Targeting the powerhouse of the cell

to treat rare genetic and age-related diseases

Stealth BIOTHERAPEUTICS

Leading Mitochondrial Medicine

February 2020

Our forward-looking statements and disclaimers

This presentation and various remarks we make during this presentation contain forward-looking statements within the meaning of The Private Securities Litigation Reform Act of 1995. Such forward-looking statements include those regarding Stealth BioTherapeutics' plans, strategies and expectations for its preclinical and clinical advancement of its drug development programs including elamipretide, SBT-20, SBT-272, SBT-259 and SBT-550; the potential benefits of Stealth BioTherapeutics' product candidates; its key milestones for 2020; its plans regarding future data presentations; and its financial guidance regarding the period in which it will have capital available to fund its operations. The words "anticipate," "expect," "hope," "plan," "potential," "possible," "will," "believe," "estimate," "intend," "may," "predict," "project," "would" and similar expressions are intended to identify forward-looking statements, although not all forward-looking statements contain these identifying words. We may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Actual results or events could differ materially from the plans, intentions and expectations disclosed in the forward-looking statements we make as a result of known and unknown risks, uncertainties and other important factors, including: our ability to obtain additional funding; the ability to successfully demonstrate the efficacy and safety of Stealth BioTherapeutics' product candidates and future product candidates; the preclinical and clinical results for Stealth BioTherapeutics' product candidates, which may not support further development and marketing approval; the potential advantages of Stealth BioTherapeutics' product candidates; the content and timing of decisions made by the U.S. FDA, the EMA or other regulatory authorities, investigational review boards at clinical trial sites and publication review bodies, which may affect the initiation, timing and progress of preclinical studies and clinical trials of Stealth BioTherapeutics product candidates; Stealth BioTherapeutics' ability to obtain and maintain requisite regulatory approvals and to enroll patients in its planned clinical trials; unplanned cash requirements and expenditures; competitive factors; Stealth BioTherapeutics' ability to obtain, maintain and enforce patent and other intellectual property protection for any product candidates it is developing; and general economic and market conditions. These and other risks are described in greater detail under the caption "Risk Factors" included in the Stealth BioTherapeutics' Annual Report on Form 20-F for the year ended December 31, 2018 filed with the Securities and Exchange Commission on April 4, 2019 and any future filings with the Securities and Exchange Commission. Any forward-looking statements contained in this presentation and various remarks we make during this presentation speak only as of the date hereof, and Stealth BioTherapeutics' expressly disclaims any obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by law.

Rare metabolic hypertrophic cardiomyopathies

Failing heart: an "engine out of fuel"

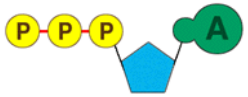
Normal heart

- Glucose →
- **Fatty acids** →
- Amino acids →
- Ketone bodies →
- Lactate →

Hypertrophic heart

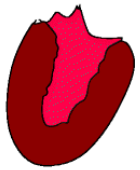
- **Glucose** →
- Fatty acids →
- Amino acids →
- **Ketone bodies** →
- Lactate →

Glucose metabolism: "throttling the afterburner"



Mitochondria in the healthy heart produce and consume 6 kg of ATP daily. 98% is produced by fatty acid oxidation; 2% is produced by glycolysis.

Mitochondrial dysfunction and oxidative stress (including ROS induced ROS proliferation), contribute to a shift from fatty acid oxidation to glycolysis.



Oxidative stress and increased glycolysis are associated with hypertrophic remodeling across a number of rare diseases.

Impact on human health

This metabolic pathway has been implicated in several diseases in which cardiomyopathy is the leading cause of early mortality:

- **Barth syndrome (Barth)**
- **Sengers syndrome (Sengers)**
- **3-Methylglutaconic Aciduria with Deafness, Encephalopathy, and Leigh-Like Syndrome (MEGDEL)**
- **Duchenne's muscular dystrophy (DMD)**
- **Friedreich's ataxia (FDRA)**
- **Becker's muscular dystrophy**

It is also implicated in forms of **heart failure**.

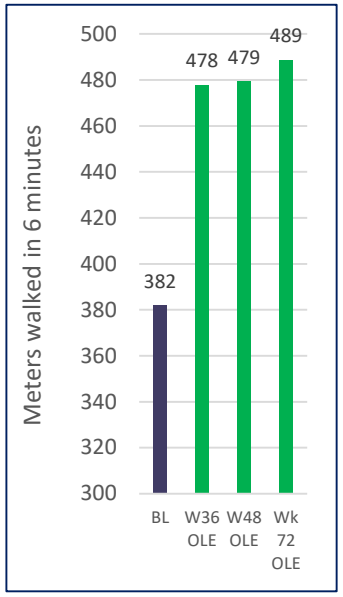
Patient clinical experience (trial or compassionate)
Under consideration; preclinical data with elam/analogues

Neubauer, N Engl J Med 2007; Ritterhoff, Cardiovasc Res, 2017; Takimoto, et al., AHAJournals, 2020; Takimoto et al., Hypertension, 2007; Tran et al., J Am Heart Assoc. 2019; Velden, et al., Cardiovascular Research (2018); Dudek et al., Cardiovascular Research (2017); Christiansen et al., Am J Physiol Heart Circ Physiol, 2015; Ikon et al., Lipids. 2017; Maack et al., JACC, 2011; Kolwicz et al., Cardiovascular Res, 2011; Burelle et al., J Mol Cell Cardiol. 2010; Guertl et al., Int J Exp Pathol. 2000; Feingold et al., Circulation. 2017;

Stealth BIOTHERAPEUTICS

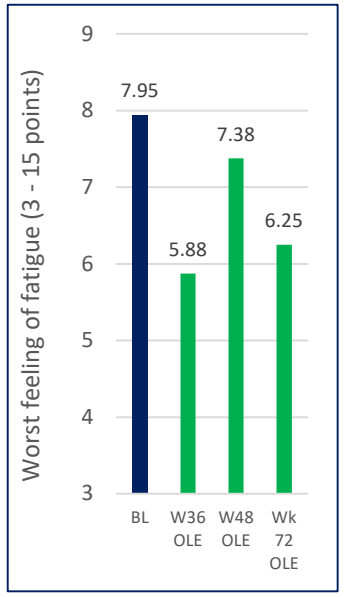
TAZPOWER: longer therapy during OLE improved multiple endpoints

6MWT (n=8)



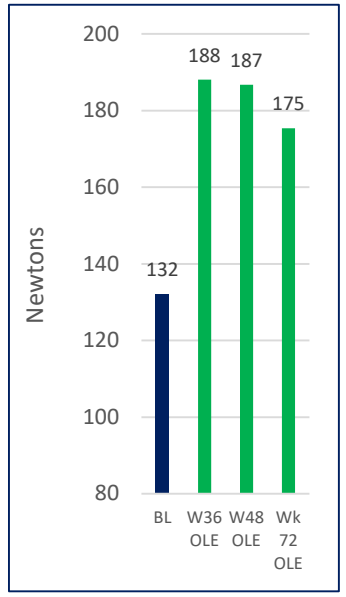
Δ BL:Wk 36 OLE
p=0.02

BTHS-SA fatigue (n=8)



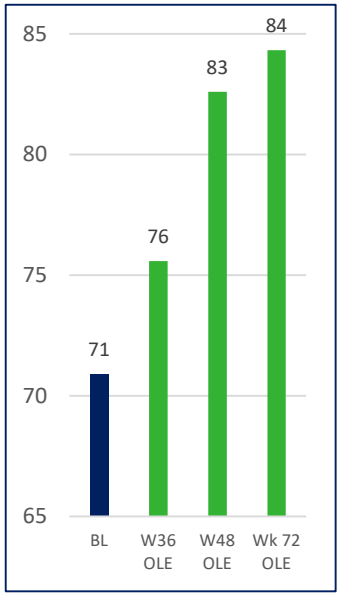
Δ BL:Wk 36 OLE
p=0.03

Muscle strength (n=8)



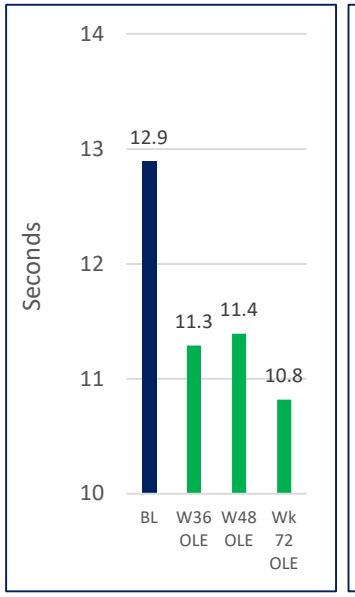
Δ BL:Wk 36 OLE
p=0.02

SWAY balance (n=8)



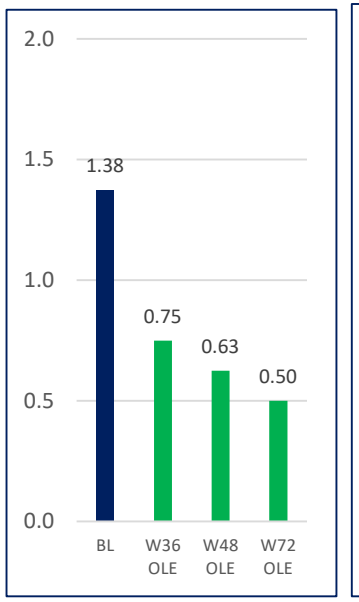
Δ BL:Wk 36 OLE
p=0.20

5X SST (n=8)



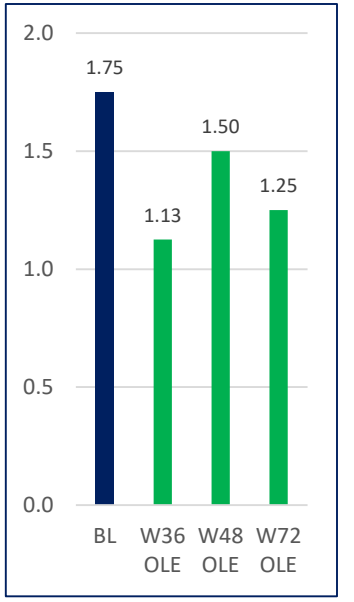
Δ BL:Wk 36 OLE
p=0.22

CGI Symptoms (n=8)



Δ BL:Wk 36 OLE
p=0.10

PGI Symptoms (n=8)



Δ BL:Wk 36 OLE
p=0.05

SPIBA-001 Retrospective Natural History Control Study

Subjects

TAZPOWER (SPIBA-201) OLE participants (Wk 36)

n=8

conducted 2017-2019 by multi-disciplinary team at Johns Hopkins

Natural history control propensity score matched by independent statisticians

n=19*

collected 2012-2019 by same multi-disciplinary team at Johns Hopkins;

* n=15 for 5XSST, n=12 for SWAY Balance

Endpoints

Per protocol, included all common assessments and endpoints collected for both TAZPOWER and non-trial natural history (NH)

- Primary:
  - 6MWT
- Secondary:
  - Muscle strength by HHD
  - 5XSST
  - SWAY Balance
  - Multi-domain responder index (MDRI)
  - *4 domains: 6MWT, muscle strength by HHD, 5XSST, SWAY Balance*
  - *Minimally Clinically Important Difference (Responder Definition) = 10% for each domain*
  - *Response score = +1, worsening score = -1, no change score = 0, added for total MDRI score*
- Primary timepoint of interest corresponds with OLE Wk 36; OLE Wk 48 also assessed

Regulatory considerations

✓ **Prospectively defined SAP**

SPIBA-001 Concept SAP prespecified propensity match methods using age, height and BL 6MWT as covariates; propensity score model developed by independent statistical team blinded to all but BL values from SPIBA-201 and NH.

✓ **Avoid patient selection or referral bias**

NH open to all Barth patients at BSF bi-annual conferences from 2014-2018; SPIBA-001 control inclusion criteria limited only by age (≥12) and availability of longitudinal data points.

✓ **Consistency of control and treated groups**

Control and treated groups should be similar in all respects including disease severity (age and ability to complete assessments homogenizes), duration (genetic; manifests at birth), prior treatments (none), other aspects of disease.

✓ **Consistency of data elements**

Overlapping functional assessments in SPIBA-201 and NH.

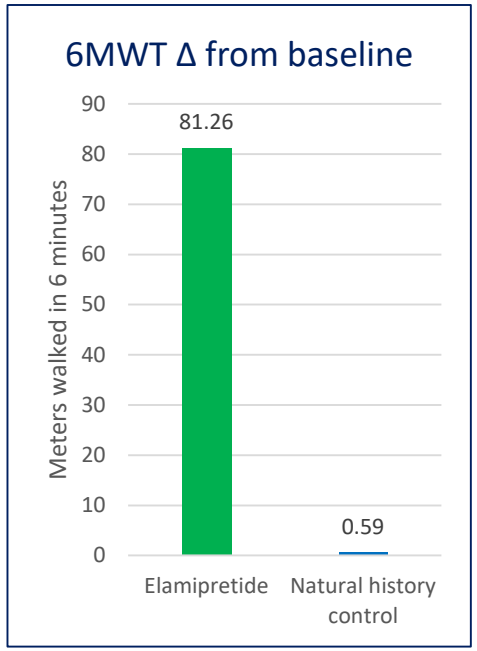
✓ **Consistency of time points and data collection**

Contemporaneous time-period for collection (SPIBA-201 2017-2019; NH 2014-2019); same multi-disciplinary team performed all assessments.

SPIBA-001 shows significant improvement over natural history controls

Week 36 OLE compared to propensity-score matched natural history control subjects (NHC)

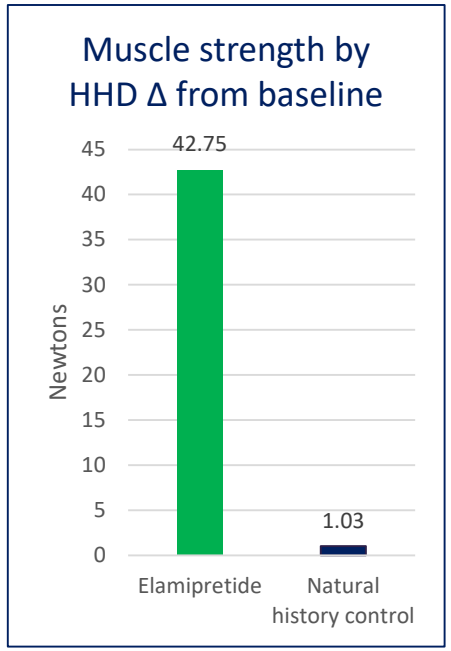
Primary endpoint



p=0.0005

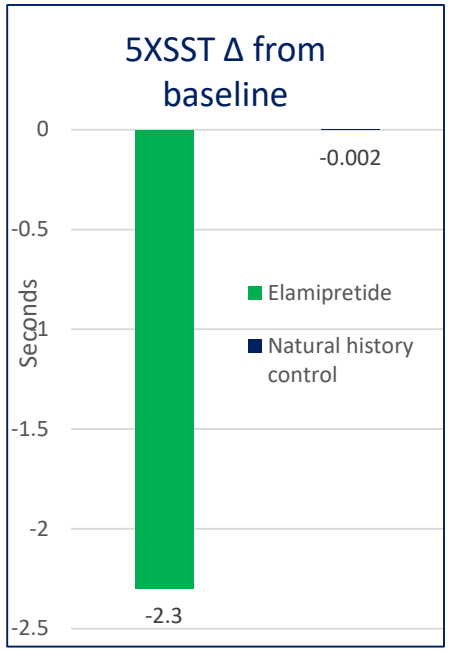
Week 48 OLE: Elam 93.08, NHC 0.88, p=0.0006

Secondary endpoints



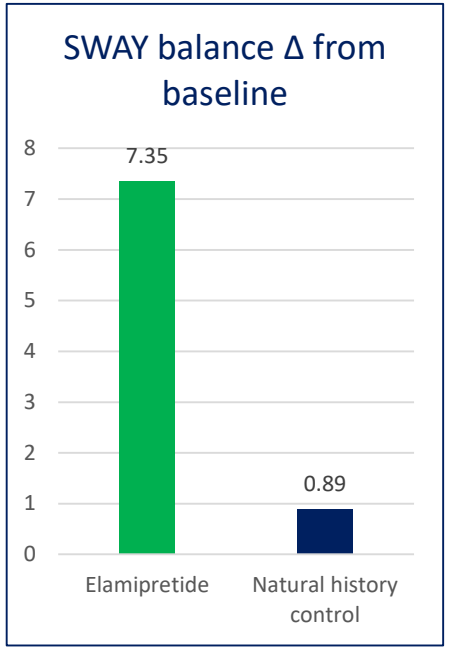
p=0.0002

Week 48 OLE: Elam Δ 49.92, NHC Δ 1.97, p=0.0004



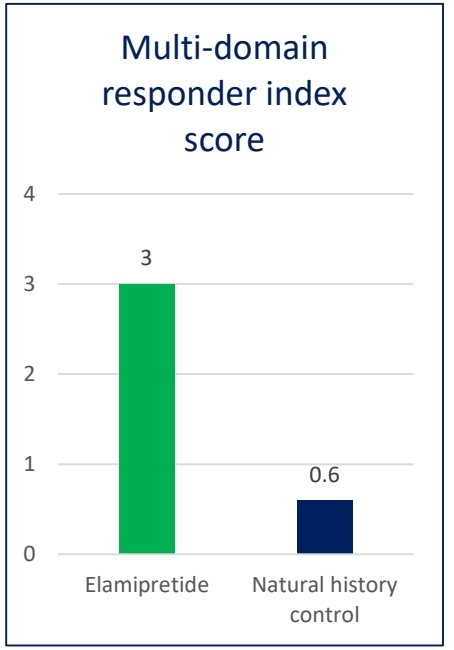
p<0.05

Week 48 OLE: Elam Δ -2.76, NHC Δ -0.004, p=0.04



p=0.13

Week 48 OLE: Elam Δ 8.69, NHC Δ 1.11, p=0.12

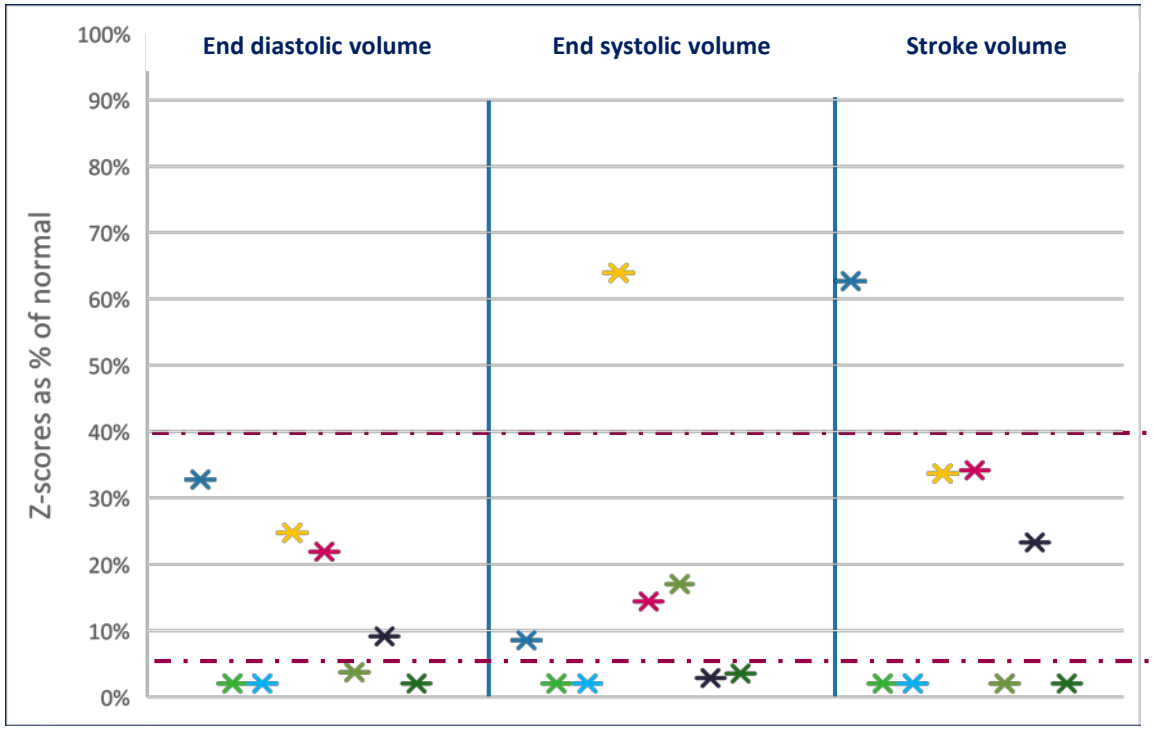


p=0.0001

Week 48 OLE: Elam LSM Δ 3.1, NHC Δ 0.7, p=0.0001

Volumes increasing for most patients with long term therapy

BL volume z-scores benchmarked to normal (n=8 subjects through Wk 36 OLE)

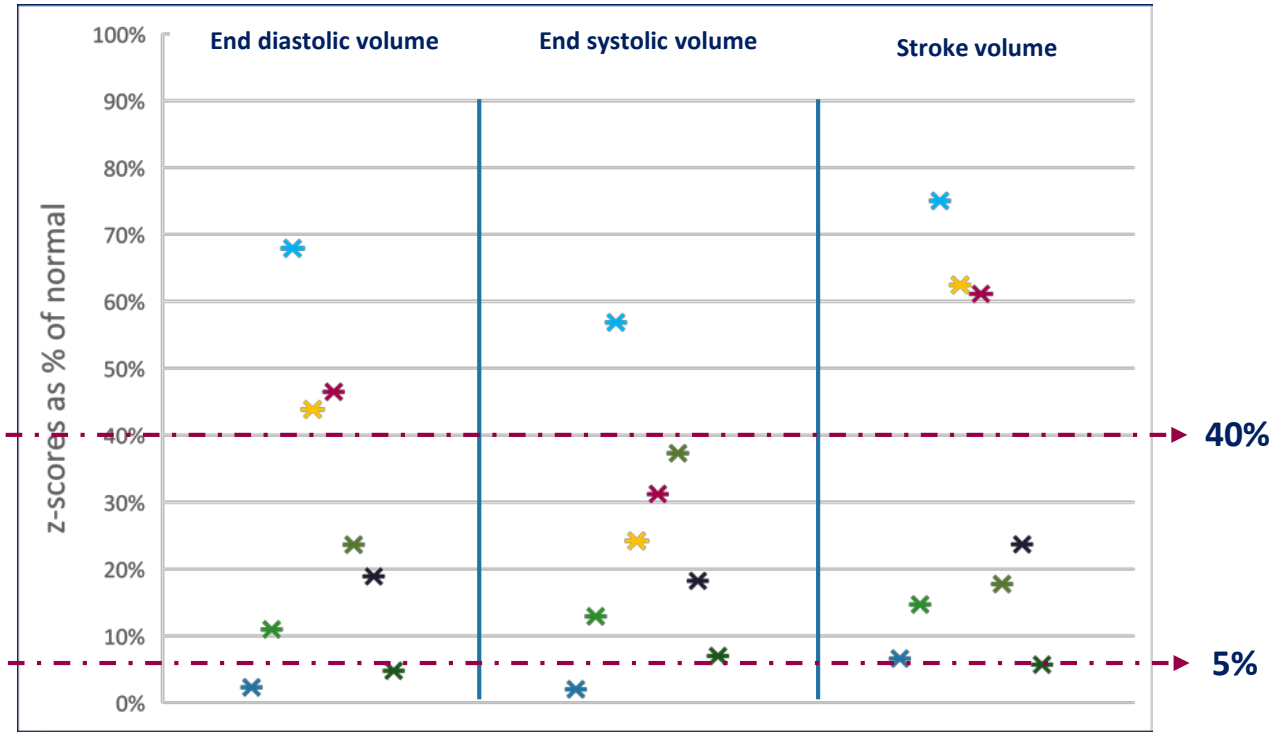


Mean z-score = 13th %

Mean z-score = 14th %

Mean z-score = 20th %

Wk 36 OLE volume z-scores benchmarked to normal (n=8)

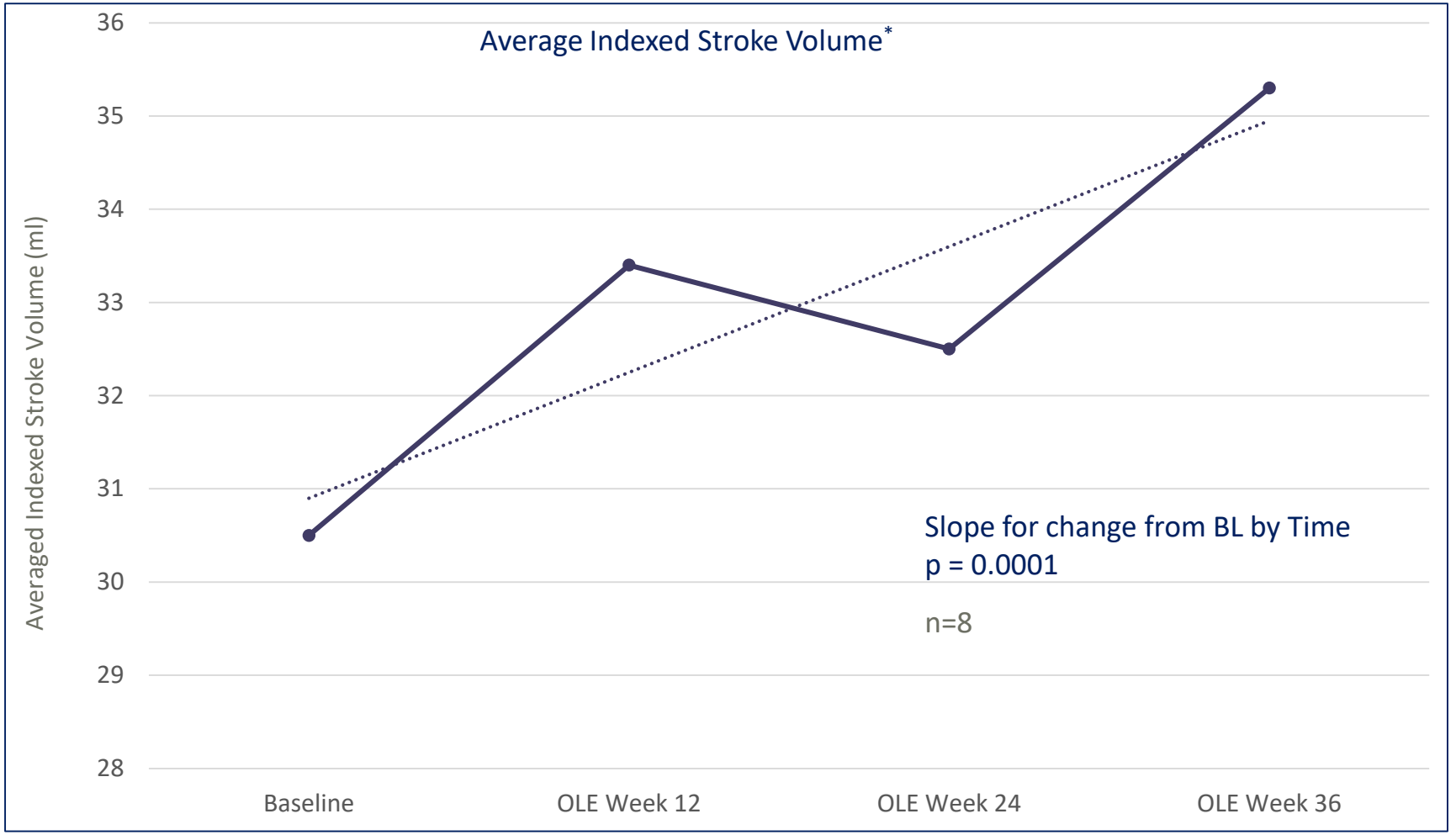


Mean z-score = 27th %
Slope for Δ BL:Wk 36
OLE p=0.0004

Mean z-score = 23rd %
Slope for Δ BL:Wk 36
OLE p<0.01

Mean z-score = 33rd %
Slope for Δ BL:Wk 36
OLE p=0.0001

Improving stroke volume: the major determinant of peak exercise capacity



- Mean z-scores for Week 36 completers (n=8) improved from 20th percentile at baseline to 33rd percentile at Week 36 OLE.
- **Stroke volume has been found to be the major determinant of peak exercise capacity in patients with hypertrophic cardiomyopathy, supporting its utility as surrogate endpoint in Barth.**

Data on file. Stealth BioTherapeutics.

* Average of estimated slopes via linear regression

Lele et al., 1995.

Improvement in heart function correlates with endpoint improvements

Correlation of Change in Stroke Volume with Changes in Functional & PRO Assessments at OLE W36 (N=8)

Spearman Correlation Coefficient		
Parameter (change)	Change	p value
6MWT	0.43	0.29
Muscle Strength by HHD (newtons)	0.81	**0.01**
SWAY Balance Score	-0.05	0.91
5XSST (seconds)	-0.76	**0.03**
BTHS-SA Total Fatigue Score	-0.40	0.32
CGIS	-0.38	0.35
PGIS	-0.46	0.26

Data on file. Stealth BioTherapeutics.

Next steps for rare cardiomyopathy platform

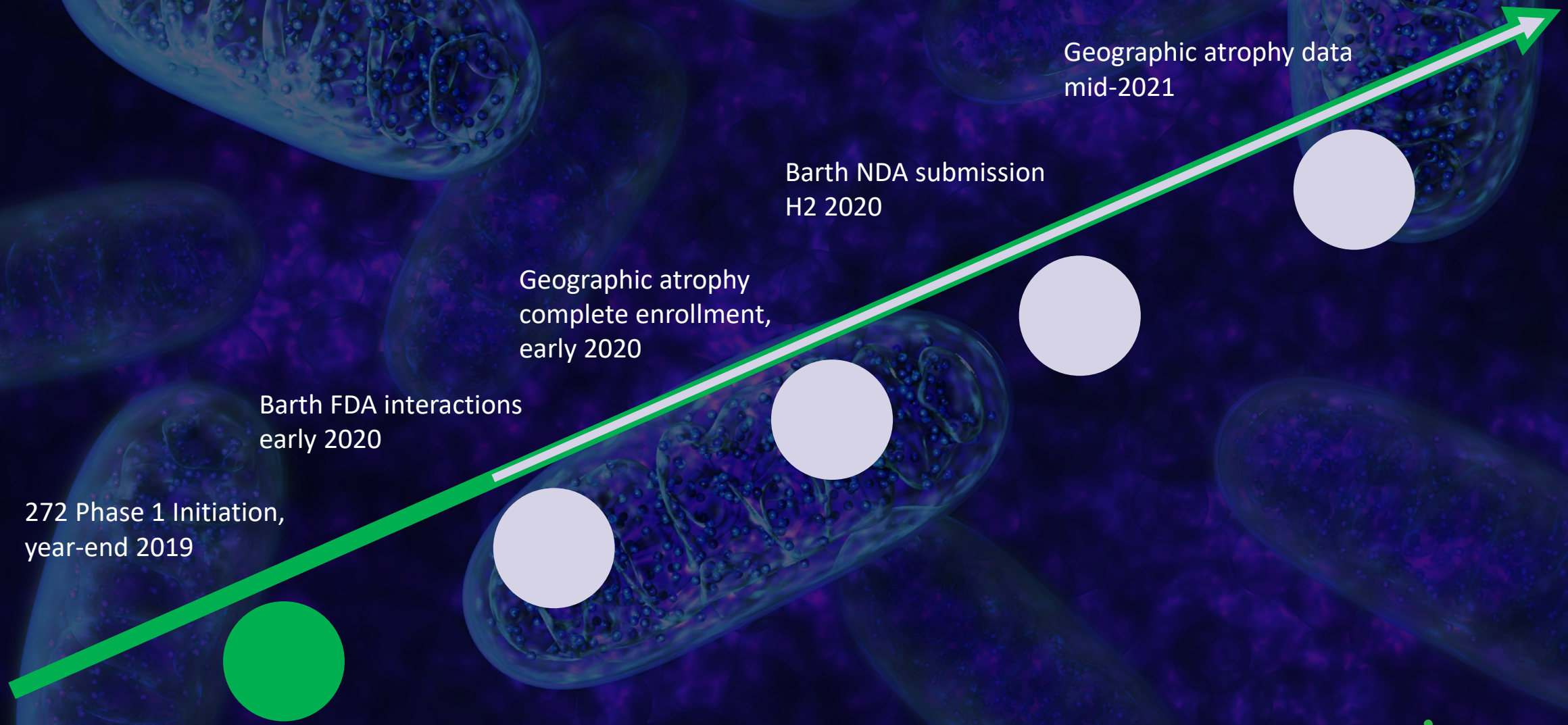
Barth

- ✓ Stealth BT, representative(s) from BSF, and TAZPOWER patient(s)/caregiver(s) to meet with FDA to present new SPIBA-001 Retrospective Natural History Control Study data and TAZPOWER data from surrogate endpoints of cardiac function, with goal of aligning on regulatory pathway.
- ✓ Ongoing discussions with heart failure regulatory experts and Barth KOLs to further characterize meaningfulness of observed changes in cardiac function.
- ✓ NDA preparation ongoing to support H2 2020 submission.

Franchise expansion

- ✓ Meetings with advocacy and KOLs to further inform choice of first expansion opportunity and trial design.
- Anticipate meeting with FDA to align on endpoints prior to trial. initiation
- Hope to initiate first expansion study by early 2021.

Be mighty…our patients are waiting



Stealth BIOTHERAPEUTICS