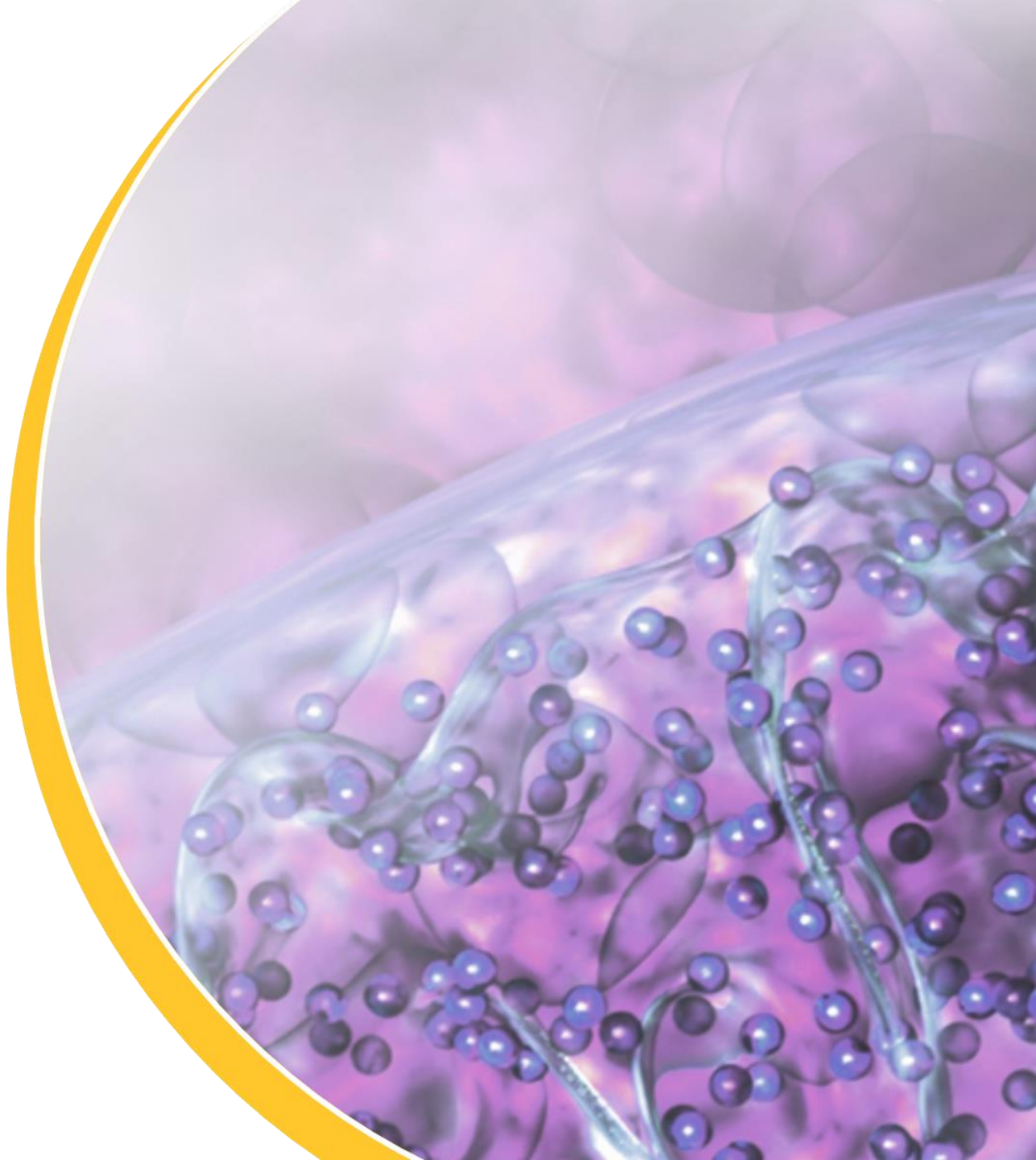
Epirium Bio

Novel Oral 15-PGDH Platform: Increasing Muscle Strength to Treat Sarcopenia and Neuromuscular Disease

- MF-300 "First-in-Class" Gerotheraputic Oral Sarcopenia Therapy
- MF-300 + Myostatin Inhibitor Proof of Principal Efficacy in SMA SMNΔ7
- Additional Opportunities: Sarcopenic Obesity, Rare Disease & IBD



Experienced Team with a Demonstrated Track Record of Success

Epirium Leadership Team

Alex Casdin, CEO

25+ year track record success in biotech & healthcare:

Port. Mgr: Pequot Capital; CEO & PM: Cooper Hil Partners, Reneo Capital

VP Finance, Amylin; CFO, Sophiris

Investor, Board Member & Audit Chair – Ignyta (acq. Roche), Erasca;

Board: Dusa (acq. Sun Pharma) , 454 Life Sciences (acq. Roche)

Eric Miller, CFO

Synthorx (acq. Sanofi)

Acadia Pharm -Commercial Stage

Cadence Pharm. (acq. by Mallinckrodt)

Micah Webster, Ph.D. Sr. Director, TS

Ph.D. in Cellular and Molecular Biology, JHU

Scholar Rock, Associate Director, Translational Science

Discovery programs & Biomarker Strategy for apitegromab

Key Consultant Advisors

Leigh MacConell, Ph.D. Clinical Development

25 years drug development, primarily in metabolic and liver disease

Led multiple drug approvals including first in class for T2DM (GLP-1)

Successfully worked with FDA to define drug approval pathways for disease areas without prior regulatory precedence including NASH

Elaine Chiquette, Pharm.D. Scientific Affairs

C-Suite executive with 20+ years experience in pharma, biotech, and medical device

Led regulatory approvals for NDA, BLA, PMA across USA, EU and China

Formerly served as CSO and head of regulatory & medical affairs at Gelesis

Roger Fielding, Ph.D. Professor of Medicine

Researcher studying the underlying mechanisms contributing to the age-associated decline in skeletal muscle mass

Published over 200 per-reviewed papers and 8,000 citations

Conducted numerous studies examining the roll of skeletal muscle power on physical performance in older adults

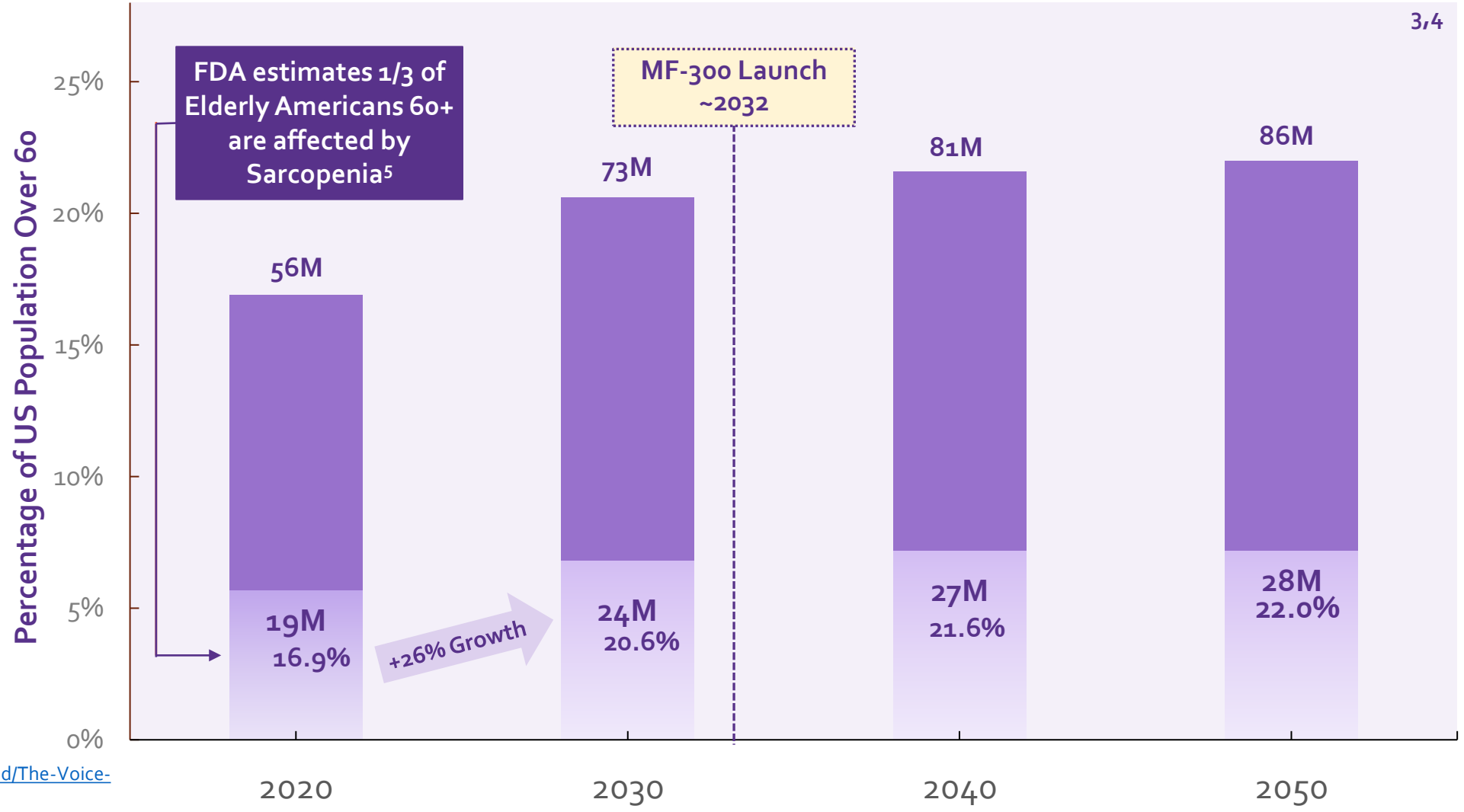
Sarcopenia: Large and Growing Unmet Medical Need w/ No FDA Approved Therapy

Current U.S. Healthcare Sarcopenia Spending Estimated >$40 Billion Annually[1]

Dependence
~7 million seniors "at-risk" of losing independence

Falls
Increased Morbidity & Mortality[2]

Mortality
Increased risk of death[2]



U.S. Population est. 331M
1. Goates S, et al. J Frailty Aging. 2019.
2. www.agingresearch.org. Sarcopenia Facts and Figures
3. Burns ER, J Safety Res. 2016.
4. Papadopoulou SK. Nutrients. 2020.
5. https://www.fda.gov/files/about%20fda/published/The-Voice-of-the-Patient--Sarcopenia.pdf

Sarcopenia Root Cause: Diminished Muscle Quality

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Sarcopenia:

- **Severe loss of muscle strength** and mass with aging
- **Strength declines faster than muscle mass**[1] due to **Diminished muscle quality**[2,4]
  - Existing muscle is weaker, contracts slower
  - Disproportionate loss of fast twitch muscle force
  - Progressive denervation of muscle
  - Reduced regenerative potential of muscle stem cells

Strength decline outpaces reductions in muscle mass with aging[1]

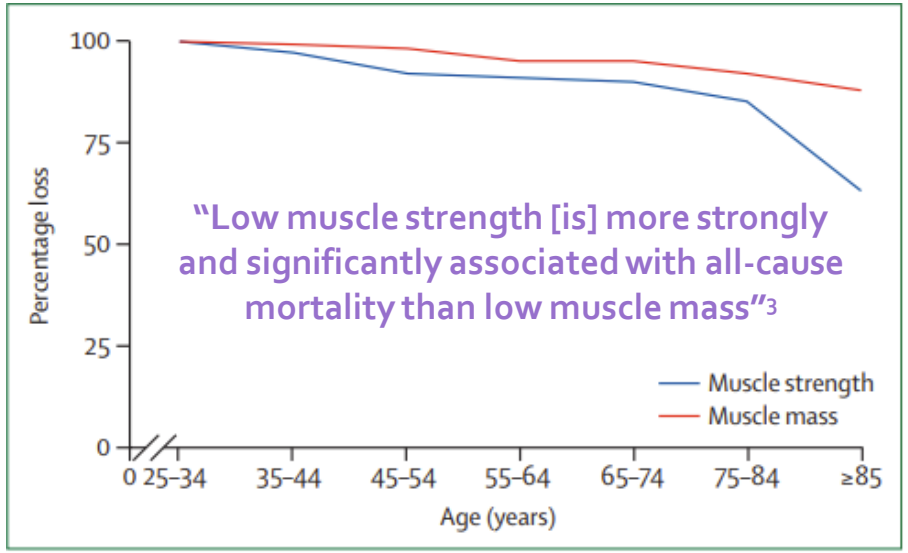

Figure 1: Percentage loss of muscle mass and muscle strength with age in men

"Maintaining or gaining muscle mass does not prevent aging-associated declines in muscle strength"[5]

[1] Cruz-Jentoft and Sayer, *Lancet*, 2019
[2] Jubrias and Conley, *Fun. Neurobio. of Aging*, 2001
[3] Li et al., *Med Sci Sports & Exercise*, 2017
[4] Mohien et al., *eLife*, 2019
[5] Goodpaster et al., *J Gerontology*, 2006

PGE2 Increases cAMP in Human Muscle Cells & Improves Muscle Function in Aged Mice

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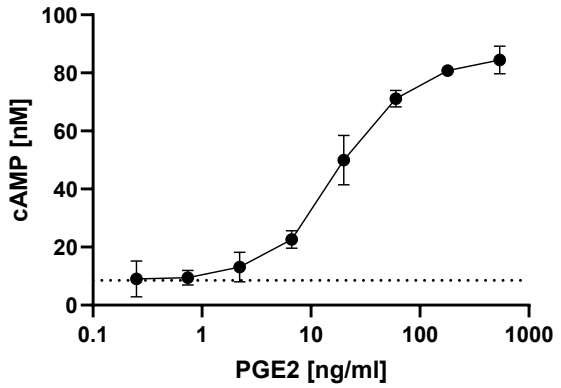
PGE2 increases cAMP in primary human myocytes



15-PGDH ⊣ PGE2 → EP4 → cAMP

Epirium cell-based assay

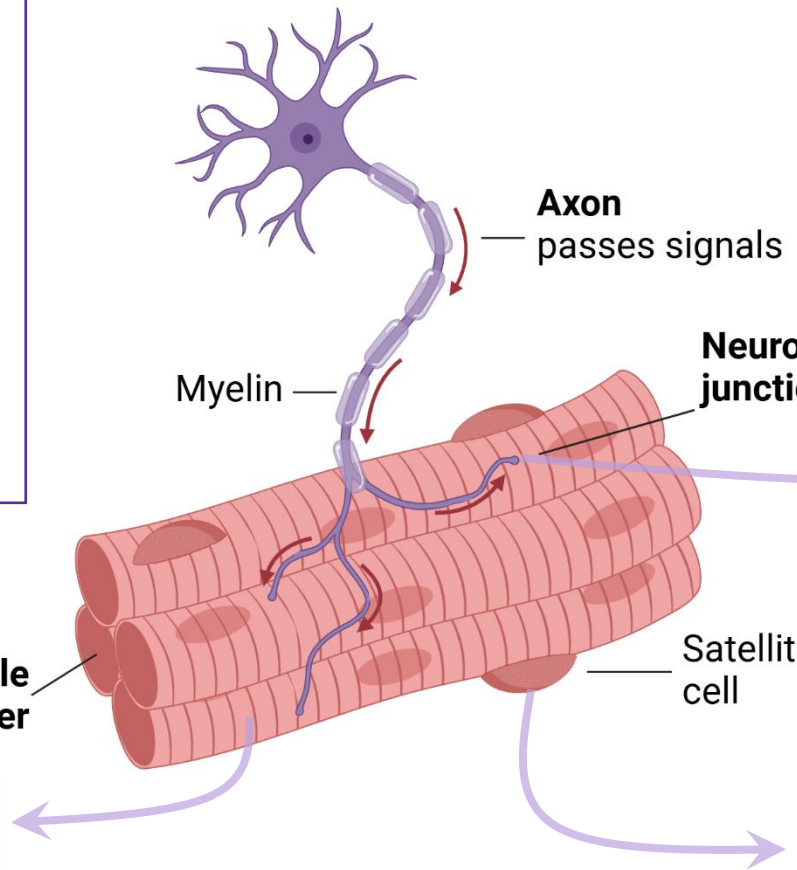
NMJ Integrity

SCIENCE TRANSLATIONAL MEDICINE | RESEARCH ARTICLE

MUSCLE PHYSIOLOGY

Regeneration of neuromuscular synapses after acute and chronic denervation by inhibiting the gerozyme 15-prostaglandin dehydrogenase

Mohsen A. Bakooshli[1†], Yu Xin Wang[1,2†*], Elena Monti[1], Shiqi Su[1], Peggy Kraft[1], Minas Nalbandian[1], Ludmila Alexandrova[3], Joshua R. Wheeler[4,5], Hannes Vogel[4,5], Helen M. Blau[1*]



Muscle Intrinsic Effects

RESEARCH ARTICLE

Science

AGING

Inhibition of prostaglandin-degrading enzyme 15-PGDH rejuvenates aged muscle mass and strength

A. R. Palla[1,2], M. Ravichandran[1,2], Y. X. Wang[1,2], L. Alexandrova[4], A. V. Yang[1,2], P. Kraft[1,2], C. A. Holbrook[1,2], C. M. Schürch[2,3], A. T. V. Ho[1,2]*, H. M. Blau[1,2]†

Stem-Cell Proliferation

PNAS

Prostaglandin E2 is essential for efficacious skeletal muscle stem-cell function, augmenting regeneration and strength

Andrew T. V. Ho[a,1], Adelaida R. Palla[a,1], Matthew R. Blake[a], Nora D. Yucel[a], Yu Xin Wang[a], Klas E. G. Magnusson[a,b], Colin A. Holbrook[a], Peggy E. Kraft[a], Scott L. Delp[c], and Helen M. Blau[a,2]

Cell Stem Cell

CellPress

Article

Multiomic profiling reveals that prostaglandin E2 reverses aged muscle stem cell dysfunction, leading to increased regeneration and strength

Yu Xin Wang,[1,2,12] Adelaida R. Palla,[1,12] Andrew T.V. Ho,[1,8,12] Daniel C.L. Robinson,[1] Meenakshi Ravichandran,[1] Glenn J. Markov,[1] Thach Mai,[1] Chris Still II,[3,10] Akshay Balsubramani,[4,5] Surag Nair,[4] Colin A. Holbrook,[1] Ann V. Yang,[1] Peggy E. Kraft,[1] Shiqi Su,[1,2] David M. Burns,[1,11] Nora D. Yucel,[1] Lei S. Qi,[6,7,8] Anshul Kundaje,[4,9] and Helen M. Blau[1,13,*]

15-PGDH, a Gerotherapeutic Target, Reduces PGE2 Levels, is Upregulated in Aged Muscle

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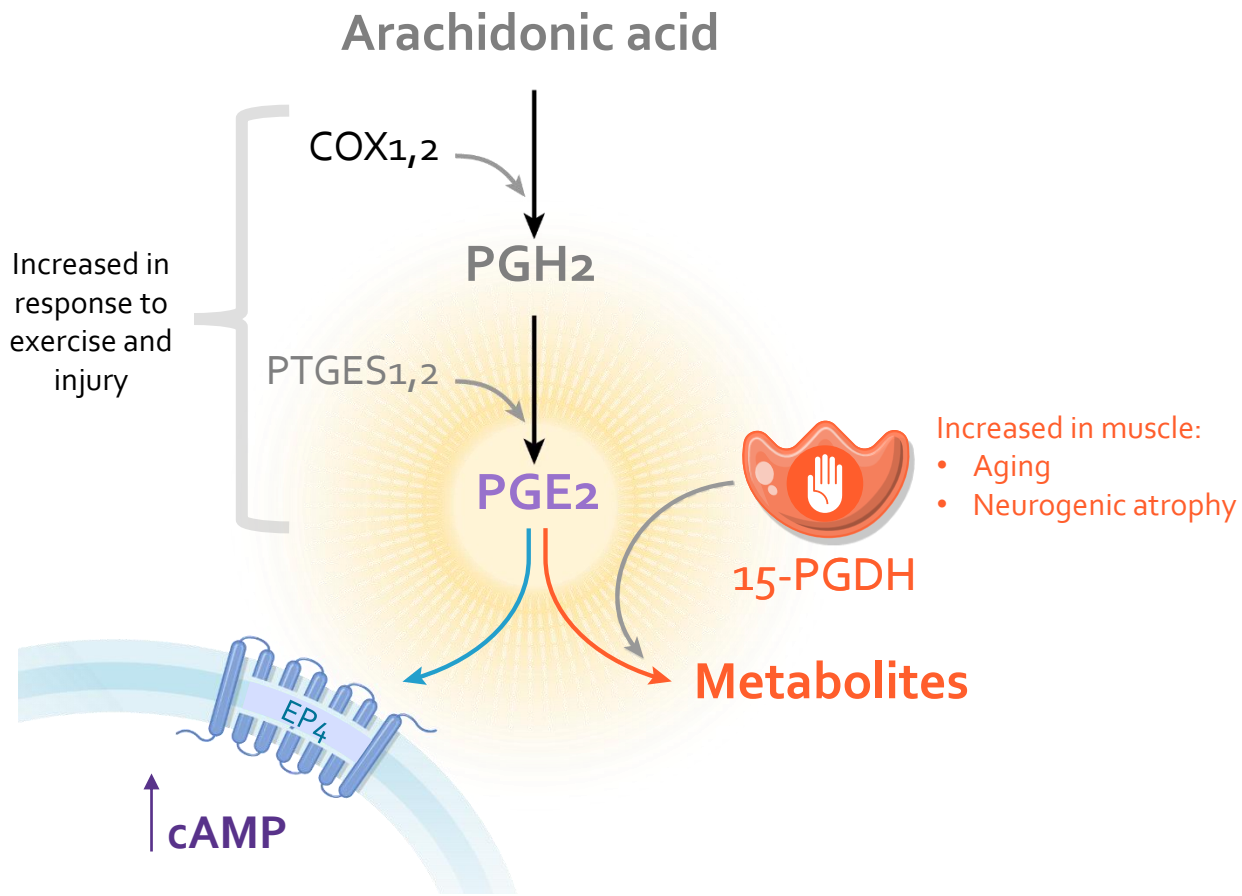
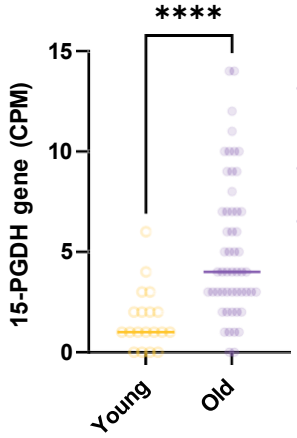
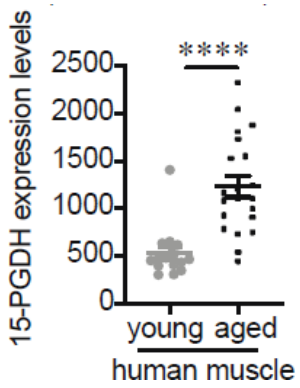
15-HydroxyProstaglandin Dehydrogenase Metabolically degrades PGE2



15-PGDH gene expression Elevated in aged human muscle[3,4]

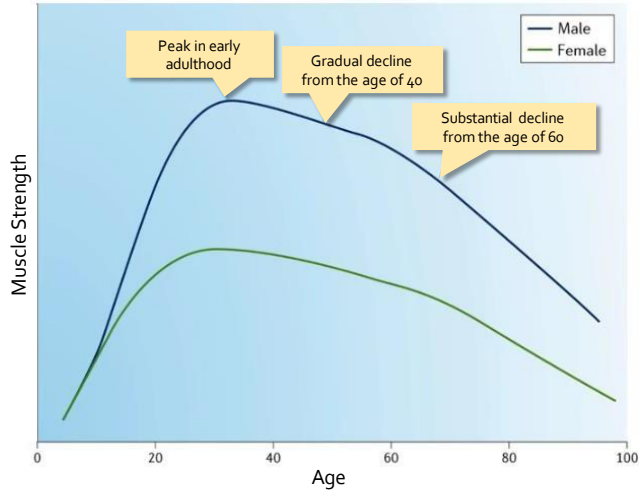


- Vastus lateralis (women and men)
- Young, N = 19 (**25±3 y.o.**)
- Older, N = 29 (**78±6 y.o.**)



- Vastus lateralis, RNA-seq (men)
- Young, N = 19 (**avg. age 20 y.o.**)
- Older, N = 29 (**avg. age 57 y.o.**)

Grip strength, a predictor of sarcopenia risk, declines with age[5]



[3] GEO167186, [4] Raue et al., *J Appl Physiol* 2012 (published in Palla et al., *Science* 2021), [5] Dennison et al., *Nat Rev Rheum* 2017

MF-300: Epirium's Therapeutic Strategy to Increase PGE2 Levels in Aged Muscle

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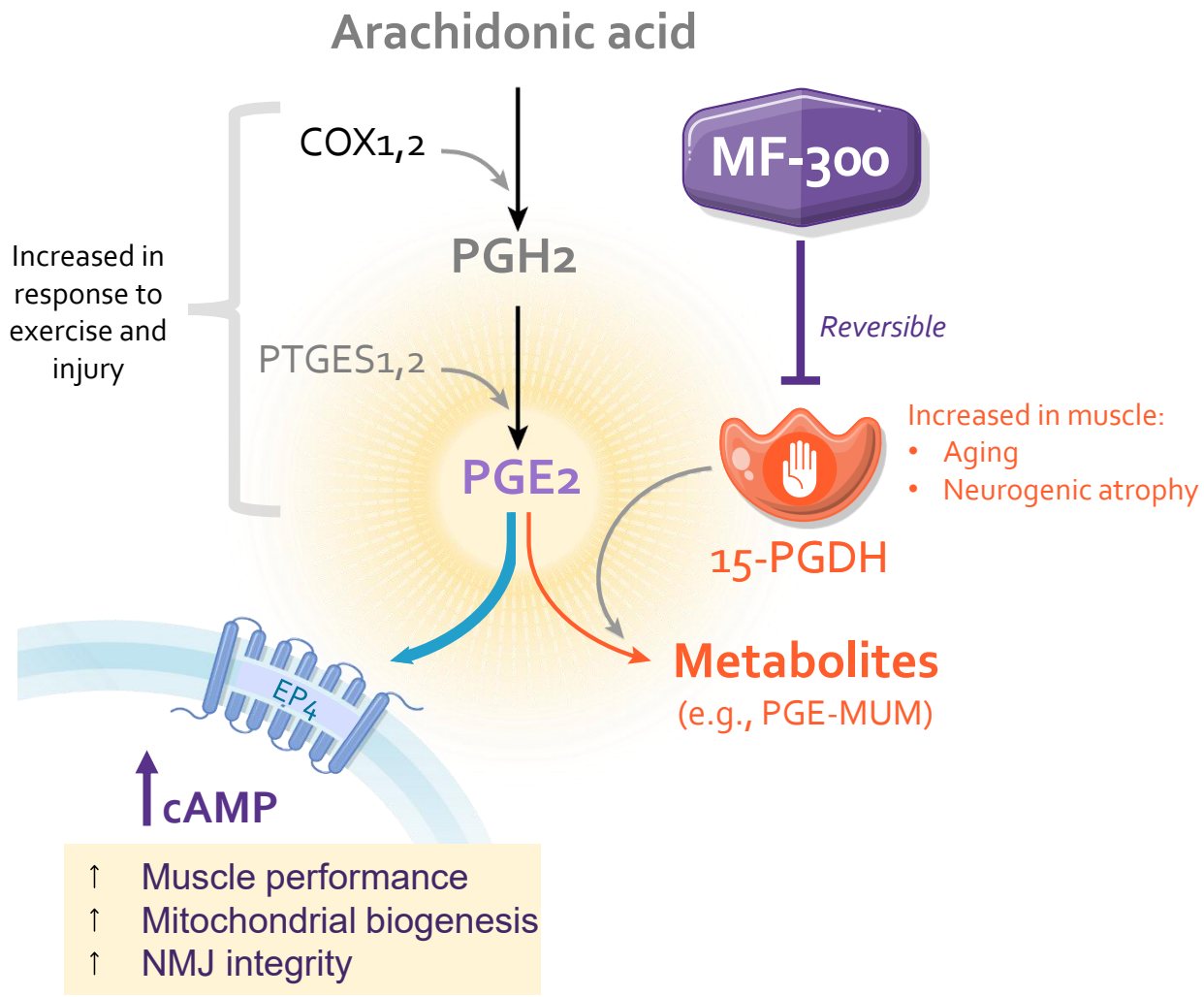
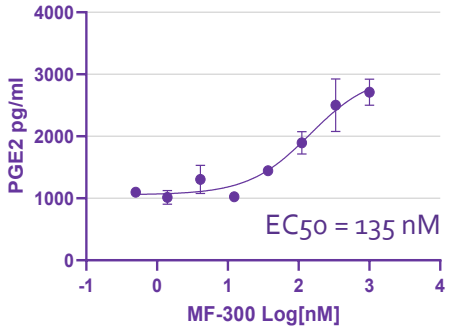
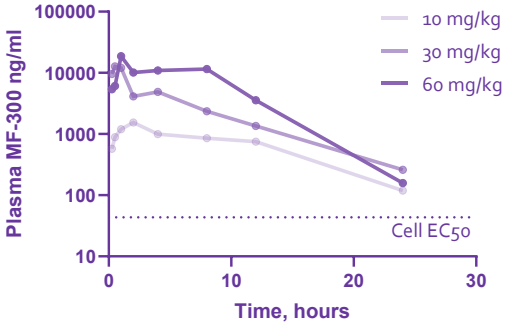
MF-300
Inhibits 15-PGDH to increase levels of PGE2



MF-300 increases PGE2 in cell-based assay



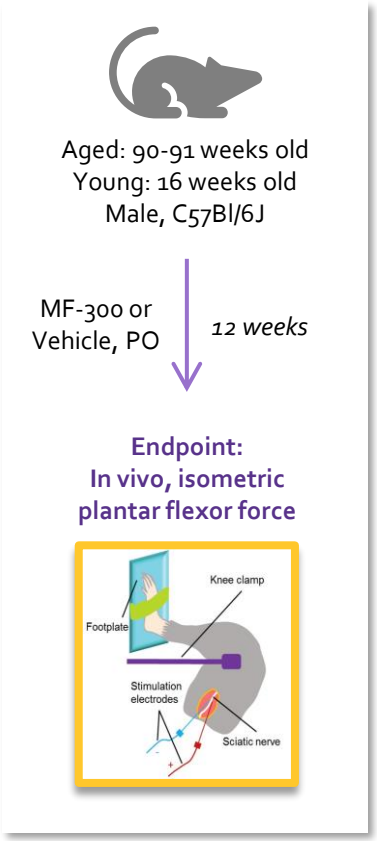
MF-300 is bioavailable and stable in vivo (oral administration)

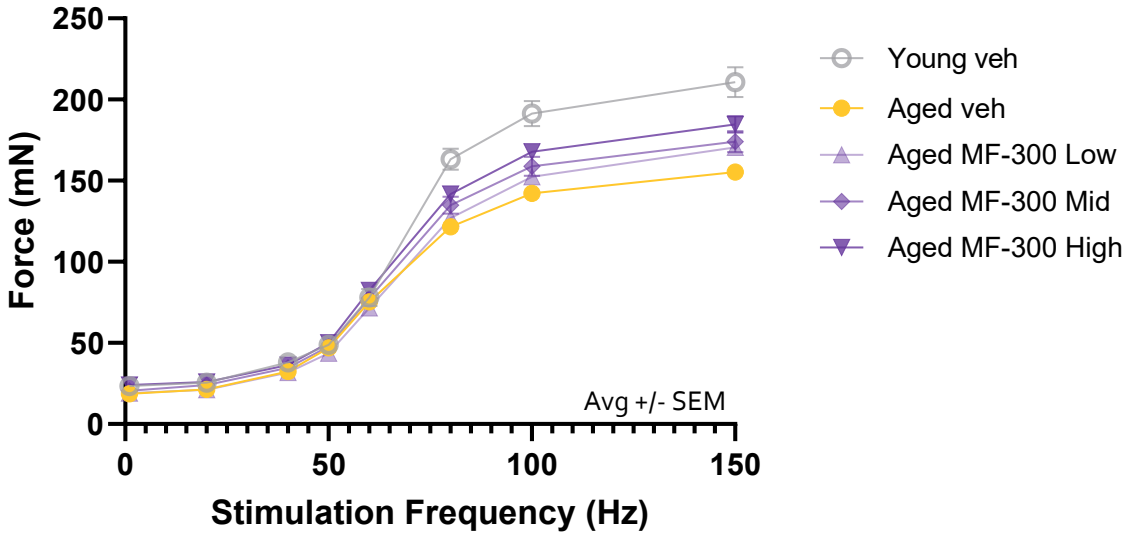


MF-300 Muscle Force Efficacy in Aged Mice with 12-Weeks Oral Administration

Exposure response observed (based on cumulative 12-week exposure across groups)

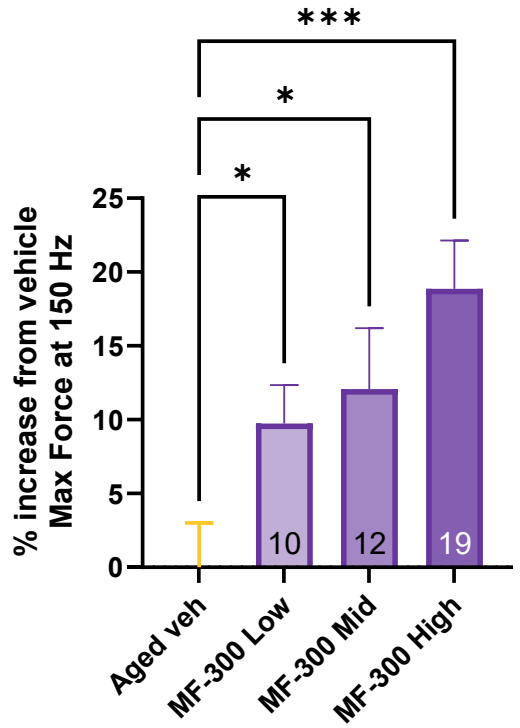
Max force of isometric plantar flexion at 12 weeks





Aged veh vs:	2way ANOVA w/ Dunnett's multiple comparisons test
MF-300 Low	ns
MF-300 Mid	p < .0001
MF-300 High	p < .0001

% increase over veh at 150 Hz



Avg +/- SEM; 1way ANOVA

MF-300 Increases Muscle Force with Correlated Reduction in PD Biomarker

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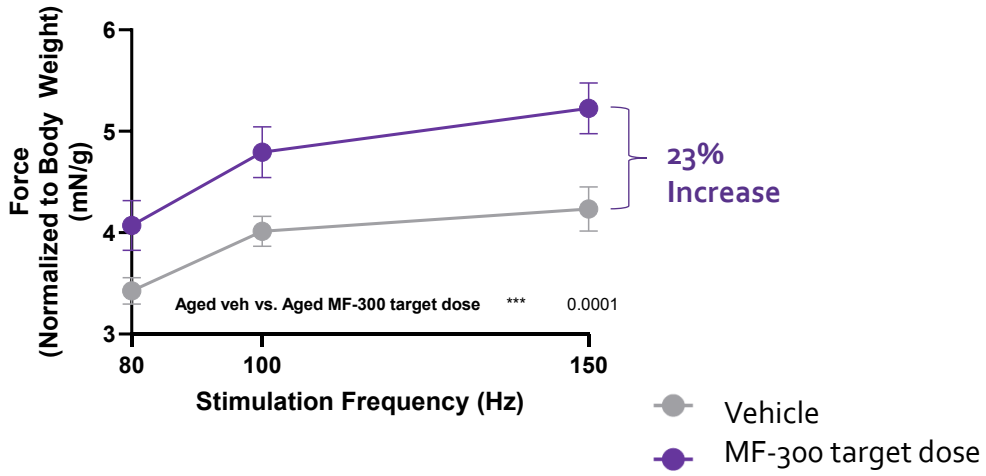
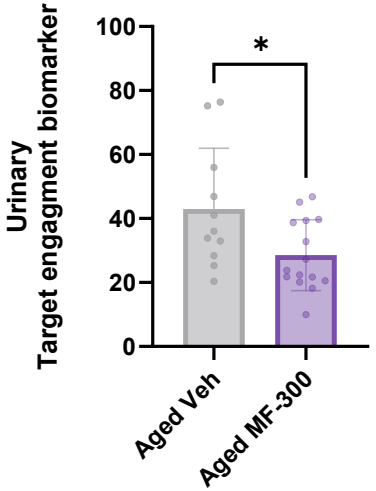
MF-300 Increased muscle force in aged mice

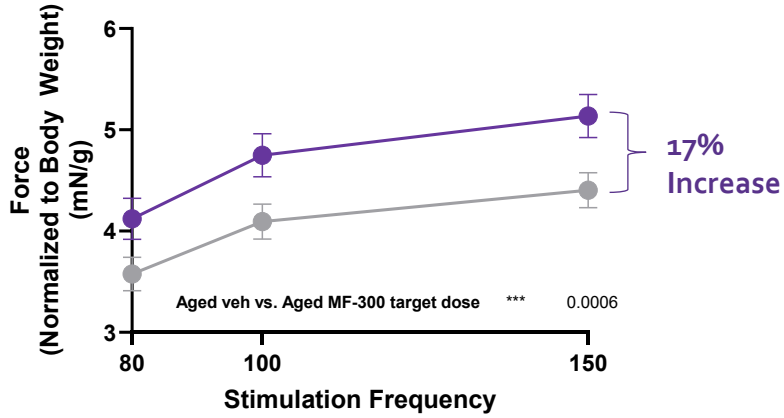
MF-300 Reduced urinary metabolite of PGE2

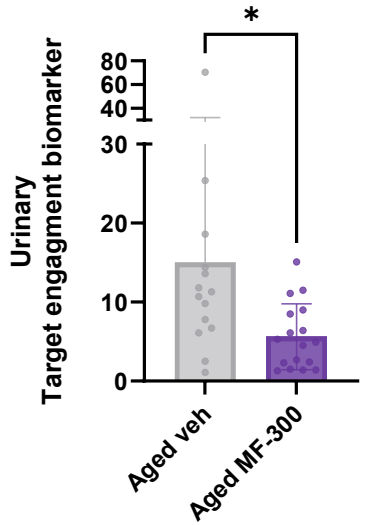
Study 1





Study 2





Clinical Update

- Phase 1 Overview
- Phase 2 Planning: Design & Endpoints

Financials & Wrap-up

Phase 1 Overview

Objectives: **Assess the safety and tolerability of MF-300 following single ascending doses (SAD) and multiple ascending doses (MAD) along with:**

- MF-300 Pharmacokinetics (PK) & Pharmacodynamics (PD), including target engagement (TE) biomarkers
- Potential for food effect on the PK of MF-300 following a single oral dose
- Characterize the PK/PD, PK/safety relationships, allowing for Ph2 dose selection

Population: **Adult healthy volunteers ≥ 18 - < 65 years of age & Healthy Elderly Cohort ~65-75 years of age**

Part 1a SAD

- N=8 per cohort (2 pbo, 6 MF-300)
- Broad range of doses
- Large safety margin
- Allows for flexible dosing
- Elderly cohort dose selection

Single Ascending Dose
5 dose adult cohorts, 1 elderly cohort

Part 1b Food Effect

- N=12 (all MF-300)
- MF-300 administered in the fed or fasted state

Food Effect
2 sequence 2 period cross-over

Part 2 MAD

- N=10 per cohort (2 pbo, 8 MF-300)
- Daily dosing for 5 days to achieve steady state PK

Multiple Ascending Dose
3 dose adult cohorts & 1 Elderly follow-on cohort

Current Phase 2 Design: 24-week Treatment Duration w/ 12-week Interim Analysis

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Overview

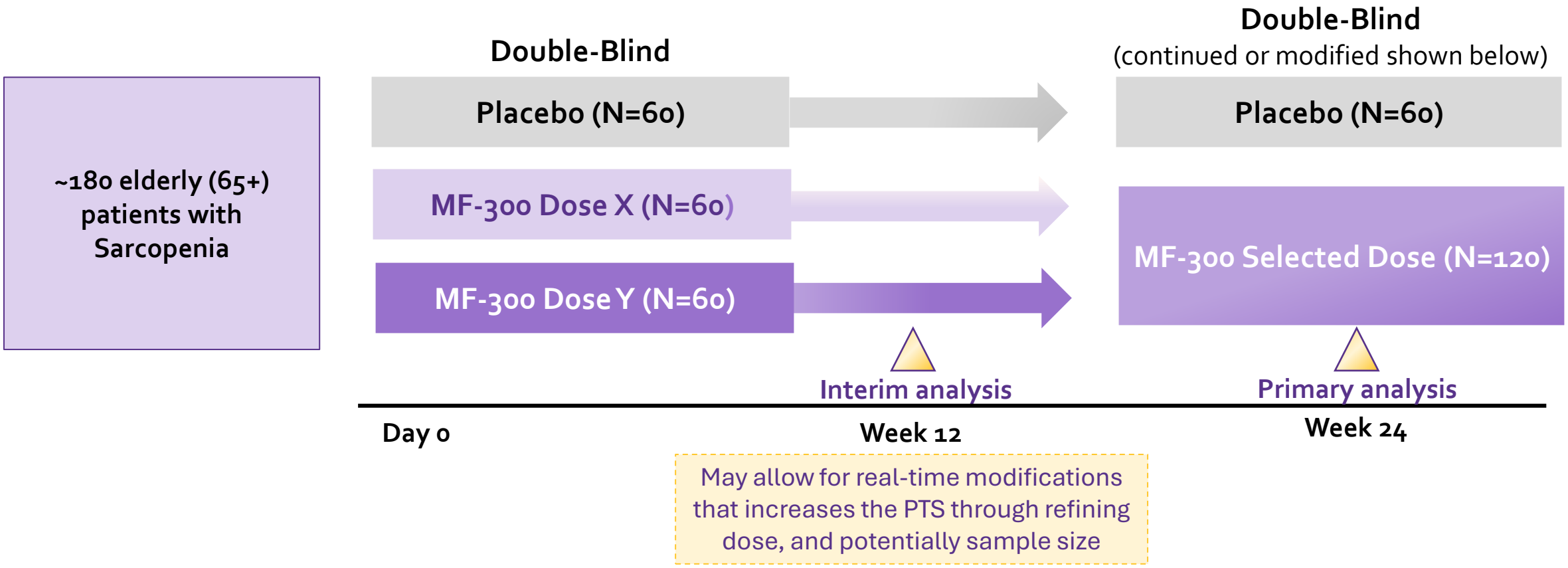
24 week randomized, double-blind, placebo-controlled, adaptive design

Interim Analysis

Analysis 20/arm at Week-12

Primary Analysis

Potential PE: Timed 5xs Chair Stand; Secondary Endpoints: e.g., Muscle Strength, SPPB, PROs



May allow for real-time modifications that increases the PTS through refining dose, and potentially sample size

Phase 2 Planning: Entry Criteria & Indication Relevant Endpoints

Entry Criteria

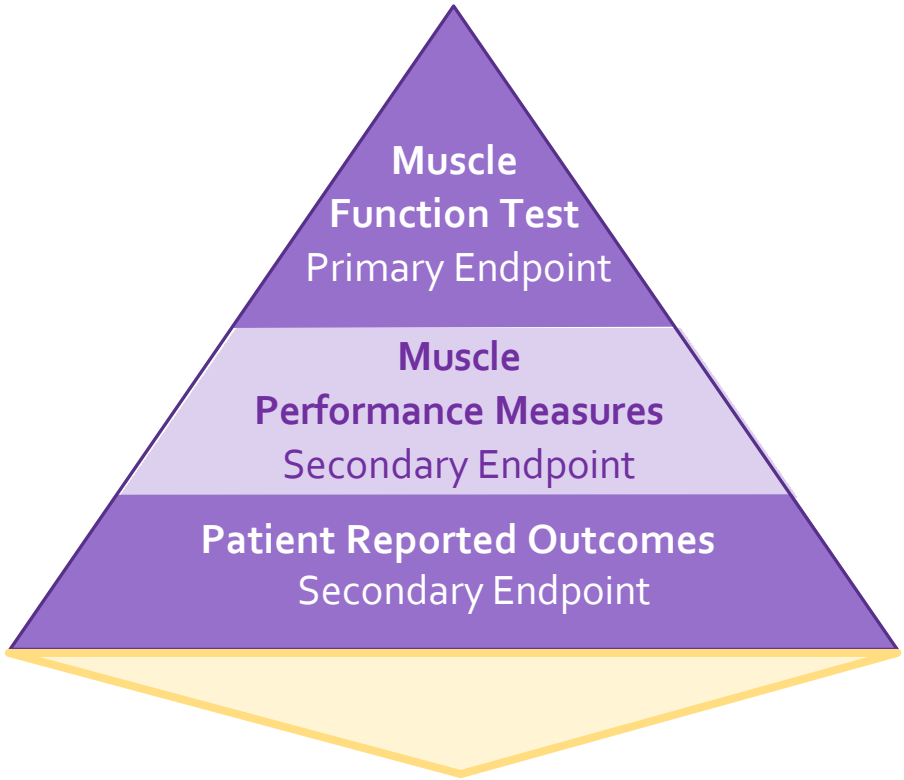
Elderly (≥65 yo)[1] men and women with sarcopenia according to SDOC definition:[2]

- Low grip strength (<35.5 kg for men, <20 kg for women) &
- Slowness (walking speed <0.8 m/s)
- SPPB* Score 4 – 8
- Poor performance on 5xs chair stand test

***SPPB = Short Physical Performance Battery (12 pt Scale higher better)**

1. Reginster JY, et al. Aging Clin Exp Res. 2021;33:3-17.
2. Bhasin S, et al. J Gerontol A Biol Sci Med Sci. 2023;78:S86–S93.

Totality of Evidence to Support Sarcopenia Indication



Meaningful Patient Benefit

Endpoints

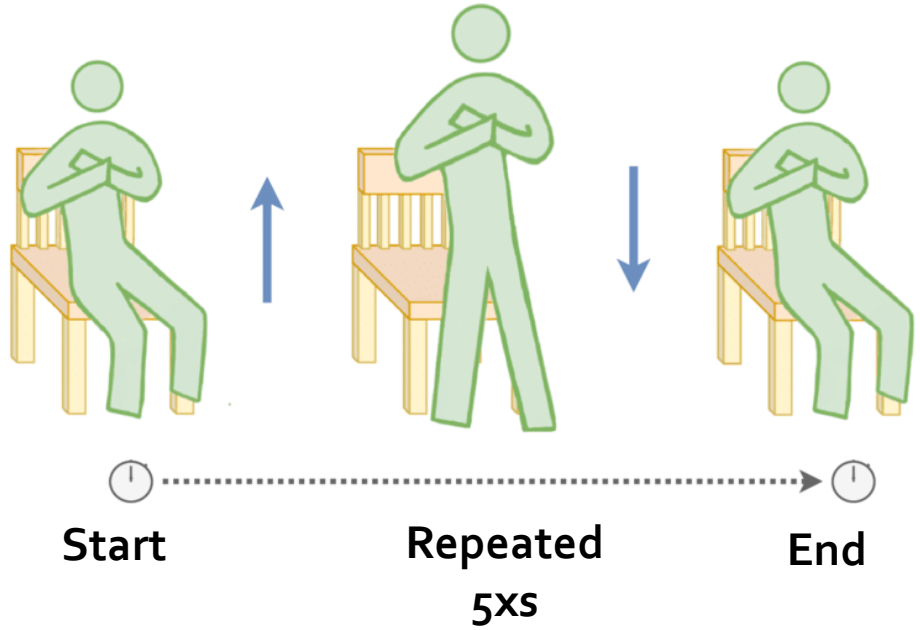
Primary Endpoint:
CFB vs. PBO
5xs Chair Stand Test (sec)

Key secondary endpoints:
CFB vs. PBO in

- Knee extension strength
- 4-meter gait speed test (sec)
- SPPB
- Hand grip strength (kg)
- PROs
  - PROMIS – Physical
  - SarQoL

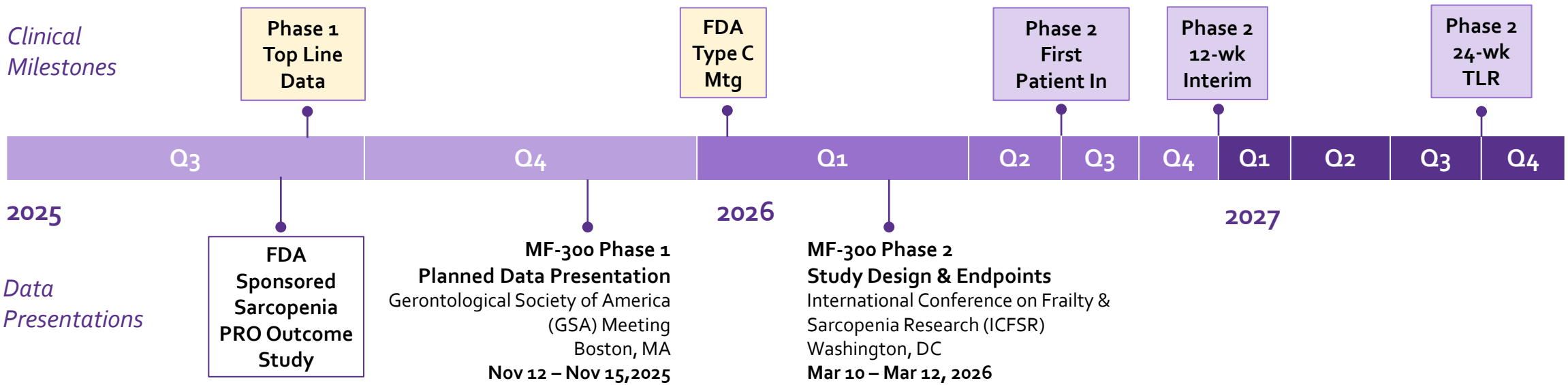
Rationale for the 5x Chair Stand Test as the Primary Endpoint

- **Accepted proxy measure of lower limb power and strength**
  - Endorsed by World Health Organization (WHO) ICOPE[1] & EWGSOP2[2]
  - Core component of SPPB[3]
- **Strong predictor of clinical outcomes**
  - Activities of daily living
  - Fall Risk
  - All-Cause Mortality
- **Assesses Locomotor Capacity, a key domain of Intrinsic Capacity (IC)**
- **Loss of 1 second (~10%) per year is considered clinically significant**



1. ICOPE=Integrated Care for Older People (9789240103726-eng.pdf)
2. EWGSOP2=European Working Group on Sarcopenia in Older People 2 (CRUZ-JENTOFT AJ, et al. Age and Aging. 2019;48:16-31).
3. Short Physical Performance Battery

Key MF-300 Phase 1 & 2 Clinical Milestones & External Activities



Series B Funded Milestones: MF-300 Phase 2 Data Readout & IND Ready IND

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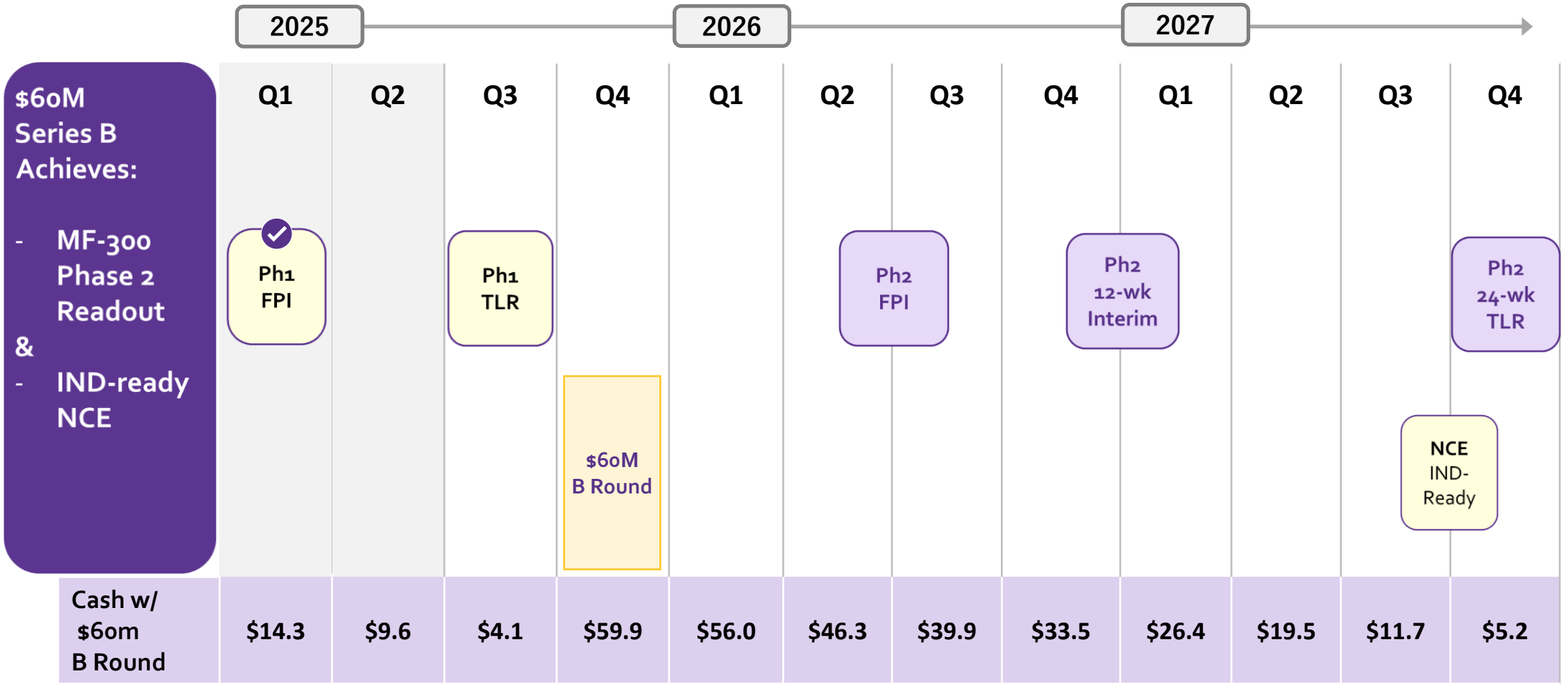

MF-300 Value Creating Milestones over next 6 months

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✓ **Phase 1 SAD/MAD Initial Topline Results – Sep '25**
- Results include PK/PD and Target Engagement (TE) Biomarkers

✓ **MF-300 + MSTNi Muscle Mass & Force Efficacy in Δ7 SMA Model**
- Broadens Indication Set: Sarcopenic Obesity, Sarcopenia & Rare Diseases

Phase 1 Presentations: Nov. GSA & Dec. SCWD
- Key KOL, Regulatory, and Strategic engagement opportunities

FDA Input on Phase 2 Plans (Type C Meeting) – Jan '26
- Leveraging SAB, PRO & Muscle Function Study

Results from Colitis Prevention Study (DSS) w/ MF-1305
- Leverages interest in IBD, sets stage for value-creating treatment

Positioned to Capitalize on "Oral Small Molecule Pipeline in a Mechanism"

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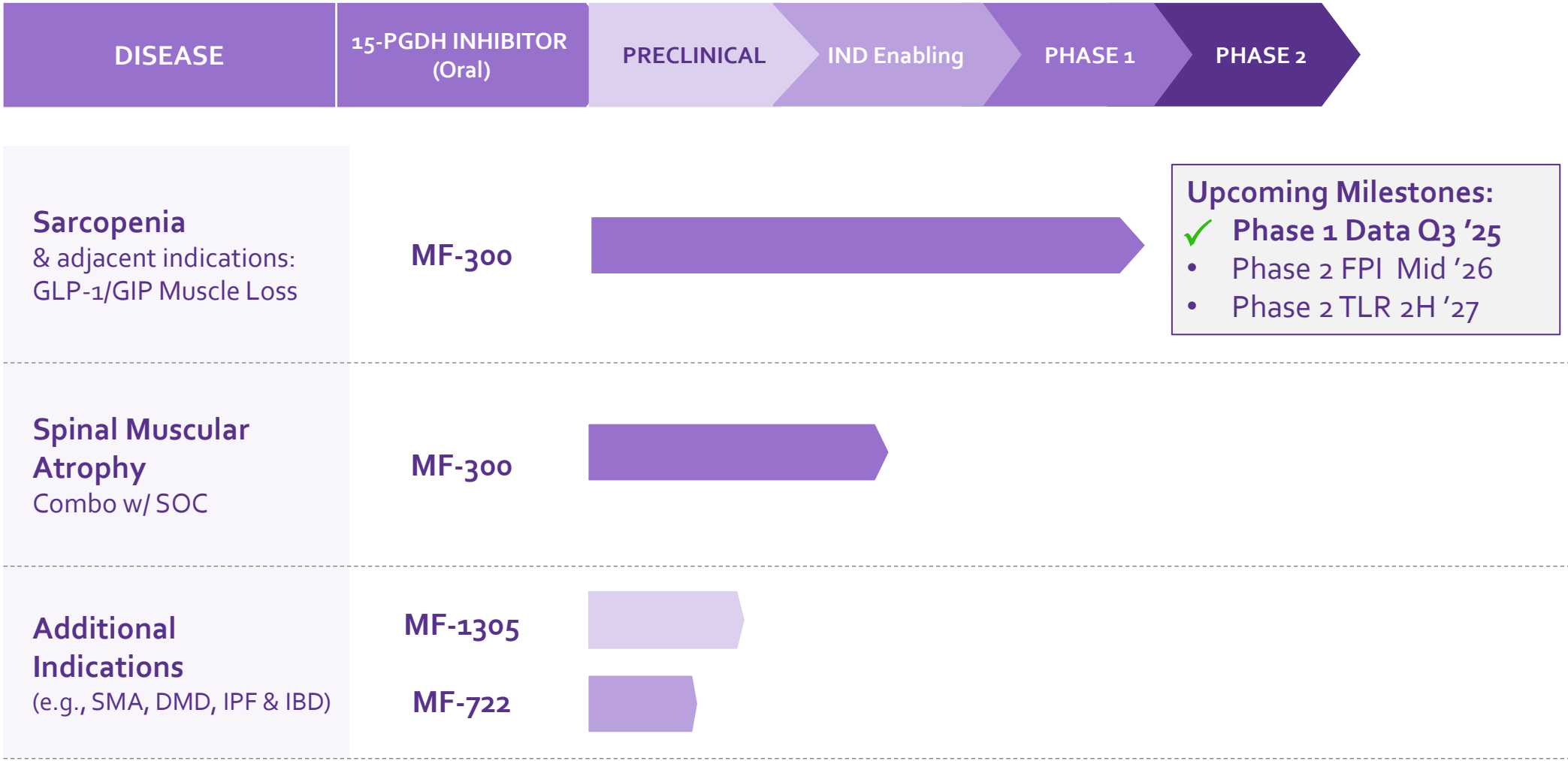

Spinal Muscular Atrophy Appendix

MF-300 Attractive Profile in Translational SMA Model in Mice

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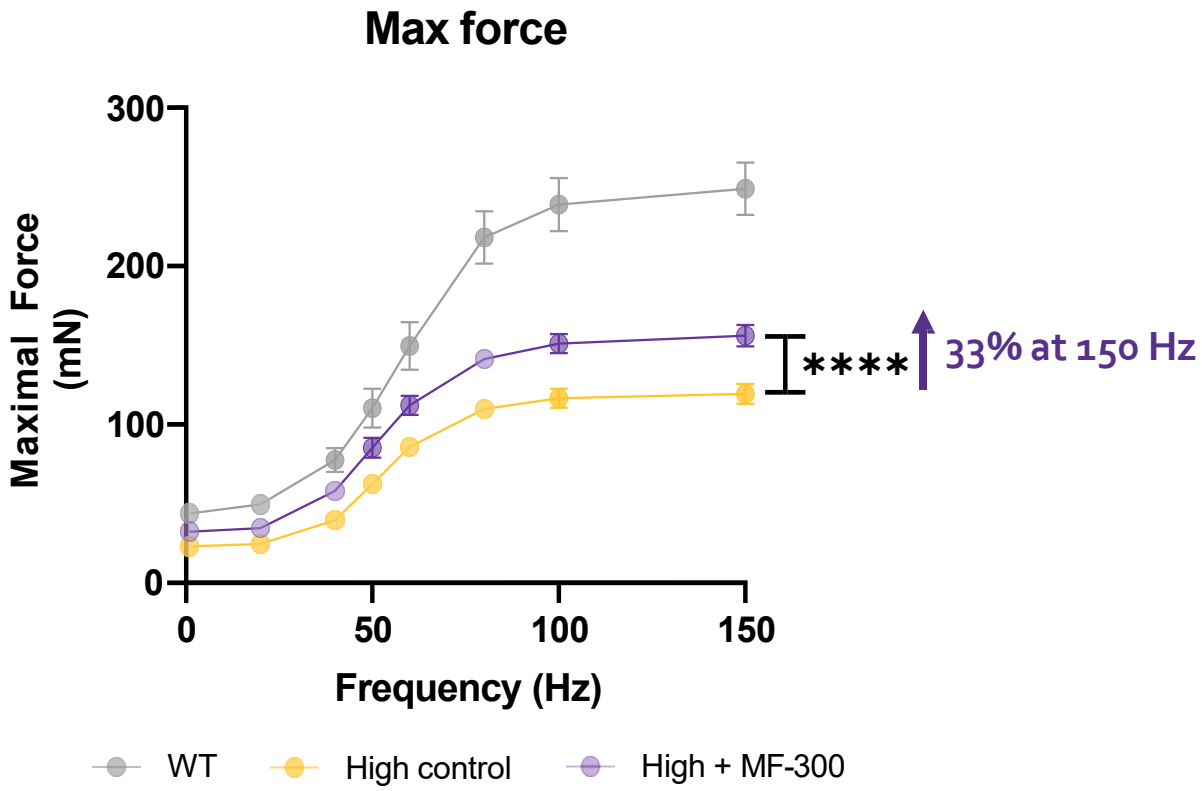
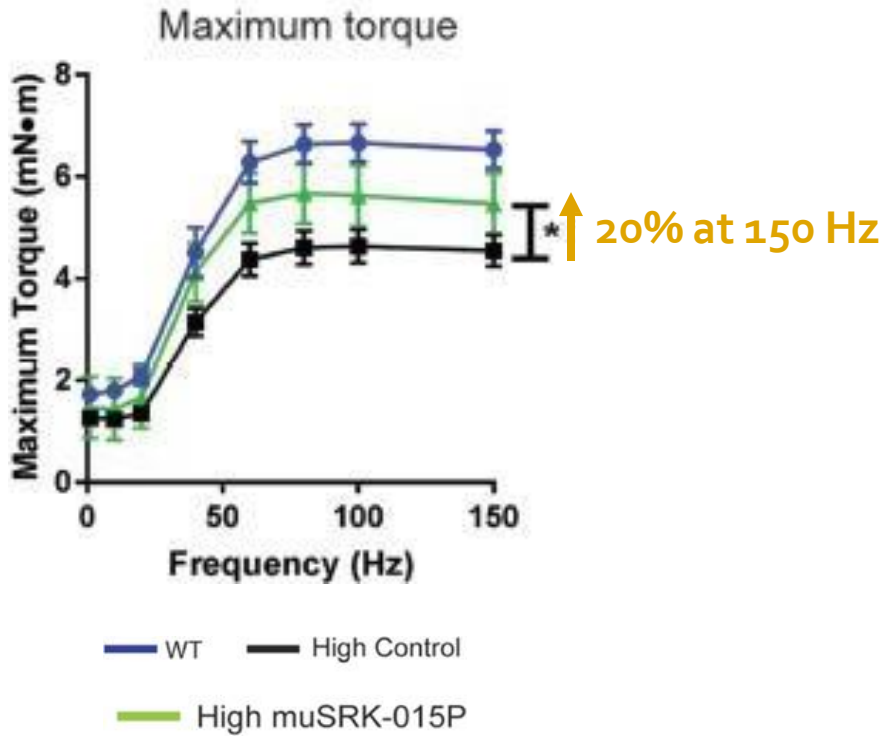
MF-300 in SMNΔ7 High/High Male mice



mSRK-015P in mouse Δ7 High/High Male and female mice



Force = Torque

MYOLOGICA

Scholar Rock's Preclinical and Clinical Data Set Precedent for Translation of Efficacy

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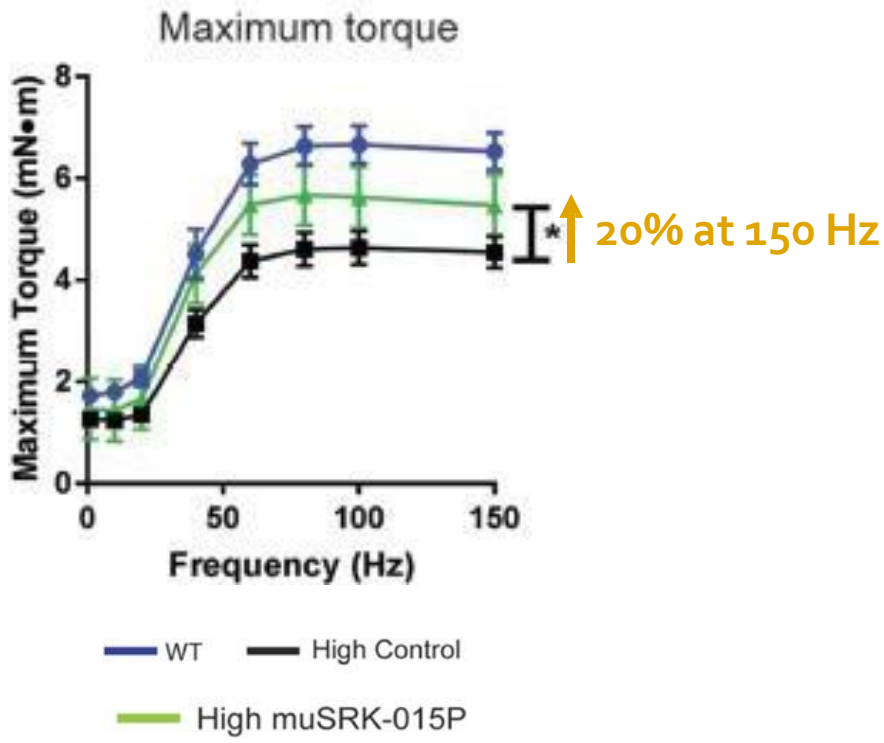
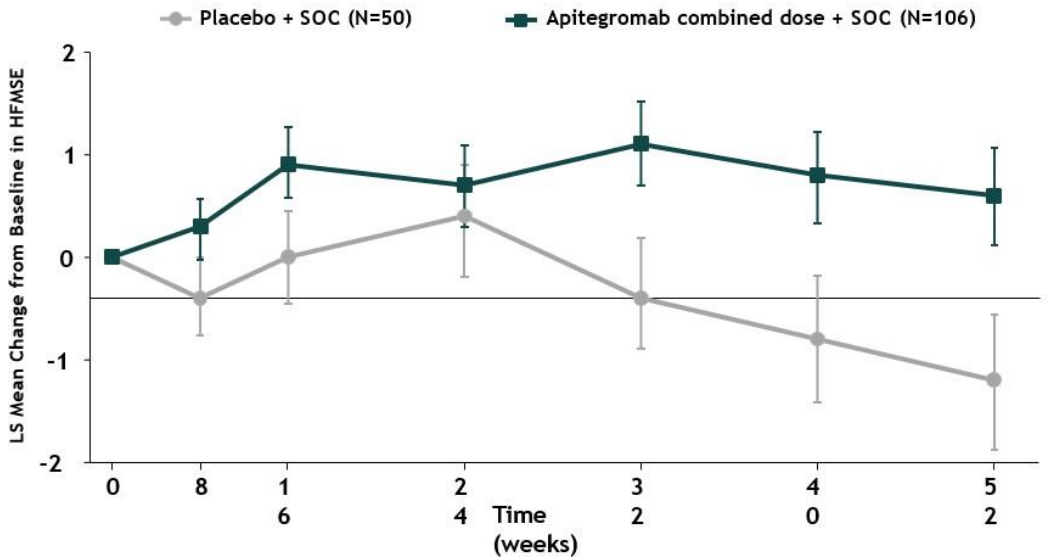
Demonstrates that a 20% increase in isometric plantar flexor force in mice translates to clinical benefit

mSRK-015P in mouse Δ7 High/High



Apitegromab in SMA + SOC (Ph 3 SAPPHIRE)

Least Squares Mean (+/- SE) Change from Baseline in HFMSE Total Score by Visit (MITT Set)



Change from Baseline in HFMSE Total Score

	Analysis	n	Results (vs Placebo, n=50)	Unadjusted *P*-value	
Primary Analysis	Apitegromab 10+20 mg/kg combined	106	1.8	0.0192*	✓ Achieved Statistical Significance
	Apitegromab 20 mg/kg	53	1.4	0.1149*	
	Apitegromab 10 mg/kg	53	2.2	0.0121**	

ScholarRock

Long et al., *Hum Mol Gen*, 2016