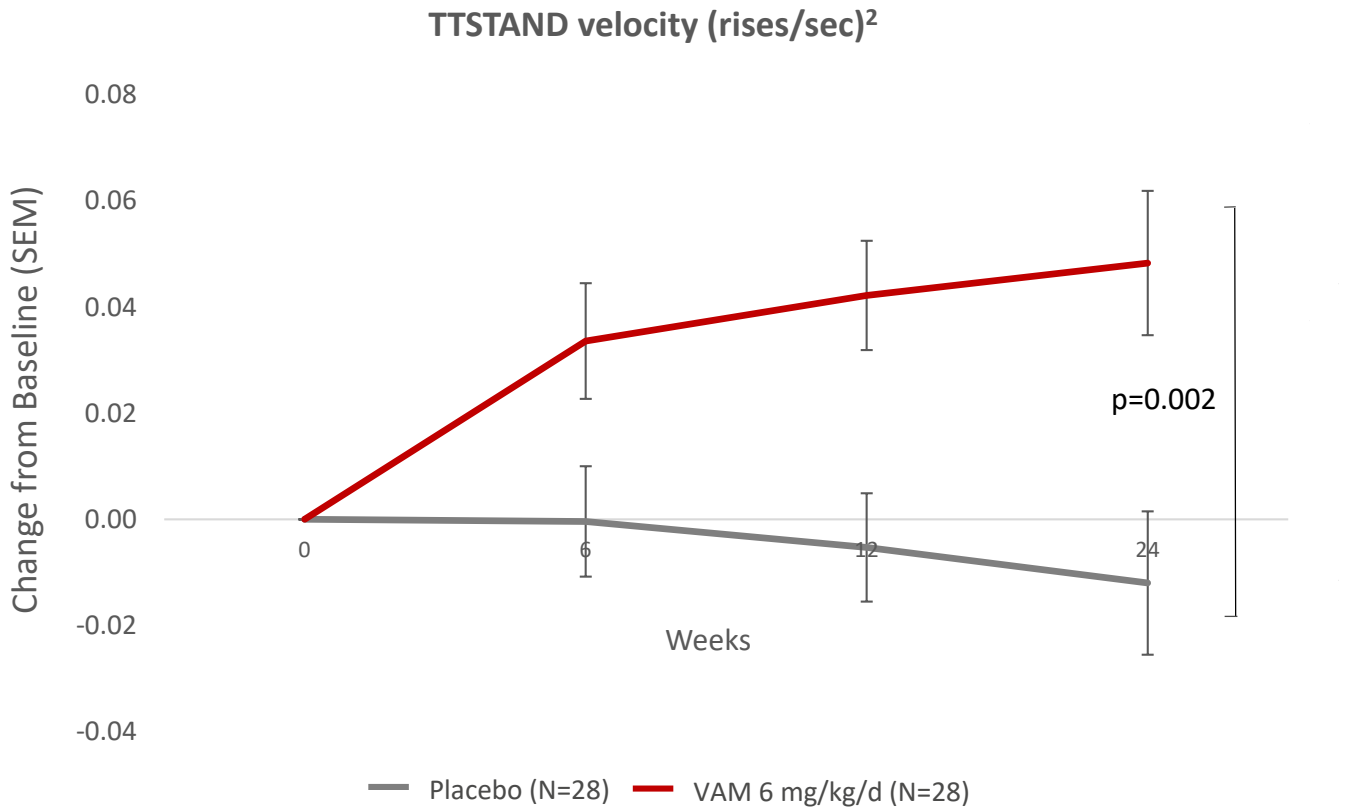
Consistent and robust efficacy shown by primary endpoint and majority of secondary endpoints for both vamorolone doses

Rank	Endpoint	Comparison vs placebo	Difference	P-value
Primary	**TTSTAND velocity**	**vam 6mg/kg/d**	**0.06 rises/s**	**0.002**
Pre-Specified Secondary	TTSTAND velocity	vam 2mg/kg/d	0.04 rises/s	0.017
	6MWT	vam 6mg/kg/d	42 m	0.003
	6MWT	vam 2mg/kg/d	37 m	0.009
	TTRW velocity	vam 6mg/kg/d	0.24 m/s	0.002
	TTRW velocity	vam 2mg/kg/d	0.13 m/s	0.103
Exploratory	TTCLIMB velocity	vam 6mg/kg/d	0.07 tasks/s	<0.001
	TTCLIMB velocity	vam 2mg/kg/d	0.06 tasks/s	0.006
	NSAA	vam 6mg/kg/d	3.4 points	<0.001
	NSAA	vam 2mg/kg/d	3.2 points	<0.001

Time to Stand (TTSTAND), 6 Minute Walk Test (6MWT), Time to Run/Walk 10m (TTRW), Time to Climb 4 Stairs (TTCLIMB), North Star Ambulatory Assessment (NSAA). mITT-1: modified intention to treat population from period 1, MMRM estimates of changes from baseline, vam: vamorolone

Primary endpoint met with clinically relevant treatment difference

Observed difference of 0.06 rises/sec is expected to delay the time to loss of ambulation by 2-3 years[1]



23% improvement in time to rise after 6 months of treatment with VAM 6mg/kg/d [3]

Rise time (sec) [2]	BL	w 24	% Change
VAM 6 mg/kg/d	6.0	4.6	- 23%
Placebo	5.4	5.5	+ 2%

1. McDonald et al. PPDM Conf. 2021 Poster #16, 2. mITT-1: modified intention to treat population from period 1, MMRM estimates of changes from baseline, 3. Press Release June 1, 2021, descriptive statistics

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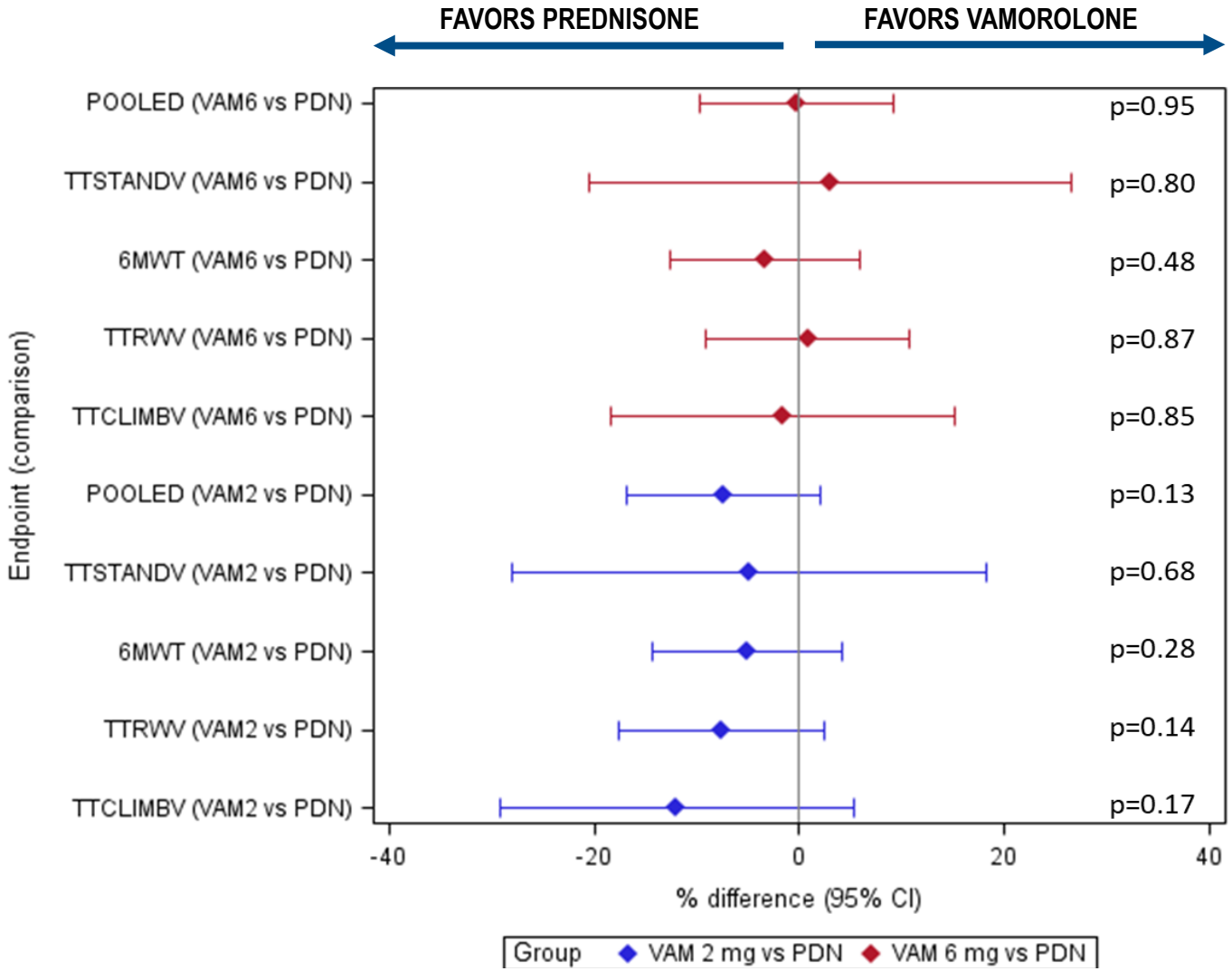
Comparable efficacy of vamorolone 6 mg/kg/d vs prednisone 0.75 mg/kg/d

Difference between groups in percentual change from baseline at week 24 (post hoc analysis)



PDN: Prednisone 0.75 mg/kg/d; VAM: Vamorolone at 2 and 6 mg/kg/d; PLA: Placebo; Time to Stand (TTSTAND), 6 Minute Walk Test (6MWT), Time to Run/Walk 10m (TTRW), Time to Climb 4 Stairs (TTCLIMB), North Star Ambulatory Assessment (NSAA).
Data on file (adapted from Poster 524 presented at WMS 2021), mITT-1

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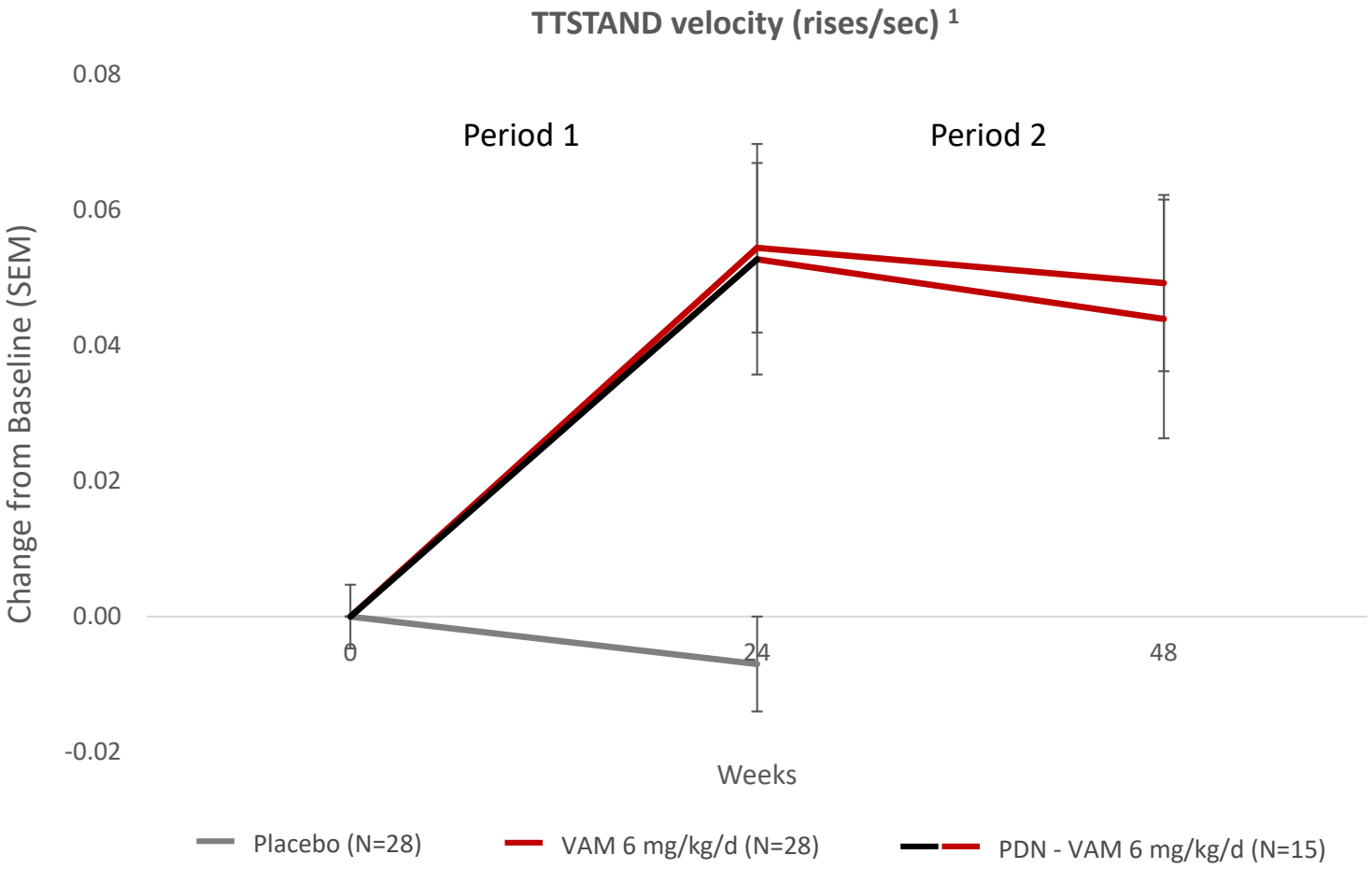
No loss of efficacy when switching from prednisone to vamorolone

Durable treatment effect maintained over 48 weeks with vamorolone 6 mg/kg/d[1]



- During treatment period 1, patients on vamorolone 6 mg/kg/d showed same change in TTSTAND velocity as patients on prednisone before switching to vamorolone 6 mg/kg/d
- During treatment period 2, both groups showed same maintenance of effect
- Historical data consistently show that there is no further improvement with prolonged steroid treatment after the initial improvement in TTSTAND[2]

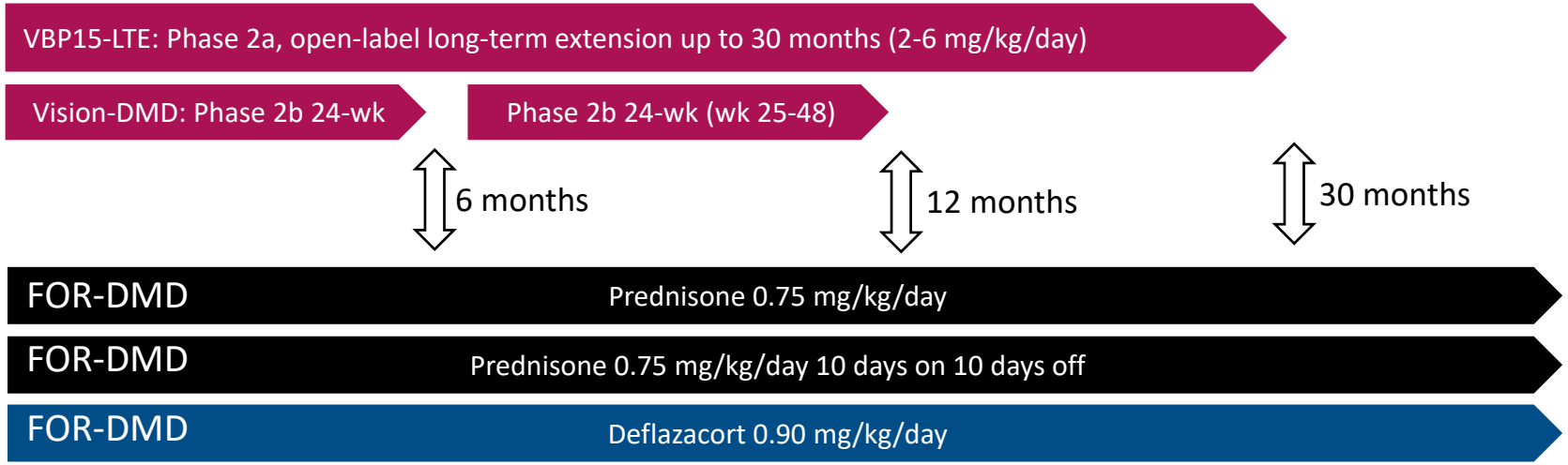
1. Data on File VAM-2021-002, mITT-2: modified intention to treat population from period 1 and 2, MMRM estimates of changes from baseline. PDN –prednisone 0.75mg/kg/day: PCB: Placebo, PDN-VAM: prednisone 0.75 mg/kg/d in Period 1 transitioned to vamorolone 6mg/kg/d in Period 2 group after a 4-week tapering period; 2. McDonald et al. Poster PPMD Annual Conference 2021

The FOR-DMD study provides external comparator data [1]

Pre-specified analyses in double-blind, randomized, academic-run, independent study

DMD boys 4- <7
Steroid naive
N=121 (Pivotal Phase 2b, 48-wks)
N=46 (LTE, 30-months)

DMD boys 4-8
Steroid naive
N=196 , 3-5 year follow up



Time point	Efficacy		Safety	
	Comparison	Method	Comparison	Method
24 weeks / 6 months	PDN (VISION-DMD) vs PDN (FOR-DMD)	Propensity score matching[2]	PDN (VISION-DMD) vs PDN (FOR-DMD)	Inclusion criteria matching[3]
48 weeks / 12 months	VAM vs PDN vs DFZ	Propensity score matching[2]	VAM vs PDN vs DFZ	Inclusion criteria matching[3]
2.5 year[4]	Not applicable	Not applicable	VAM vs PDN vs DFZ	Inclusion criteria matching[3]

1. Guglieri et al JAMA 2022 doi:10.1001/jama.2022.4315 -2. Pre-defined propensity scores calculated based on baseline age, TTSTAND, NSAA score, height and weight; analysis weighted by the propensity scores..Patients meeting the common inclusion criteria of all studies are included 3. For safety endpoints that require a long follow-up time, e.g.fractures, 4. Mah et al JAMA Network Open 2022 e2144178. doi:10.1001/jamanetworkopen.2021.44178. Efficacy and saefty compariosns pre-specified.

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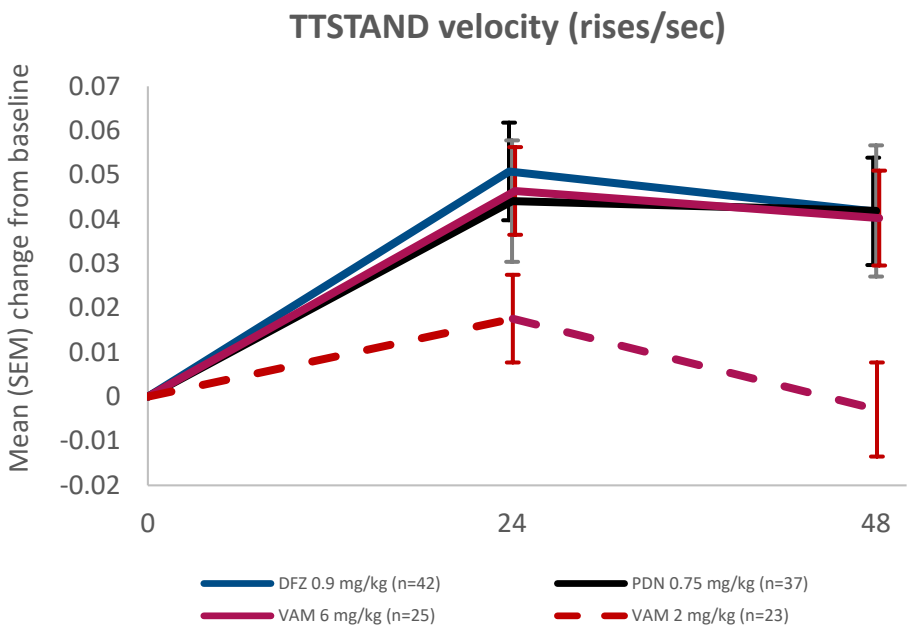
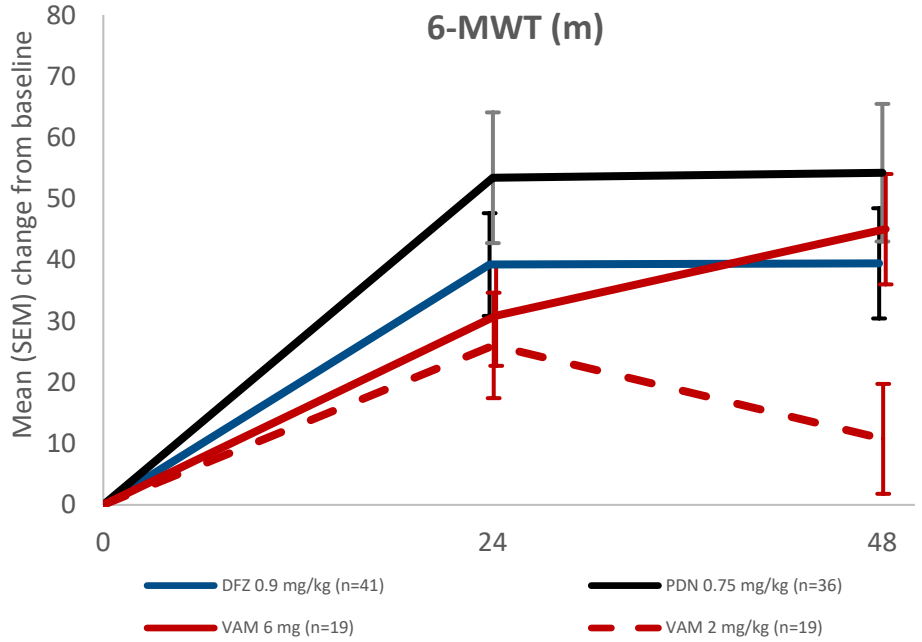
VISION-DMD pre-specified* analyses vs FOR-DMD external control

Propensity matched cross study comparison shows comparable efficacy for vamorolone 6 mg/kg/d versus standard of care corticosteroid treatment





PDN: prednisone; VAM: vamorolone; DFZ: deflazacort

* Cross study comparisons with FOR-DMD as external control specified prior to data base lock in the statistical analysis plan of the VISION.DMD pivotal study.

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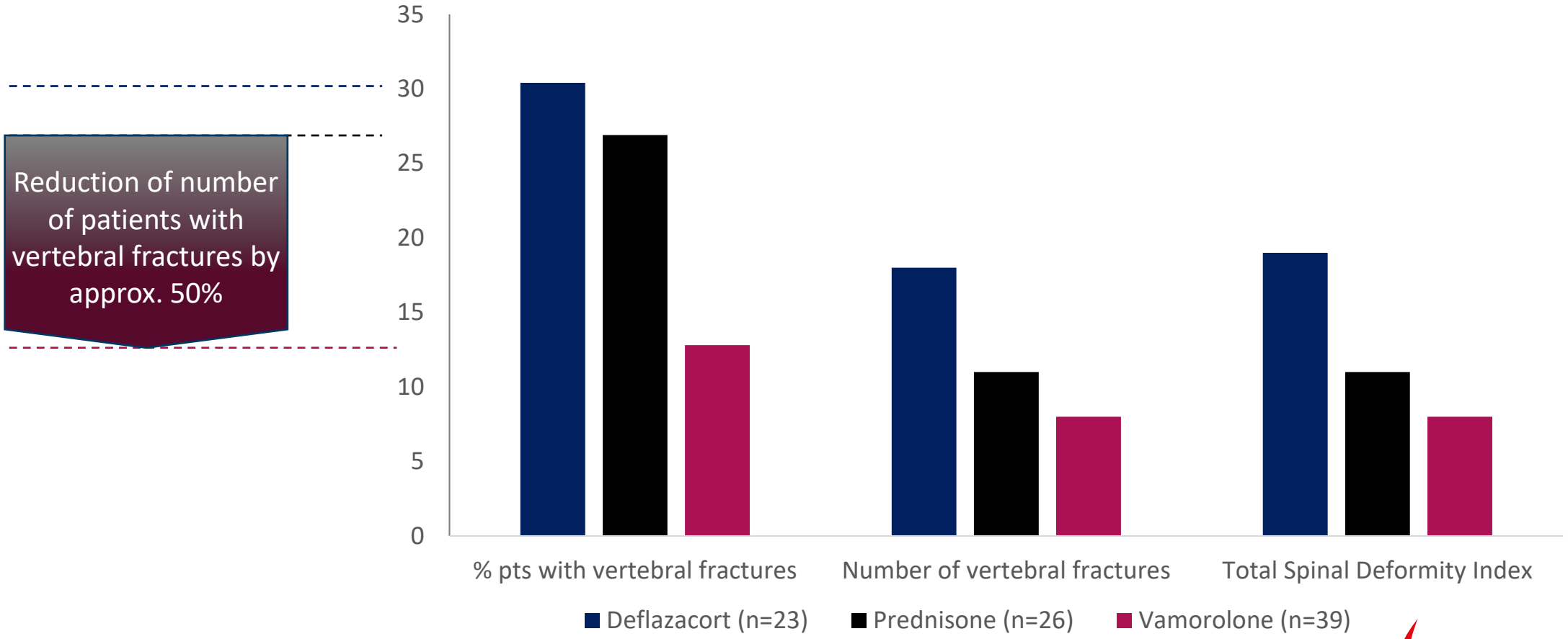
Fewer and less severe spinal fractures with vamorolone compared to classical corticosteroids over 2.5 years

Vamorolone long-term extension (LTE) study vs FOR-DMD, matched comparison, central reading using modified Genant grades[1]

Bone Health



1: https://www.santhera.com/assets/files/content/scientific-literature/FP03-WMS_poster_20_August_2022.pdf
Spinal Deformity Index (SDI): sum of the Genant Grades from T4 to L4, and therefore, is the composite of both fracture number and severity

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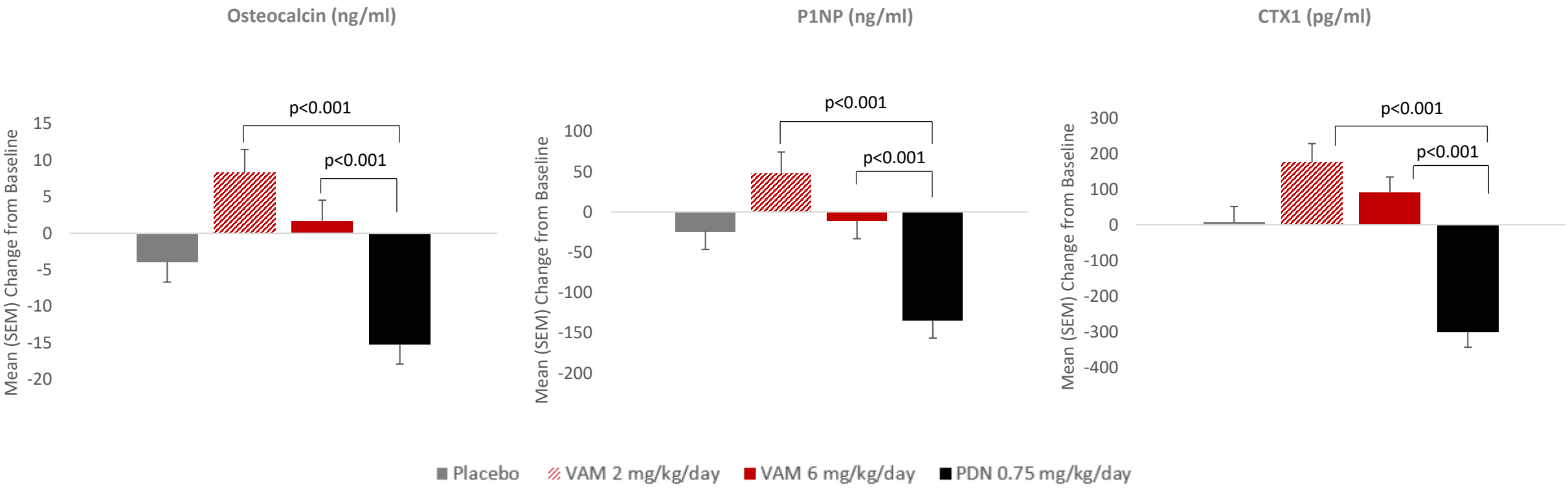
Bone biomarker data from VISION-DMD study supports findings on long-term bone health

Unlike classical corticosteroids, vamorolone does not have a negative impact

Bone Health

Biomarkers of bone formation [1]

Biomarkers of bone remodelling [1]



1. Data on File : VAM-2021-007, PDN, prednisone; SEM, standard error of mean; VAM, vamorolone. CTX1, C-terminal telopeptide of type 1 collagen; P1NP, procollagen type 1 N-terminal pro-peptide. Safety population (SAF-1) at 24 weeks, pre-specified analysis

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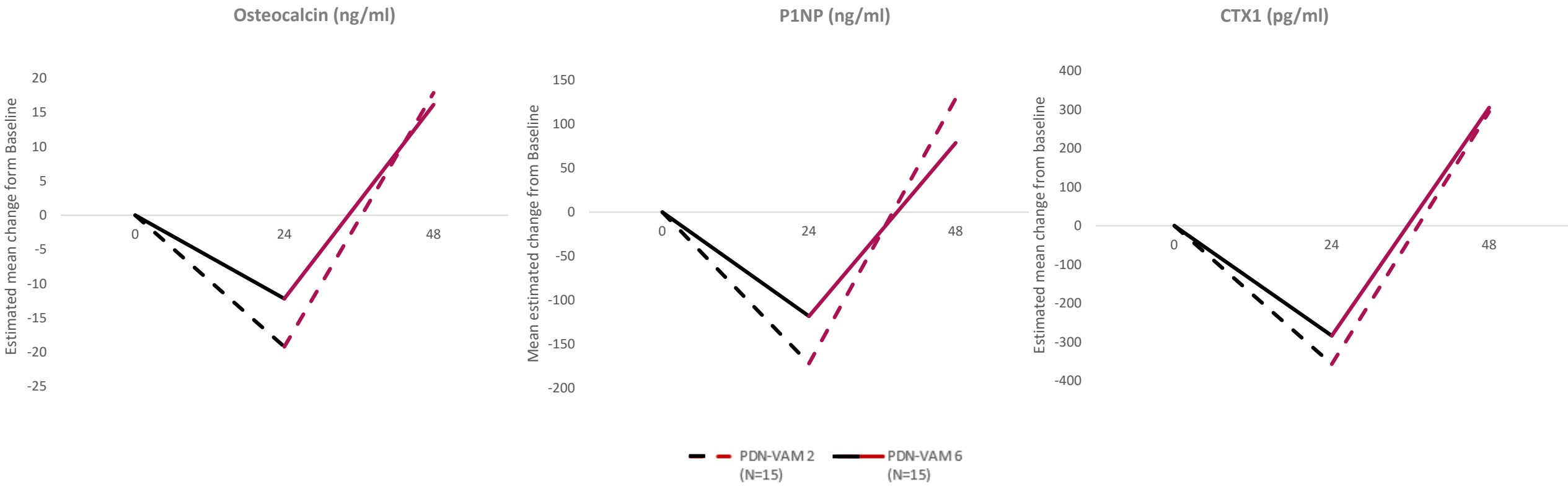
Bone biomarker data from VISION-DMD study supports findings on long-term bone health

Rapid recovery of bone biomarkers after switching from prednisone

Bone Health

Biomarkers of bone formation [1]

Biomarkers of bone remodelling [1]



1. Data on File 2022, PDN, prednisone; VAM, vamorolone. CTX1, C-terminal telopeptide of type 1 collagen; P1NP, procollagen type 1 N-terminal pro-peptide. Safety population (SAF-2), change from baseline to week 48

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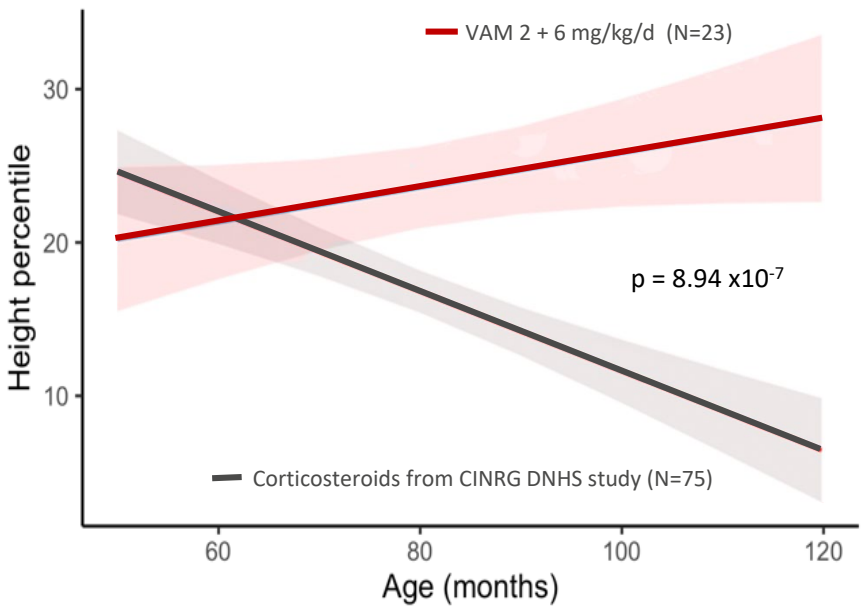
Vamorolone allows for normal bone development and growth

Comparison to natural history data and in patients switching from prednisone

Bone Health

Vamorolone did not stunt growth unlike other corticosteroids used in DMD

Modelling of height trajectory from long-term vamorolone data and corticosteroids from CINRG Natural History Data[2]



Switching from prednisone to vamorolone recovers normal growth trajectory (VISION-DMD study)

Change in Height z-score[1]

1. Safety Population 2 (SAF-2); PDN – Prednisone 0.75 mg/kg/d; PDN-VAM: growth trajectory (z-score) compared for prednisone in Period 1 and vamorolone (2 + 6 mg/kg/d) in Period 2; All doses daily; MMRM estimates of changes from baseline 2. Mah et al; ePoster LB.08 WMS 2021

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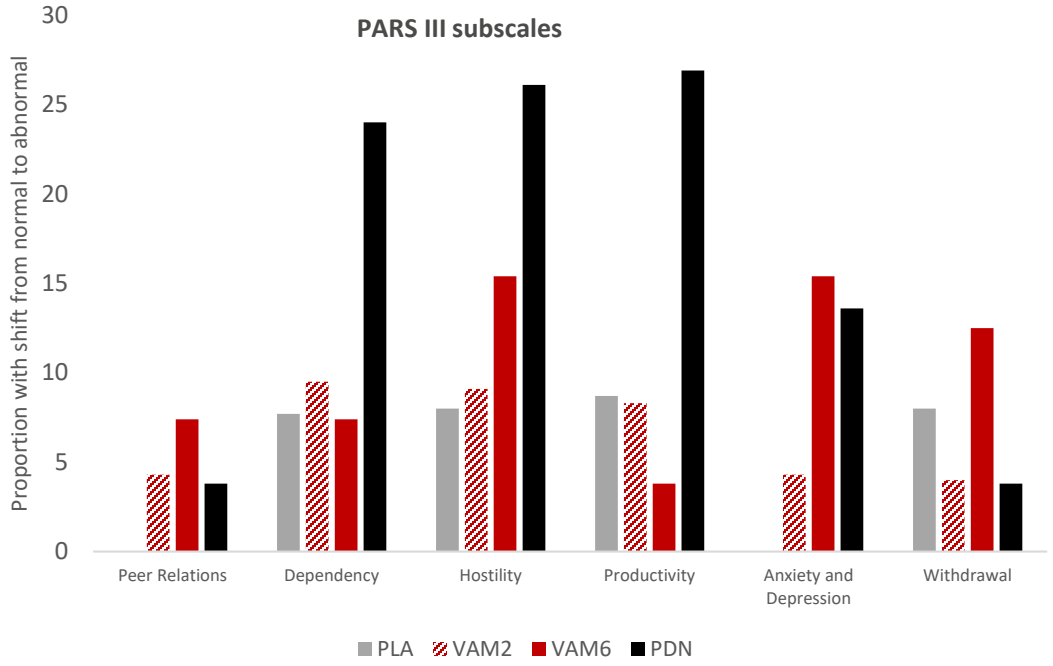
Fewer and less severe behavioral problems reported with vamorolone

Comparison of behavioral problems reported for vamorolone vs prednisone at week 24

VISION-DMD Study	Placebo N = 29	Prednisone 0.75 mg/kg/d N = 31	Vamorolone 2 mg/kg/d N = 30	Vamorolone 6 mg/kg/d N = 28
Behavior problems AESIs, n (%)	4 (13.8)	10 (32.3)	5 (16.7)	6 (21.4)
Moderate/severe AESIs, n (%)	1 (3.4)	7 (22.6)	1 (3.3)	-
AESIs leading to discontinuation, n (%)	0	1 (3.2)	0	0



PARS III scale: proportion of patients shifting from normal to a clinically relevant worsening by subscale, defined as shift from normal adjustment score (z-score <1) at baseline to abnormal adjustment score (z-score ≥1) at Week 24 based on normative data from Henriksen 2009

VISION-DMD Study Data on File Santhera 2022

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Vamorolone value proposition

- **Durable efficacy comparable to standard of care with vamorolone 6mg/kg/day**
  - Statistically robust efficacy vs placebo at 24 weeks for both 2mg/kg/day and 6mg/kg/day
  - No loss of efficacy when switching from prednisone to vamorolone
  - Long-term efficacy of vamorolone 6mg/kg/day comparable to standard of care glucocorticoid at 48 weeks

- **Preserved bone health with vamorolone, unlike deleterious effect of standard of care Glucocorticoids (GC)**
  - Normal bone turnover biomarkers and reduction of risk of spinal fractures with long-term treatment vs GCs
  - Height trajectory as expected from CDC normalized growth curves unlike GCs and comparable to placebo

- **Improved safety profile compared to prednisone evident in the first 24 weeks**
  - Placebo-like Treatment Emergent Adverse Events (TEAEs) with vamorolone 2mg/kg
  - Fewer and milder TEAEs with vamorolone 6mg/kg/day compared to prednisone, including behavioral problems.

- **Effective 3-fold dose range with a dose-dependent safety profile allows for individualized dose adjustment as needed to best manage tolerability to maintain treatment long-term**

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Vamorolone program in DMD submitted both in US, EU and UK

FDA and EMA filing both accepted and under review on pivotal VISION-DMD study and supportive long-term data

Filing based on pivotal VISION-DMD study and additional long-term extension data compared to FOR-DMD natural history study

- Positive primary (p=0.002, TTSTAND velocity) as well 4 out of 5 secondary endpoints statistically significant at week 24 vs placebo
- Clear safety benefit over prednisone with maintained efficacy when switching to vamorolone after week 24
- Strong data on bone health observed with vamorolone treatment as key differentiator to classical corticosteroid treatment
- Orphan Drug Designation (EU, US)

2021			2022				2023			
Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
VISION-DMD Week 24		VISION-DMD Week 48	Rolling Submission			FDA Filing Completed	FDA Filing Accepted			Potential Approval
Positive Pivotal Outcome		Positive Study Completion			EMA Filing	EMA Filing Validated				Potential Approval
							MHRA (UK) Filed			Potential Approval

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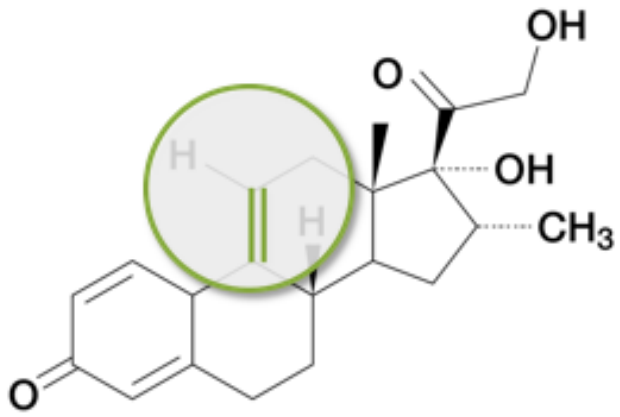
Vamorolone in Becker muscular dystrophy



Becker muscular dystrophy (BMD) disease profile and corticosteroid use

Genetics	Cause	Patients	Symptoms	Medical need
X-linked recessive form of muscular dystrophy typically diagnosed between age 5 and 15	Partial loss of function of dystrophin with a broad clinical variability	Higher life expectancy and lower prevalence than DMD (approx. 1/3)	Progressing muscle weakness and degeneration with later and slower onset compared to DMD	No approved treatment and under-represented development efforts

CORTICOSTEROIDS IN BMD

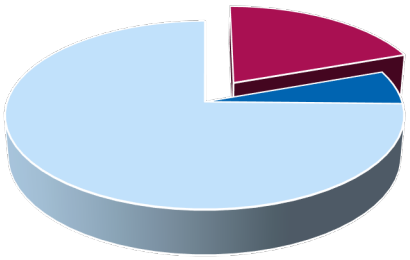
Steroid use is lower compared to DMD due to perceived less favorable benefit-risk ratio for current steroids[1]

Vamorolone addresses safety concerns and may qualify for a chronic treatment in BMD

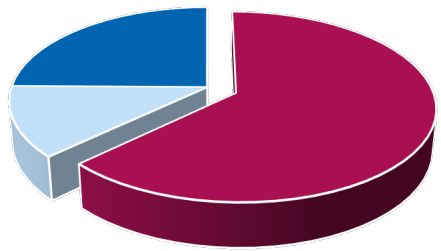
Evidence for corticosteroid use in BMD

- Efficacy from limited patient case studies
- Data from *in vivo* models of inflammation

BMD 20% [1]



DMD 63% [1]



- currently on corticosteroids
- no longer on corticosteroids
- never been on corticosteroids

1 Cowen et al., 2019, BMC Neurology

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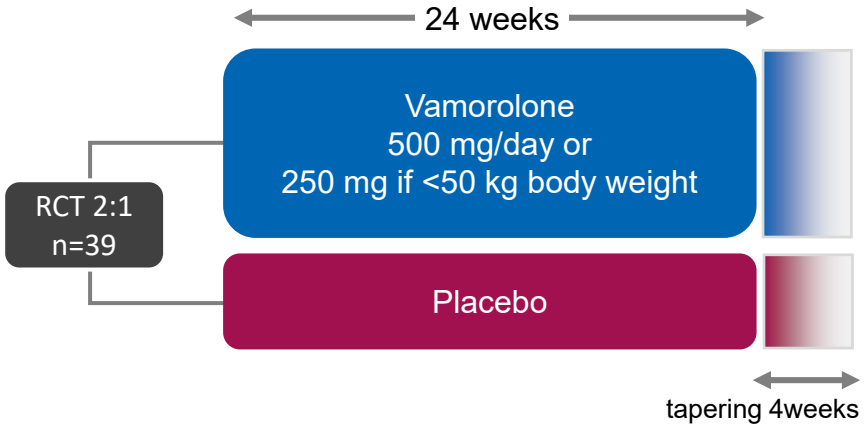
Vamorolone holds promise in BMD based on data generated for DMD

Vamorolone potential benefits in BMD[1,2]

1. Anti-inflammatory agent with reduced side effects via dissociative character of vamorolone
2. Cardiac benefit via mineralocorticoid antagonism
3. Potential to increase dystrophin levels via suppression of dystrophin-targeted microRNAs



Phase 2 trial of **vamorolone** in steroid-naive patients aged 18 – 64 years with data in late 2023

	NCT05166109
Sponsor	ReveraGen
Objectives	Safety and efficacy
Centers	Pittsburgh (US), Padua (IT)
PI	P. Clemens, US
Funding	FDA , NIH, Foundation Eradicate Duchenne

CURRENT CLINICAL DEVELOPMENT IN BMD (all three drugs are developed both in BMD and DMD) [3]

- Phase 2 completed: Givinostat (Italfarmaco), 12-month treatment in 51 patients
- Phase 2 recruiting: EDG-5506 (Edgewise), 12-month treatment in 54 patients
- Phase 2 recruiting: Vamorolone (ReveraGen/Santhera), 24-week treatment in 39 patients
- Natural history study ongoing: (Edgewise), 24-month observational study in 150 patients

1: Heier et al. Life Science Alliance Feb 2019, 2 (1);2: Fiorillo et al., 2018, PhysiolGenomics;
3 Clinicaltrials.gov RCT: Randomized controlled trial; PI: Principle investigator

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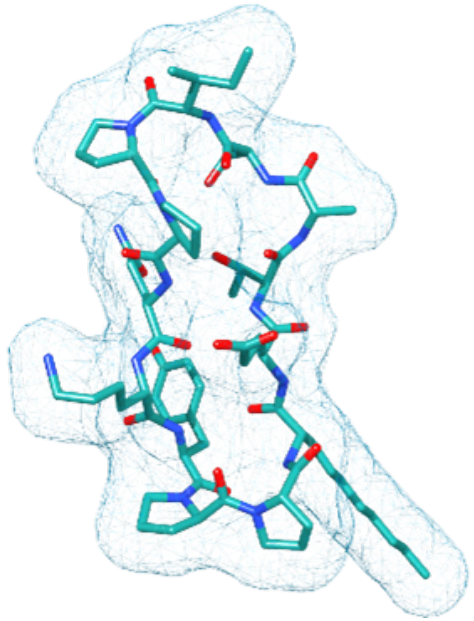
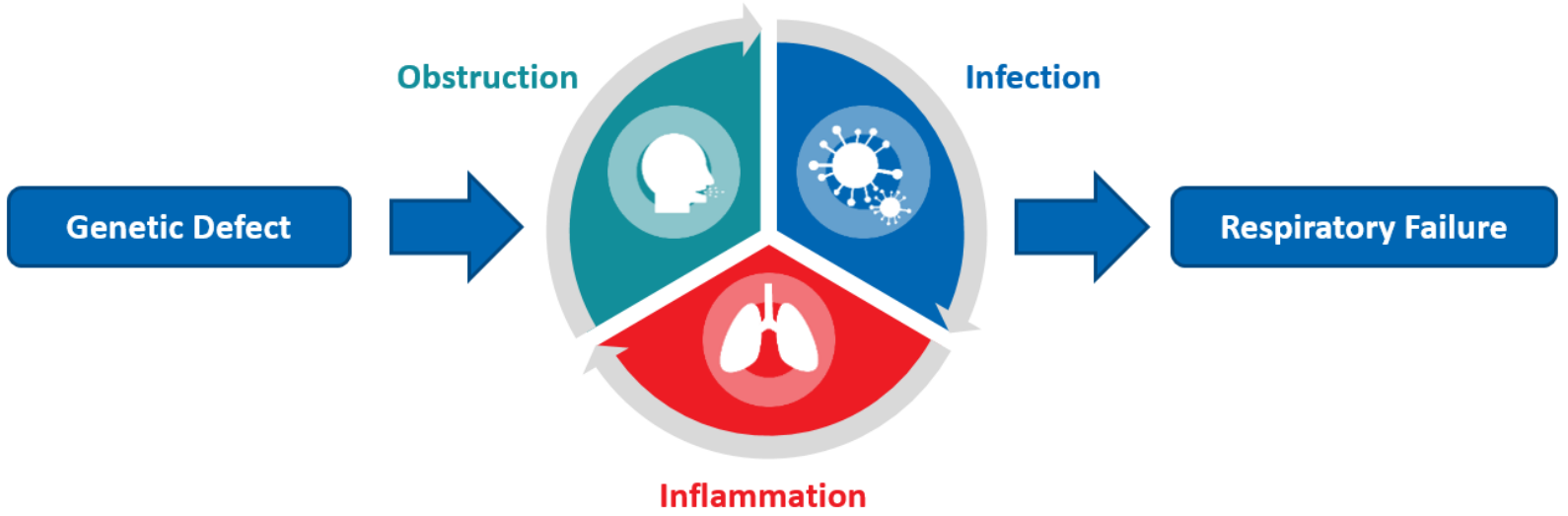
Lonodelestat in cystic fibrosis and potentially other inflammatory pulmonary disorders



Cystic fibrosis is a rare genetic lung disorder with unmet medical need

Genetics	Cause	Patients	Symptoms	Medical need
Autosomal recessive disorder diagnosed at young age	Mutations in the CF transmembrane conductance regulator (CFTR) gene	More than 80,000 patients in US and Europe combined	Persistent lung infections, chronic inflammation and loss of respiratory function	No approved treatment specifically addressing inflammation in CF

Need to break vicious cycle of airway obstruction, respiratory failure and resulting chronic inflammation [1,2]



1. De Rose, V, *Eur Resp J* (2002) 19;333; 2. Mogayzel, PJ, et. al. *Am J Respir Crit Care Med (2013)* 187(7):680

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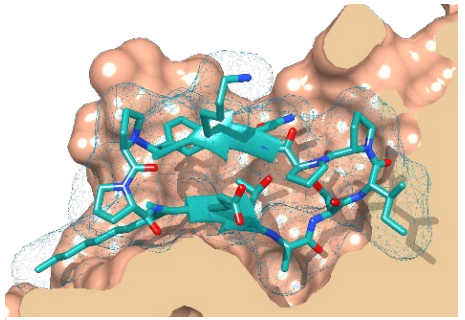
Lonodelestat targets elastase, a protease responsible for lung damage

Pathological levels of neutrophil elastase (NE) during inflammation destroy lung tissue over time [1]



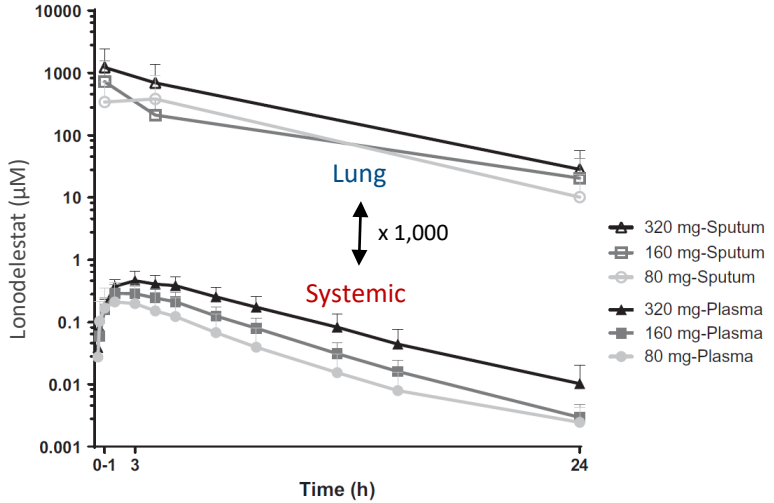
Lonodelestat bound to elastase

Lonodelestat is a highly potent, reversible and selective NE inhibitor

- Effective in pico-molar range (Ki 0.05nM) inhibiting free and membrane bound NE
- Demonstrated efficacy in various in vivo models for lung diseases (inhaled/intranasal)

Administration via inhalation using Pari eFlow®

- CE marked medical device since 2005, widely used in chronic indications, also in CF
- High prolonged exposure in lung but desired low systemic exposure after inhalation



Mean levels (±SD) of lonodelestat after inhalation of single ascending doses in subjects with CF (SAD study, Barth et al. J. Cyst Fibr. 2020)

1: Polverino et al. CHEST 2017; 152(2):249-262;

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Effect on inflammatory biomarker at a safe dose established in Phase 1

Single and multiple ascending dose (SAD & MAD) studies supported by the Cystic Fibrosis Foundation and successfully completed with lonodelestat

Phase 1 SAD in healthy volunteers [1]

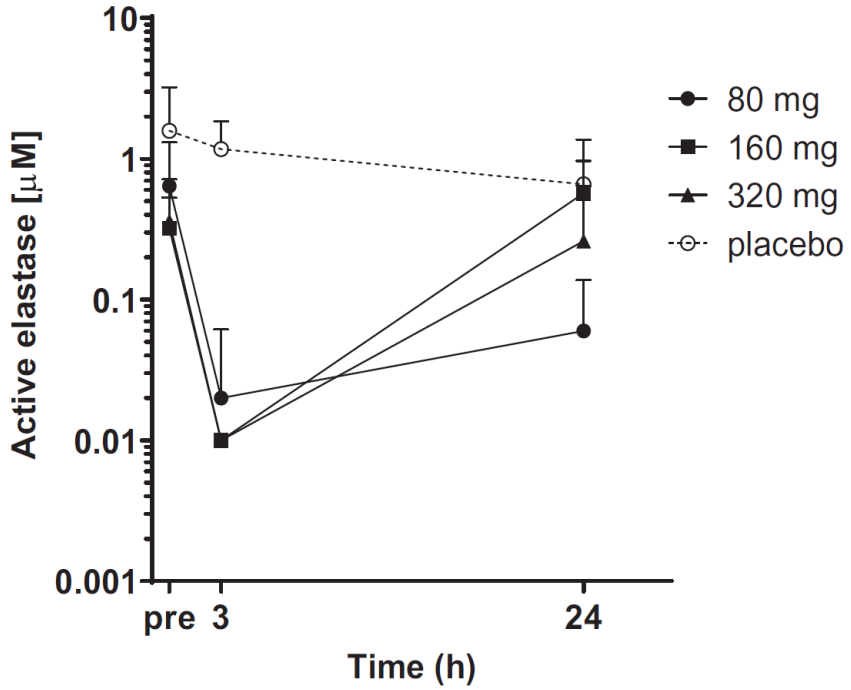
Linear dose relationship and well tolerated doses up to 480 mg per day via inhalation (N=48)

Phase 1 SAD in patients with CF [1]

Good tolerability at doses of 80/160/320 mg QD, achieving high concentrations in sputum and complete inhibition of elastase (N=24)

Phase 1 MAD in patients with CF [2]

Good tolerability and transient, near complete inhibition of elastase activity with daily inhalation of 40/80/160 mg QD, 80 mg BID over a period of 2 – 4 weeks (N=32)



Absolute values in µM of active NE in sputum after inhalation of lonodelestat (mean ± SD values, N=6 per group) [1]

1: Barth et al. J. Cyst Fibrosis (2020), 19:299; 2: Santhera press release March 2021

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Successful Phase 1 program paves way for further clinical development

Key achievements in CF development program

- Safe dose regimen identified
- Effect on inflammatory biomarker established
- High local targeting through inhalation demonstrated

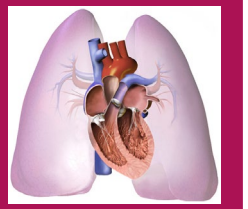
Opportunities beyond CF

- Excessive neutrophil activity in range of pulmonary diseases provides rationale for pipeline expansion
- Identified opportunities in both acute and chronic indications
- Program is Phase 2 ready in CF and ARDS, but currently paused

Next steps in CF

- Preparation of Phase 2a program in patients currently non-eligible for CFTR modulator therapy with a dose of 2 x 40 mg daily

Opportunities beyond CF



- Acute lung injury / ARDS
- Pulmonary arterial hypertension
- Primary ciliary dyskinesia
- Non-cystic fibrosis bronchiectasis
- Alpha-1 antitrypsin deficiency
- Chronic obstructive pulmonary disease
- Pulmonary fibrosis following cancer therapy
- *...and other disorders associated with excessive elastase activity*

ARDS: Acute respiratory distress syndrome; CFTR: Cystic Fibrosis Transmembrane Conductance Regulator

Financial overview & upcoming milestones

Key figures* – Jun 30, 2022

	CHF million
• Net (loss) for the period	(29.7)
• Cash (used) in operations	(12.0)
• Cash & cash equivalents	12.7
• Debt outstanding (maturity 2024)	(39.1)
• Shareholders' equity	(13.8)

Capital structure – Mar 1, 2023

	Listed SIX (SANN)
• Number of shares outstanding (excl treasury)	85,021,816
• Market capitalization	CHF 67.5 million
• Major shareholders	Idorsia 17.7%
• Research coverage	H.C. Wainwright, ValuationLAB

Cash runway

- Existing cash facility funds operations into Q4-2023 (PDUFA date)

Upcoming milestones – vamorolone

Q2-2023 Early access program France / UK

Q4-2023
- U.S. FDA decision (PDUFA date Oct 26)
- EU CHMP recommendation
- US commercial launch
- EU commercial launch
- UK approval decision

*All amounts unaudited Consolidated IFRS

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Santhera Pharmaceuticals

Developing medicines to meet the needs of patients living with rare diseases

March 2023