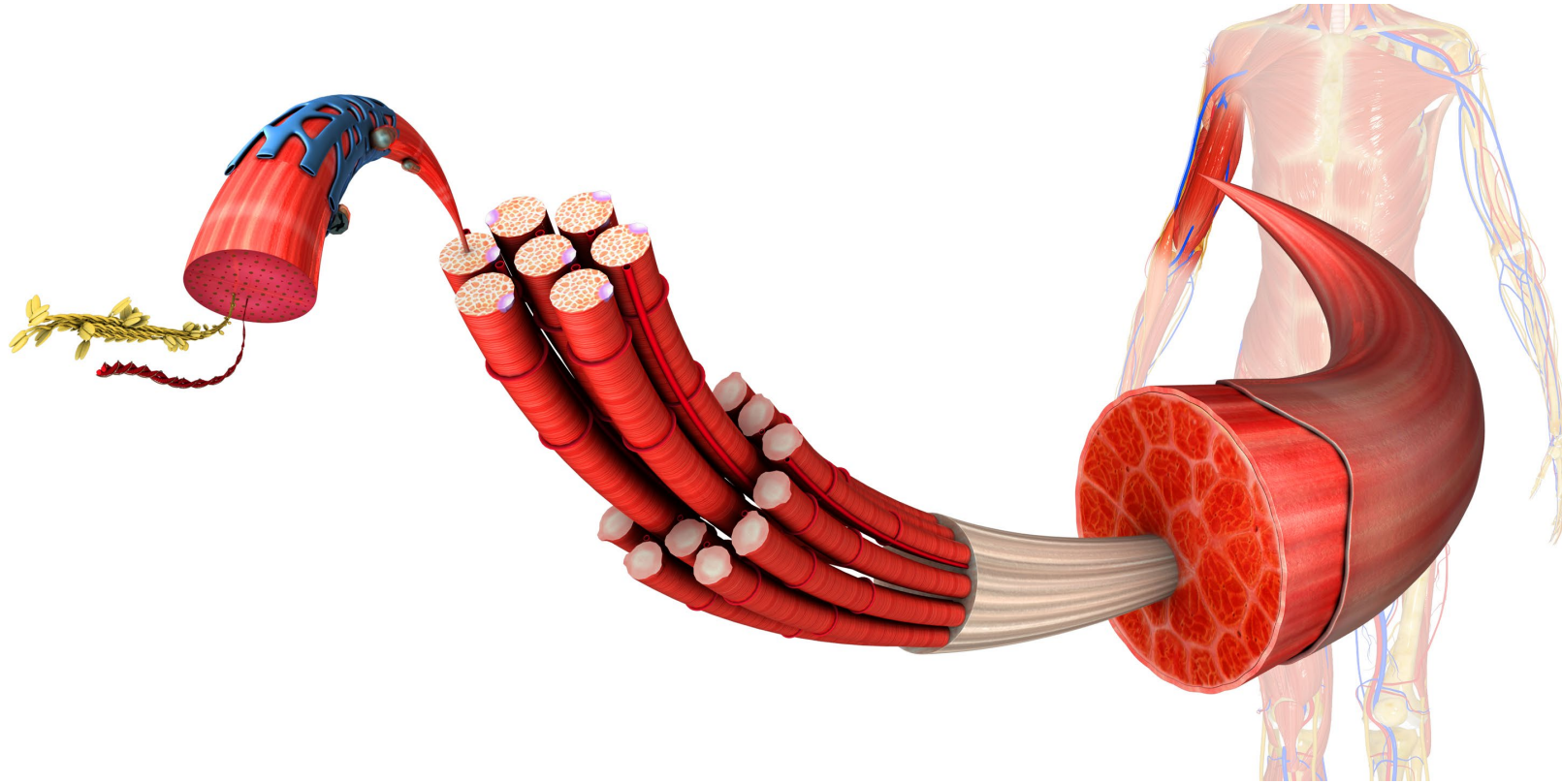
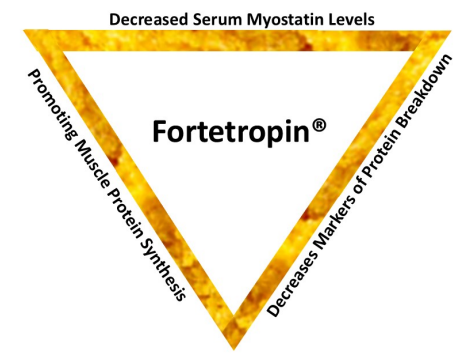


Considerations for Longevity Benefits of Optimized Muscle and Supporting Muscle Preservation



Dr. Chris D. Meletis
Naturopathic Physician

Today's Discussion



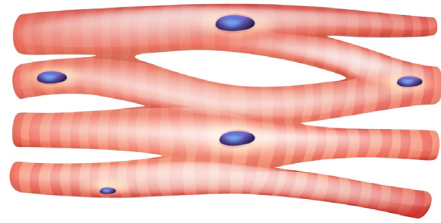
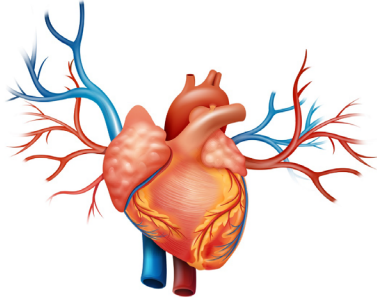
- ✓ Muscle-derived Myokines role in Whole Body Wellness
- ✓ Improved Metabolic Health
- ✓ Mental Health Wellness
- ✓ Morbidity and Mortality Mitigation
- ✓ Review of the science of Fortetropin, a heavily researched “novel” molecule “Fortetropin” to help safeguard healthy muscle physiology.
- ✓ Anabolic Resistance as an obstacle to healthy muscle aging

Disclaimer:

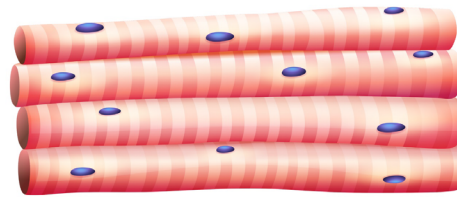
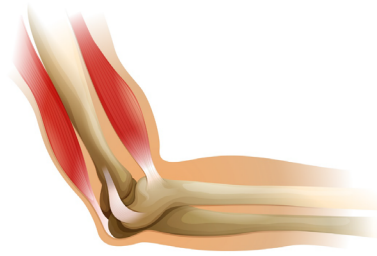
I am an independent clinical educator and advisor for MYOS MD & Niagen-Bioscience.

Muscular Performance – Requires Full Body Optimization

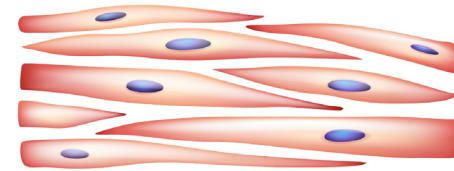
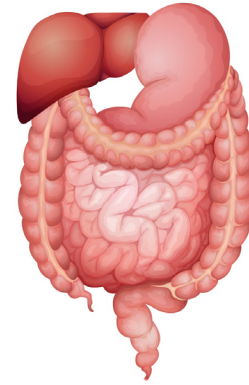
Types of Muscle



Cardiac muscle



Skeletal muscle



Smooth muscle

Fueling Muscles, Brain, Heart, GI Tract, Anabolic Tissues, Anti-Inflammatory, and Immune Performance

Muscular, Athletic, and Immune Performance Requires Energy



How Low a Thyroid Function?



How Great an Adrenal Fatigue?

How Much Sleep Deprivation?



How Diminished a Gonadal Function?

How Significant an Infection?

How Diminished a Mitochondrial Function?



How “Charged Up” are Your Patient’s Cells?



We Can't Maximize Genetic Potential While Experiencing an Energy Deficit

Skeletal Muscles are Pivotal to Longevity

Skeletal muscles, which **comprise approximately 40% of total body mass**, are metabolically active tissues that play an essential role in caloric utilization and have been **demonstrated in the scientific literature to be associated with longevity**.

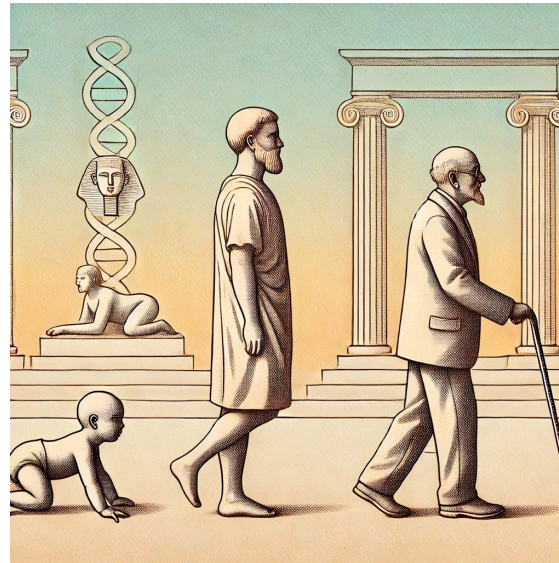
Individuals over the age of 60 years that are classified in the lowest third of strength, were 50% more likely to die of all-cause mortality than individuals in the upper third of strength.

Muscular strength is significantly and inversely associated with the risk of death from all causes after controlling for potential confounders, including cardiorespiratory fitness.

Historical Insight On Aging: Riddle of The Sphinx



"Which creature has one voice yet becomes four-footed, two-footed, and three-footed?"



Sarcopenia Fuels Morbidity and Mortality



After age 30, people lose about 3% to 5% of their muscle mass each decade, with the most significant loss occurring in inactive people.

Muscle loss accelerates around age 60.

Figure 1. Associated with age-related sarcopenia.

REVIEW

Open Access



Hand grip strength as a proposed new vital sign of health: a narrative review of evidences

Raju Vaishya¹, Anoop Misra², Abhishek Vaish¹, Nicola Ursino³ and Riccardo D'Ambrosi^{3,4*}

Abstract

Hand grip strength (HGS) serves as a fundamental metric in assessing muscle function and overall physical capability and is particularly relevant to the ageing population. HGS holds an important connection to the concept of sarcopenia, which encompasses the age-related decline in muscle mass, strength, and function. It has also been reported to indicate the health of an individual. We reviewed the interplay between HGS and various health parameters, including morbidity and mortality, by carrying out a literature search on PubMed, Scopus and Google Scholar between 10 and 30 August 2023, to identify the relevant papers on the relationship between health and HGS. We used several keywords like 'hand grip strength', 'muscle strength', 'sarcopenia', 'osteosarcopenia', 'health biomarker', 'osteoporosis', and 'frailty', to derive the appropriate literature for this review. This review has shown that the HGS can be measured reliably with a hand-held dynamometer. The cut-off values are different in various populations. It is lower in Asians, women, less educated and privileged, and those involved in sedentary work. Several diseases have shown a correlation with low HGS, e.g., Type 2 diabetes, cardiovascular disease, stroke, chronic kidney and liver disease, some cancers, sarcopenia and fragility fractures. The low HSG is also associated with increased hospitalization, nutritional status, overall mortality and quality of life. We believe that there is adequate evidence to show that HGS stands as an important biomarker of health. Its utility extends to the identification of diverse health issues and its potential as a new vital sign throughout the lifespan.

Keywords Muscle, Sarcopenia, Frailty, Vital sign, Handgrip strength, Biomarker, Osteoporosis, Diabetes, Health



REVIEW

Open Access



Hand grip strength as a proposed new vital sign of health: a narrative review of evidences



Fig. 1 Associations of hand grip strength with health-related metrics

Box 2 Handgrip Strength and Association with diseases and health-related problems

Morbidity

A) Non-communicable diseases

Type 2 diabetes
Metabolic syndrome
Cardiovascular diseases
Dyslipidaemia
Hypertension
Cancers
Non-alcoholic fatty liver disease
Chronic liver disease
Chronic kidney disease
Chronic respiratory diseases

Cognitive dysfunction and impaired mental health

B) Musculoskeletal problems

Chronic low back pain
Osteosarcopenia
Osteoporotic fractures

Mortality

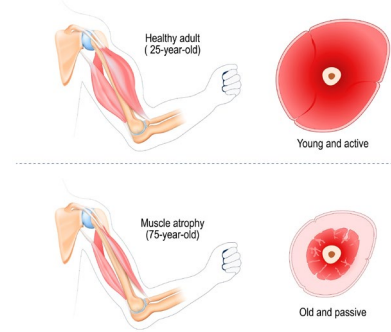
All-cause mortality
Cardiovascular diseases-related mortality
Cancer-related mortality
In-hospital mortality
Post-operative mortality
Cirrhosis-related mortality

Other health-related problems

Nutritional status
Institutional admissions
Longer hospital stay
Reduced quality of life
Functional disability

Aging Muscles Accelerate Our Aging

SARCOPENIA



Aging is associated with notable changes in muscle mass, structure, and function.

Risk Factors for Poor Skeletal Muscle Aging (Sarcopenia):

- Telomere attrition
- Mitochondrial dysfunction
- Physical inactivity
- Hormonal changes
- Low-grade systemic inflammation as well as a hypo-protein diet

It has been stated that sarcopenia could be regarded as a “geriatric syndrome.”



Use It

Lose It

Use It Or Lose It



The old adage of “**use it or lose it**” is blatantly accurate regarding muscle mass loss with disuse regardless of age or disease state.

Disuse describes a **spectrum of behavior from reduced habitual physical activity to whole-body disuse.**

This includes complete disuse, such as immobilization or bed rest, which can decrease skeletal muscle mass and strength.

Euthyroid Sick Syndrome

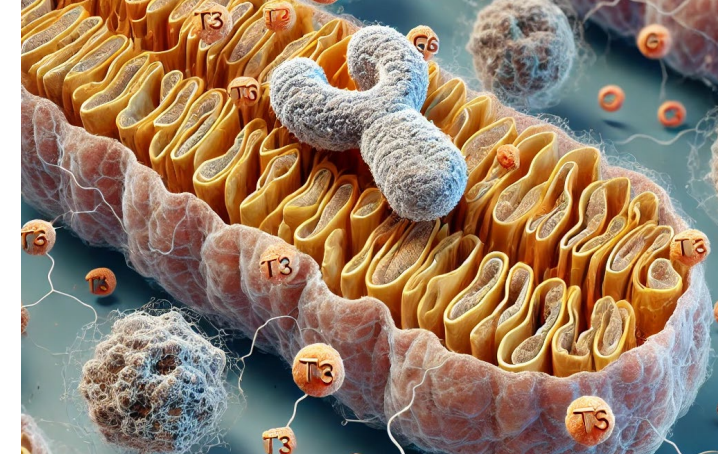


Euthyroid sick syndrome (nonthyroidal illness syndrome):

- Changes in thyroid function tests
- Present in about **75 percent of hospitalized patients**
- Seen in patients with severe critical illness, deprivation of calories, and following major surgeries
- The most common hormone pattern in euthyroid sick syndrome is **a low total T3 and free T3 levels with low or normal T4 and thyroid-stimulating hormone (TSH) levels**

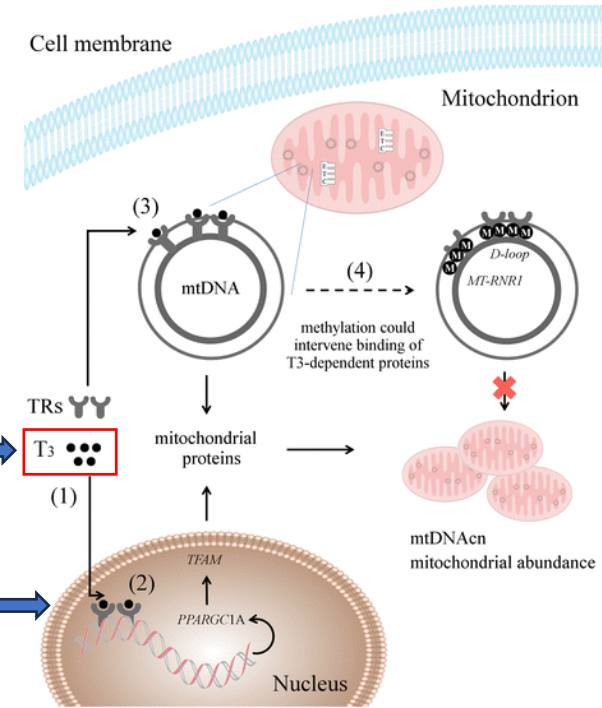
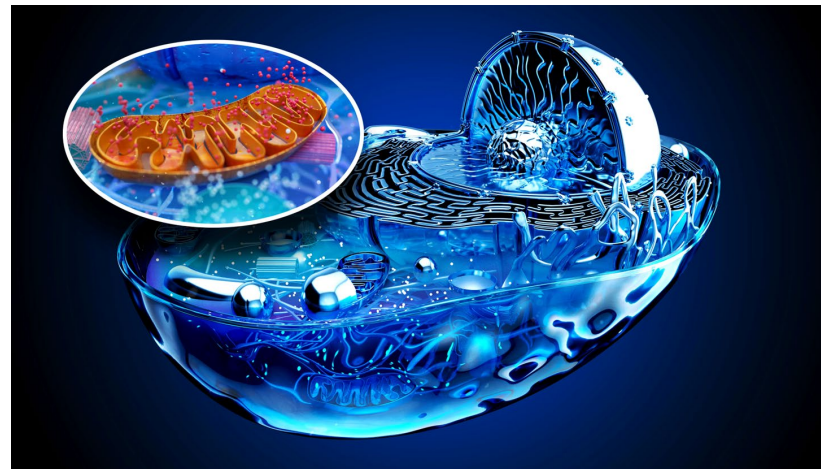
The thyroid hormone triiodothyronine (T_3) activates thermogenesis by uncoupling electron transport from ATP synthesis in brown adipose tissue (BAT) mitochondria.

T3 and Muscle Function

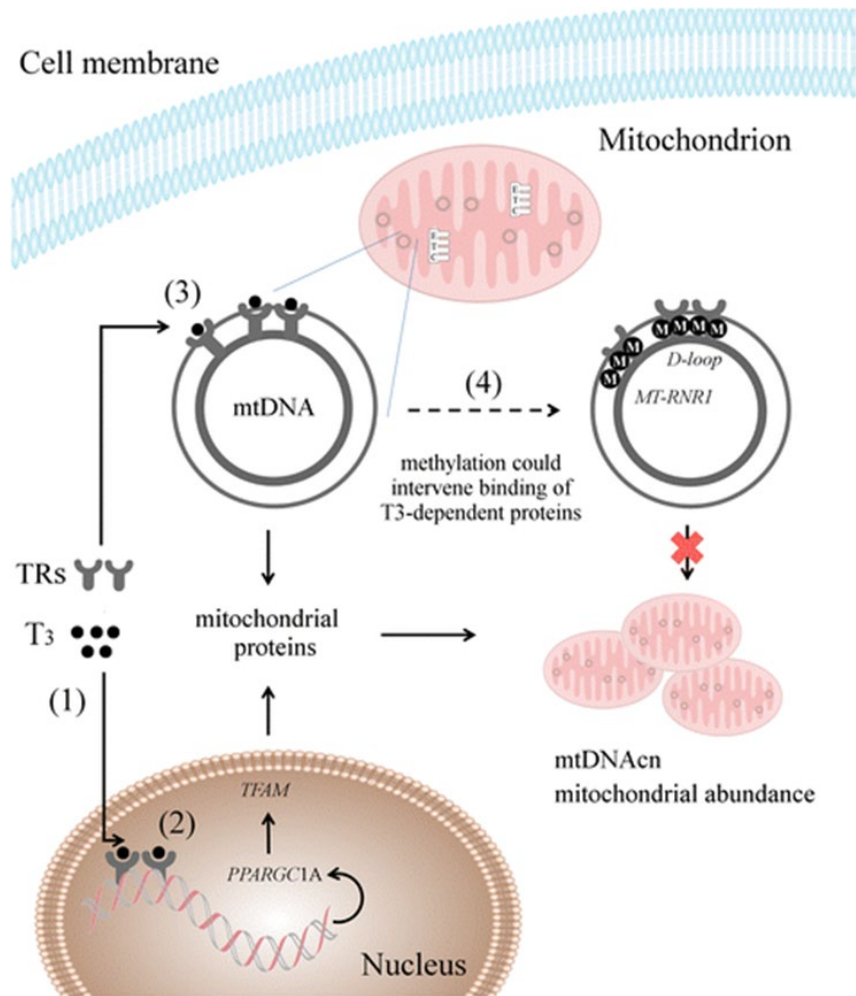


In skeletal muscles:

- T3 enhances the oxidative capacity by increasing mitochondrial density and function
- **Improves endurance and energy efficiency**
- This is why hypothyroidism often results in fatigue, muscle weakness, and reduced stamina, as the energy output of mitochondria is diminished



Success on the Scale **Does Not** Equate to Sustainability



Efficacious **obesity reduction drugs should not be pursued without considering the undesirable effects** accompanying body fat loss.

Mobilization of lipophilic compounds stored in the body's adipose tissue, chlorinated compounds, such as dichlorodiphenyltrichloroethane (DDT), and PCBs.

Organochlorine compounds stored in adipose tissue during periods of caloric deficit raise an essential question about **another class of toxic compounds with carbon-fluorine bonds** in human tissues with long half-lives, “**forever chemicals.**”

Warning: Don't Die from Dieting



Resistance Exercise Minimal Dose Strategies for Increasing Muscle Strength in the General Population: an Overview

James L. Nuzzo¹ · Matheus D. Pinto¹ · Benjamin J. C. Kirk¹ · Kazunori Nosaka¹

Accepted: 23 February 2024 / Published online: 20 March 2024
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Abstract

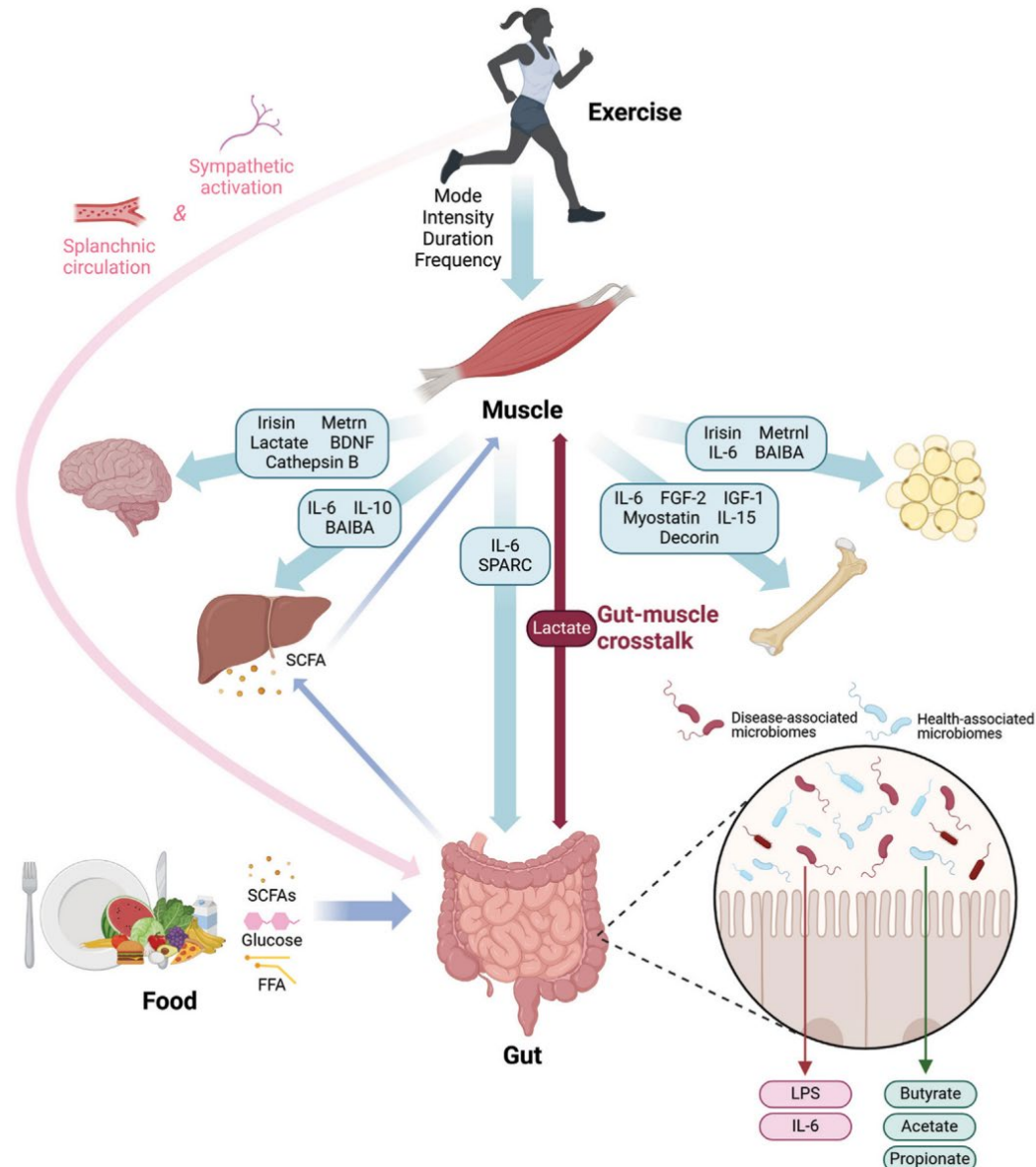
Many individuals do not participate in resistance exercise, with perceived lack of time being a key barrier. Minimal dose strategies, which generally reduce weekly exercise volumes to less than recommended guidelines, might improve muscle strength with minimal time investment. However, minimal dose strategies and their effects on muscle strength are still unclear. Here our aims are to define and characterize minimal dose resistance exercise strategies and summarize their effects on muscle strength in individuals who are not currently engaged in resistance exercise. The minimal dose strategies overviewed were: “Weekend Warrior,” single-set resistance exercise, resistance exercise “snacking,” practicing the strength test, and eccentric minimal doses. “Weekend Warrior,” which minimizes training frequency, is resistance exercise performed in one weekly session. Single-set resistance exercise, which minimizes set number and session duration, is one set of multiple exercises performed multiple times per week. “Snacks,” which minimize exercise number and session duration, are brief bouts (few minutes) of resistance exercise performed once or more daily. Practicing the strength test, which minimizes repetition number and session duration, is one maximal repetition performed in one or more sets, multiple days per week. Eccentric minimal doses, which eliminate or minimize concentric phase muscle actions, are low weekly volumes of submaximal or maximal eccentric-only repetitions. All approaches increase muscle strength, and some approaches improve other outcomes of health and fitness. “Weekend Warrior” and single-set resistance exercise are the approaches most strongly supported by current research, while snacking and eccentric minimal doses are emerging concepts with promising results. Public health programs can promote small volumes of resistance exercise as being better for muscle strength than no resistance exercise at all.



Resistance Exercise Minimal Dose Strategies for Increasing Muscle Strength in the General Population: an Overview

Finally, we have not provided a recommendation for which minimal dose programs should be adopted. Instead, we have shown evidence that various minimal dose approaches improve or maintain muscle strength in nonathlete populations. Thus, individuals who are currently not partaking in resistance exercise should be encouraged to participate in the resistance exercise program that they are most likely to adhere to over an extended period. Future research can help to describe dose–response relationships for various minimal dose approaches and determine which minimal dose programs result in the greatest exercise adherence and/or health benefits. The current review focused on muscle strength as a key outcome, because muscle strength correlates with mortality and other outcomes of health and fitness [1–3]. The results presented in the table footnotes throughout the current paper show that minimal dose approaches sometimes improve outcomes other than muscle strength, such as muscle mass, muscle endurance, and up-and-go times. The effectiveness of minimal dose approaches for improving other outcomes, such as risk of falls, can be considered in future research.

1 02 **Exercise, Gut Microbiome, and Gastrointestinal Diseases:**
2 **Therapeutic Impact and Molecular Mechanisms**



Today's Journey Together

GLP-1 & Bariatric Surgery Rapid Weight Loss = Muscle Loss

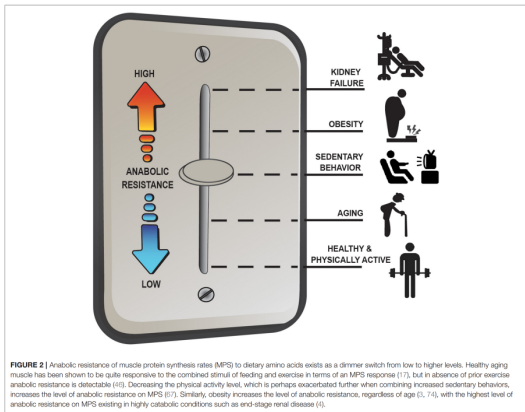


Fortetropin- Lowers Myostatin, Enhances Protein Synthesis



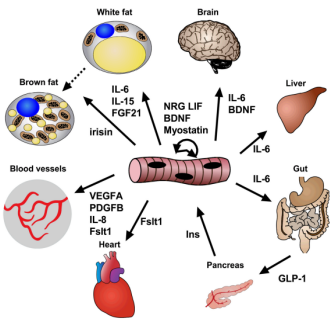
Fortetropin®, an all-natural bioactive compound derived from raw, fertile chicken egg yolk that has been clinically shown to increase muscle growth, enhance rate of muscle protein synthesis, and lower levels of circulating myostatin.

Dialing Back the Impact of Anabolic Resistance



Front Nutr. 2021; 8:615849.

Skeletal Muscle Systemic Influence on Homeostasis



Muscle as an endocrine organ.

Circulation. 2014;129(7): 798–810.

GLP-1 & Bariatric Surgery **Rapid Weight Loss** = Muscle Loss



Rapid Weight Loss **Increases Muscle Loss** (Sabotage 101)

Maintaining muscle while losing fat is critical to successful sustained weight loss efforts.

GLP-1 agonist drugs and bariatric surgery lead to both fat loss and muscle loss during long-term treatment.

Muscle is involved in weight loss in several ways, including:

- Metabolically active tissue, muscle burns more calories at rest
- Preservation of muscles leads to a higher basal metabolic rate (keeping the weight off)
- Helps maintain insulin sensitivity and blood sugar

Interview Excerpts from Healthline



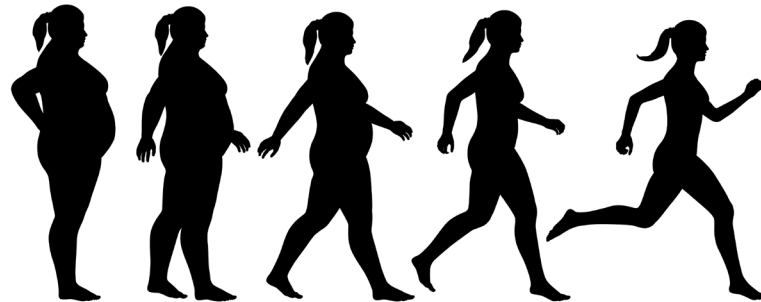
“Sarcopenia affects the elderly population and typically is associated with aging. However, **rapidly losing weight with GLP-1s like Ozempic or Wegovy without the proper diet and exercise can also cause sarcopenia** (sometimes referred to as ‘skinny fat’) at any age, negatively affecting a person’s quality of life by reducing their stamina and ability to perform daily activities, such as easily walking up stairs,” Dr. Rekha Kumar, a practicing endocrinologist in NYC.

It Seems Clinically Evident:

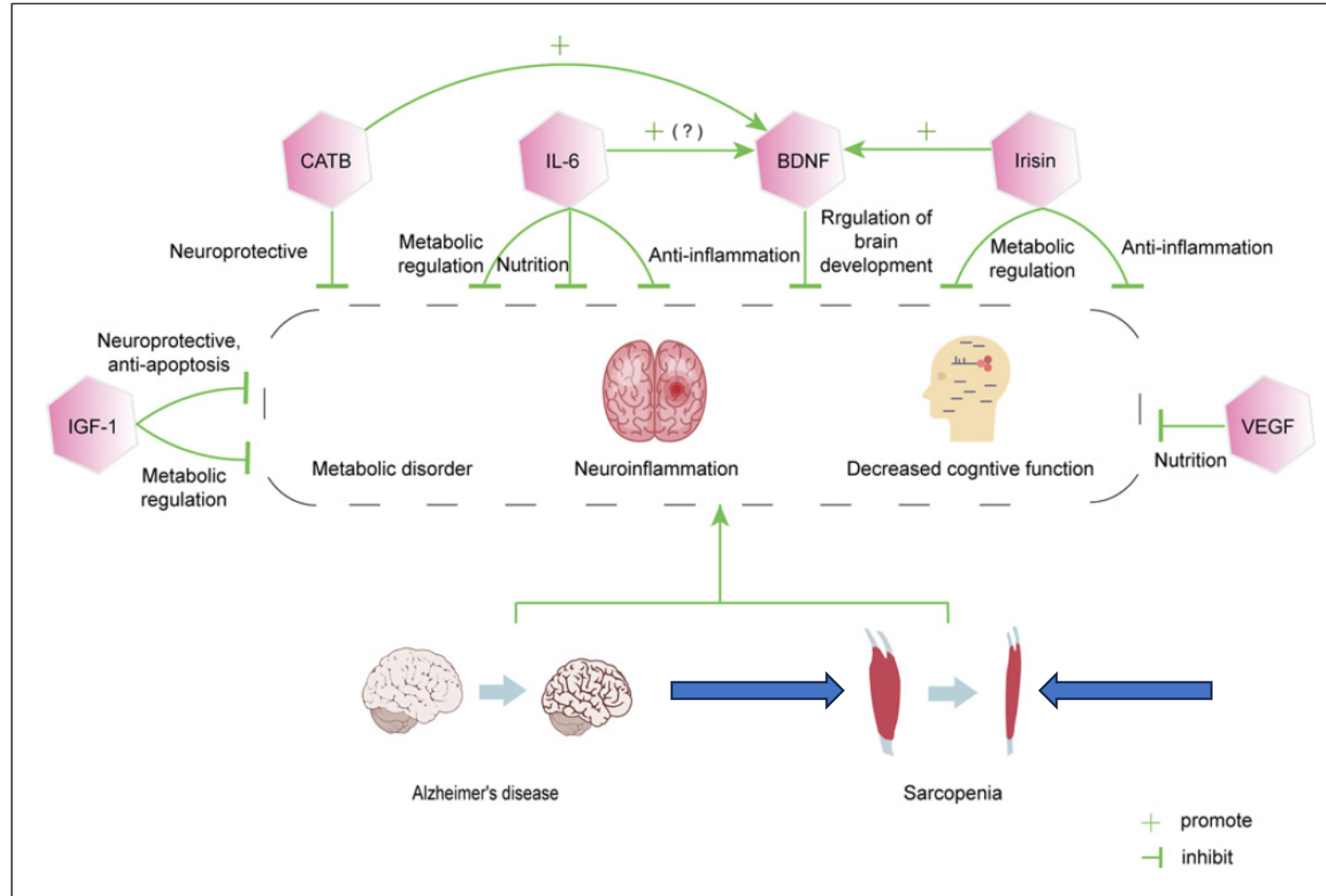
Less caloric intake, unless emphasis is placed on protein, and a well-planned exercise routine are fertile grounds for muscle loss and nutrient insufficiencies.

Less Weight Equates to Less Weight Bearing

- **Reduced skeletal muscle mass and function is associated:**
 - With chronic diseases
 - Poor quality of life
 - Physical disability
 - Increased risk of fractures
 - Risk for frailty
- Muscle loss becomes a vicious cycle since it promotes injury, which in turn contributes to a more sedentary phase of life, leading to more muscle loss.

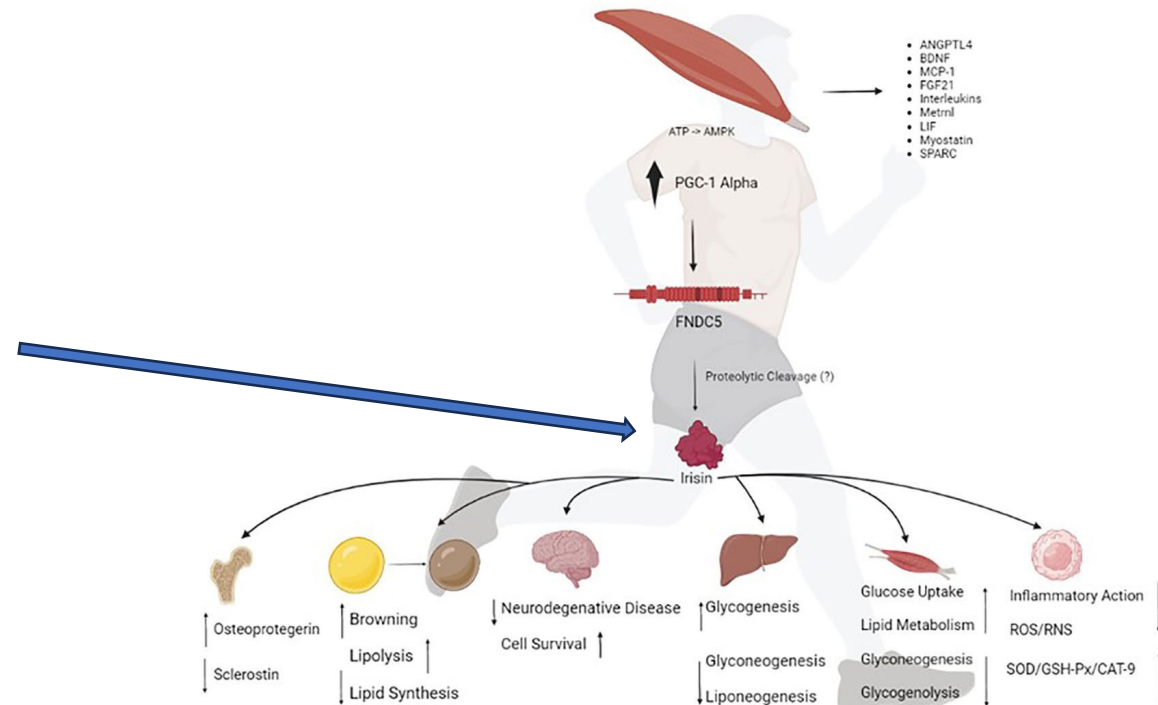


Muscle Health Influences a Biochemical Cascade



Irisin and Myostatin

- **Reducing myostatin can increase irisin levels**, promoting beneficial metabolic effects.
- Myostatin inhibits muscle growth and has received wide attention as a potential target for preserving muscle mass.
- **Deletion of myostatin in mice leads to secretion of irisin and browning of white fat.**



***Trigger Alert-* Only For Those That Love Biochemical Pathways**

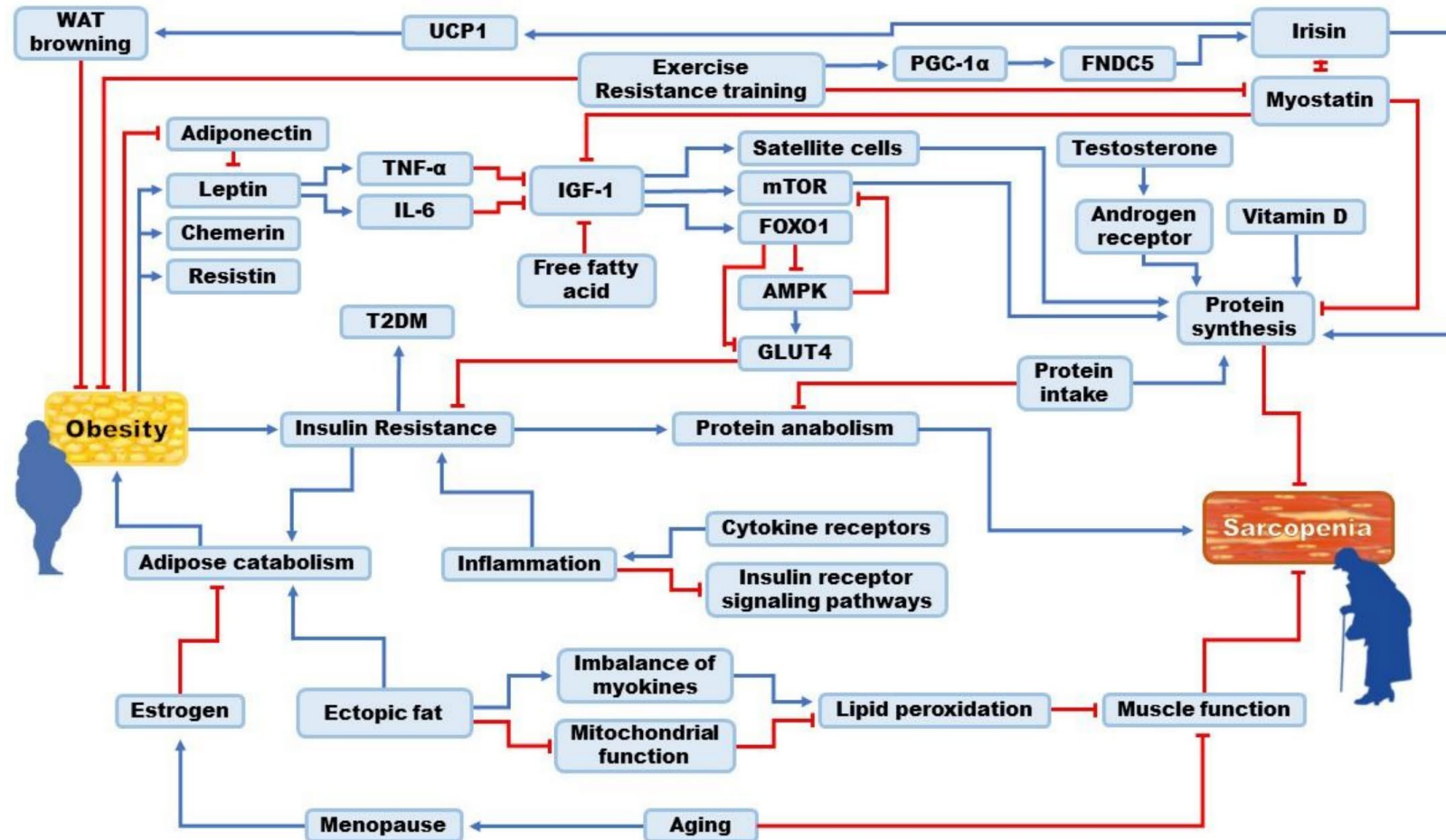


Figure 1. Mechanism of sarcopenic obesity (SO) and its association with endogenous metabolites.

Adipocytes 101 Discussion

Brown Adipocytes:

- Function:** Brown fat cells are involved in **thermogenesis**, the process of heat production. They have numerous mitochondria containing uncoupling protein 1 (**UCP1**), allowing them to generate heat by burning calories.

Browning Process:

- Triggers:** Browning of white fat can be triggered by cold exposure, certain hormones (like **irisin** and **norepinephrine**), and specific types of exercise.
- Thermogenesis:** Once transformed, beige adipocytes can burn stored fat to generate heat, which increases energy expenditure and can reduce fat mass.

Health Implications:

- Obesity and Weight Loss:** Browning of white fat may promote weight loss by increasing the body's ability to burn calories and prevent fat storage.

Fortetropin- Lowers Myostatin, Enhances Protein Synthesis

Fortetropin[®], an all-natural bioactive compound derived from raw, fertile chicken egg yolk that has been clinically shown to increase muscle growth, enhance rate of muscle protein synthesis, and lower levels of circulating myostatin.



Myostatin Dysregulation

- **Myostatin is an important therapeutic target** due to its vital **involvement in several disorders, including diabetes and obesity.**
- Various clinical trials using myostatin-neutralizing compounds/antibodies have been shown to **improve muscle homeostasis** and metabolic diseases.
- Myostatin **works as a negative regulator of muscle growth.**
- Myostatin protein levels are increased in skeletal muscle and plasma from obese insulin-resistant individuals, whereas the **decrease of myostatin improves insulin sensitivity and reduces obesity.**

J Gerontol A Biol Sci Med Sci. 78, 32–37. | *Front Endocrinol.* (Lausanne) 2023; 14:181913. | *Diabetes.* 2009; 58:30–38.

Exp Clin Endocrinol Diabetes. 2019; 127:550–556. | *J Frailty Aging.* 2018; 7:21–27.

Research Article

Effects of Fortetropin on Muscle Protein Synthesis in Old Double-Blinded, F

William Evans, PhD,^{1,2,*}
Tyler Field, BS,¹ Hussein M
and Marc Hellerstein, MD,

¹Department of Nutritional Sciences and
Medicine, Durham, North Carolina. ²Depa

*Address correspondence to: William J. E
Berkeley, CA. E-mail: william.evans@berkeley

Received: April 7, 2020; Editorial Decision De

Decision Editor: Anne Newman, MD, MPH, I

Abstract

Background: Fortetropin is a proteo-lipid
mass.

Methods: The purpose of this study was t
(FSR) of muscle protein in 10 healthy, olde
protein ontologies. D₂-creatine dilution wa
samples were collected to determine body F
randomly assigned to Fortetropin (19.8 g/d
Results: Restricting kinetic data to protein:
criteria. The mean FSR for a majority of pr
(32/38 myofibril proteins, 33/44 sarcoplas
between groups using a binomial test and v
Conclusions: The overall magnitude of th
ontologies affected. While these results sho
promoting muscle protein synthesis in olde

Keywords: Aging muscle, Muscle protein synthe

Sarcopenia has been defined as the age-relat
mass (1). In older people, low muscle ma
with reduced functional capacity and an in
(2). Recent studies demonstrate that muscle
fect on risk of disability, fall, and poor func
basal rates of muscle protein synthesis may
sarcopenia is, at least in part, a result of a
synthesis after a protein containing meal,
resistance (4). This age-related reduction

Original Research

The Effects of Fortetropin on Muscle Composition, Strength, and Mechanism of Action in a R

Matthew H. Sharp, MS, Ryan P. Lowery, MS, C. Brooks
Kevin A. Shields, MS, James C. Healy, BS, Ned Q. Arick,
Jacob M. Wilson, PhD

Department of Health Sciences and Human Performance, Th
S., N.Q.A., J.M.W.); Molecular and Applied Laboratory, Sch
C.D.F., J.C.H., R.M.T., M.D.R.)

Key words: supplements and functional foods, exercise, b

Objective: The purpose of this study was to in
and strength in resistance-trained individuals an
using human and rodent models.

Methods: In the rodent model, male Wistar
control (CTL) or 0.26 g Fortetropin for 8 days.
bout. Nonexercised and exercised limbs were ha
protein expression relative to mammalian target c
model, 45 (of whom 37 completed the study), resi
groups receiving a placebo macronutrient matche
12 weeks of resistance training. Lean mass, m
measured before and after 12 weeks of training.

Results: The human study results indicated a
6.6 g (+1.7 kg) and 19.8 g (+1.68 kg) but not pl
was a Group × Time effect for muscle thickness
All groups increased equally in bench press an
exercise ($p \leq 0.05$) in which the control plus exer
monomer protein expression and polyubiquitin
Fortetropin exercising conditions as indicated by
both exercising conditions.

Conclusions: Fortetropin supplementation in
protein breakdown while simultaneously increasin

INTRODUCTION

The molecular mechanisms that underpin skeletal musc
hypertrophy are complex and involve the interplay betwe
anabolic and catabolic signaling pathways. One key variab
that mediates skeletal muscle anabolism is activation of t
mammalian target of rapamycin (mTOR) pathway [1]. Protec
ysis in skeletal muscle appears to be mediated by ubiquitin–pr
teasomal degradation [2]. Myostatin is a major regulato
protein that impacts both mTOR and ubiquitin signaling [3

*Address correspondence to: Matthew H. Sharp, Department of Health Scienc
E-mail: msharp2113@gmail.com
Color versions of one or more of the figures in the article can be found online a

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Published by Taylor and Francis Group, LLC

RESEARCH ARTICLE

Fortetropin supplemen rise in circulating myostatin induced muscle atrophy limb immobilization trial

Changhyun Lim, James I
Brad S. Currier, Giulia Cc

Department of Kinesiology, Exer
Canada

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OPEN ACCESS

Citation: Lim C, McKendry J, Giacomini T, McLeod
JC, Ng SY, Currier BS, et al. (2023) Fortetropin
supplementation prevents the rise in circulating
myostatin but not disuse-induced muscle atrophy
in young men with limb immobilization: A
randomized controlled trial. PLoS ONE 18(5):
e0286222. <https://doi.org/10.1371/journal.pone.0286222>

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University of Physical Education, POLAND

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all of the content of peer review and author
responses alongside final, published articles. The
editorial history of this article is available here:
<https://doi.org/10.1371/journal.pone.0286222>

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source are credited.

Abstract

Supplementation with Forte
egg yolks, reduces circulating
mitigate muscle atrophy dui
tation on muscle size and si
Twenty-four healthy young
cated to either a Fortetropin
of FOR or placebo (PLA-SL
matched cheese powder fo
immobilization, and 2-wk re
nography, dual-energy X-ra
assessments were perform
measure vastus lateralis an
and muscular strength. Blo
plasma myostatin concentr
± 864 pg/mL, $P = 0.013$) bu
0.900). After the immobiliza
were decreased by 7.9 ± 1.1
0.001) respectively, with no
recovered after 2-wk of non
not recovered (vs. day 1, P
between groups. Suppleme
not disuse-induced muscle

RESEARCH ARTICLE

Fortetropin inhibits disuse muscle atrophy in dogs after tibial plateau leveling osteotomy

Dana A. White, Kenneth R. Harkin, James K. Roush, Walter C. Renberg,
David Biller

Department of Clinical Sciences, Veterinary Health Center, Kansas State University, Manhattan, Kansas,
United States of America

These authors contributed equally to this work.

These authors also contributed equally to this work.

* dawdvm15@gmail.com



Abstract

Objective

To determine if a commercial myostatin reducer (Fortetropin) would inhibit disuse muscle atrophy in dogs after a tibial plateau leveling osteotomy.

Design

A prospective randomized, double-blinded, placebo-controlled clinical trial.

Animals

One hundred client-owned dogs presenting for surgical correction of cranial cruciate ligament rupture by tibial plateau leveling osteotomy.

Procedures

Patients were randomly assigned into the Fortetropin or placebo group and clients were instructed to add the assigned supplement to the dog's normal diet once daily for twelve weeks. Enrolled patients had ultrasound measurements of muscle thickness, tape measure measurements of thigh circumference, serum myostatin level assays, and static stance analysis evaluated at weeks 0, 8, and 12.

Results

From week 0 to week 8, there was no change for thigh circumference in the Fortetropin group for the affected limb (-0.54cm , $P = 0.31$), but a significant decrease in thigh circumference for the placebo group (-1.21cm , $P = 0.03$). There was no significant change in serum myostatin levels of dogs in the Fortetropin group at any time point ($P > 0.05$), while there was a significant rise of serum myostatin levels of dogs in placebo group during the period of forced exercise restriction (week 0 to week 8; $+2,892\text{ pg/ml}$, $P = 0.02$). The percent of body weight supported by the affected limb increased in dogs treated with Fortetropin ($+7.0\%$, $P < 0.01$) and the placebo group ($+4.9\%$, $P < 0.01$) at the end of the period of forced exercise

A Powerful Solution: Inhibiting Myostatin

Myostatin:

- Reduces protein synthesis
- Rise with aging

Breaking the Dysfunctional Myostatin Cycle:

In a study of younger, middle-aged, and older men and women, serum myostatin levels increased with age. The study also indicated that myostatin levels are the **highest in physically frail older women** and that the higher the skeletal muscle mass, **the lower the myostatin levels**.

Researchers reported in the journal *Gerontology*, “**Myostatin inhibition provides a promising means to attenuate or reverse skeletal muscle loss in the context of sarcopenia as well as cachexia (disease-associated muscle loss), and to enhance skeletal muscle regeneration in the context of congenital disease (i.e. muscular dystrophies) and injury.**”

[illegible]

- Sharp MH, Lowery RP, Mobley CB, et al. The Effects of Fortetropin Supplementation on Body Composition, Strength, and Power in Humans and Mechanism of Action in a Rodent Model. *J Am Coll Nutr.* 2016;35(8):679-691.

GERONTOLOGICAL SOCIETY OF AMERICA

Journal of Gerontology
Volume 68, Number 1, February 2013
Abstracts are published in the Journal of Gerontology

GERONTOLOGY

Research Article

Effects of Forteprotein on the Rate of Muscle Protein Synthesis in Older Men and Women: A Randomized, Double-Blinded, Placebo-Controlled Study

William Evans, PhD,^{1,2,3} Mahalakshmi Shankaran, PhD,¹ Eddie Hyngson, BS,¹ Robert A. Rasmussen, BS,¹ Hilaria M. Bunker, PhD,¹ Robert S. Schetter, PhD,¹ and Mark Hershkovitz, MD, PhD¹

Abstract: Muscle mass and strength decline with age, and this is associated with increased risk of falls, disability, and mortality. We hypothesized that the protein supplement Forteprotein (a blend of whey and soy protein) would increase muscle protein synthesis (MPS) and thereby attenuate the age-associated decline in muscle mass and strength. In a randomized, double-blind, placebo-controlled study, 20 older men and women (mean age = 70.5 years) were assigned to either a 12-week treatment with Forteprotein or a placebo. MPS was measured using a stable isotope technique. Results showed that Forteprotein significantly increased MPS compared to placebo. These findings suggest that Forteprotein may be a useful supplement for older adults to maintain muscle mass and strength.

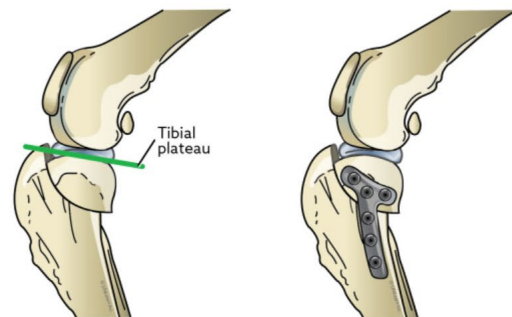
Keywords: aging, muscle, protein, exercise, forteprotein

As people age, they lose muscle mass and strength. This loss of muscle mass and strength is associated with a decline in physical function, which in turn increases the risk of falls, disability, and mortality. The loss of muscle mass and strength is also associated with a decline in bone density, which increases the risk of fractures. Therefore, it is important to find ways to maintain or increase muscle mass and strength in older adults. One way to do this is by increasing protein intake. Protein is the building block of muscle, and it is essential for muscle protein synthesis (MPS), the process by which new muscle protein is made. Therefore, increasing protein intake should increase MPS and thereby increase muscle mass and strength. Forteprotein is a protein supplement that contains a blend of whey and soy protein. It is designed to be easy to digest and absorb, and it is suitable for older adults. In a randomized, double-blind, placebo-controlled study, we tested the effects of Forteprotein on MPS in older men and women. The results showed that Forteprotein significantly increased MPS compared to placebo. These findings suggest that Forteprotein may be a useful supplement for older adults to maintain muscle mass and strength.

- Effects of Fortetropin on the Rate of Muscle Protein Synthesis in Older Men and Women:
A Randomized, Double-Blinded, Placebo-Controlled Study.
J Gerontol A Biol Sci Med Sci. 2021;76(1):108-114.

Fortetropin Inhibits Muscle Atrophy in Dogs

- In a study of dogs suffering from disuse muscle atrophy after undergoing tibial plateau leveling osteotomy (TPLO) surgery, the dogs given Fortetropin experienced no change in myostatin levels.
- In contrast, the placebo-treated dogs experienced an increase in myostatin over eight weeks.
- Dogs given Fortetropin also experienced no change in thigh circumference, while the placebo-treated dogs had a reduction in thigh circumference over eight weeks.



Once the cut in the tibia is made, the bone segment is rotated to achieve a "level" tibial plateau.

The rotated tibial segment is secured for healing using a specially designed orthopedic plate. It may be appropriate to consider removal of this plate once healing is complete.

The development of tibial plateau leveling osteotomy (TPLO)

RESEARCH ARTICLE

Fortetropin inhibits disuse muscle atrophy in dogs after tibial plateau leveling osteotomy

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* These authors contributed equally to this work.
† These authors also contributed equally to this work.

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Abstract

Objective

To determine if a commercial myostatin inhibitor (Fortetropin®) would inhibit disuse muscle atrophy in dogs after a tibial plateau leveling osteotomy.

Design

A prospective randomized, double-blinded, placebo-controlled clinical trial.

Animals

One hundred client-owned dogs presenting for surgical correction of cranial cruciate ligament rupture by tibial plateau leveling osteotomy.

Procedures

Patients were randomly assigned into the Fortetropin® or placebo group and clients were instructed to add the assigned supplement to the dog's normal diet once daily for twelve weeks. Enrolled patients had ultrasound measurements of muscle thickness, tape measure measurements of thigh circumference, serum myostatin level assays, and static stance analysis evaluated at weeks 0, 4, 8, and 12.

Results

From week 0 to week 8, there was no change in thigh circumference in the Fortetropin® group for the placebo group (P=0.03), but a significant decrease in thigh circumference for the placebo group (P=0.001). There was no significant change in serum myostatin levels of dogs in the Fortetropin® group at any time point (P>0.05), while there was a significant rise of serum myostatin levels of dogs in placebo group during the period of follow-up (P=0.001) (week 0 to week 8, P=0.001). The percent of body weight supported by the affected limb increased in dogs treated with Fortetropin® (P<0.01) and the placebo group (P=0.01) at the end of the period of forced exercise.

PLOS ONE | <https://doi.org/10.1371/journal.pone.0231306> April 9, 2020

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Strategies to Decrease Myostatin

Potential Treatments Targeting Myostatin:

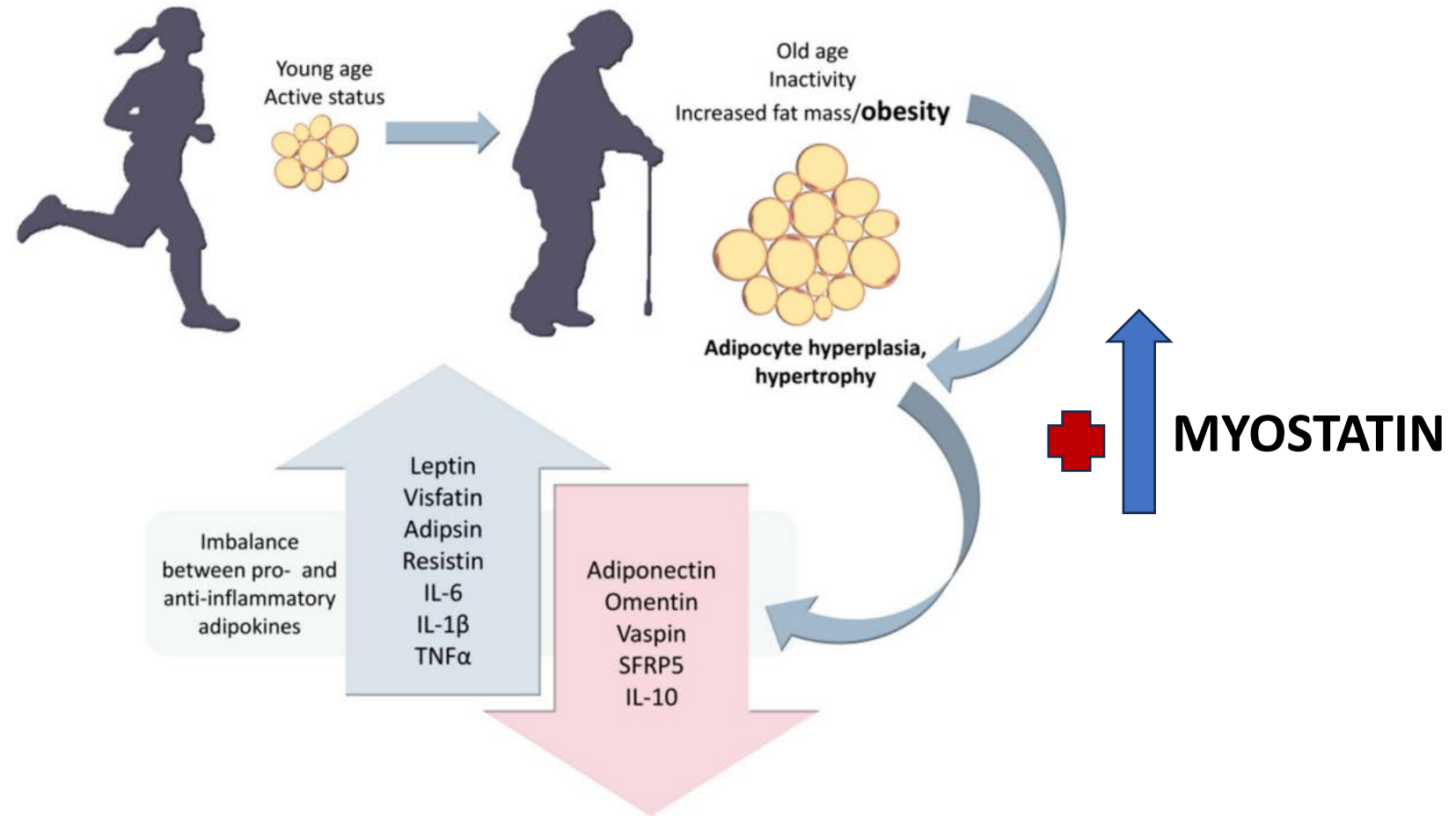
Lessen Myostatin Levels or Activity

- **Fortetropin**
- Antibodies, Peptides, and Small Molecules

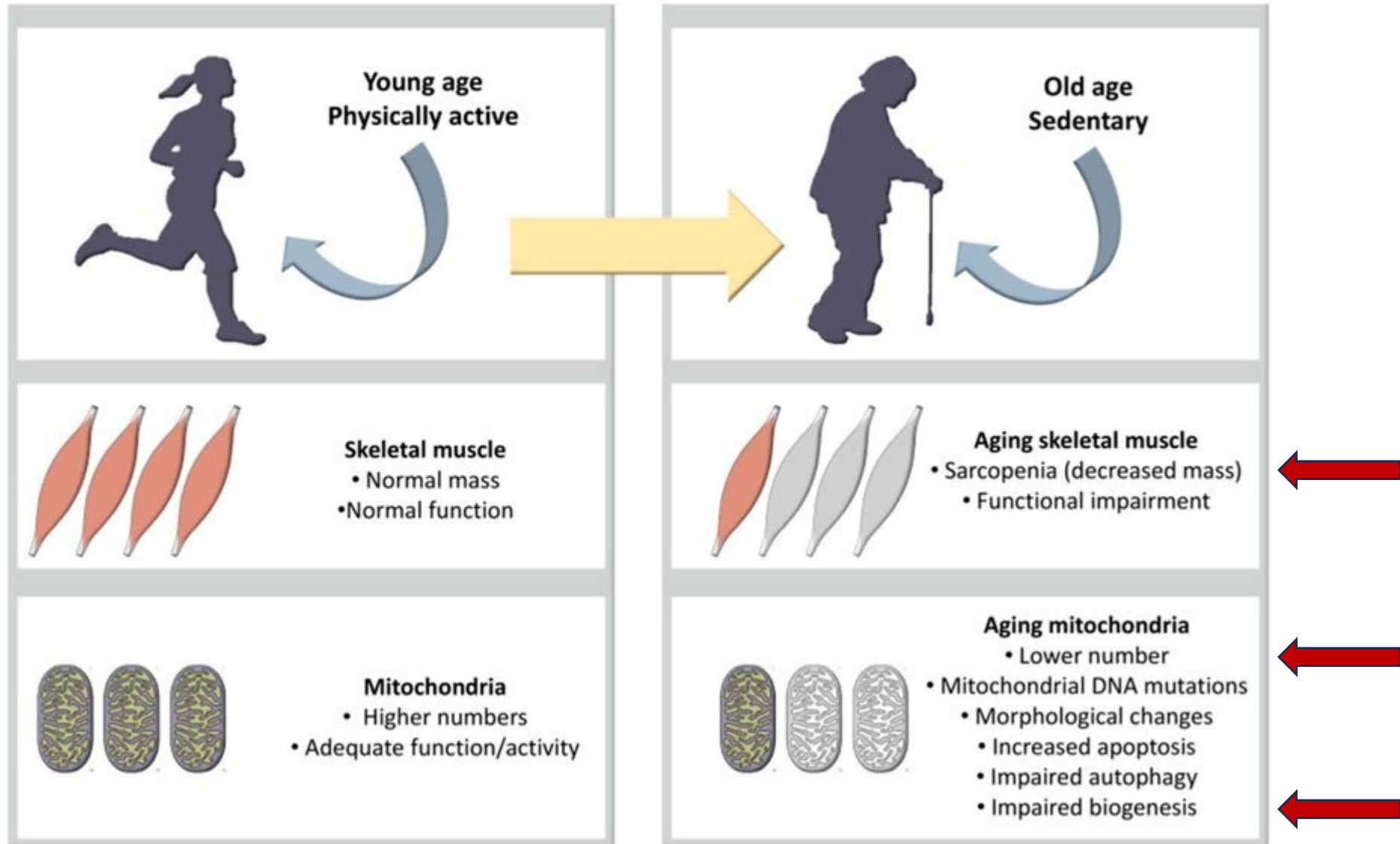
Exercise: Resistance training has been shown to reduce myostatin levels, helping to slow the progression of sarcopenia.

Dietary Interventions: Ensuring adequate protein intake maintains muscle mass. Some studies suggest that amino acids, particularly leucine, may help combat the effects of elevated myostatin by promoting protein synthesis.

Myostatin Levels Increase with Aging



Sarcopenia and Diminished Mitochondria Function



Snapshot on How Fortetropin Works



How it Works

Fortetropin has been clinically shown to lower levels of circulating myostatin and increase the fractional rate of muscle protein synthesis in men and women ages 60-75.

An Overview of Fortetropin Science

What is Fortetropin?

FORTETROPIN is a revolutionary ingredient, developed by top scientists and researched at some of the finest institutions in the world.

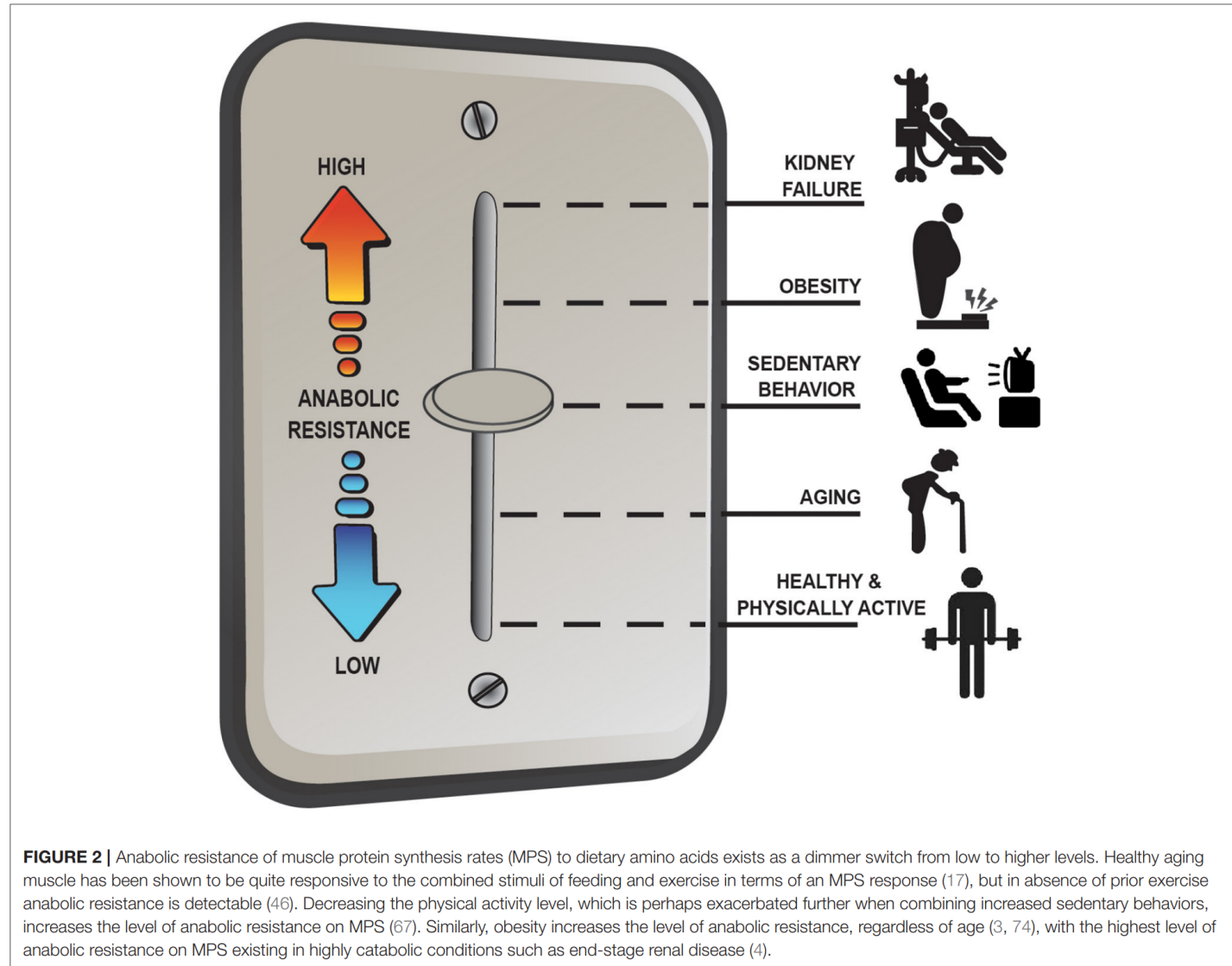
Derived from raw, fertile egg yolk powder, Fortetropin is backed by eight (8) U.S. Patents and six (6) successful clinical trials.

In a 2020 study at the prestigious University of California Berkeley, world renowned muscle health researcher Dr. William Evans measured the efficacy of Fortetropin among men and women aged 60-75. In a double-blind, placebo-controlled study, Dr. Evans found that the men and women supplementing with Fortetropin experienced on average an 18% increase in muscle protein synthesis vs. the placebo group.

This landmark study was published in the Journal of Gerontology and has been the subject of international lectures given by Dr. Evans.



Dialing Back the Impact of Anabolic Resistance



Controlling Myostatin Elevation + Hormone Activity

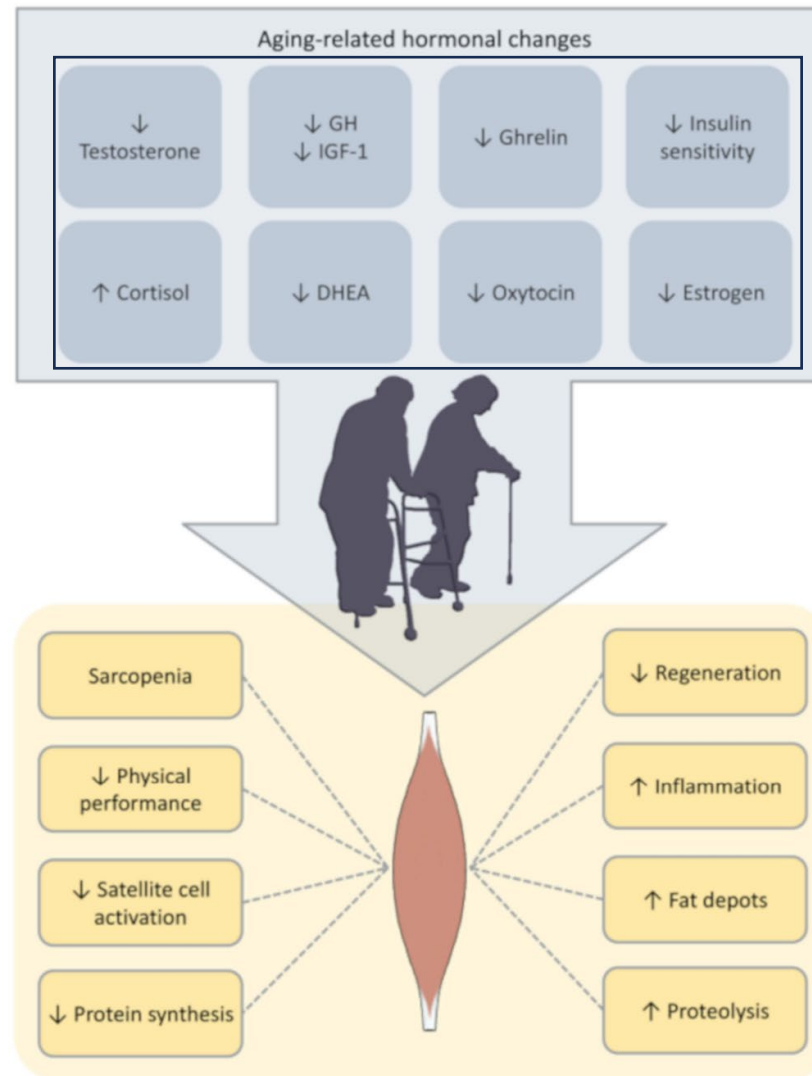


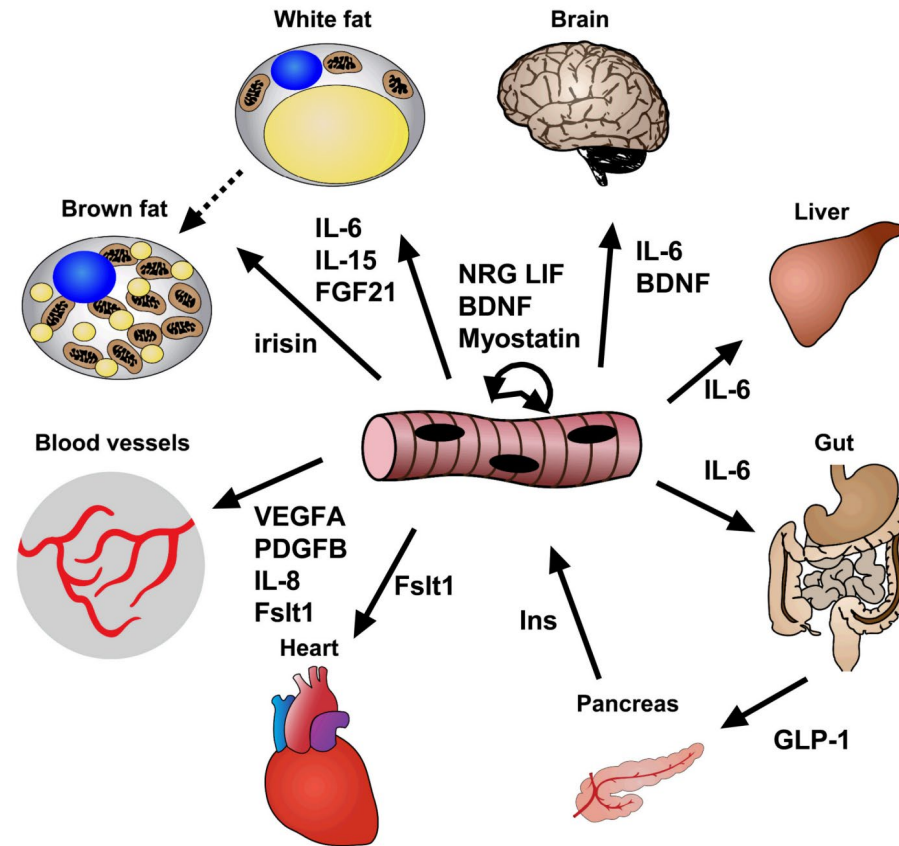
Figure 5. Hormonal changes and their impact on skeletal muscles.

Anabolic Resistance- A Significant Aging Hurdle

- **Skeletal muscle insensitivity to the normally stimulatory effects of dietary amino acids** in circulation and exercise contributes significantly to muscle disuse atrophy.
- Anabolic resistance plays an overt role in the development of age-related sarcopenia and obesity.
- The commonality of decreased physical activity/muscle contraction between these conditions is certainly a contributing factor for the associated anabolic resistance.



Skeletal Muscle Systemic Influence on Homeostasis



Muscle as an Endocrine Organ

Muscle Preservation and Exercise is a MUST

Hippocrates, guided by his theory of balanced humors, advocated that absolutely everyone, young or old, needs exercise—but not too much.

A landmark 1953 study noted that **drivers** of public trolleys in London had twice as many acute coronary syndromes as conductors of the same trolleys; the only notable difference was that **conductors** walked as they collected tickets, while drivers sat.



Putting Our Muscles to Work



Exercise Regulates Myokines in Aging-Related Diseases

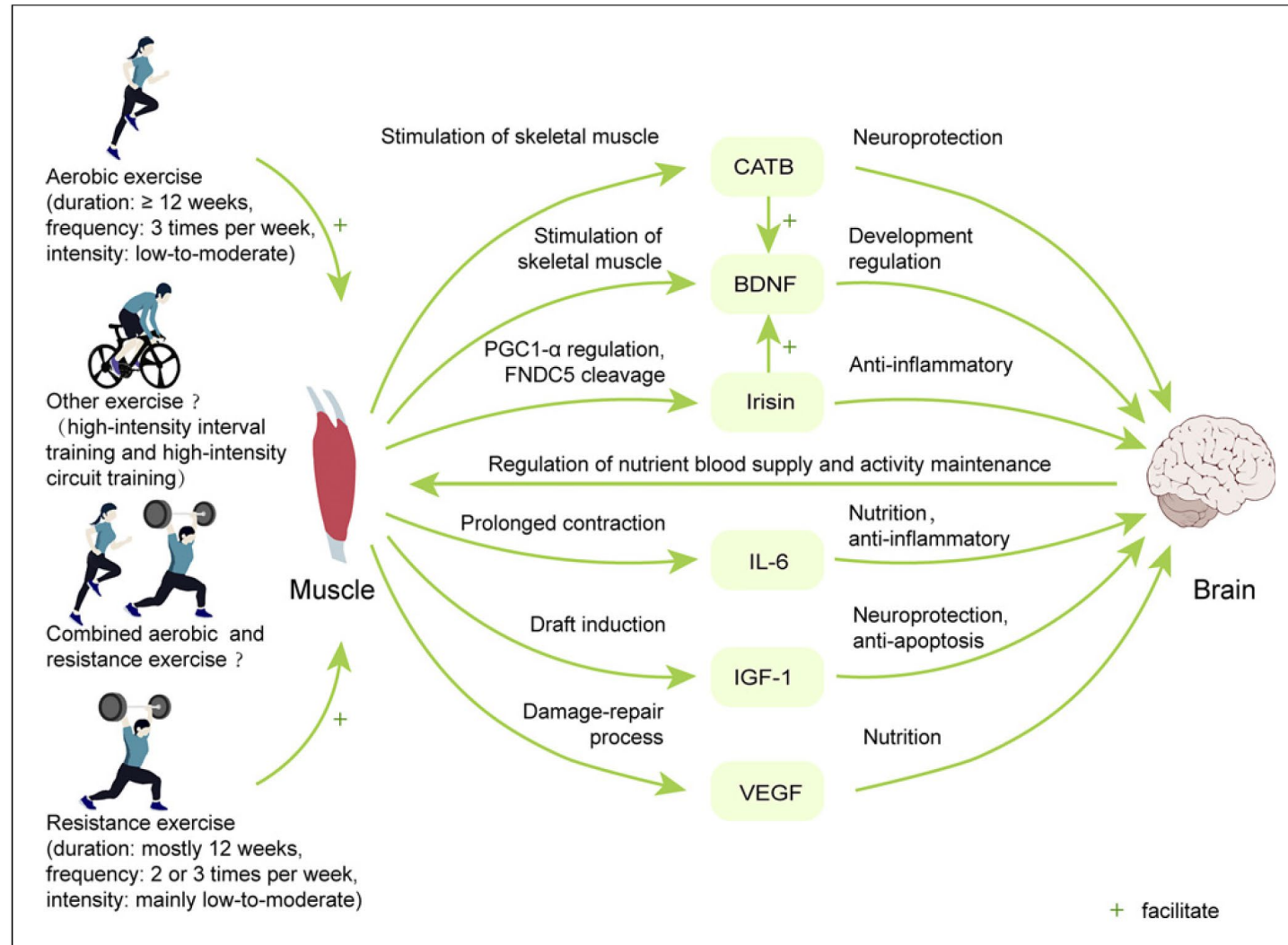


Fig. 4. Exercise-regulated myokines participate in muscle-brain crosstalk.



Exerkines in health, resilience and disease

Lisa S. Chow¹✉, Robert E. Gerszten², Joan M. Taylor³, Bente K. Pedersen⁴, Henriette van Praag⁵, Scott Trappe⁶, Mark A. Febbraio⁷, Zorina S. Galis⁸, Yunling Gao⁸, Jacob M. Haus⁹, Ian R. Lanza¹⁰, Carl J. Lavie¹¹, Chih-Hao Lee¹², Alejandro Lucia^{13,14,15}, Cedric Moro^{16,17}, Ambarish Pandey¹⁸, Jeremy M. Robbins¹⁹, Kristin I. Stanford¹⁹, Alice E. Thackray²⁰, Saul Villeda²¹, Matthew J. Watt²², Ashley Xia²³, Juleen R. Zierath^{24,25}, Bret H. Goodpaster²⁶✉ and Michael P. Snyder²⁷✉

Abstract | The health benefits of exercise are well-recognized and are observed across multiple organ systems. These beneficial effects enhance overall resilience, healthspan and longevity. The molecular mechanisms that underlie the beneficial effects of exercise, however, remain poorly understood. Since the discovery in 2000 that muscle contraction releases IL-6, the number of exercise-associated signalling molecules that have been identified has multiplied. Exerkines are defined as signalling moieties released in response to acute and/or chronic exercise, which exert their effects through endocrine, paracrine and/or autocrine pathways. A multitude of organs, cells and tissues release these factors, including skeletal muscle (myokines), the heart (cardiokines), liver (hepatokines), white adipose tissue (adipokines), brown adipose tissue (baptokines) and neurons (neurokines). Exerkines have potential roles in improving cardiovascular, metabolic, immune and neurological health. As such, exerkines have potential for the treatment of cardiovascular disease, type 2 diabetes mellitus and obesity, and possibly in the facilitation of healthy ageing. This Review summarizes the importance and current state of exerkine research, prevailing challenges and future directions.

Exercise-Induced Exerkines Have a Full Body Ripple Effect

A multitude of organs, cells, and tissues release these factors, including skeletal muscle (myokines), the heart (cardiokines), the liver (hepatocytes), white adipose tissue (adipokines), brown adipose tissue (cytokines), and neurons (neurons).

Exercises have potential roles in improving cardiovascular, metabolic, immune, and neurological health.

Exerkines have the potential to treat cardiovascular disease, type 2 diabetes mellitus, and obesity and possibly facilitate healthy aging.

Age-Related Muscle Anabolic Resistance:

Inevitable or Preventable?

A leading accelerant of muscle atrophy (sarcopenia) is aging itself.

Processes happening in the body that can lead to muscle loss:

- ✓ **Reduced activity in nerve cells** responsible for coordinating movement
- ✓ Andropause, Menopause, Elevated Cortisol, Thyroid Dysfunction, Growth Hormone Deficit
- ✓ **Elevated inflammation**
- ✓ Anabolic resistance: Age-related suppression of muscle protein synthesis
- ✓ Disuse, a sedentary lifestyle, or injury can also cause muscle atrophy.
- ✓ **Poor Nutritional Status: GI Health, Rapid Weight Loss, and Select Medications**
- ✓ **Aging without proactive steps in place**

Biological vs. Chronological Age



Effect of hamstring flexibility on cervical range of motion and deep neck flexor endurance in healthy young adults: A study to explore myofascial tensegrity network

Seher Ozyurek ^a✉, Burcin Aktar ^{a b}✉, Altay Kosova ^a✉, Ebru Aydin ^a✉, Rubeya Turedi ^a✉, Nihan Ozunlu Pekyavas ^c✉

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<https://doi.org/10.1016/j.jbmt.2024.05.025>

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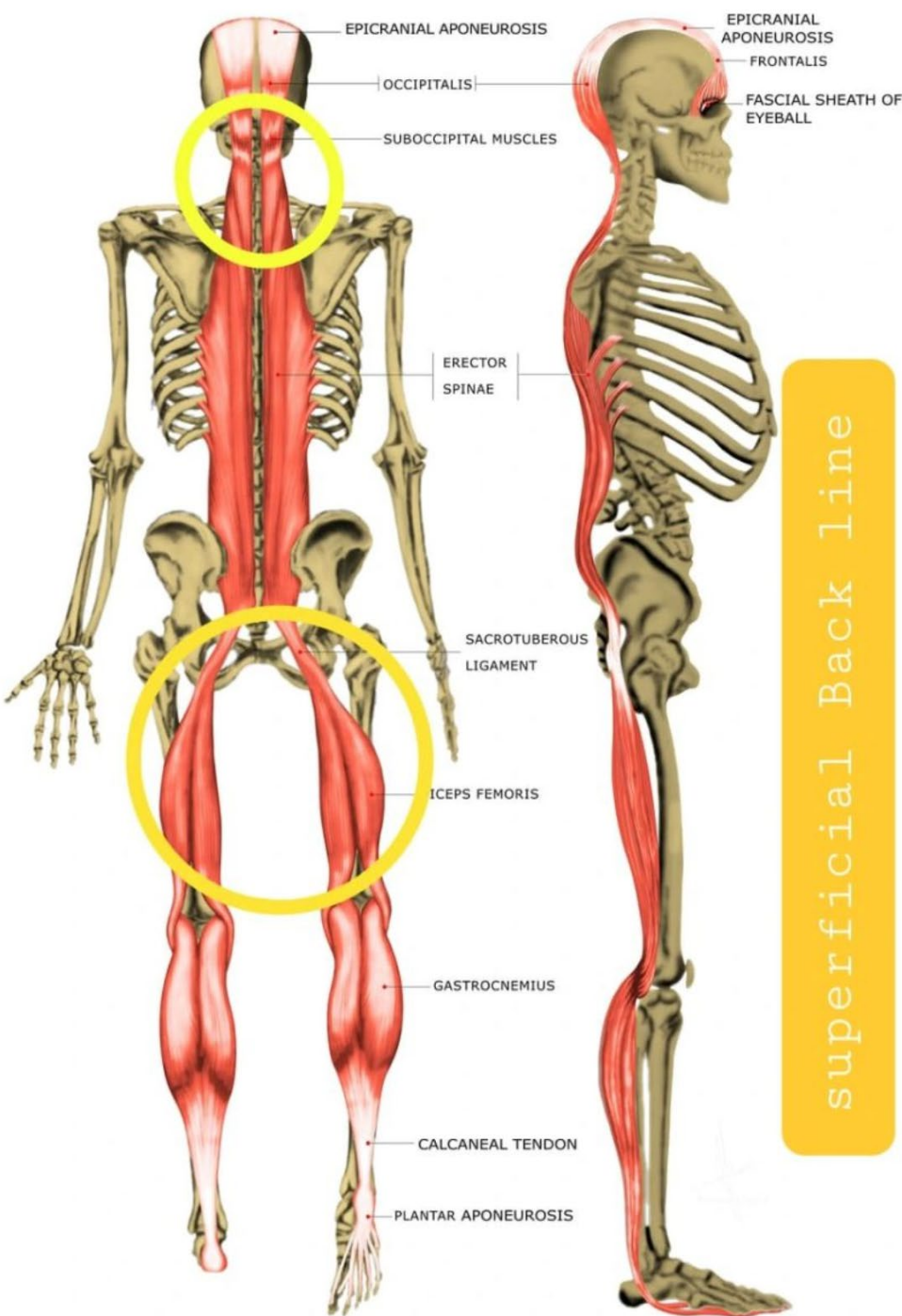
Highlights

- Limited hamstring flexibility can negatively affect deep neck flexor endurance.
- No effect of hamstring flexibility on active cervical range of motion.
- Preliminary clinical findings may support the hypothesis of a myofascial network between the hamstring and neck region.

Abstract

Introduction

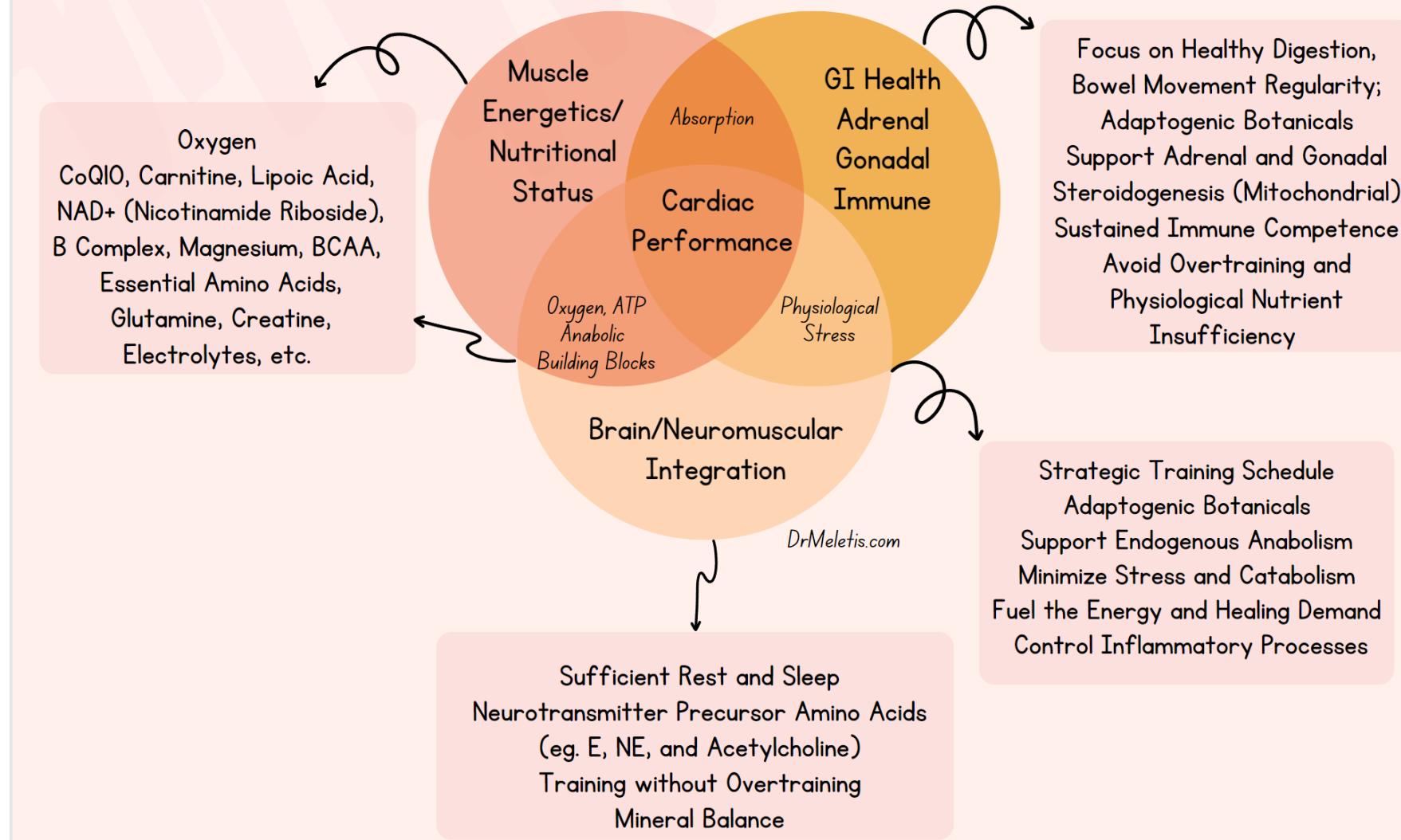
According to the concept of biotensegrity, the whole body consists of fascial lines. The relationship between muscles and fascia is important to ensure full and proper range of motion. This study investigated the effect of hamstring flexibility on cervical range of motion and deep neck flexor muscle endurance. The aim was to explore the relationship between the hamstring muscles and neck region in the myofascial tensegrity network.



Sampling of Current Patient Using Fortetropin

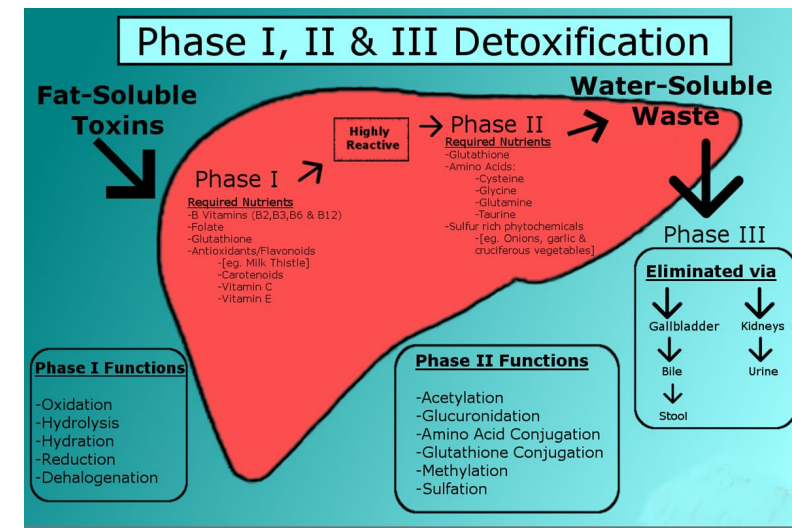
- 63 yo Female: Severe Osteoporosis and Sarcopenic Patient (Underweight)
- 55 yo Male: Pre- and Post-Surgical Knee Repair (Good BMI-Preventative b/c “disuse”)
- 86 yo Male: Post Femur Fracture (Good BMI, 10,000 steps per day prior to injury)
- 35 yo Male: Hx of Yo-Yo dieting, Lost 40 pounds with GLP-1, gained it all back (OSA)
- 13 yo Male: Dx with Duchenne’s Muscular Dystrophy

360 Look at Athletic Performance



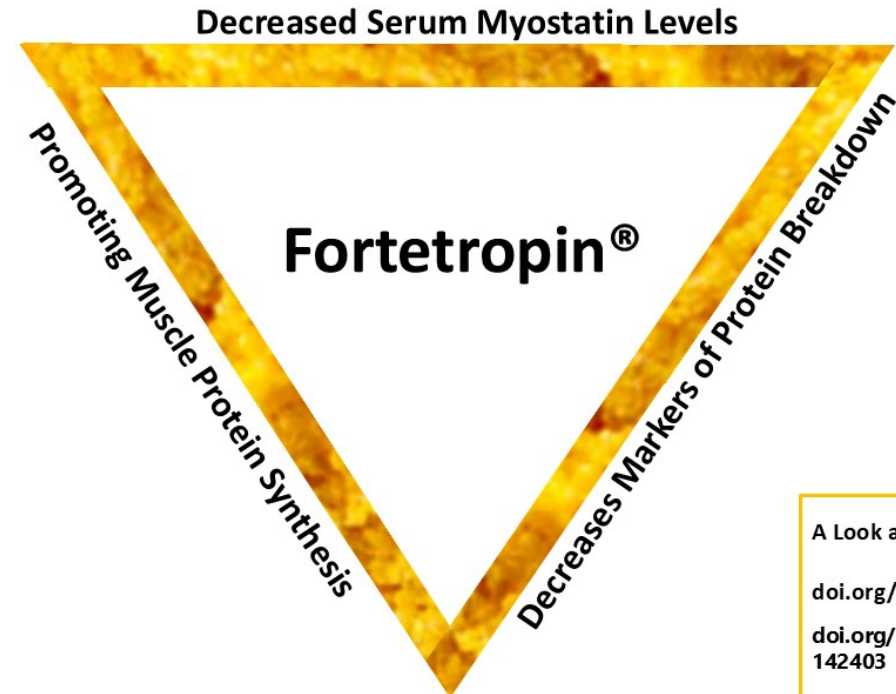
Successful **Muscle Retention** with Optimized Weight

- **Fortetropin:** Mitigating Anabolic Resistance by **inhibiting myostatin** and supporting healthy mTOR levels within skeletal muscle
- Consume Sufficient Calories to Prevent Increased T3 to Reverse T3 Conversion
- Sufficient Protein and Essential Amino Acids
- Mitochondrial Support: NAD+ (NR), CoQ10, PQQ, Resveratrol, etc.
- Exercise- Steps and Resistance Training
- Detoxification Support when Liberating Fat Soluble Toxins
- Ensure Good Sleep Quality and Quantity (Rule Out Sleep Apnea)
- Testing Including:
 - Diabetes (HA1c)
 - Dysregulated Cortisol
 - DHEA
 - Total and Free Testosterone
 - TSH, Free T4, Free T3, Reverse T3, etc.
 - Growth Hormone



Fortetropin: A Powerful Addition to Our Clinical Tool Box

Proposed Mechanism of Action*



A Look at the Science*

doi.org/10.1093/gerona/glaa162

doi.org/10.1080/07315724.2016.1142403

Thank you for Attending ---Time for Questions

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