



NASC Preferred Supplier Educational Webinar Series



Mobility Solutions: Partnering joint health innovation and muscle health importance



The importance of Glucosamine for animal health

Peter Mazzilli

Importance of Joint Health

- Joint health is important to overall health
 - Cartilage begins to break down with age, making movement more difficult and painful
 - Glucosamine is a vital building block of cartilage and is naturally produced in the body
 - Glucosamine levels naturally fall with age
- Most clinical research historically on human side
- Glucosamine has become widely accepted to treat animals to deliver the same benefits as shown in humans



Sampling of Glucosamine Clinical Studies in Humans 2007-2016

- Supplementation improved knee flexion and extension for athletes¹
- Significantly decreased CTX-II levels (biomarker of collagen and cartilage degradation)²
- Decreases the risk of developing knee osteoarthritis (OA)³
- Reduced type II collagen degradation while maintaining synthesis⁴

¹ Ostojic et al. Glucosamine administration in athletes: effects on recovery of acute knee injury. *Res Sports Med* 15:113-124, 2007.

² Yoshimura et al. Evaluation of the effect of glucosamine administration on biomarkers for cartilage and bone metabolism in soccer players. *Int J Molec Med* 24:487-494, 2009.

³ Runhaar et al. The role of diet and exercise and of glucosamine sulfate in the prevention of knee osteoarthritis: Further results from the Prevention of knee Osteoarthritis in Overweight Females (PROOF) study *Semin Arthritis Rheum* 45: S42-S48, 2016

⁴ Tomonaga et al. Evaluation of the effect of N-acetyl-glucosamine administration on biomarkers for cartilage metabolism in healthy individuals without symptoms of arthritis: A randomized double-blind placebo-controlled clinical study. *Exp Ther Med* 12: 1481-1489, 2016:

Glucosamine Supplementation

- Surveys show that a majority of supplement users have either experienced benefits from taking glucosamine or believe in its effectiveness ^{1,2}
- In spite of few clinical studies in animals, our research shows that 65% of dog owners recognize the benefits and have given their dogs glucosamine (US)³. This number is similar in Europe and Australia
- Animal supplement brands continue to develop new glucosamine products.



1 Trust Transparency Center ITC Insights – Consumer Survey 2020

2 Trust Transparency Center. (2019). 2019 2nd annual Trust Transparency Center Single Ingredient Trade Association Consumer Survey

3 TSI Group Consumer Survey of Dog Owners, US, Australia, Germany, France, UK 2020-2021

Glucosamine Supplementation

- Dogs: Recommendations vary from 250 mg to 1500 mg daily
 - Generally recommended at an earlier age for certain breeds more prone to OA
- Horses: Dosages can be as high as 10,000 mg or more daily due to low absorption
 - Can begin at a young age depending on level of training
- Cats: 150 mg to 500 mg daily dose

Glucosamine sources

Historical Processes

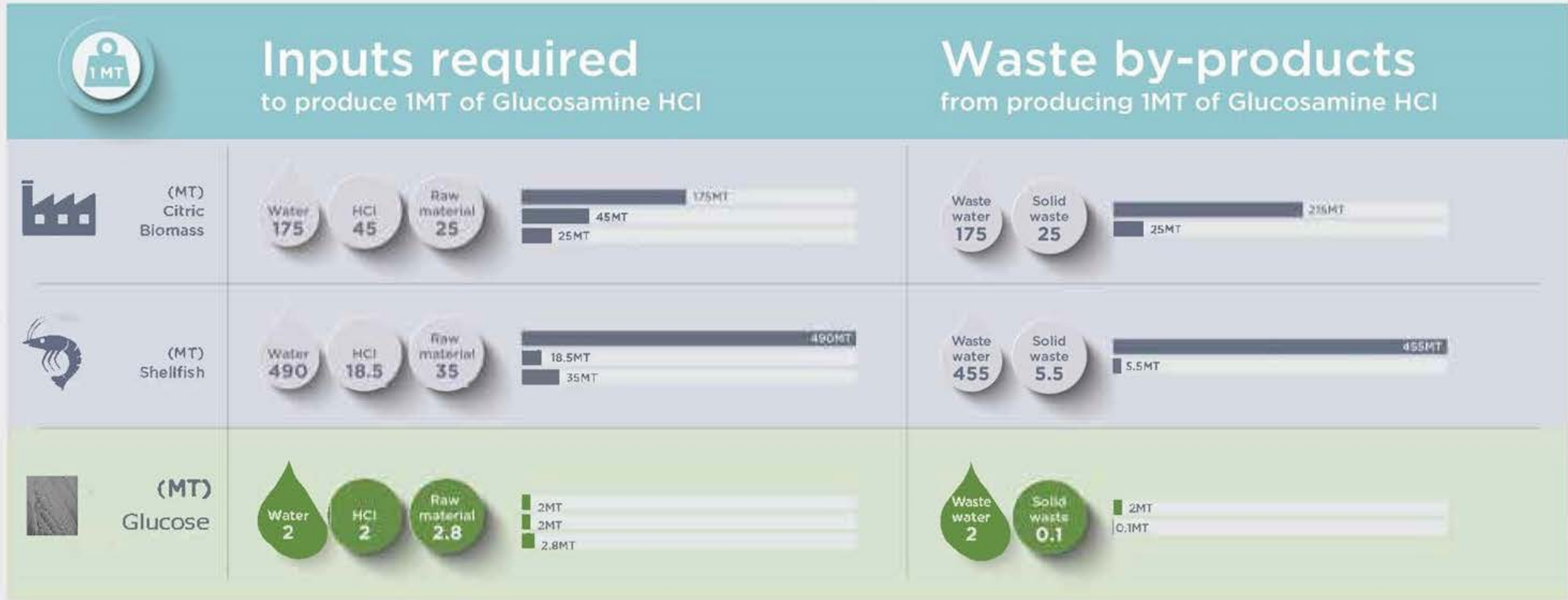
- Derived from chitin, the building block of glucosamine
 - Chitin exists naturally in shellfish shells, also in some fungal biomasses
 - Historically was derived exclusively from shellfish
- Shellfish produced glucosamine has several drawbacks:
 - ❖ People with kosher and vegan diets and/or shellfish allergies could not consume
 - ❖ The process requires large amounts of water and heavy chemicals
 - ❖ The process produces large volumes of hazardous waste water and solid waste
- Methods developed to extract chitin from citric biomass
 - ❖ This addressed the shellfish and allergen concerns but still hard on the environment

New, Optimized Process

- Process was developed to produce glucosamine from glucose
 - Glucose as a raw material produced from fermented corn
- Resulting product is bio-equivalent to glucosamine produced from shellfish
- Production process dramatically reduced environmental impact

How Dramatic?

Environmental impact from glucosamine production



By the Numbers

- Making glucosamine from glucose versus shellfish reduces the water use by 99.6% and solid waste generation by 98%
- Hydrochloric acid input is reduced by nearly 90%
- Waste water reduction and acid reduction dramatically reduces the need for sodium hydroxide for waste treatment
- For every shellfish glucosamine tablet made – 5 ½ times its weight was produced in solid waste
- It takes nearly a billion gallons of water to produce enough shellfish glucosamine to meet the US demand

What do consumers say?

- Not just good for the planet, it's good for business
- US survey:
 - 60% of glucosamine users are willing to pay a price premium for a product that is sustainably sourced ¹
 - 82% of pet owners will pay a premium when choosing a product for their dogs ²
 - 55% will pay a 10% or higher premium ²
 - 73% say ingredient sourcing is an important influence when choosing supplement products for their pets (that's higher than "Vet Recommended")²

¹ Trust Transparency Center ITC Insights – Consumer Survey 2020

² TSI Group Consumer Survey of Dog Owners, US, Australia, Germany, France, UK 2020-2021

What do consumers say?

- These numbers are even higher globally
- Pay more for sustainably produced or “green” products: ¹
 - UK – 84%
 - Australia – 87%
 - Germany – 92% (68% would pay a premium of 10% or more)
 - France – 88%

¹ TSI Group Consumer Survey of Dog Owners, US, Australia, Germany, France, UK 2020-2021

Future of Glucosamine

- Glucosamine use expected to grow in animal supplement market
- Glucosamine from vegetal source will continue to overtake shellfish source due to consumer demand for cleaner processes and products for themselves and their companion animals
- This is an opportune time for brands to capitalize on the sustainability messaging





HMB (β -hydroxy β -methylbutyrate)

Shawn Baier, MS, MBA

Maintaining muscle health with age...

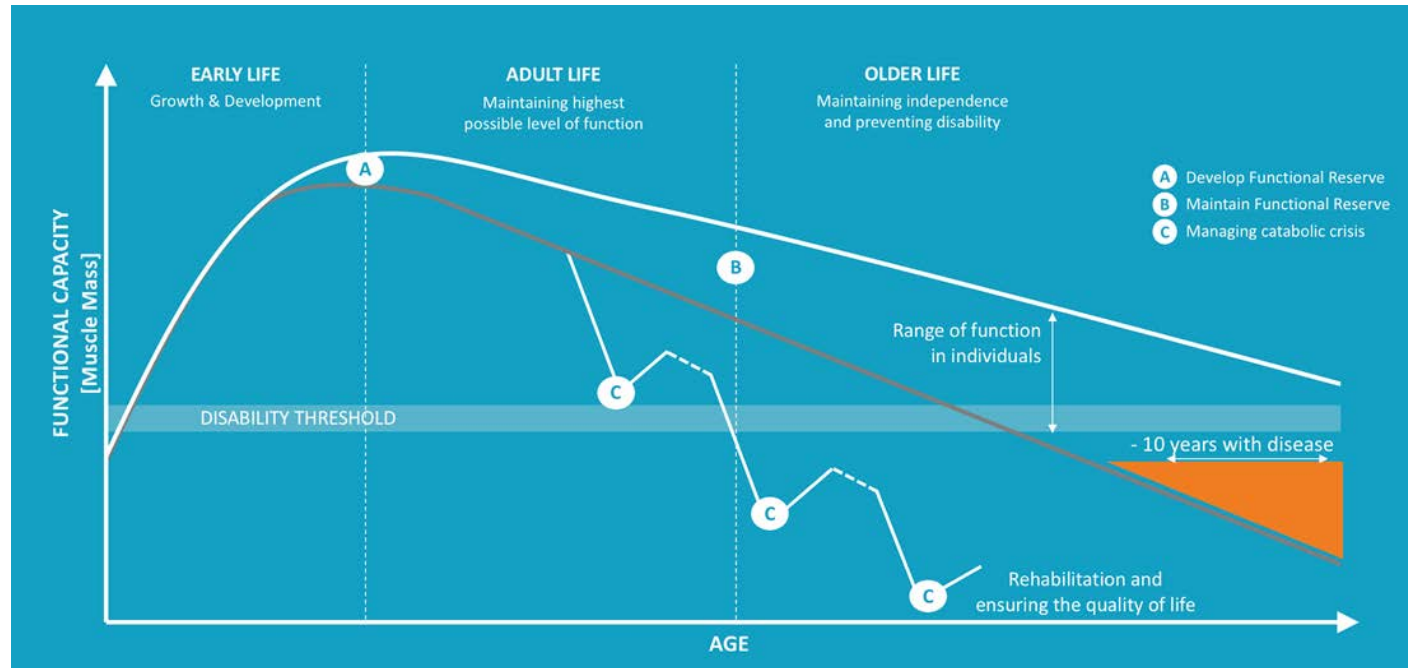
We know that the aging adult population suffers from loss of muscle mass which translates to reduced strength, mobility issues, and to a diminished quality of life.

“No single feature of age-related decline is more striking than the decline in lean body mass which affects ambulation, mobility, energy intake, overall nutrient intake and status, independence and breathing.”

Dr. Irwin Rosenberg

This tells us that our muscle health is critical to our and our companion animal's long-term health and well-being!

What is Muscle Health?

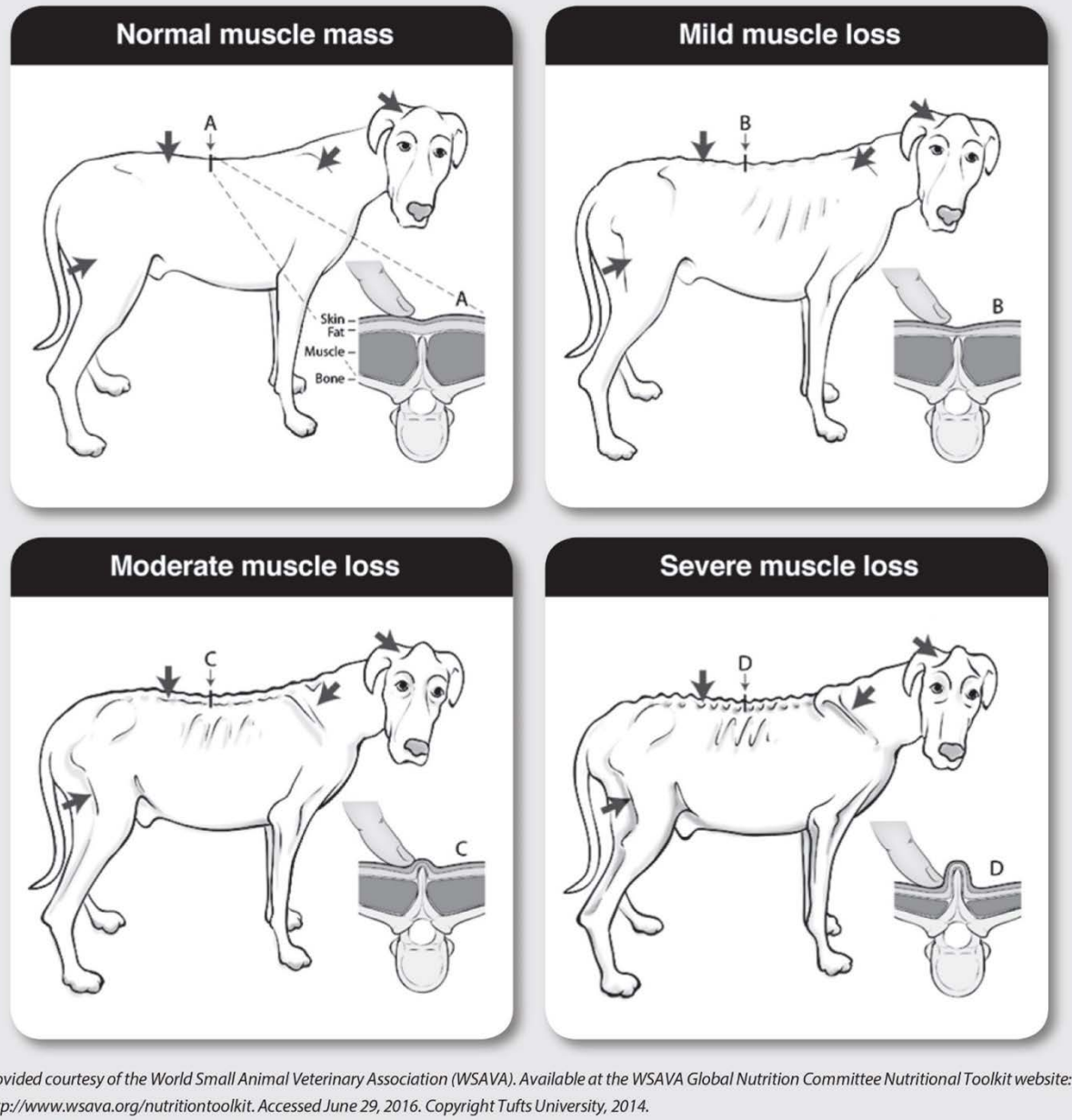


Skeletal muscle

- Responsible for all movement and support
- Essential to metabolic function, endurance and strength. Muscle is our metabolic powerhouse
- Altered muscle metabolism plays a role in nearly all pathological conditions and chronic diseases
- Essential to overall health and well-being
- There is an inevitable age-related decline in body condition that needs to be addressed to improve quality of life

Just like people, Muscle Loss is A Major Health Problem Facing Our Companions!

- Like humans, muscle loss is inevitable with age.
- In fact, mobility and strength are two of the most critical health concerns for all pet owners and loss of muscle is the primary cause of loss of strength, mobility and stability.
- Furthermore, age related muscle loss is associated with increased morbidity and mortality in cats and dogs.



Finally, since our pets age more quickly than we do, it's important to ensure they receive the proper nutrition and exercise much earlier in life...

So what is the solution?...



CAT YEARS	HUMAN YEARS
7	54
10	63
15	78
20	97



DOG YEARS	HUMAN YEARS (small to very large dogs)*
7	44 to 56
10	56 to 78
15	76 to 115
20	96 to 120

Age: Estimated Human Equivalents for Older Pets

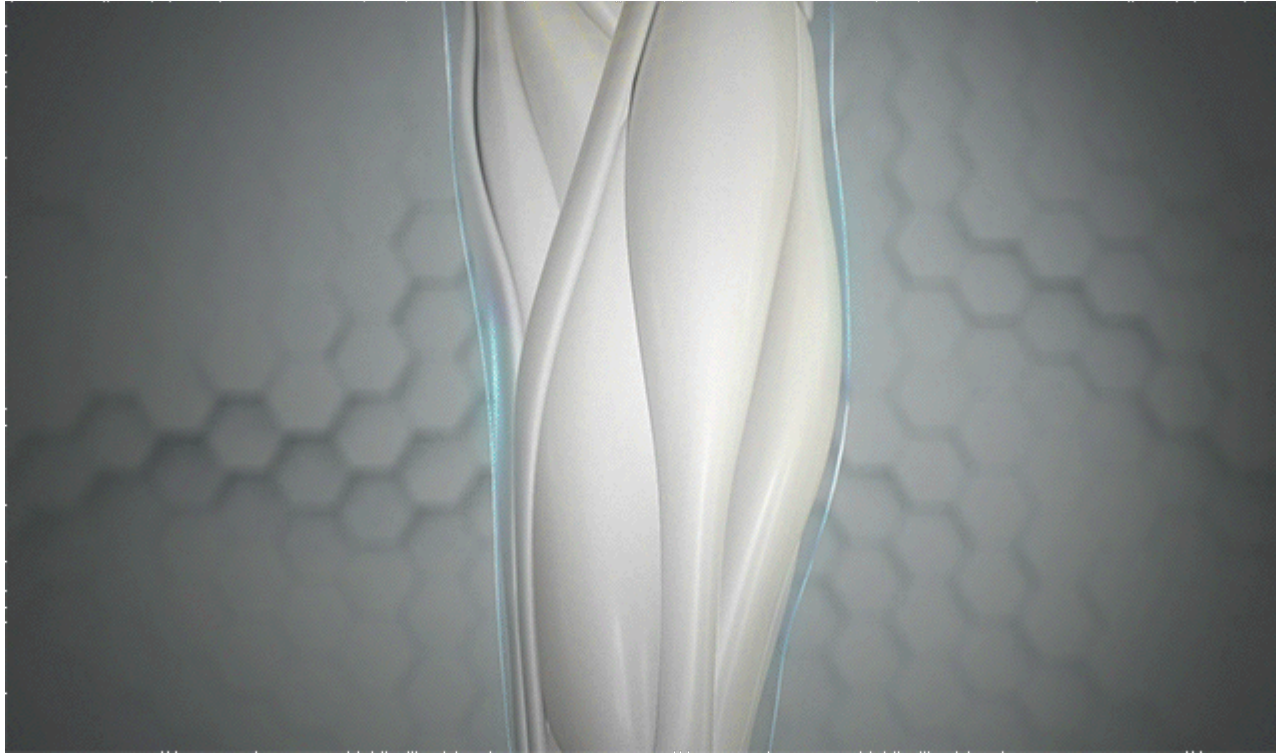
*Small: 0-20 lbs; Medium: 21-50 lbs; Large: 51-90 lbs; Very large: >90 lbs

HMB is the PROVEN answer for the prevention of age-related muscle loss



- Scientifically proven to help humans... can also help our companion animals
- HMB has been used for over 2 decades to help people improve their quality of life by maintaining muscle health that is otherwise impacted negatively by the aging process.
- Like people, maintaining muscle mass also improves pets' quality of life and can positively impact lifespan by keeping them healthy and mobile in their later years.

How Does HMB Work?



Muscle mass is the sum of muscle protein synthesis and breakdown.

HMB enhances muscle protein synthesis and, **most importantly, it simultaneously decreases muscle protein breakdown.**

Protein Utilization

- Protein isn't absorbed as well in older age animals and additional protein in the diet isn't necessarily the solution
- HMB can also 'turn on the machinery' and help better utilize the protein that is consumed
- Which results in...



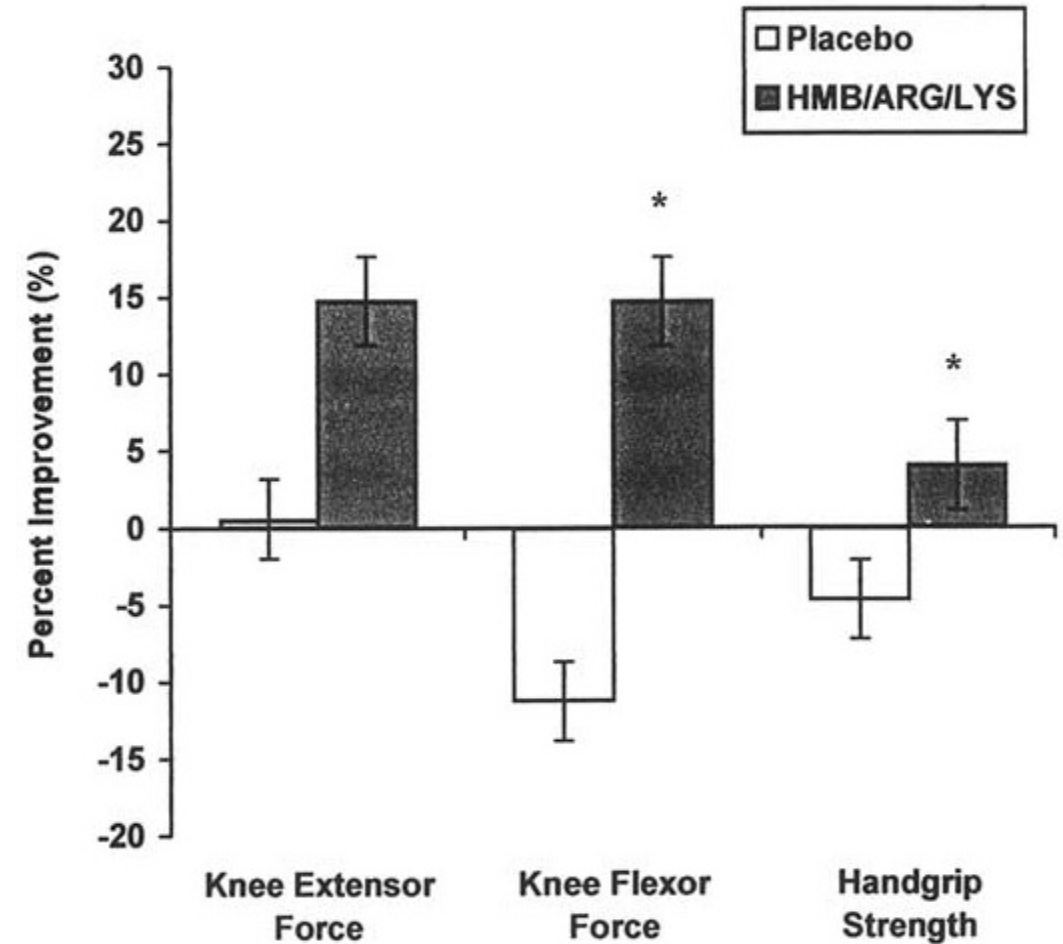
HMB increases muscle strength and quality

HMB enhances muscle strength and function in older adults

- 27 elderly women; 62-85 y (avg 72 y)
- 12 weeks study
- HMB (2 g/d) + Arginine + Lysine or Isocaloric placebo

Results:

- Handgrip strength increased ~5% in the HMB group and decreased by a similar amount in the placebo group
- Knee extensor and knee flexor strength increased by ~15%



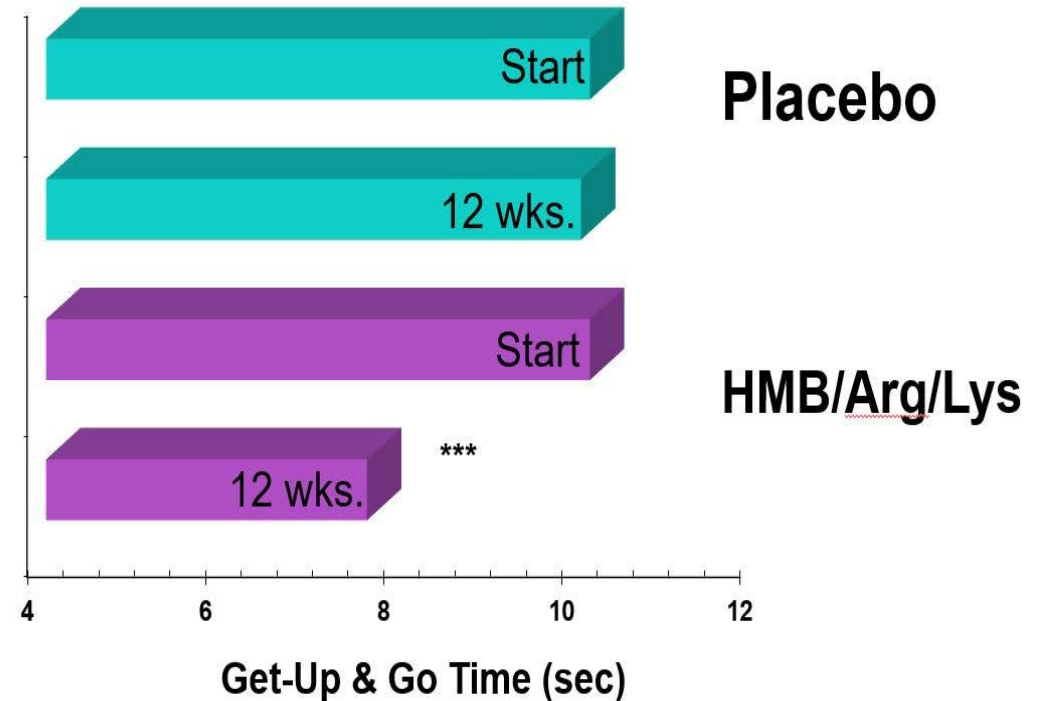
HMB supports functional mobility

MB enhances functional mobility in older adults

- 50 elderly women; 65-90 y (avg 77 y)
- 12 weeks study
- HMB (2 g/d) + Arginine + Lysine or Isocaloric placebo
- Functional mobility evaluated using Get-Up & Go Test

Results:

- Get-Up & Go performance improved by 17% (- 2.3 seconds) in the HMB supplemented group



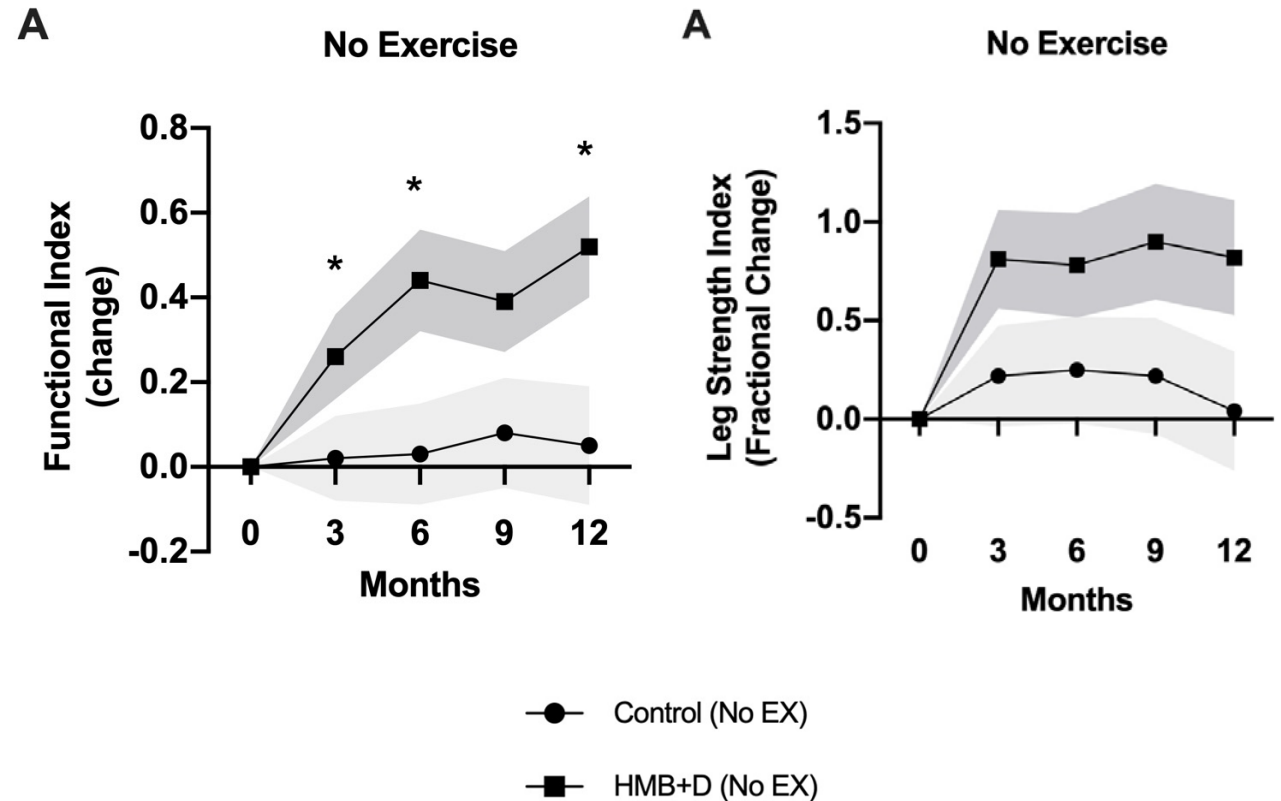
Muscle Health with Age

HMB+D improves physical function in non-exercising older adults

- 117 men and women ≥ 60 y (avg. 69 y) with insufficient Vitamin D (15-30 ng/mL 25OHD)
- 12-month study - testing at baseline, 3, 6, 9, and 12 months
- HMB (3 g/d) + Vitamin D3 or placebo \pm moderate resistance exercise training

Results:

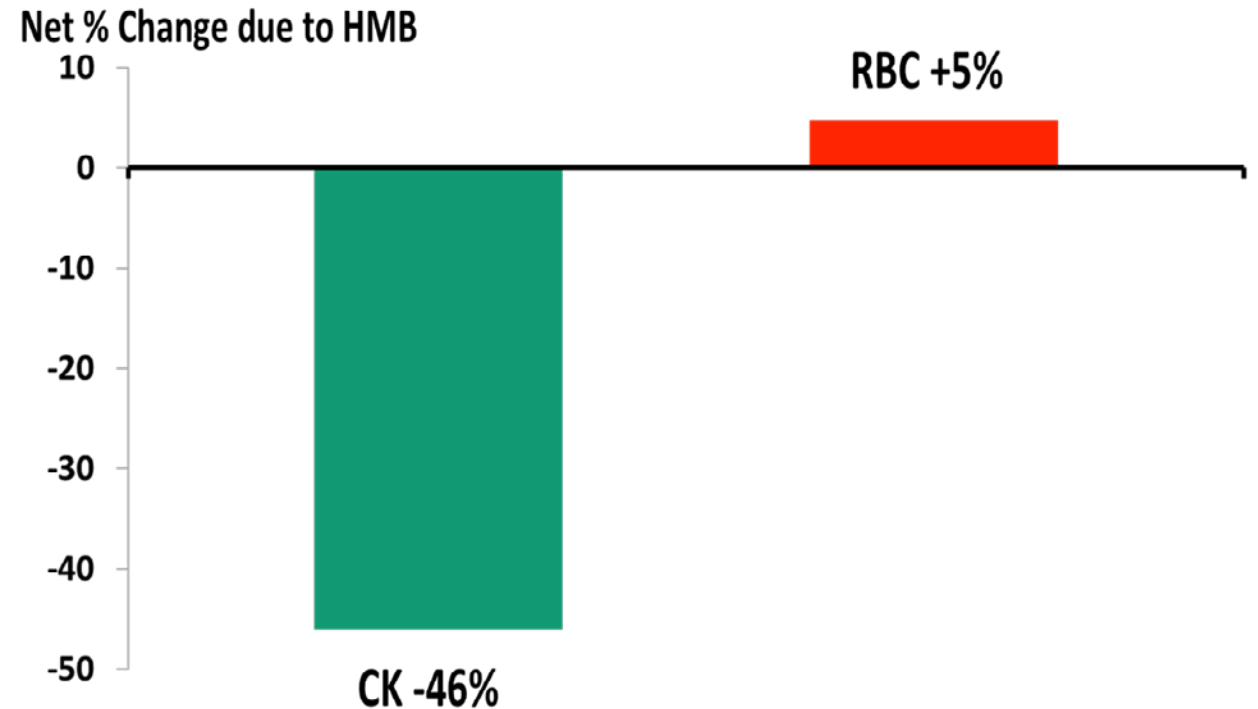
- HMB+D supplementation increased 25OHD levels into sufficient range
- HMB+D increased functional and tended to increase strength in non-exercisers



HMB Benefits in Canines

Canine Study #1: Greyhounds

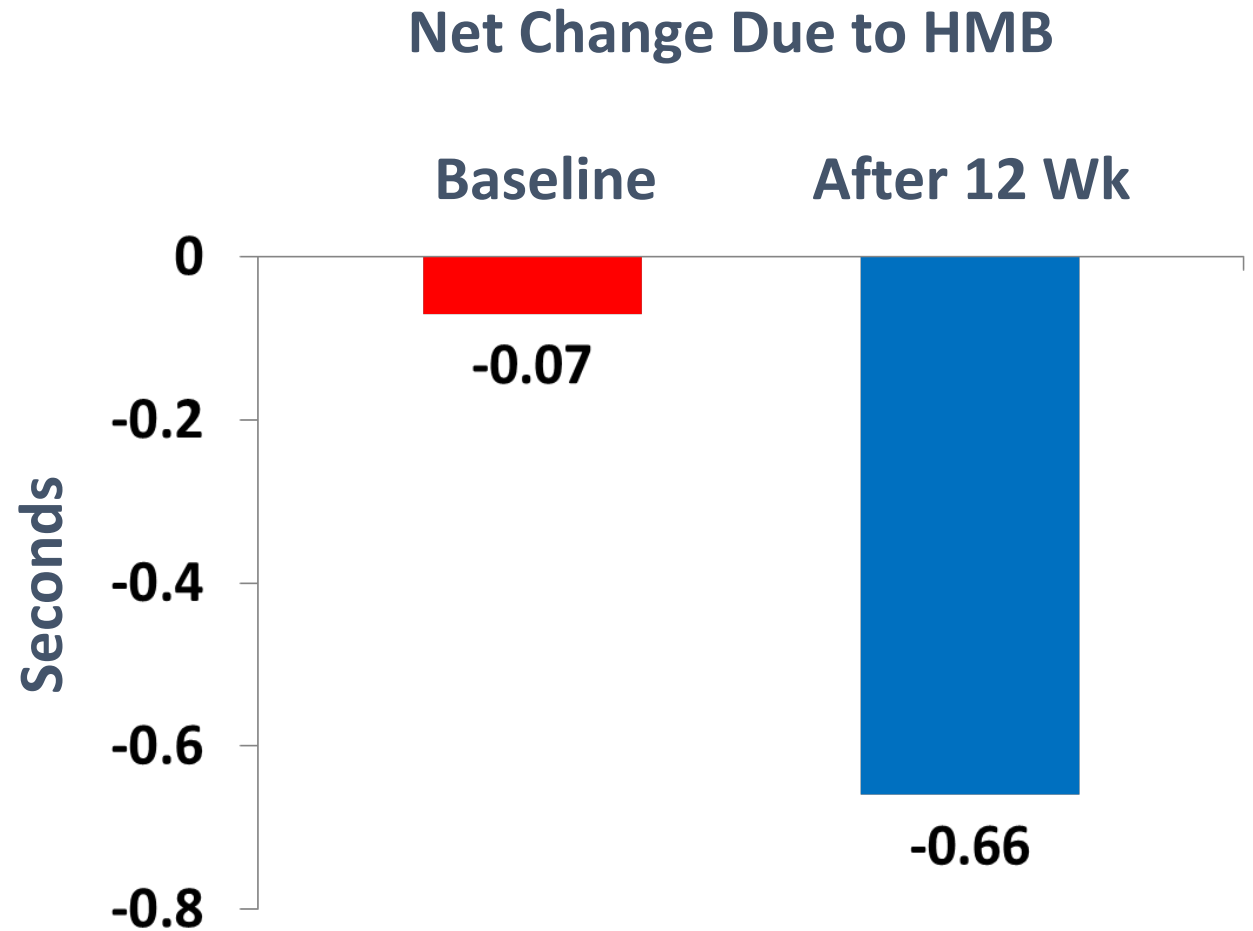
HMB supplementation decreased creatine phosphokinase and increased red blood cells.



HMB Benefits in Canines

Canine Study #1: Greyhounds

HMB supplementation
resulted in a decrease in
race time.

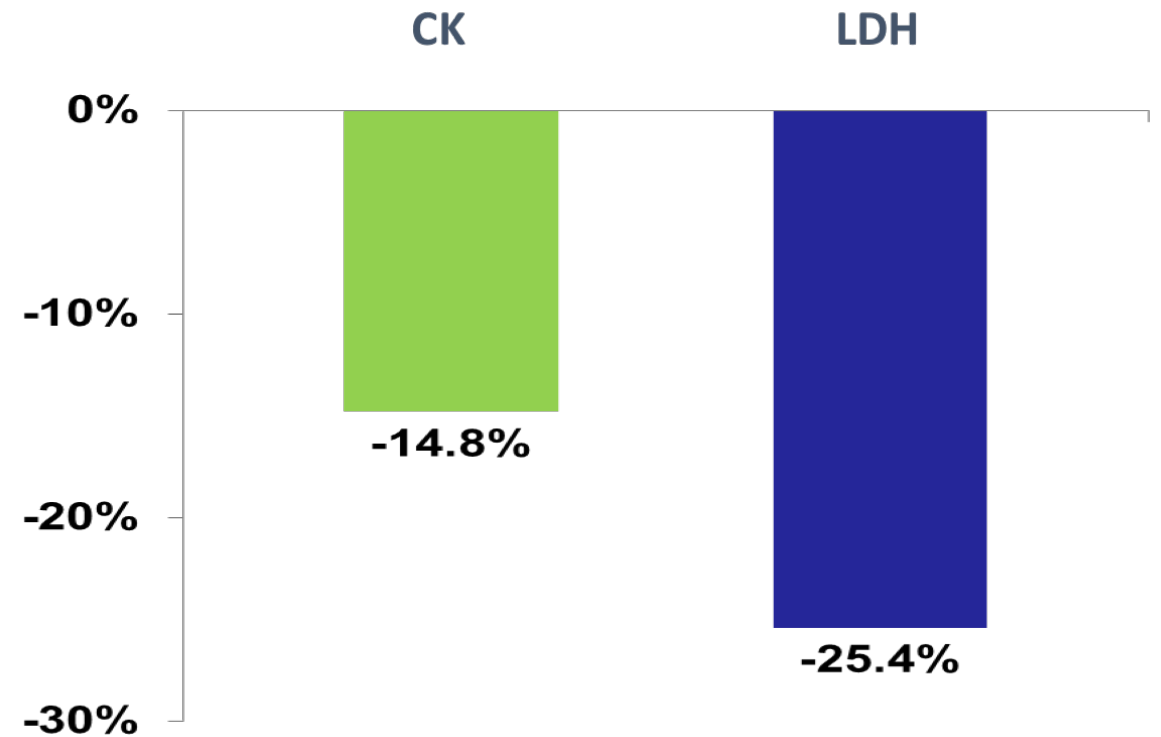


HMB Benefits in Canines

Canine Study #2: Sled Dogs

HMB supplementation reduced indicators of muscle damage as indicated by the muscle enzymes creatine phosphokinase (CK) and lactate dehydrogenase (LDH).

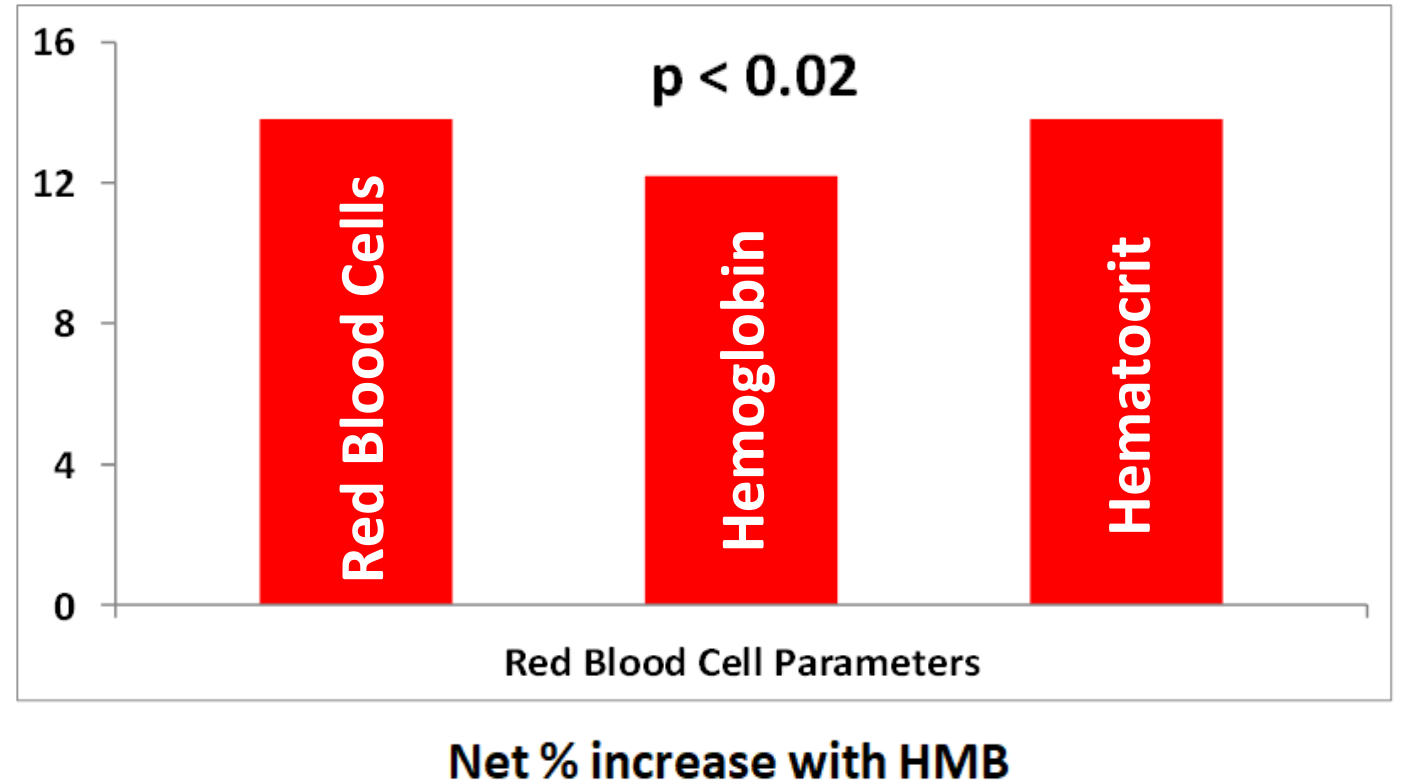
Change in post-Iditerod enzyme levels with HMB



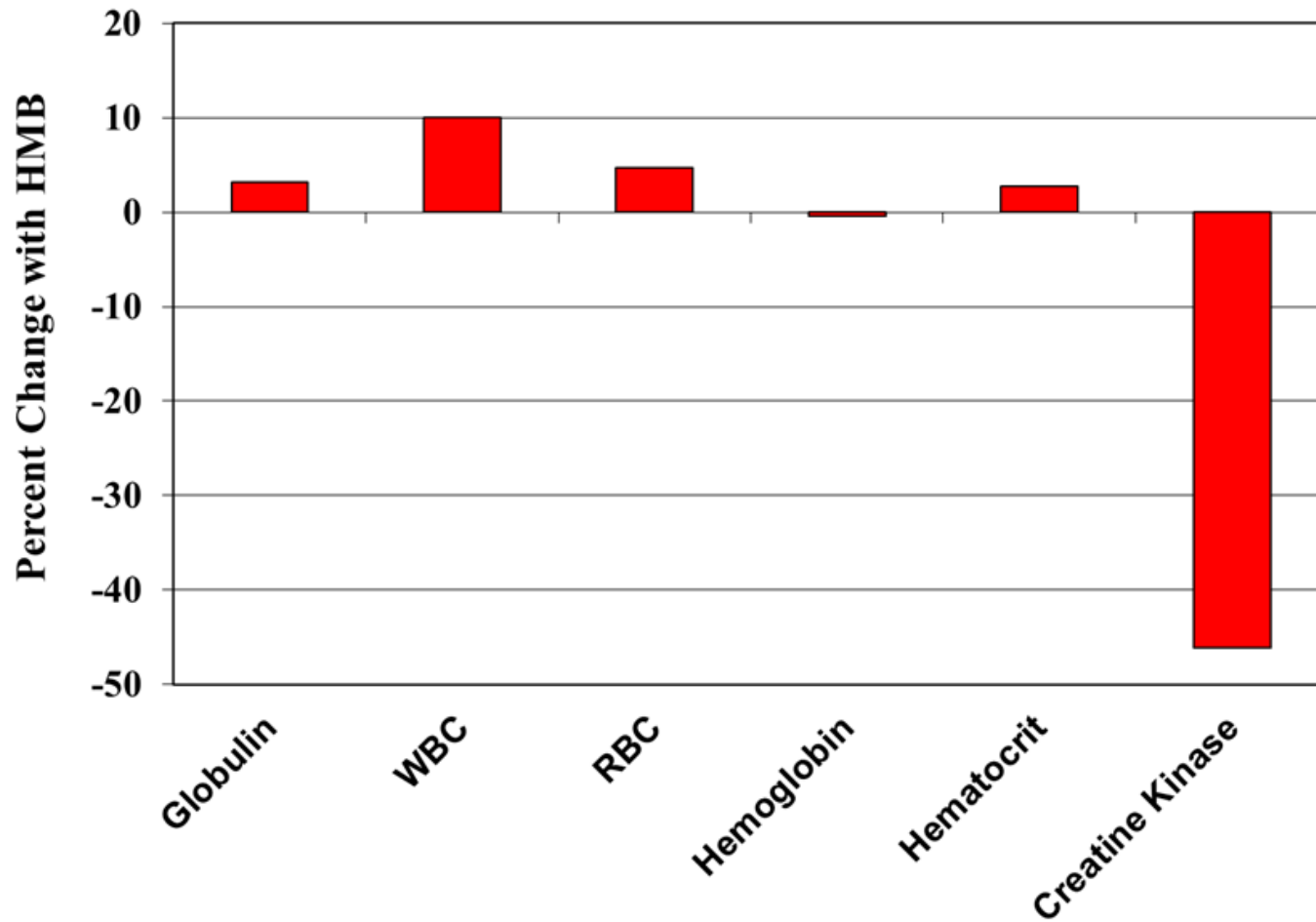
HMB Equine Support

Primary findings were an increase in indicators of aerobic performance

10 Quarter Horse and Paint geldings; 10 g of CaHMB per day (5 g/serving).



HMB Equine Support



Net HMB Effect on Initial Training Period

48 thoroughbred horses; 10 g of CaHMB per day (5 g/serving)

HMB Equine Support

- increased indicators of aerobic metabolism
- allowed the horses to condition faster
- tended to decrease muscle damage allowing for a faster recovery
- improved performance



The Best Solution for Muscle Loss

- HMB is one of the most clinically validated nutritional ingredients for muscle health
- HMB has been shown to increase muscle mass, function and strength in aging adults
- HMB improves muscle recovery after exercise, injury, or illness
- With the improvement in muscle function and strength, HMB can improve mobility and positively impact joint stability



Complete mobility solution by combining:

- Joint health innovation from Glucosagreen® brand glucosamine
- Muscle health support from myHMB® brand HMB



- Manufactured and distributed exclusively by TSI Group Ltd, the **Glucosamine Experts**
- Expertise in developing custom formulations to optimize tablet, capsule or soft chew production
- Co-branding opportunity with a strong brand from the market leader



myHMB is the best source of HMB on the market:

- discovered compound
- used in safety, toxicity, and efficacy studies
- trusted history of quality and supply

Make **myHMB** part of your mobility solution for companion animal products

Thank you!