Annual Shareholder Meeting 2019

Thomas Meier, CEO

Basel, 28 May 2019

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THEIR FUTURE - OUR FOCUS

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Strategic milestones achieved in past 18 months

- **Growing revenues from product sales of Raxone® (idebenone) in LHON**
  - Raxone business for LHON reached profitability (including ongoing clinical post-authorization program)
- **In-licensed POL6014 for the treatment of CF and other pulmonary diseases: *February 2018***
  - Started Phase Ib, multiple ascending dose (MAD) study in patients with CF
- **Acquired option to exclusive license for *vamorolone: November 2018***
  - Complementing DMD pipeline with late-stage product with excellent strategic fit
- **Collaboration in gene therapy research for congenital muscular dystrophy with Biozentrum: *May 2019***
  - Co-financed by Innosuisse
- **Regulatory filing for Puldysa® (idebenone) in DMD in Europe: *May 2019***
  - Submitted application for Conditional Marketing Authorization with new data on long-term efficacy of *idebenone* on respiratory function outcomes and data on clinical relevance of observed treatment effect
- **License agreement with Chiesi Group provides financial resources to advance late stage pipeline**
  - Upfront payment upon closing CHF 50m, total deal value CHF 105m

Capabilities from development to commercial sales

Clinical Science
Bio. Stats
Medical Affairs
Drug Safety & PV
Non-Clinical
Clinical Operat.
Reg. Affairs
Market Access
Comm. Operat.
Patient Advoc.
Technic. Dev.
Supply Chain
Marke-ting

Management
Human Resources, Communication
Administration, Finance
Legal Compliance, Quality Assurance

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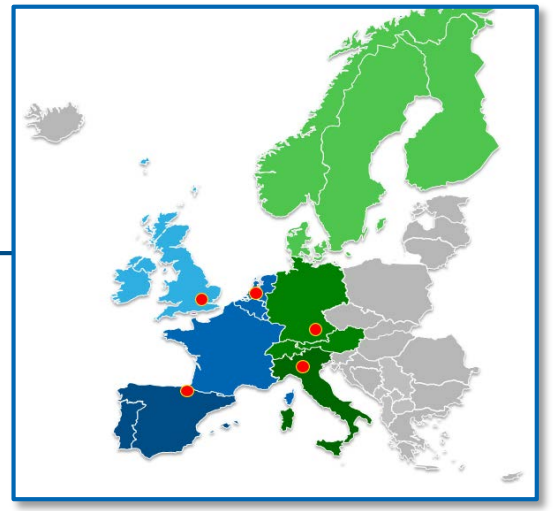
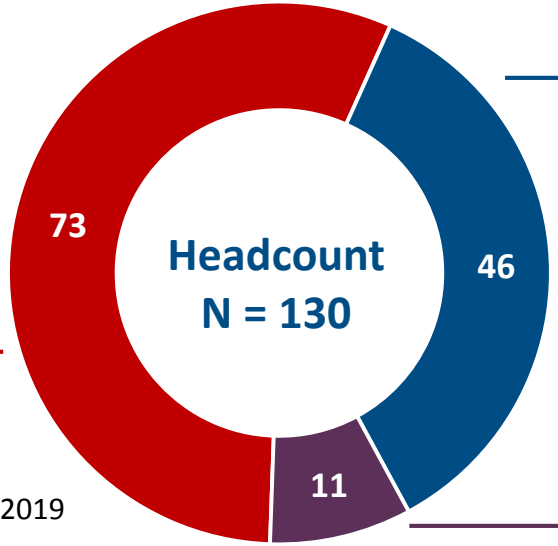
Geographical presence and headcount





Status: Q1 2019

■ Swiss HQ ■ EU Clusters ■ North America

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Our product pipeline

Santhera Pipeline	Drug	Preclin.	Phase I	PoC	Pivotal	Filing	Market
Neuro-ophthalmological Diseases							
Leber's Hereditary Optic Neuropathy	Idebenone						*Raxone®*
Neuromuscular Diseases							
Duchenne Muscular Dystrophy (GC non- users)	Idebenone					CMA/EU	
Duchenne Muscular Dystrophy (GC users)	Idebenone				ongoing		
Duchenne Muscular Dystrophy	Vamorolone				ongoing	ReveraGen BioPharma	
Congenital Muscular Dystrophy	Omigapil		completed				
Congenital Muscular Dystrophy, Type 1A	Gene Therapy					BIOZENTRUM	
Pulmonary Diseases							
Cystic Fibrosis	POL6014		ongoing				
AAT, NCFB, PCD, COPD	POL6014		to be explored				

GC: Glucocorticoid; CMA: conditional marketing authorization; AAT: Alpha-1 antitrypsin deficiency; NCFB: Non-cystic fibrosis bronchiectasis;
PCD: primary ciliary dyskinesia; COPD: Chronic Obstructive Pulmonary Disease
*Raxone® (150 mg idebenone) is approved in the Europe, Israel, Serbia for the treatment of visual impairment in adolescent and adult patients with LHON

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Raxone® (*idebenone*) in Leber's Hereditary Optic Neuropathy (LHON)

Neuro-ophthalmological Diseases

Chaz, patient living with LHON

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Raxone® is the first and only approved treatment for LHON

- LHON, a rare mitochondrial disease resulting in progressive and severe vision loss
- Most common in males with a disease onset between 15 – 35 years of age
- Within 1 year > 90% of patients experience vision loss in both eyes
- Raxone® approved in EU, Norway, Iceland, Liechtenstein, Israel and Serbia

Raxone® is the first and only available treatment in LHON and can lead to **stabilization** or **recovery** of vision

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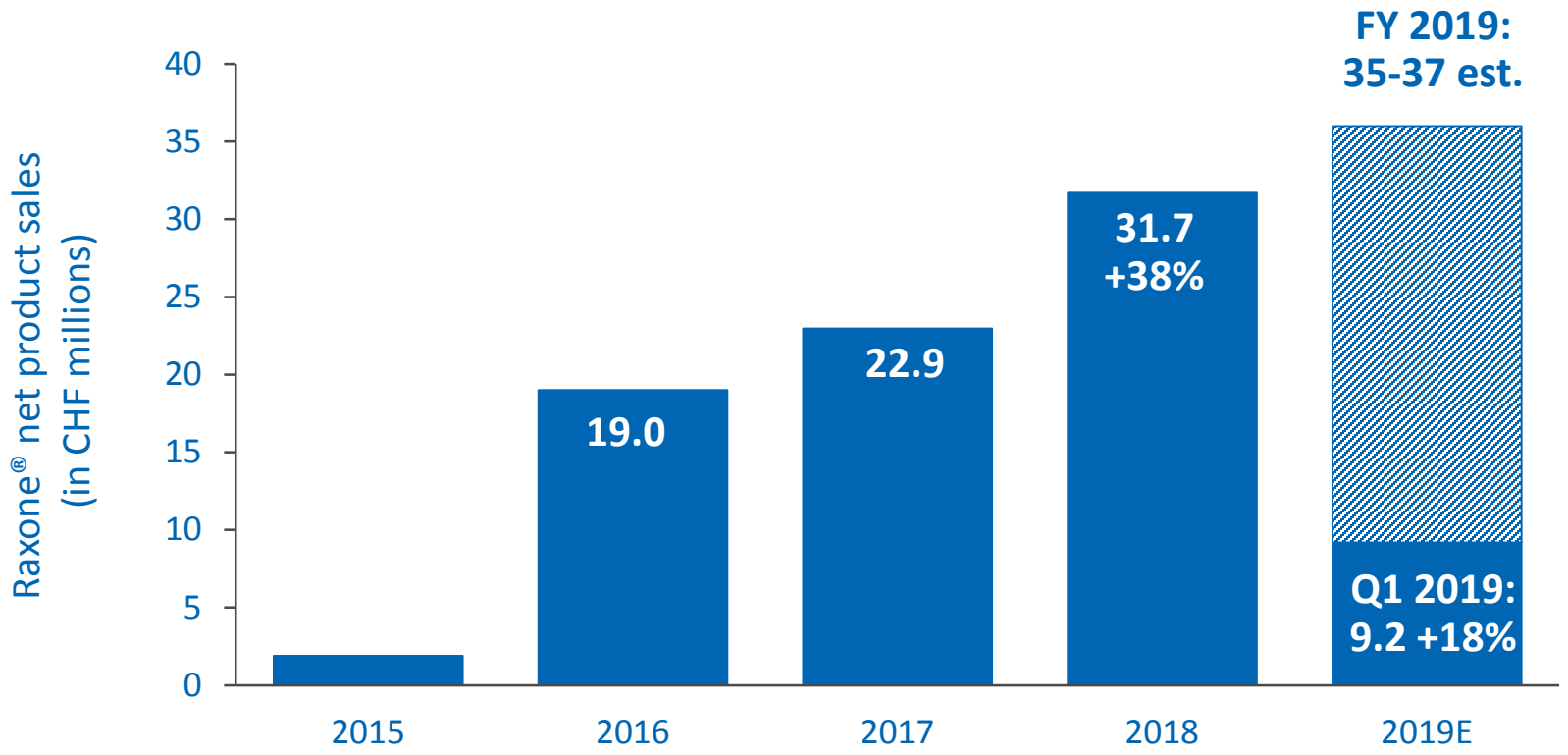
Raxone® sales up 38% in 2018 – continued growth in 2019



Raxone® is sold in more than 20 European countries and Israel

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License agreement with Chiesi Group for Raxone® in LHON

Santhera Enters into License Agreement with Chiesi Group for Raxone® in LHON Valued at up to CHF 105 Million

- *Transaction allows Santhera to advance its long-term growth strategy by focusing on the development of its clinical-stage neuromuscular and pulmonary programs*
- *Deal includes upfront cash payment of CHF 50 million (EUR 44 million) which is due after closing of the transaction*

Pratteln, Switzerland, May 23, 2019 – Santhera Pharmaceuticals (SIX: SANN) announces that it has entered into an exclusive license agreement with Chiesi Farmaceutici, an international research-focused healthcare group (Chiesi Group), under which Chiesi Group will in-license Raxone® for the treatment of LHON for a total consideration of up to CHF 105 million (EUR 93 million), comprising an upfront cash payment of CHF 50 million (EUR 44 million) and near- to mid-term sales milestone payments of up to CHF 55 million (EUR 49 million).

CHIESI Group

- The Group employs 5,700 people
- Global sales in 2017: € 1’700 million
- Direct commercial presence in 27 countries worldwide; distribution partners in 80 countries
- Focus on the research, development, production and marketing of therapeutic solutions
- Disease area: respiratory, neonatology, special care and **rare diseases**
- Currently with one ophthalmology product, intention to broaden this pipeline

Chiesi
People and ideas for innovation in healthcare

Revenues in € million (2017)

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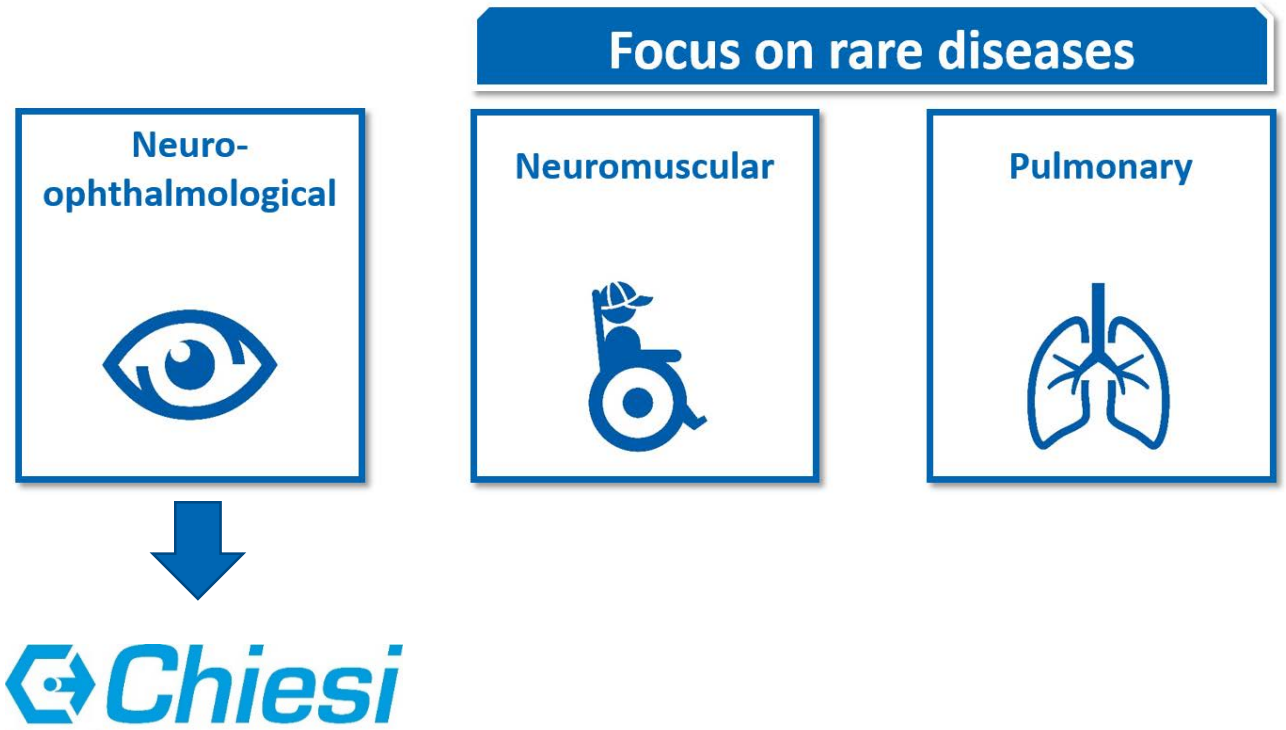
Strategic consideration of this license agreement

- Product pipeline in neuromuscular and pulmonary diseases provides key inflection points in 2020
  - EMA decision on Puldysa® in DMD
  - *Vamorolone* pivotal study readout in DMD
  - Start of Phase 2 with POL6014 in CF
- Upfront payment of CHF 50m and future milestone payments will be invested in advancing neuromuscular and pulmonary pipeline towards these key inflection points



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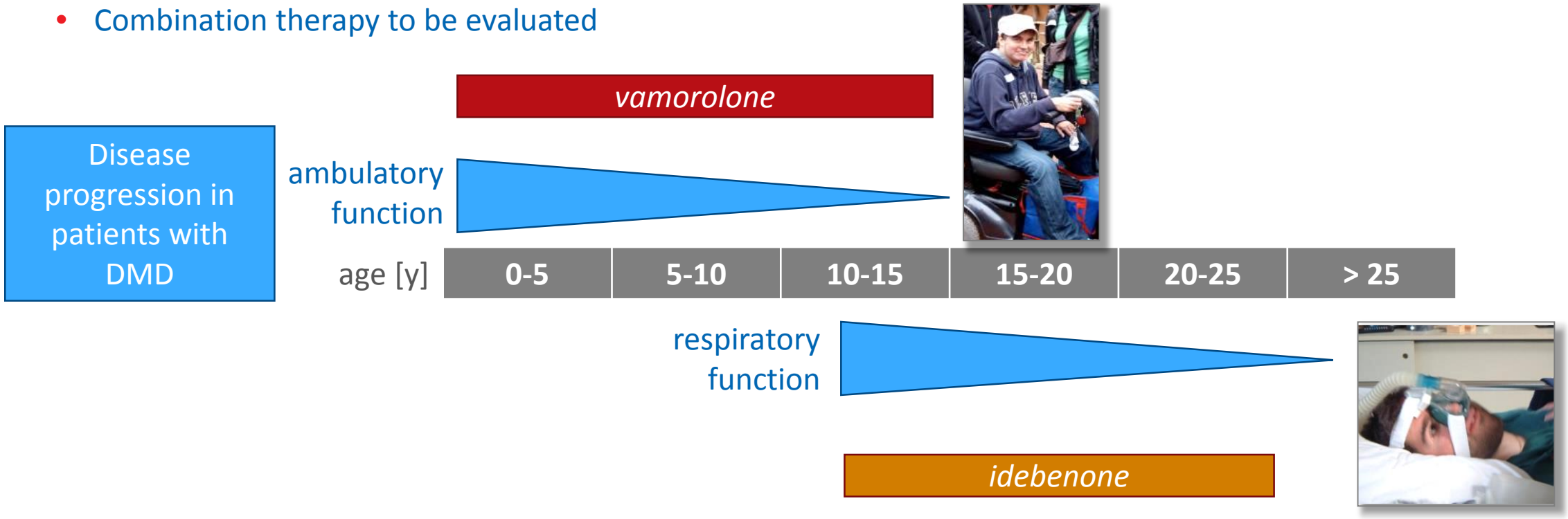
Pipeline synergies between *idebenone* and *vamorolone* for the treatment of patients with DMD

- Combination of *vamorolone* and *idebenone* addresses medical need of DMD patients at all disease stages
- *Vamorolone* and *idebenone* could be used in all patients (not restricted to certain mutations)
- Combination therapy to be evaluated



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Idebenone
in Duchenne Muscular Dystrophy (DMD)
Neuromuscular Diseases

Anthony, patient living with DMD

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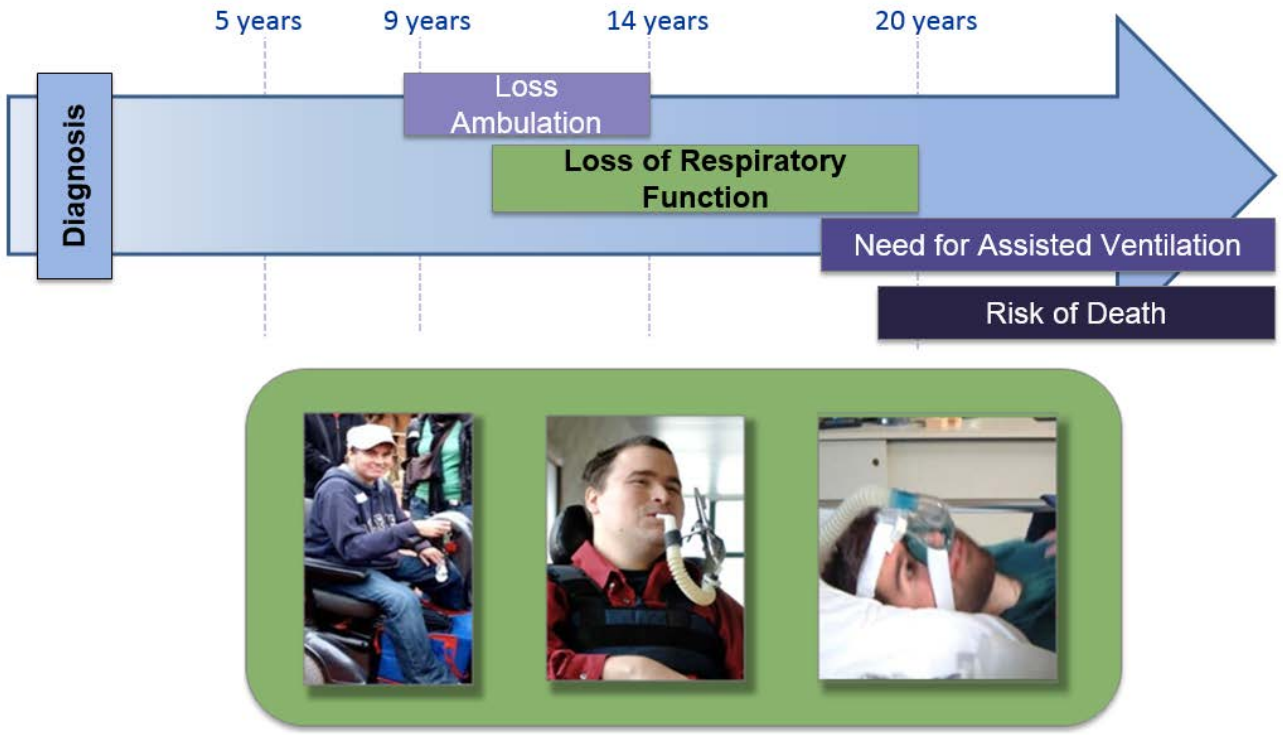
Medical need for effective treatment of respiratory illness in advanced patients with DMD

- Increasing respiratory muscle weakness in DMD leads to:
  - Decreased lung volumes and flow rates
  - Decreased ability to cough effectively and clear airways from mucus
  - Increased risk of airway infections
- There are no approved pharmacological therapies for treating respiratory decline
- ~35,000 patients combined in US and Europe

Progressive respiratory function loss results in need for assisted ventilation



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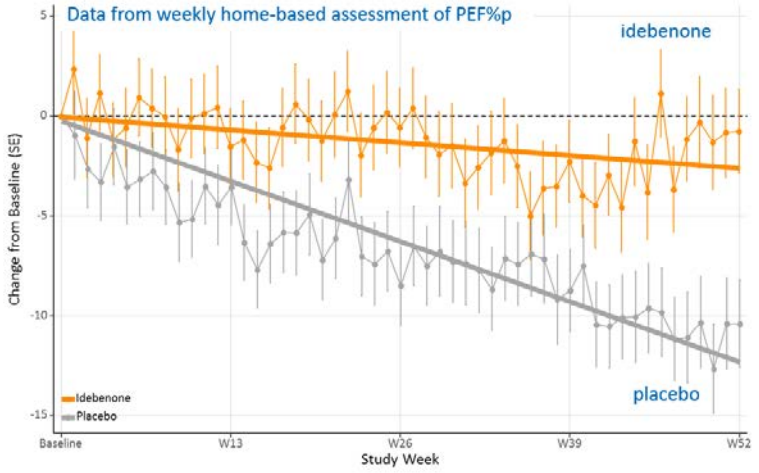
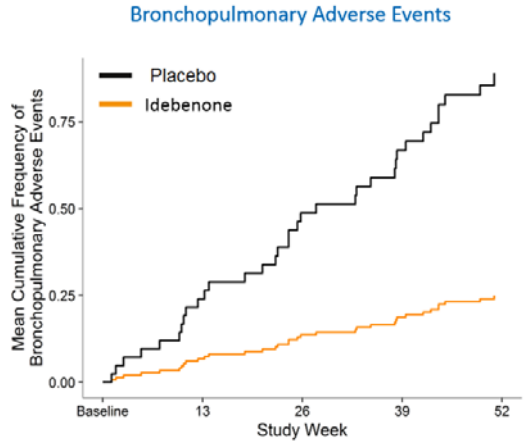
Placebo-controlled DELOS trial showed that *idebenone* slowed loss of respiratory function over 12 months

- *Idebenone* slowed loss of expiratory respiratory function (peak expiratory flow, PEF%p) and met the study primary endpoint [1,2]
- Consistent treatment effects were seen for inspiratory function (inspiratory flow reserve, IFR) and global respiratory function (forced vital capacity, FVC%p) [1,3, 4]
- *Idebenone* also reduced the risk of bronchopulmonary adverse events (such as airway infections), the need of systemic antibiotic treatment and risk of hospitalization due to respiratory complications [5]





1) Buyse et al. 2015; Lancet 385:1748-57;
2) Buyse et al. 2018; J Neuromuscular Diseases 5: 419–430.;
3) Mayer et al. 2017; J Neuromuscular Diseases. 4:189-98.;
4) Buyse et al., 2017; Pediatric Pulmonology 52:508-515;
5) McDonald et al., 2016; Neuromuscular Disorders 26: 473–480

PEF%p: peak expiratory flow percent predicted
FVC%p: forced vital capacity percent predicted

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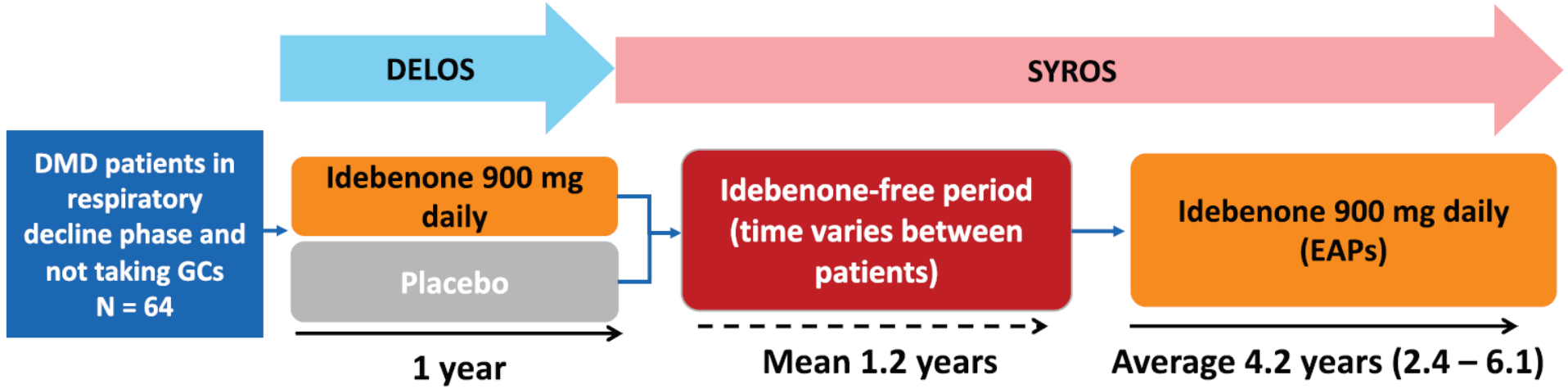
New long-term efficacy data with *idebenone* on respiratory function outcomes – the real world approach

- Long-term efficacy data are desirable to inform about patient benefit in this chronic disease
- **SYROS** : prospectively planned collection of long-term respiratory function data from patients previously enrolled in the DELOS trial
- Long-term respiratory function data were collected from 18 patients treated with *idebenone* in Expanded Access Programs (EAPs)



Mayer et al. 2019; Poster presented at MDA Clinical and Scientific Conference; April 2019

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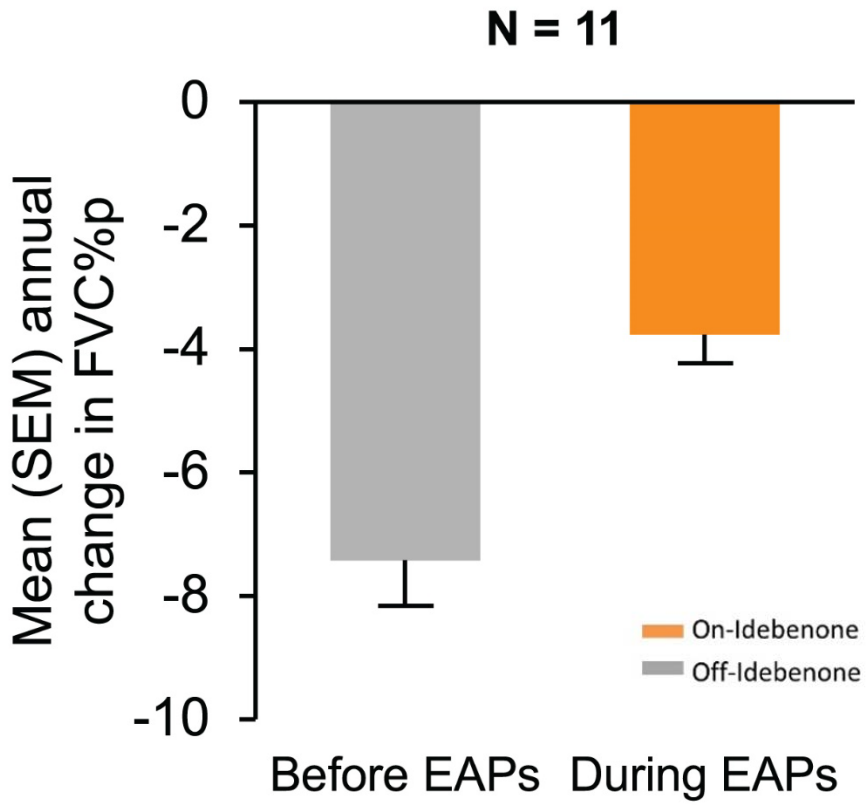
SYROS primary endpoint: Annual rate of decline in FVC%p is reduced by switching from Off-Idebenone to On-Idebenone



- Annual rate of decline of FVC%p reduced by ~50% when switching from Off-Idebenone to On-Idebenone
- SYROS primary endpoint confirms and supports efficacy outcome seen in DELOS trial

FVC%p: forced vital capacity percent predicted
EAP: Expanded Access Program
"Off-On": Off-Idebenone before EAPs and On-Idebenone during EAPs
Data from random coefficient regression model

Mayer et al. 2019; Poster presented at MDA Clinical and Scientific Conference; April 2019

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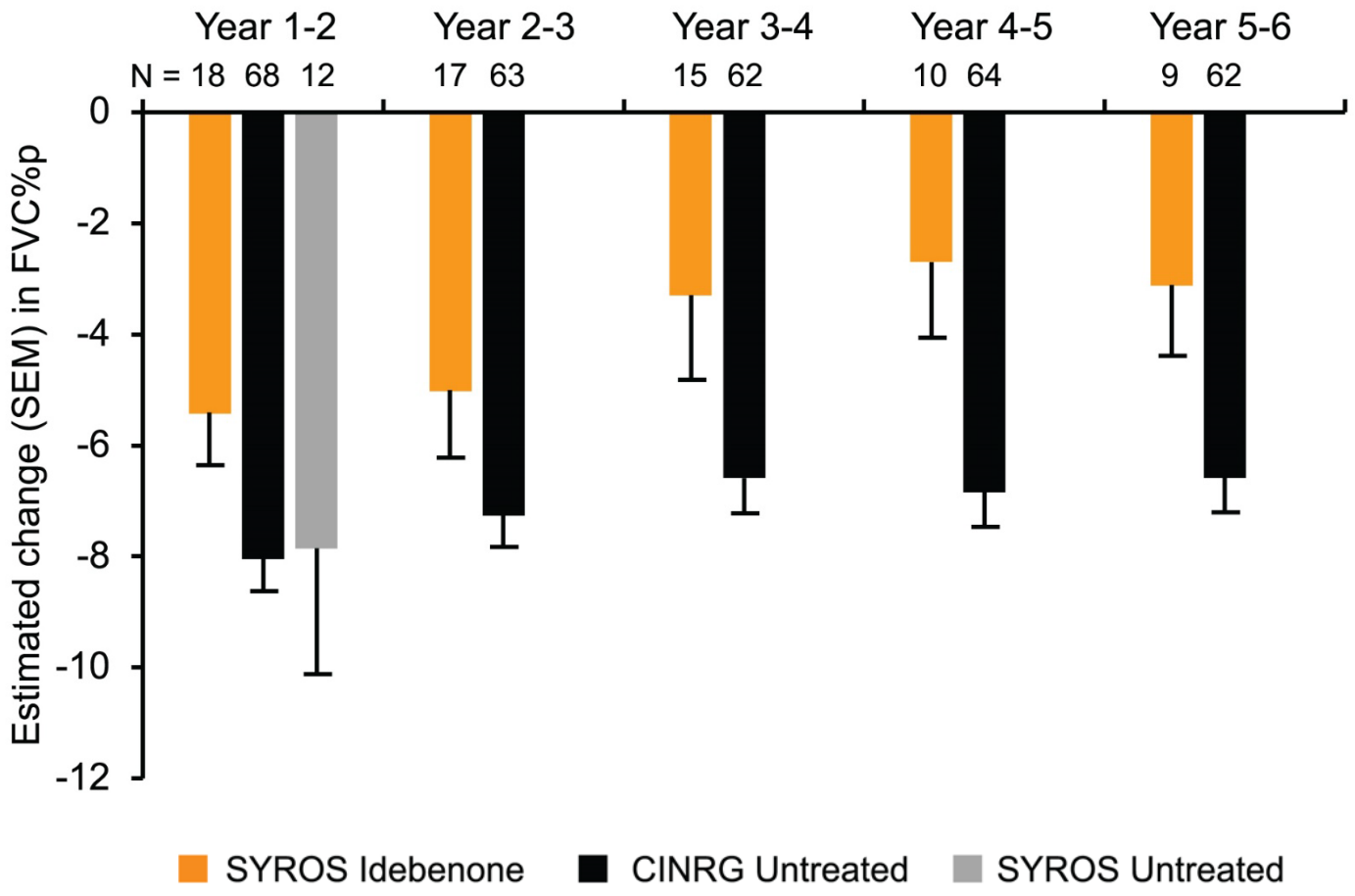
SYROS: *Idebenone* treatment showed persistent effect on respiratory function for up to 6 years



- *Idebenone* treatment showed a persistent effect in slowing decline in FVC%p for up to 6 years
- Annual decline in FVC%p in patients on *idebenone* was consistently smaller than in untreated patients from a matched external control group (from CINRG Duchenne natural history study)

Mayer et al. 2019; Poster presented at MDA Clinical and Scientific Conference; April 2019

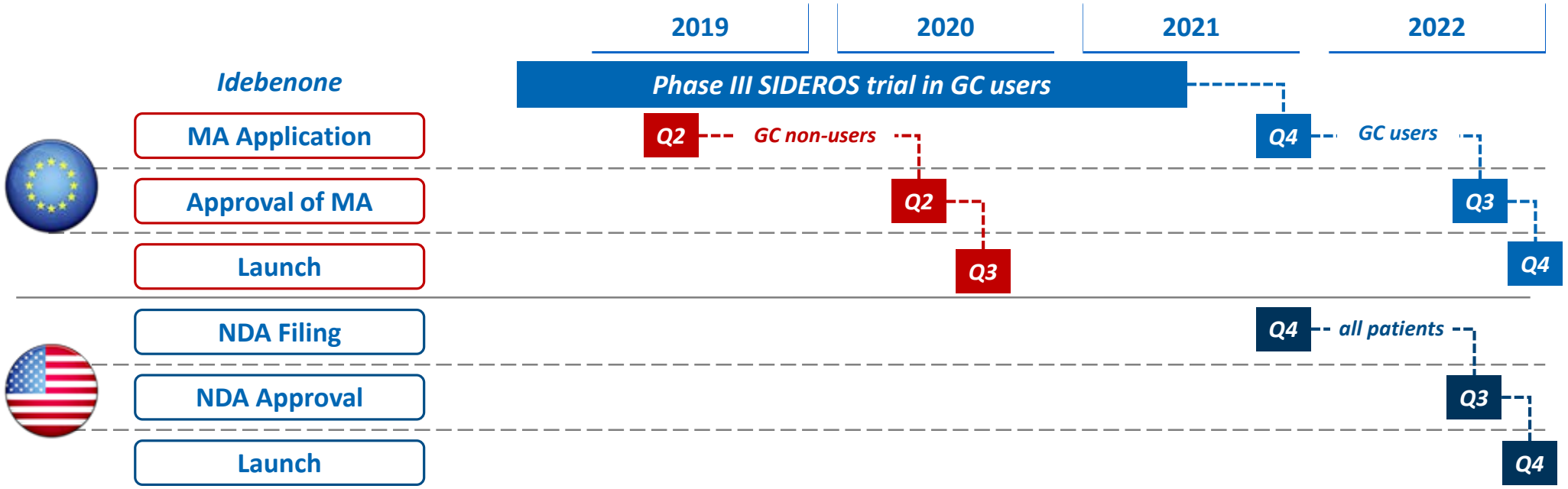
Puldysa®: Application for Conditional Marketing Authorization in Europe

Santhera Submits Marketing Authorization Application to the European Medicines Agency for Puldysa® (Idebenone) in Duchenne Muscular Dystrophy

Pratteln, Switzerland, May 27, 2019 – Santhera Pharmaceuticals (SIX: SANN) announces that it has submitted a marketing authorization application (MAA) for Puldysa® (idebenone) for the treatment of respiratory dysfunction in patients with Duchenne muscular dystrophy (DMD) to the European Medicines Agency (EMA). Santhera is seeking conditional marketing authorization (CMA).

- Extensive pre-discussion of new data and overall regulatory path with national European regulatory authorities and EMA
- New data from patients treated with *idebenone* and natural history studies close data gaps
- **Puldysa®** will be global tradename for DMD

Estimated time to market



Protection and regulatory status

- Orphan drug protection: USA (7y) and EU (10y)
- Fast track designation in USA

Competitive positioning and sales potential

- *Idebenone* targets treatment of older patients
- First treatment of respiratory complications

NDA: new drug application; MAA: marketing authorization application

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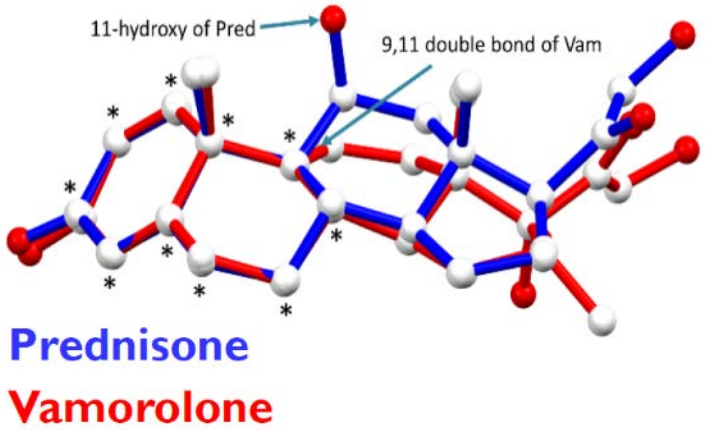
Vamorolone
in Duchenne Muscular Dystrophy (DMD)

Neuromuscular Diseases



Partnership with

ReveraGen BioPharma

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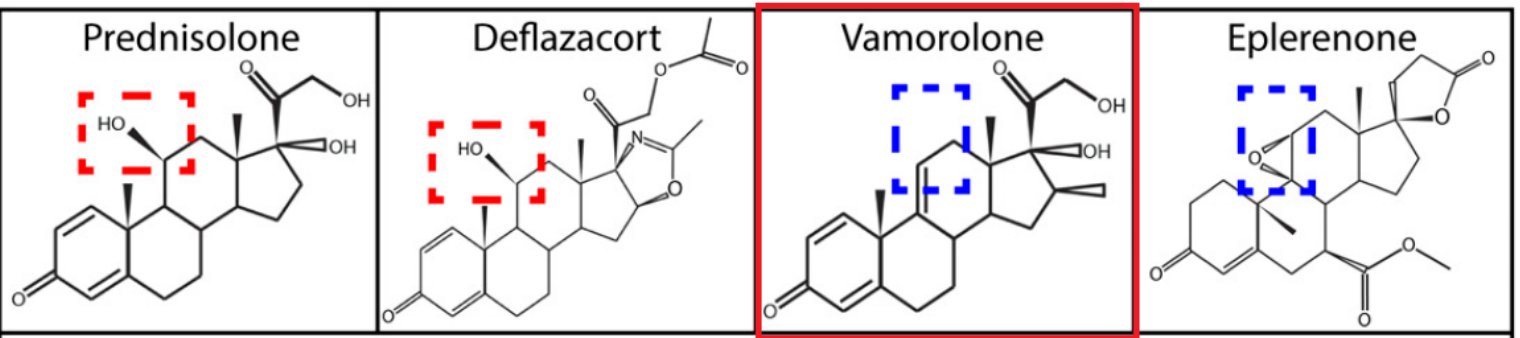
Vamorolone – revolutionizing mode of action

- Discovered and developed by ReveraGen BioPharma
- **First-in-class dissociative steroidal anti-inflammatory drug**
- Different pharmacological properties allow dissociation of beneficial effects from GC-class side effects



	Promoter Type:	Drug effect relative to Prednisone: Blue = beneficial effect, Red = negative side effect			
GR-dependent	NF-κB	Anti-inflammatory	Anti-inflammatory	Anti-inflammatory	inactive / weak
GR-dependent	GRE	Activates	Activates	inactive / weak	inactive / weak
MR-direct	MRE	Activates	inactive / weak	Antagonist	Antagonist

MR: mineralocorticoid receptor GR: glucocorticoid receptor GC: glucocorticoid

Data from Heier et al. (2018); DOI 10.26508/lsa.201800186

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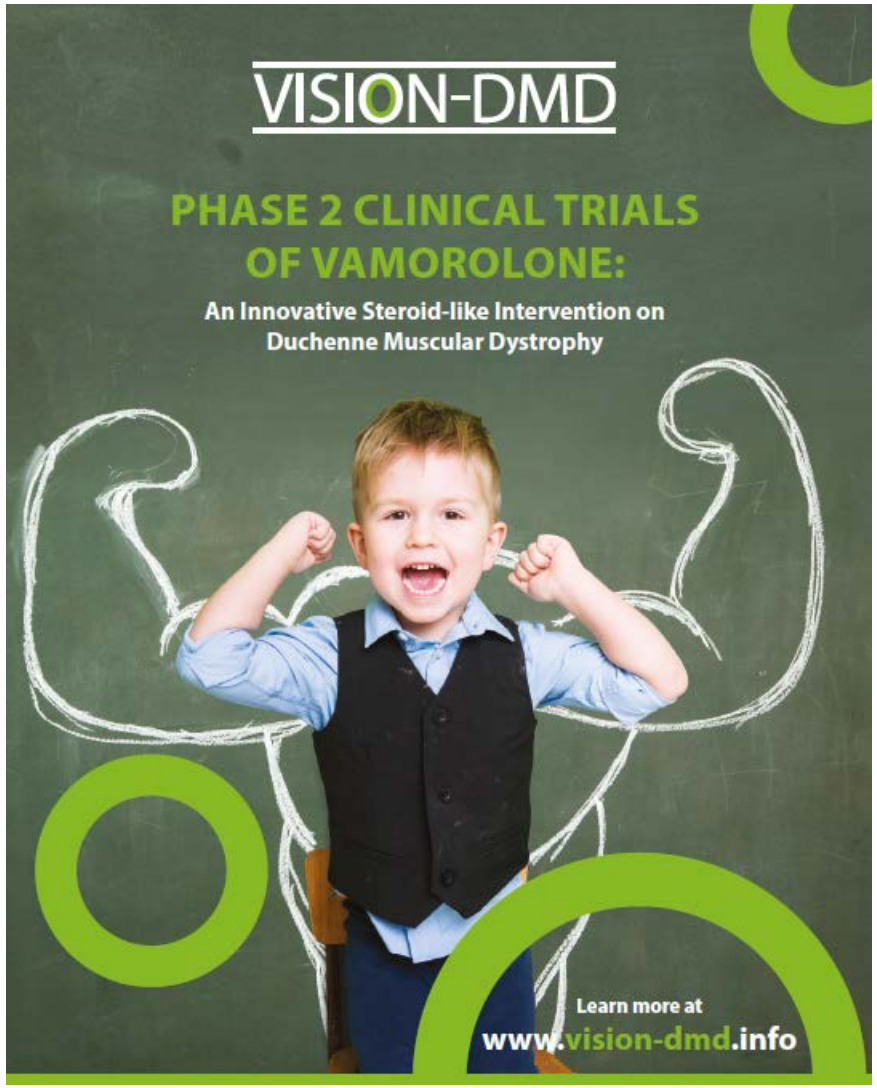
Vamorolone – pivotal Phase IIb trial (VBP15-004), ongoing



The Vision-DMD trial by ReveraGen	
Design	Phase IIb randomized, double-blind, parallel group, placebo- and active-controlled study with double-blind extension
Participants	**120 ambulant** boys ages **4 to <7 years, not taking steroids**
Design	1:1:1:1 randomization (*vamorolone* 2.0 mg/kg/day : *vamorolone* 6.0 mg/kg/day : prednisone 0.75 mg/kg/day : placebo)
Treatment	**24 week treatment period #1** (weeks 1-24), 4-week transition period (weeks 25-28), **20-week treatment period #2** (weeks 28-48)
Protocol	Developed under FDA and EMA scientific advice; "pivotal" trial
Timeline	Start: August 2018; estimated end: 2H 2020
Primary outcomes	Efficacy: Muscle function measured by **Time to Stand Test** Safety: Body weight as measured by body mass index (**BMI**)
Sites	Approximately 30 sites in US, EU, Canada, Australia, Israel

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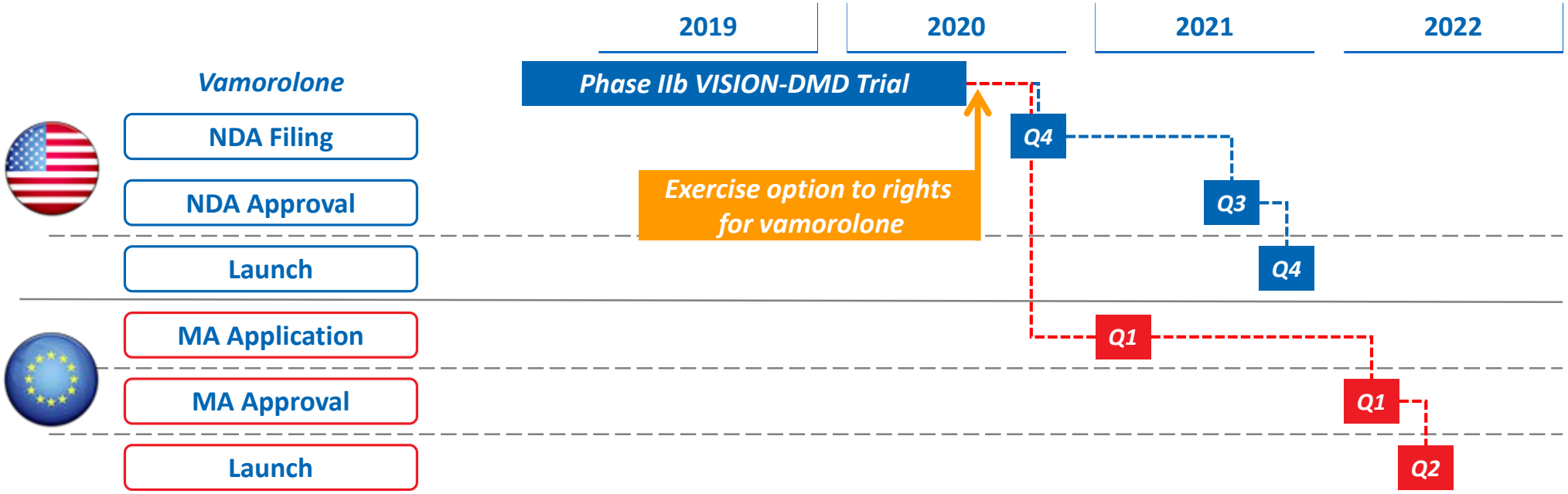
Estimated time to market



Protection and regulatory status

- Orphan drug protection: USA (7y) and EU (10y)
- Method of use patent until 2029 (by country)
- Fast track designation in USA

Competitive positioning and sales potential

- *Vamorolone* to become standard of care
- Efficacy comparable/superior to standard GCs avoiding severe side effects

NDA: New Drug Application; MAA: Marketing Authorization Application

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Gene Therapy for *LAMA2*-deficient Congenital Muscular Dystrophy (CMD) (MDC1A)

Olivia, patient living with MDC1A

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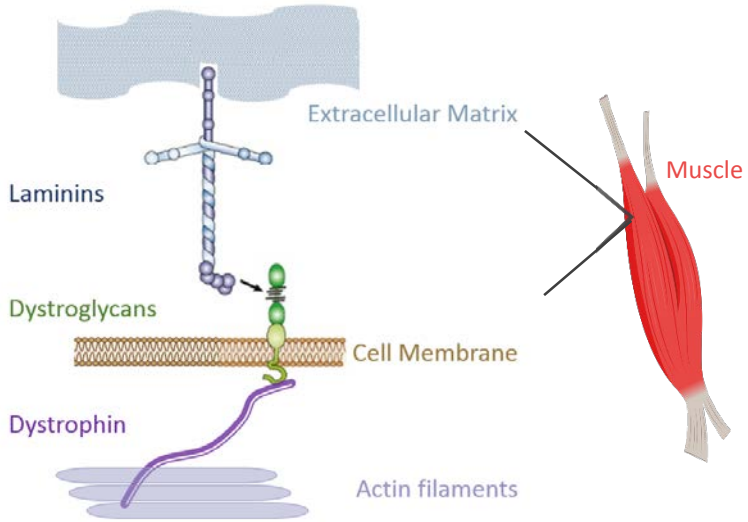
MDC1A is a severe form of CMD with no approved treatment

- Rare genetic congenital muscular dystrophy (CMD)
- Progressive and life-threatening muscle weakness

- Mutations in *LAMA2* gene
  - → dysfunctional laminins
  - → instability of muscle fibers

  - **Dysfunctional laminins** → **MDC1A**
  - Dysfunctional dystroglycans → Dystroglycanopathies
  - Dysfunction dystrophin → Duchenne MD



Neuromuscul Disord. 2017, 27(9), p793 Gene reviews www.ncbi.nlm.nih.gov/books/NBK97333/

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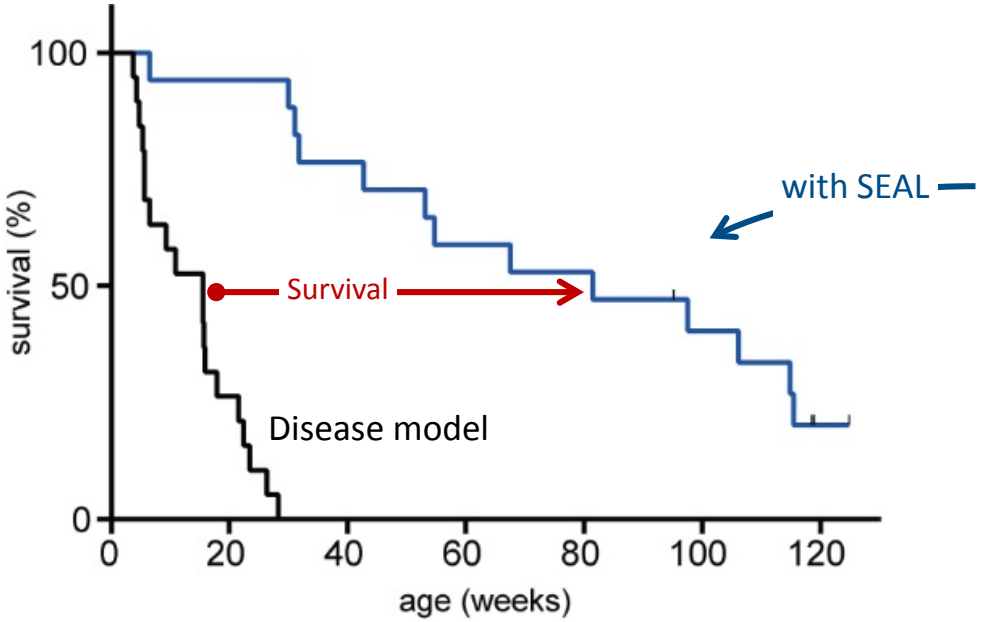
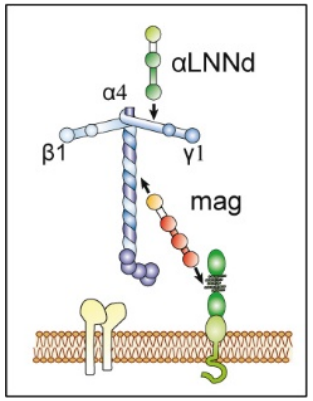
Gene technology corrects muscular dystrophy in mouse model

Simultaneous Expression of Artificial Linkers (SEAL)

- Designed linker proteins act in conjunction to compensate gene defect
- Improvements in muscle force & survival with gene therapy





αLNNd + mag → Simultaneous Expression of Artificial Linkers

SCIENCE TRANSLATIONAL MEDICINE | RESEARCH ARTICLE

MUSCULAR DYSTROPHY

Linker proteins restore basement membrane and correct *LAMA2*-related muscular dystrophy in mice

Judith R. Reinhard,[1] Shuo Lin,[1] Karen K. McKee,[2] Sarina Meinen,[1] Stephanie C. Crosson,[2] Maurizio Sury,[1] Samantha Hobbs,[2] Geraldine Maier,[1] Peter D. Yurchenco,[2] Markus A. Rüegg[1]*

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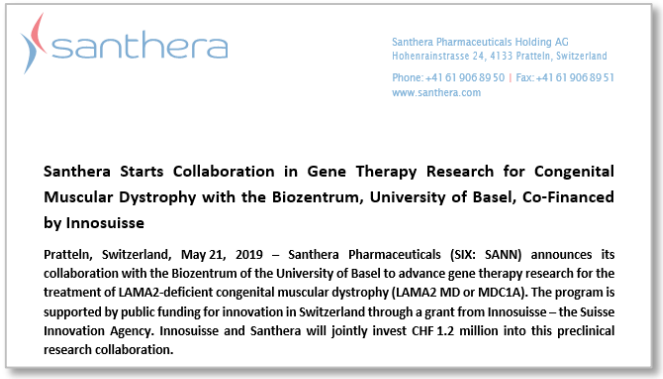
Collaborative preclinical research project with Biozentrum

- **Innovative research partnership co-financed by Innosuisse**
- **Optimizing the efficacy using AAV vectors for gene therapy in preclinical model**
- **Preparing for clinical testing in patients with MDC1A**



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Santhera Starts Collaboration in Gene Therapy Research for Congenital Muscular Dystrophy with the Biozentrum, University of Basel, Co-Financed by Innosuisse

Pratteln, Switzerland, May 21, 2019 – Santhera Pharmaceuticals (SIX: SANN) announces its collaboration with the Biozentrum of the University of Basel to advance gene therapy research for the treatment of LAMA2-deficient congenital muscular dystrophy (LAMA2 MD or MDC1A). The program is supported by public funding for innovation in Switzerland through a grant from Innosuisse – the Suisse Innovation Agency. Innosuisse and Santhera will jointly invest CHF 1.2 million into this preclinical research collaboration.

BIOZENTRUM
Universität Basel
The Center for
Molecular Life Sciences

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Innosuisse – Swiss Innovation Agency

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Our product pipeline

Santhera Pipeline	Drug	Preclin.	Phase I	PoC	Pivotal	Filing	Market
Neuro-ophthalmological Diseases							
Leber's Hereditary Optic Neuropathy	Idebenone						*Raxone®*
Neuromuscular Diseases							
Duchenne Muscular Dystrophy (GC non- users)	Idebenone					CMA/EU	
Duchenne Muscular Dystrophy (GC users)	Idebenone				ongoing		
Duchenne Muscular Dystrophy	Vamorolone				ongoing	ReveraGen BioPharma	
Congenital Muscular Dystrophy	Omigapil		completed				
Congenital Muscular Dystrophy, Type 1A	Gene Therapy					BIOZENTRUM	
Pulmonary Diseases							
Cystic Fibrosis	POL6014		ongoing				
AAT, NCFB, PCD, COPD	POL6014		to be explored				

GC: Glucocorticoid; CMA: conditional marketing authorization; AAT: Alpha-1 antitrypsin deficiency; NCFB: Non-cystic fibrosis bronchiectasis;
PCD: primary ciliary dyskinesia; COPD: Chronic Obstructive Pulmonary Disease
*Raxone® (150 mg idebenone) is approved in the Europe, Israel, Serbia for the treatment of visual impairment in adolescent and adult patients with LHON

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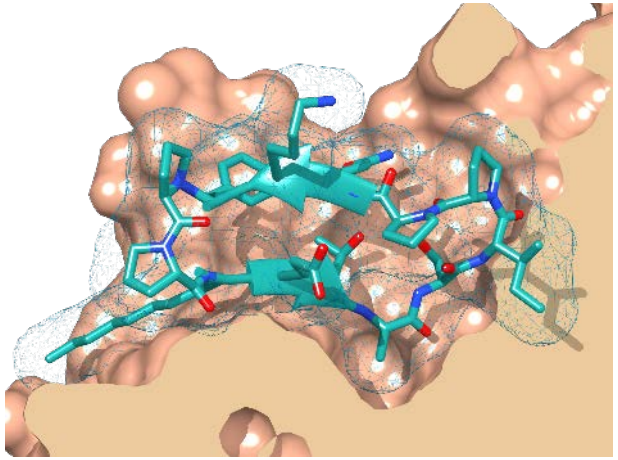
POL6014 in Cystic Fibrosis (CF)

Pulmonary Diseases



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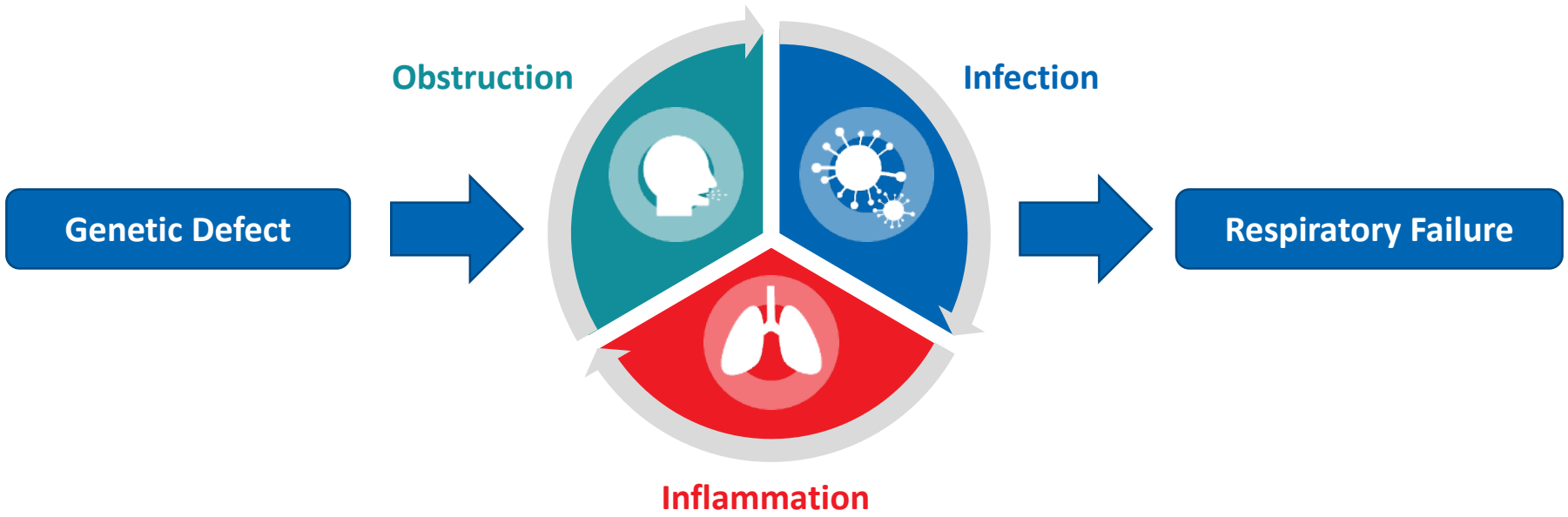
Cystic fibrosis, a rare inherited lung disease

- CF is a progressive, genetic disease leading to thick mucus in the lung (airway obstruction)
- This results in persistent lung infections, chronic inflammation and loss of respiratory function



- The disease is diagnosed in young children, about 70,000 patients live in US & EU
- Current treatments do not specifically address the chronic, underlying inflammation

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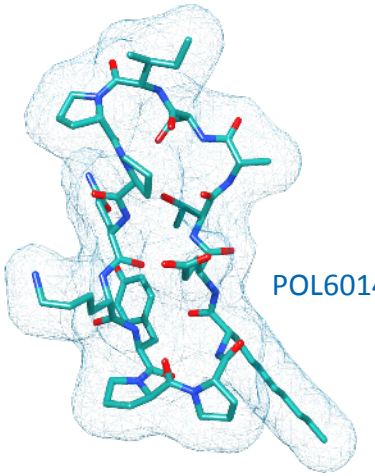
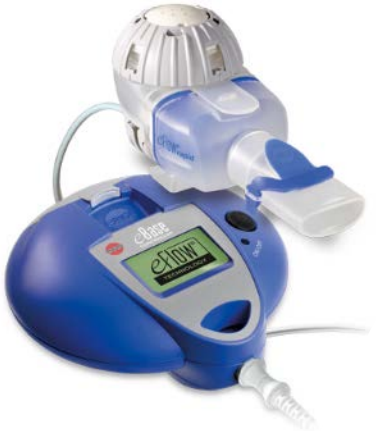
Targeting *elastase* to treat chronic lung inflammation

- Inflammation causes excessive production of neutrophil elastase (hNE)
- POL6014 is a reversible, competitive and selective inhibitor of hNE
- POL6014 presents an opportunity for a pipeline in a product
- Phase Ib, multiple ascending dose (MAD) trial in CF patients is ongoing
- Preparation for a Phase II efficacy trial started



POL6014



eFlow Nebulizer

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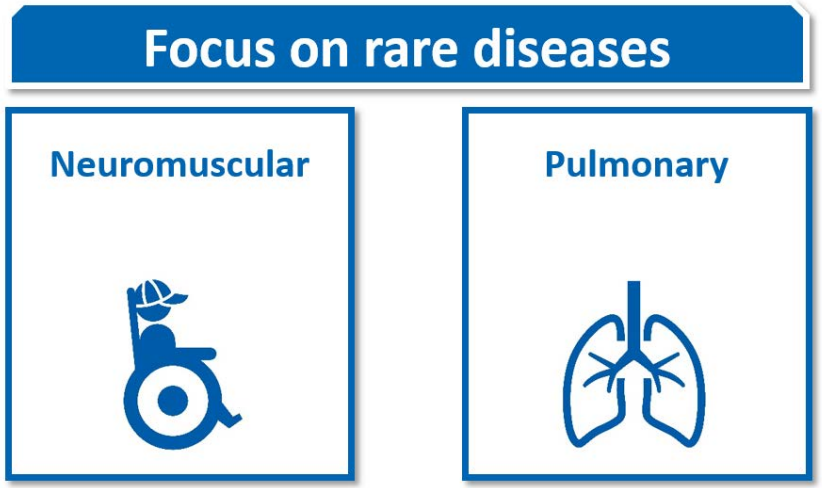
Summary

- Santhera established as specialty pharma company with focus on drugs for rare diseases
- License agreement with Chiesi Group provides non-dilutive funding to focus and advance late stage product pipeline
- Conditional Marketing Authorization Application for Puldysa® in patients with DMD submitted to EMA



- Pipeline in DMD expanded with option to acquire *vamorolone* with the potential to replace standard glucocorticoids with better safety profile
- Research collaboration towards gene therapy for congenital muscular dystrophy

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