

Entry Level Clinical Nutrition

June 2014 Update:

***SARCOSELECT: THE RESEARCH AND
CLINICAL BASIS FOR A UNIQUE
FUNCTIONAL FOOD THAT IS DESIGNED TO
OPTIMIZE MUSCLE MASS AND FUNCTION***

Jeffrey Moss, DDS, CNS, DACBN
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1

Why bother with sarcopenia?

2

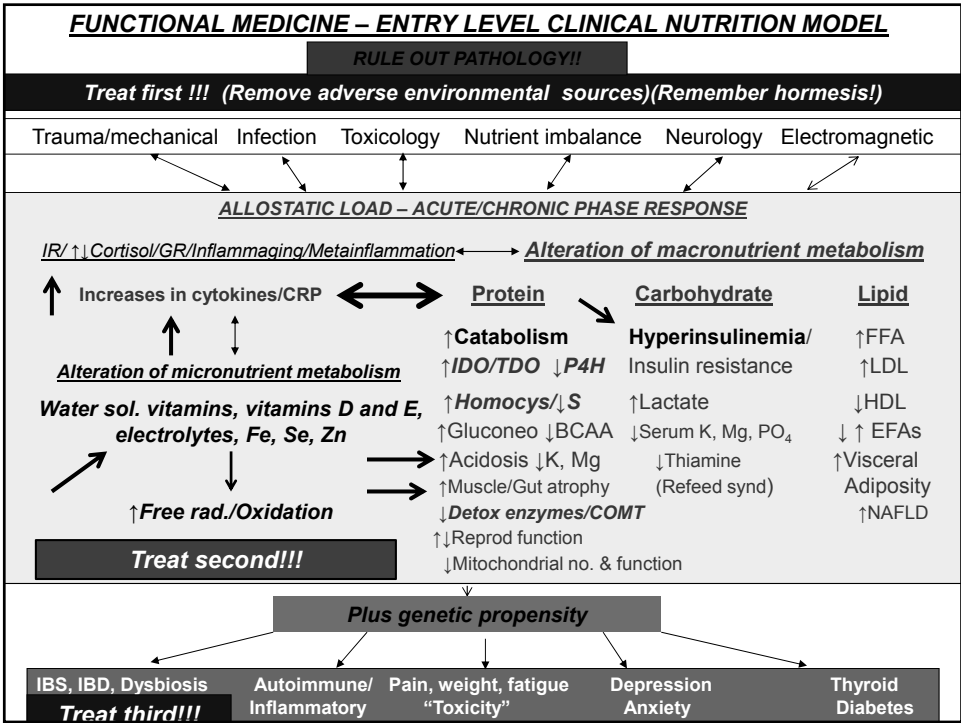
1. I'm not getting the results I would like.
2. I'm getting results but the cost is too high for many patients.
3. I'm getting results but compliance is an issue.
4. My practice is not as profitable as I would like.

3

How can learning about and
treating sarcopenia make a
difference?

4

1. Higher efficacy rate.
2. More cost and time effective results.
3. Better patient compliance



Current research on sarcopenia

7

ARTICLE IN PRESS

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ESPEL endorsed recommendation

Muscle contractile and metabolic dysfunction is a common feature of sarcopenia of aging and chronic diseases: From sarcopenic obesity to cachexia

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ARTICLE INFO

SUMMARY

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Muscle metabolic dysfunction

Protein-energy

Muscle contractile dysfunction

1. Introduction

A great achievement of modern medicine is the ability to stabilize chronic diseases, leading to extended life expectancy of populations. The chronically ill patient journey, however, is often associated with metabolic abnormalities and alterations in body composition (i.e. muscle loss with changes in adipose tissue mass).

which affect disease outcome and increase health care burden and cost. A physiological decline of skeletal muscle tissue is also an important feature of the aging process. There are strict relationships between muscle loss associated with aging and that due to chronic diseases. In addition, decreased physical activity and muscle unloading are key variables affecting skeletal muscle mass and body composition in aging and chronic disease.

The term sarcopenia was originally introduced to define age-related skeletal muscle decline, however it is now used to indicate any loss of muscle tissue and function due to aging, chronic diseases (including cancer), low protein-energy intake and physical inactivity.^{1,2} Other definitions may be used to describe decreases in muscle mass and function. The term wasting describes disease- and cancer-related muscle loss.³ Dynapenia defines decreased contractility and loss of strength.⁴ Muscle loss secondary to inactivity and unloading is often referred to as disuse atrophy.⁵ More

2. Muscle contractile and metabolic dysfunction is a common feature of sarcopenia of aging and chronic diseases: From sarcopenic obesity to cachexia

3. Conclusion

4. References

5. Appendix

6. Acknowledgements

7. Funding

8. Conflicts of interest

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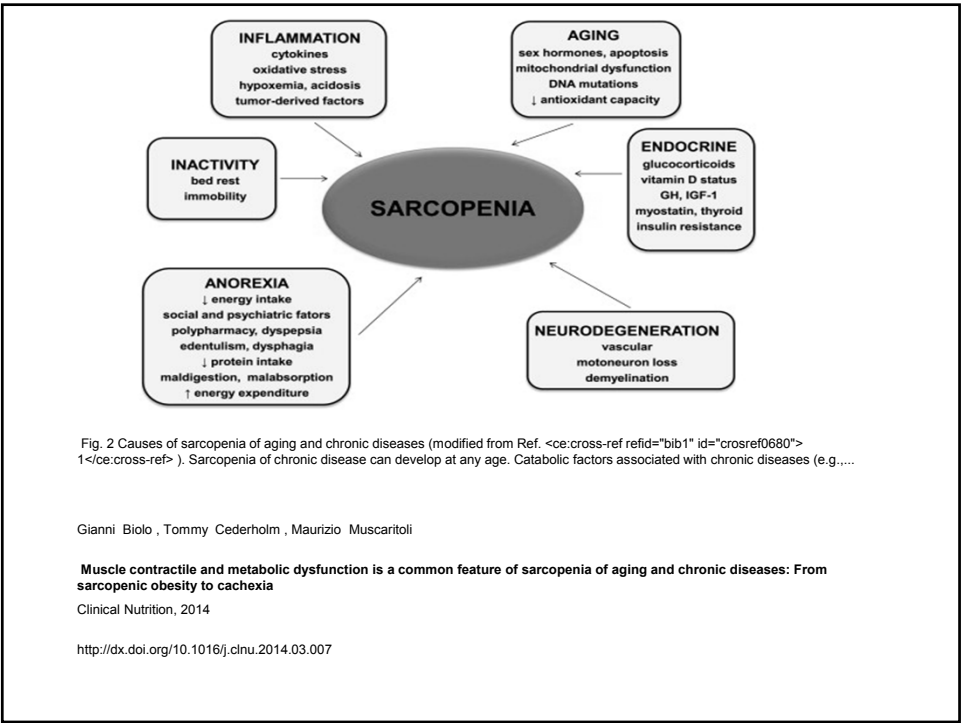
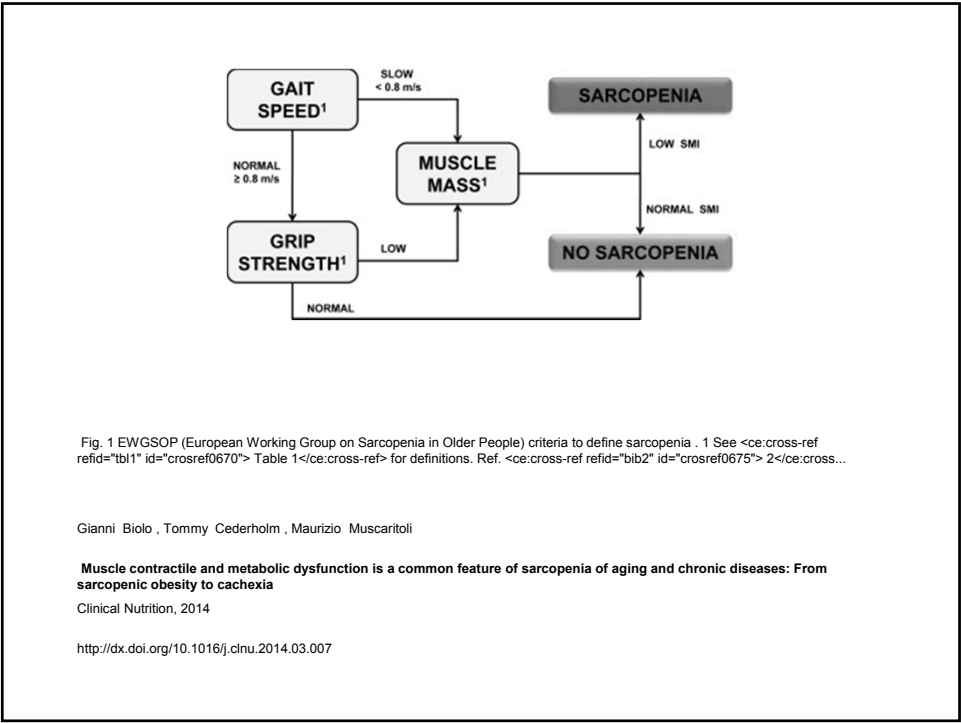
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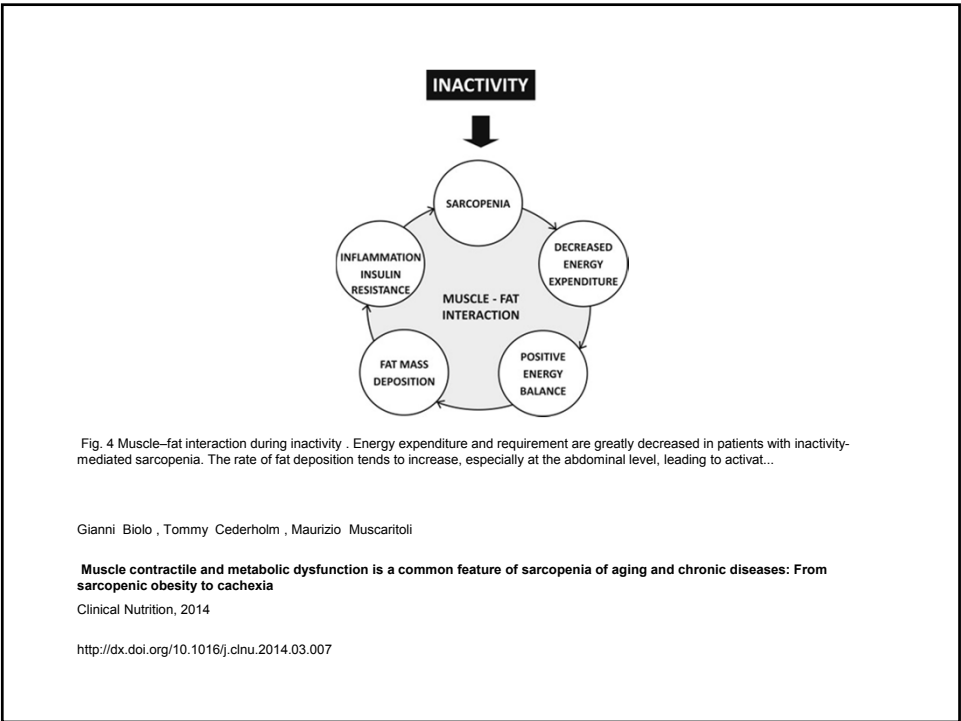
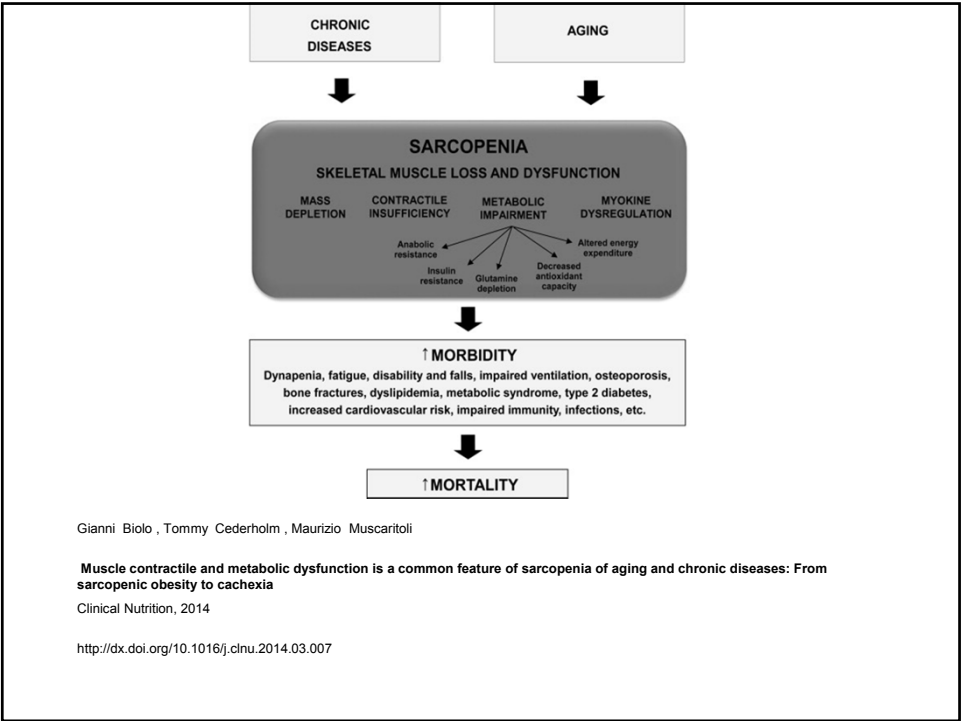
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ELCN UPDATE: How to optimize muscle mass
Jeff Moss, DDS, CN, DABCN



ELCN UPDATE: How to optimize muscle mass
Jeff Moss, DDS, CN, DABCN



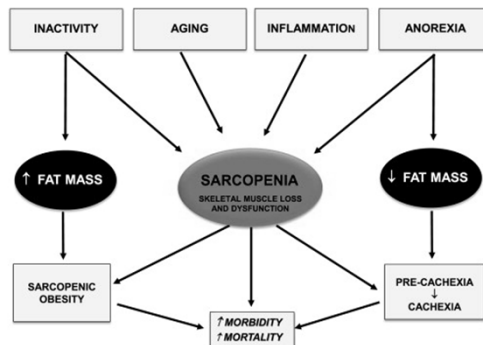


Fig. 5 Metabolic trajectories of sarcopenia of aging and chronic diseases . Inactivity, inflammation and anorexia as well as age-related catabolic factors are the major metabolic variables affecting changes in body composition. Inactivity, inflammation an...

Gianni Biolo , Tommy Cederholm , Maurizio Muscaritoli

Muscle contractile and metabolic dysfunction is a common feature of sarcopenia of aging and chronic diseases: From sarcopenic obesity to cachexia

Clinical Nutrition, 2014

<http://dx.doi.org/10.1016/j.clnu.2014.03.007>

“...sarcopenia is a major determinant of disease outcome and longevity...”

“...cost-effective control of chronic disease and optimal aging require sarcopenia prevention, diagnosis and treatment...”

15

- “Skeletal muscle is...involved in a number of metabolic functions such as energy homeostasis, heat regulation, insulin sensitivity and amino acid metabolism.”
- “Skeletal muscle has recently been identified as an endocrine organ. Muscle-derived cytokines named myokines, as well as anabolic (e.g., insulin-like growth factor-1) and catabolic (e.g., myostatin) peptides can be expressed, produced and released by muscle fibers to exert autocrine, paracrine endocrine actions.”

16

- "...in all conditions of muscle disuse atrophy energy requirement is decreased due to reductions in both resting and activity-related energy expenditure."
- "The rate of fat deposition tends to increase, especially at the abdominal level, leading to activation of systemic inflammation and insulin resistance."
- "These alterations enhance the catabolic effect of inactivity."

17

"This vicious cycle that leads to progressive muscle loss and fat gain, is frequently observed in some patients with chronic diseases and cancer as well as in sedentary lifestyle and in aging."

18

- ***“Skeletal muscle is the major site of dietary glucose disposal; therefore, muscle insensitivity to insulin actions is essential for the development of whole body insulin resistance and hyperglycemia.”***
- ***“Insulin resistance with fat accumulation contributes to a lesser post-prandial protein anabolism in skeletal muscle.”***

19

“...the view is consolidating that loss of muscle mass should be regarded to as the major factor responsible for the negative outcomes of disease-related malnutrition, including loss of autonomy and impaired quality of life.”

20

“...sarcopenia with muscle loss and dysfunction is a common feature of virtually all chronic diseases characterized by inactivity and systemic inflammation as well as of aging.”

21

Some quotes on treatment

22

- “Nutritional interventions in muscle-depleted patients with increased fat mass should involve careful assessments of energy requirement to prevent further increases in adipose tissue.”
- “In fact, overfeeding accelerated muscle loss and activated systemic inflammation and inactivity.”

23

- “The PROT-AGE study group has recently recommended an average daily intake in the range of 1.0-1.2 g protein/kg body weight/day for healthy older people (>65 years).”
- “Older patients who have acute or chronic disease need even more dietary protein, i.e., 1.2-1.5 g/kg body weight/day.”
- “Both endurance and resistance-type exercises are recommended in muscle-depleted patients with increased fat mass to maintain skeletal muscle mass and functions as well as energy balance.”

24

“Energy restriction programs on inactive patients would accelerate muscle loss.”

“Evidence indicates that restrictive diets impose significant risks of sarcopenia and malnutrition in free-living elderly populations.”

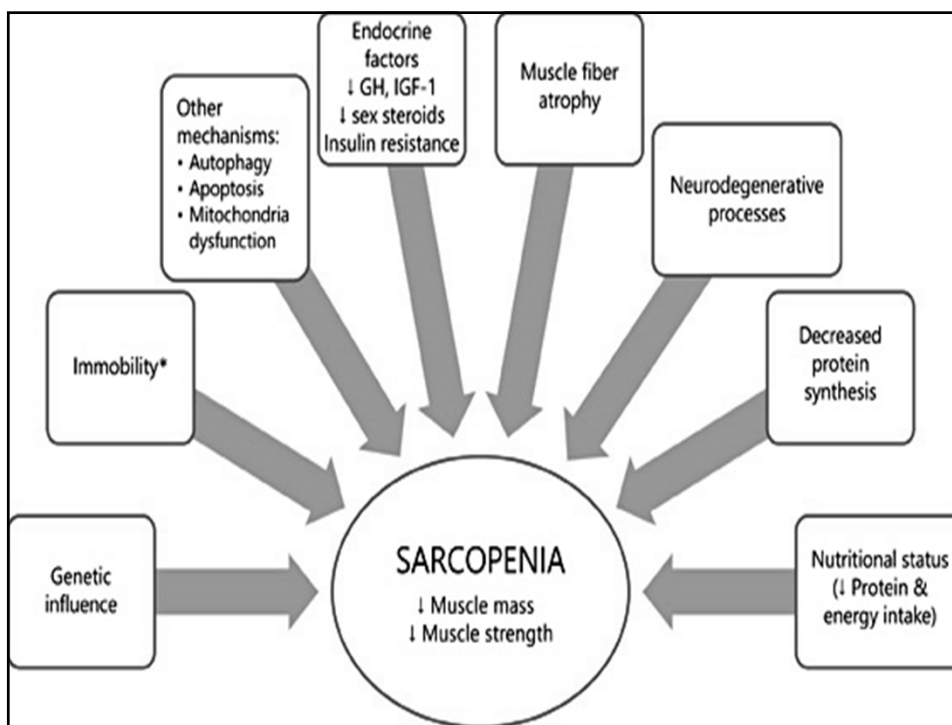
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Sarcopenia vs cachexia

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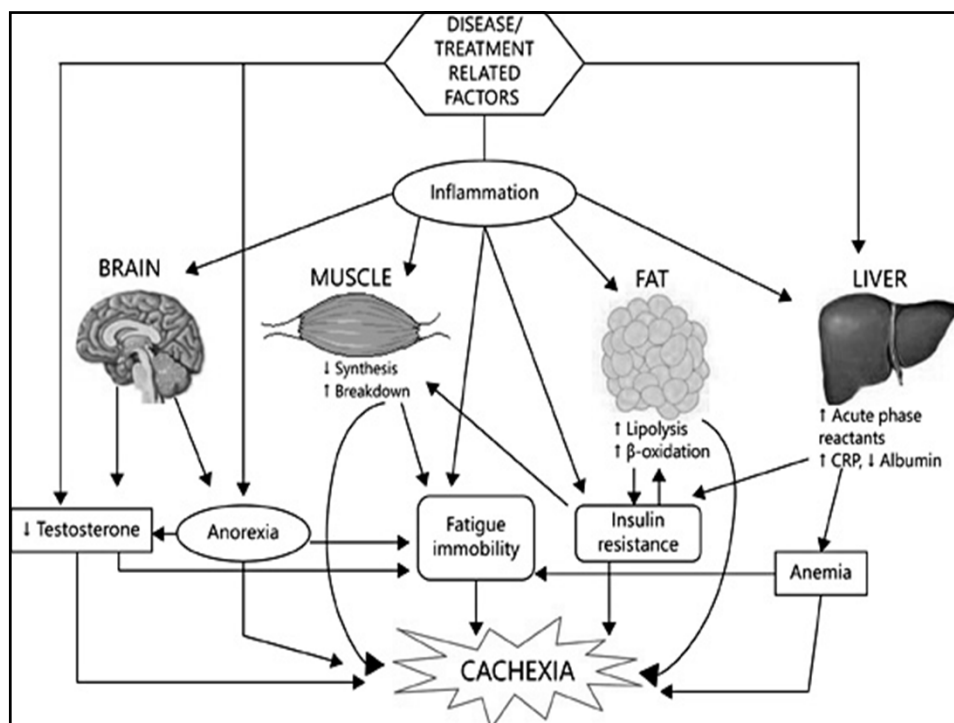
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	Sarcopenia	Cachexia
Definition	Muscle mass <2 SD of young healthy population, decreased muscle function	Weight loss >5% in 6 months
Mechanism	Aging	Pathologic
Comorbid condition	+/-	+++
Functional limitation	++	+++
Inflammation	-	++
Fat mass	Increased	Decreased
Protein degradation	-/+	+++
Resting energy expenditure	Decreased	Increased
Anorexia	+	++

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What's happening to muscle on a molecular level?

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ORIGINAL
ENDOCRINE

Weight Gain Reveals Dramatic Increases in Skeletal Muscle Extracellular Matrix Remodeling

Charmaine S. Tam, Jeffrey D. Covington, Sudip Bajpeyi, Yourka Tchoukalova, David Burk, Darcy L. Johannsen, Cristina M. Zingaretti, Saverio Cinti, and Eric Ravussin

Henningsen Biomedical Research Center (C.S.T., J.D.C., S.B., Y.T., D.B., D.L.J., E.R.), Baton Rouge, Louisiana 70808; The Charles Perkins Centre and School of Biological Sciences (C.S.T.), University of Sydney, Sydney, 2006 New South Wales, Australia; Department of Kinesiology (D.B.), University of Texas at El Paso, El Paso, Texas 79968; and Department of Experimental and Clinical Medicine-Civile Center (C.M.Z., S.C.), United Hospitals-University of Ancona, Ancona 60020, Italy

Tam CS et al. Weight gain reveals dramatic increases in skeletal muscle extracellular matrix remodeling, *J Clin Endocrinol Metab*, Vol. 99, No. 5, pp. 1749-1757, May 2014.

their baseline energy requirements for 8 weeks.

Results: Ten percent body weight gain prompted dramatic up-regulation of a repertoire of extracellular matrix remodeling genes in muscle and to a lesser degree in adipose tissue. The amount of extracellular matrix genes in the muscle were directly associated with the amount of lean tissue deposited during overfeeding. Despite weight gain and impaired insulin sensitivity, there was no change in local adipose tissue or systemic inflammation, but there was a slight increase in skeletal

“Extracellular matrix (ECM) accumulation leads to fibrosis in a wide variety of tissues, which may irreversibly alter the structure and function of affected tissues and whole-body homeostasis.”

abolic health has been fully recognized. Due to its unique ability to rapidly and dynamically expand and contract through adipocyte hypertrophy and hyperplasia, adipose tissue represents an important buffer both in terms of energy storage and release. However, obesity is characterized by overproduction and fibrosis, immune cell infiltration, and chronic low-grade inflammation, all contributing to the development of insulin resistance (1). Such pathological disturbances have typically been described in individuals with morbid obesity (2) and obese mouse models in which

“There is growing evidence that muscle ECM remodeling has a unique role contributing to muscle insulin resistance.”

First Published Online March 6, 2014

doi: 10.1210/clinem.2013-0381 J Clin Endocrinol Metab, May 2014, 99(5):1749–1757 jcem.endojournals.org 1749

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Jeff Moss, DDS, CN, DABCN

ORIGINAL ARTICLE
Endocrine Research

Skeletal Muscle Mitochondria in the Elderly: Effects of Physical Fitness and Exercise Training

Nicholas T. Broskey,* Chiara Greggio,* Andreas Boss,* Marie Boutant,*
Andriew Dwyer, Leopold Schläpfer, Didier Hans, Gerald Gremion, Roland Kreis,
Chris Boesch, Carlos Canto, and Francesca Amati

Department of Physiology (N.T.B., C.G., F.A.), School of Biology and Medicine, University of Lausanne, Lausanne CH-1005, Switzerland; Department of Clinical Research, Magnetic Resonance Spectroscopy, and Metabolism (A.B.), School of Biomedical Sciences, CHU-1015 Bern, Switzerland; Swiss Institute of

Broskey NT et al. Skeletal muscle mitochondria in the elderly: Effects of physical fitness and exercise training, *J Clin Endocrinol Metab*, Vol. 99, No. 5, pp. 1852-1861, May 2014.

activity.

Objectives: The objective of the study was to examine the influence of fitness on Mito content and function and to assess whether exercise could improve Mito function in older adults.

Design and subjects: Three distinct studies were conducted: 1) a cross-sectional observation comparing Mito content and fitness in a large heterogeneous cohort of older adults; 2) a case-control

“Herein we demonstrate that physical fitness is exquisitely correlated with mitochondrial density in skeletal muscle in older adults (60-80 y old).”

magnetic resonance spectroscopy. Peak oxygen uptake was measured by graded exercise test.

Results: Peak oxygen uptake was strongly correlated with MitoVd in 80 60- to 80-year-old adults. Comparison of chronically endurance-trained older adults vs 5 revealed differences in MitoVd, ATPmax, and some electron transport chain protein complexes. Finally, exercise intervention confirmed that 5 subjects are able to recover MitoVd, ATPmax, and specific transcription factors.

Conclusions: These data suggest the following: 1) aging per se is not the primary culprit leading to Mito dysfunction; 2) as aerobic exercise exposure rises in older age, can mitigate the loss

“As a whole, our results indicate that aging per se does not impede mitochondrial biogenesis in response to exercise and that the decreases in mitochondrial function observed in elder adults are likely to decreased physical activity.”

Received November 3, 2013; Accepted December 20, 2013.
First Published Online January 17, 2014.

1852 jcem.endojournals.org J Clin Endocrinol Metab, May 2014, 99(5):1852-1861 doi: 10.1210/1.2013-3983

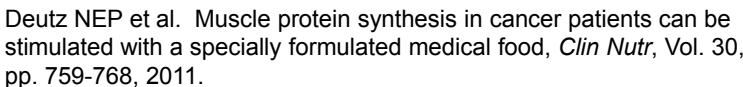
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The research basis for SarcoSelect



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Jeff Moss, DDS, CN, DABCN



- 36

- **“In the presence of systemic inflammation, it appears to be extremely difficult to achieve whole body protein anabolism in cancer patients. It therefore seems that although food intake should be increased in cachectic cancer patients, gains in lean body mass are difficult to achieve unless specific metabolic abnormalities, like inflammation, are targeted.”**

37

How were changes in muscle mass measured?

- **“A muscle biopsy was performed 2 h after the start of isotope infusion and again at 5 h in order to determine the basal rate of muscle protein synthesis.”**

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Experimental procedure

- **“Blood was taken from the sampling forearm catheter periodically for the determination of plasma phenylalanine enrichment (tracer/trace ratio). Immediately following the second muscle biopsy, one dose of the medical food (200 ml) was ingested, followed by a second dose (200 ml) 20 min after the first sip of the first dose. Each dose was consumed within 10 min. Blood samples were then drawn over the next 5 h. A third muscle biopsy was taken 300 min after the first sip of the first dose of the medical food. All muscle biopsies were taken from the same muscle via the same incision.”**

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Can the results of this short term study be extrapolated to a longer time frame?

- **“...we anticipate that acute stimulation of fractional rate of muscle protein synthesis (FSR) would translate to a sustained improved muscle function when such a medical food is consumed for a longer period.”**

40

What were the results?

41

- **“The cancer patients were in an inflammatory state, as reflected by high levels of C-reactive protein, IL-1 β , and TNF- α , but were not insulin resistant. After ingestion of the experimental medical food, plasma leucine increased to about 400 μ M as compared to the peak value of 200 μ M after the control medical food. Ingestion of the experimental medical food increased muscle protein FSR from 0.073 (SD: 0.023) to 0.097 (SD: 0.033 %/h ($p = 0.0269$). In contrast, ingestion of the control medical food did not increase muscle FSR; 0.073 (SD: 0.022) and 0.065 (SD: 0.028)%/h.”**

42

- **“Our results demonstrate that it is possible to stimulate muscle protein synthesis in catabolic cancer patients with involuntary weight loss with a specially formulated medical food, rich in leucine and protein. Cachexia is defined as a state in which muscle mass is lost at a rate greater than would be anticipated from reduced food intake alone.”**

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- **“A corollary of this definition is that decreased responsiveness to the normal anabolic effect of a meal would be expected. Consistent with the expectation of decreased responsiveness in cachexia, our results show that a medical food with a composition in the same range as commercially available medical foods did not stimulate muscle protein synthesis.”**

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How important was the leucine content?

- **“Ingestion of leucine-enriched amino acid solutions rapidly and potently activates the mammalian target of rapamycin signaling pathway and protein synthesis in human skeletal muscle. This most likely explains the enhanced muscle protein synthesis that is observed when increasing the percentage of leucine in a meal. In particular, when leucine is added to a protein meal in elderly, the ability of the meal to stimulate protein synthesis is improved.”**

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“The addition of an extra amount of leucine to a balanced amino acid composition improved the response above the level of the control medical food as observed in the present study.”

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- **“...ingestion of an EPA/DHA mixture potentially is a new approach to improving muscle protein synthesis. A recent study has confirmed an improved muscle protein synthesis by 8 weeks treatment with EPA/DHA.”**

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Concluding comment by Deutz et al.

- **“Our results demonstrated that when a medical food is optimized for protein, leucine, fish oil components, carbohydrates and fiber, muscle fractional protein synthesis rate can be stimulated. Therefore, the results of our acute study clearly show that absence of improvement of muscle protein synthesis in catabolic cancer patients with involuntary weight loss is related to the composition of the medical food and not to the unresponsiveness of muscle in these cancer patients, per se. In cancer patients, a specially formulated medical food can overcome the anabolic resistance to a conventional food supplement.”**

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Unfortunately, fish oil could not be used in SarcoSelect

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Original Research

amr

Efficacy and Safety of Meriva®, a Curcumin-phosphatidylcholine Complex, during Extended Administration in Osteoarthritis Patients

Gianni Belcaro; Maria Rosaria Cesarone; Mark Dugall; Luciano Pellegrini; Andrea Ledda; Maria Giovanna Grossi; Stefano Togni; Giovanni Appendino

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Belcaro G et al. Efficacy and safety of Meriva®, a curcumin-phosphatidylcholine complex, during extended administration in osteoarthritis patients, *Alt Med Rev*, Vol. 15, No. 4, pp. 337-344, 2010.

"...few successful clinical studies of curcumin have been reported because of its poor oral availability. Unrealistically high doses (>10 g/day) are often required to achieve plasma concentrations corresponding to those suggested by preclinical studies. To overcome these issues, a phytosome was developed, complexing curcumin with phosphatidylcholine.

Biomedical Sciences, Ohio
Western University, Ohio

Stefano Togni - Indena S.p.A.,
Via Orto 12, Milano, Italy

supported by studies in animal models, and extrapolated from in vitro studies, but not validated clinically." This paradoxical situation is due to the poor stability of curcumin, which is highly unstable at intestinal pH (half-life at pH 7: <10 min), and low oral absorption. Plasma concentrations reach 500 ng/ml of active flavonoids.

Biomedical Sciences, Ohio
Western University, Ohio

- “Significant improvements of both the clinical and biochemical end points were observed for Meriva compared to the control group. This coupled with excellent tolerability, suggests that Meriva is worth considering for the long-term complementary management of osteoarthritis.”

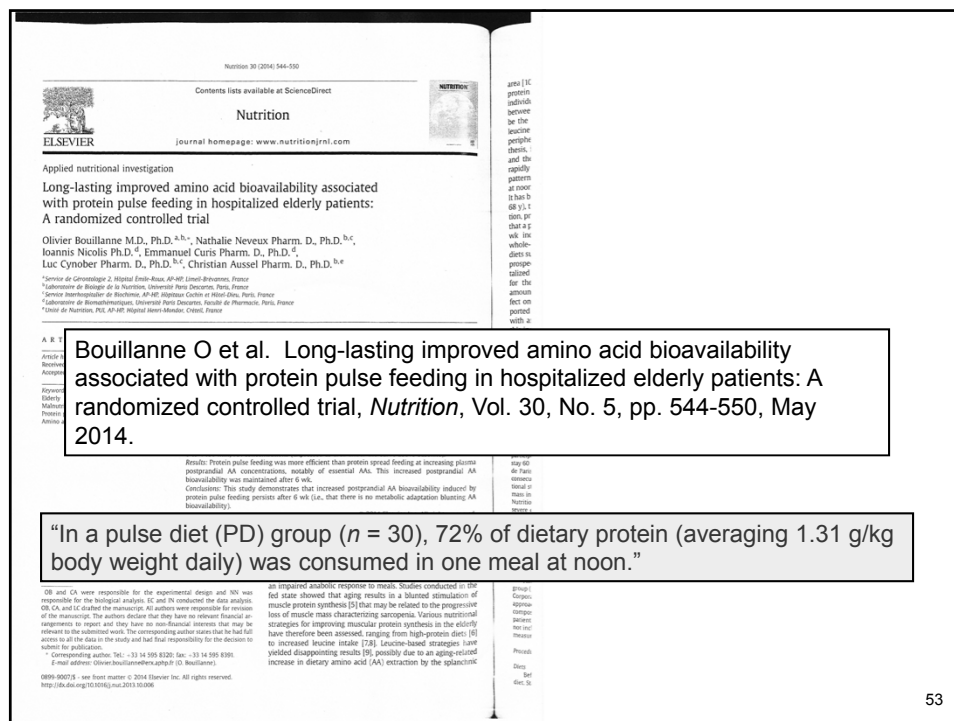
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Pulse feeding

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ELCN UPDATE: How to optimize muscle mass

Jeff Moss, DDS, CN, DABCN



“Protein pulse feeding was more efficient than protein spread feeding at increasing plasma postprandial AA concentrations, notably of essential AAs. This increased postprandial AA bioavailability was maintained after 6 wk.”



Thank you!!

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