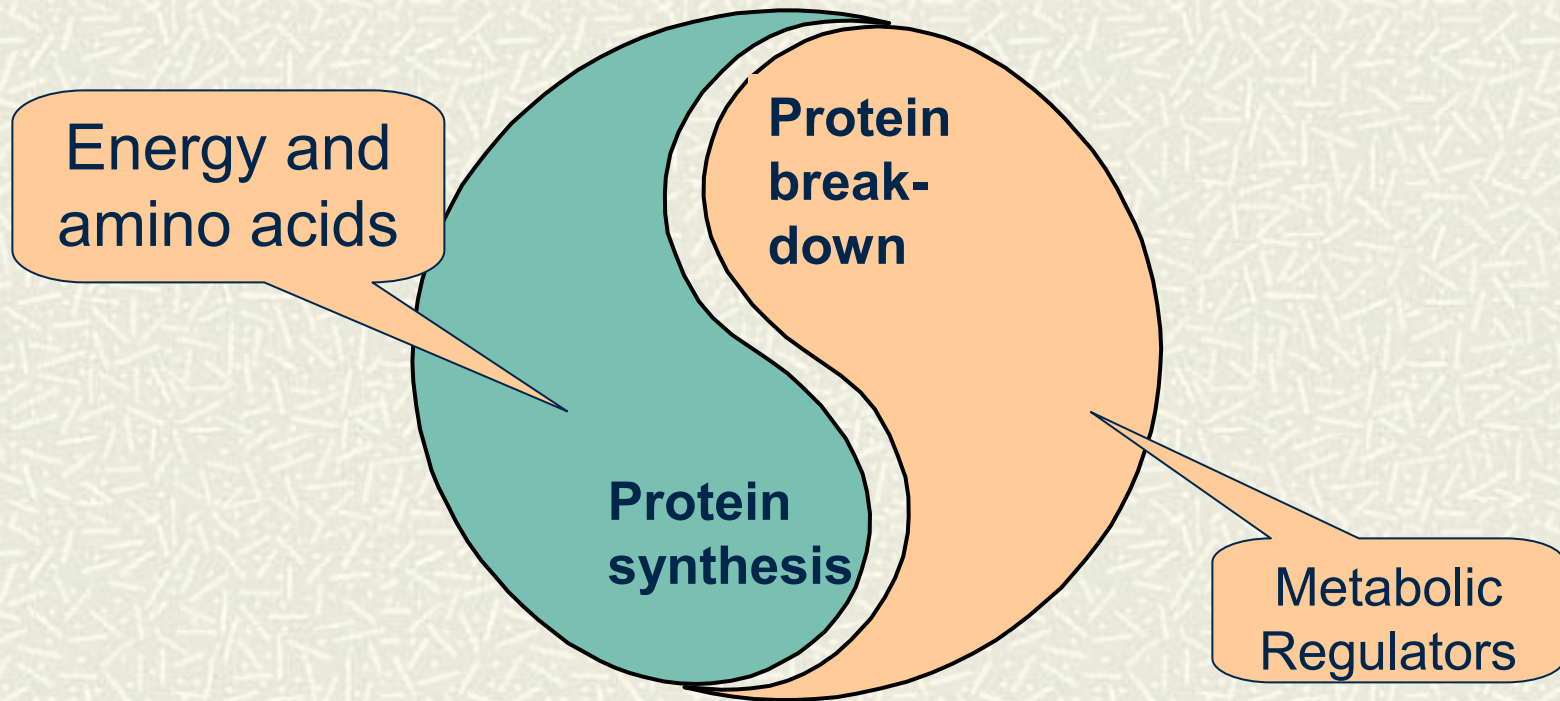
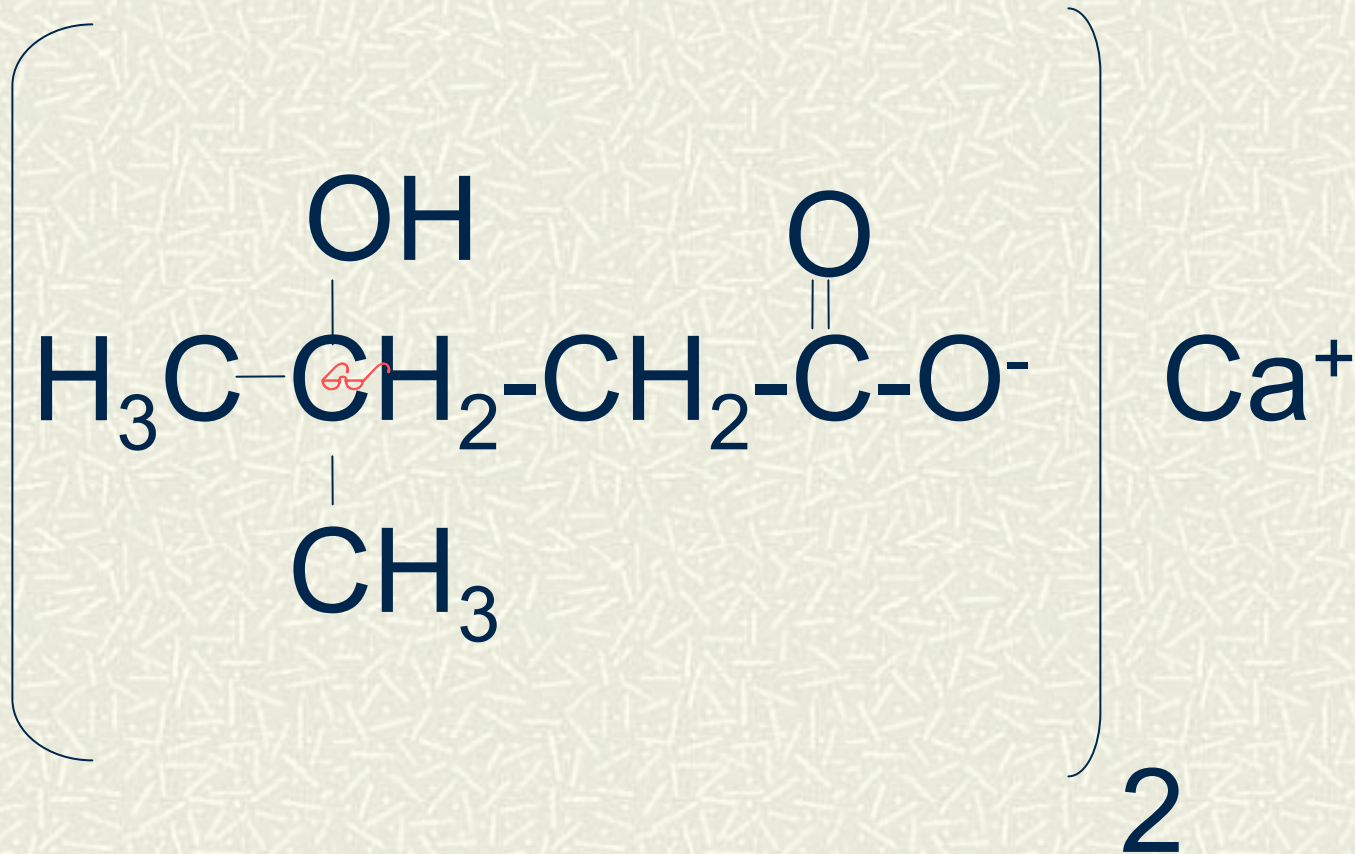


# Nutritional Strategy



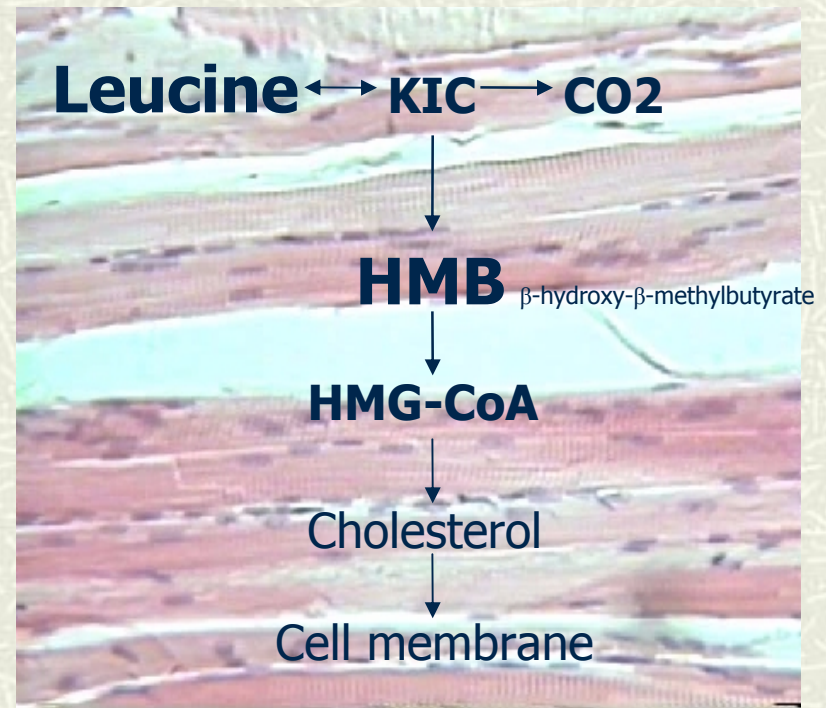
# HMB- ( $\alpha$ -hydroxy $\beta$ -methyl butyrate)



# HMB:

Theory:

# Cholesterol synthesis may limit cell growth/repair at certain times

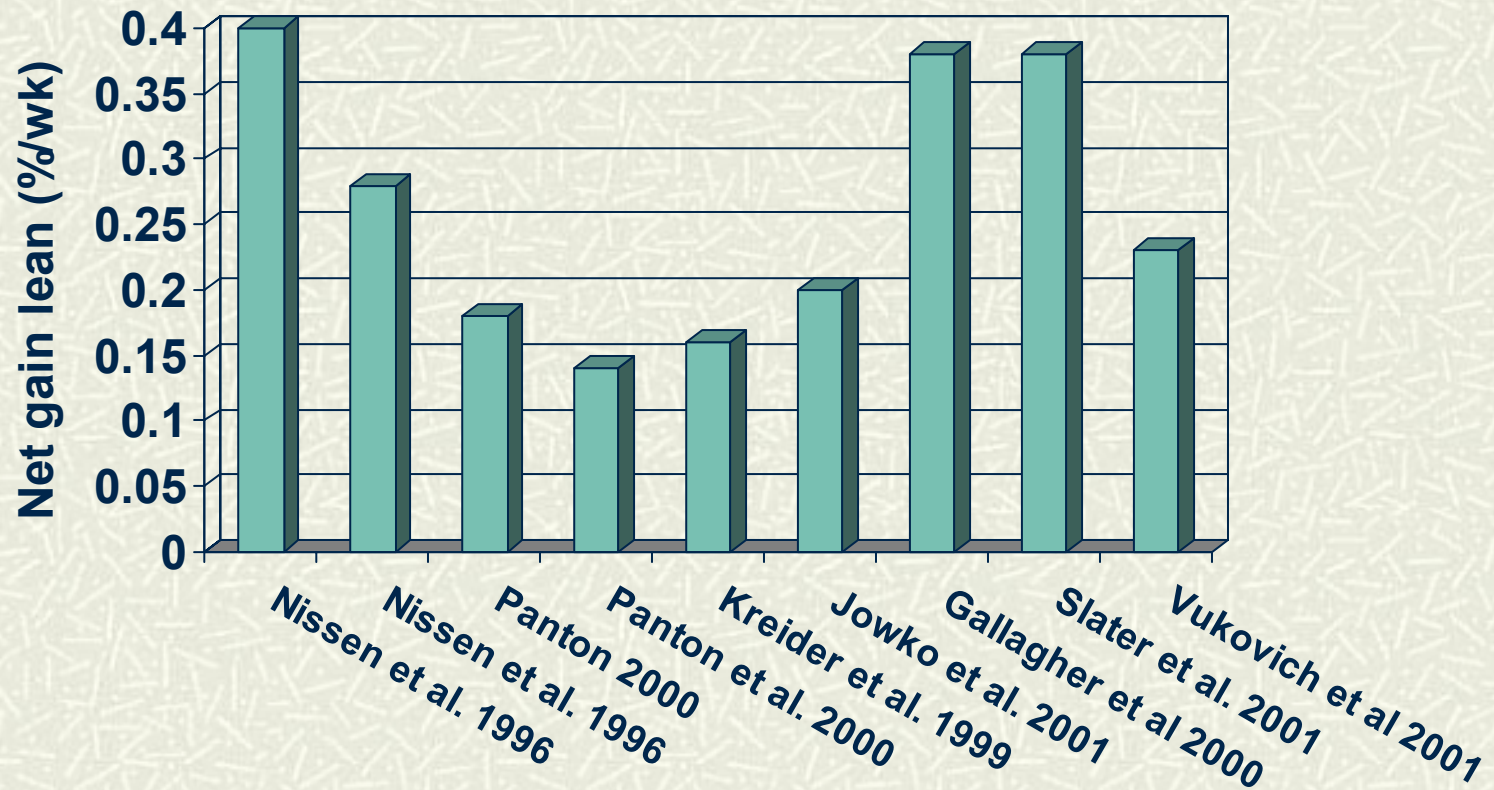


# Human Studies w/ HMB

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- # Adjunct for muscle building (Comparisons)
- # Safety
- # Combinations
- # Other effects

# HMB and Resistance training



# Safety: 3-12 weeks

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Physical	No Adverse effects *Decreased BP
Blood chemistry	No adverse changes *Lower cholesterol
Blood hematology	No adverse changes
Emotional	No adverse changes *Less negative mood

# Meta-Analysis:

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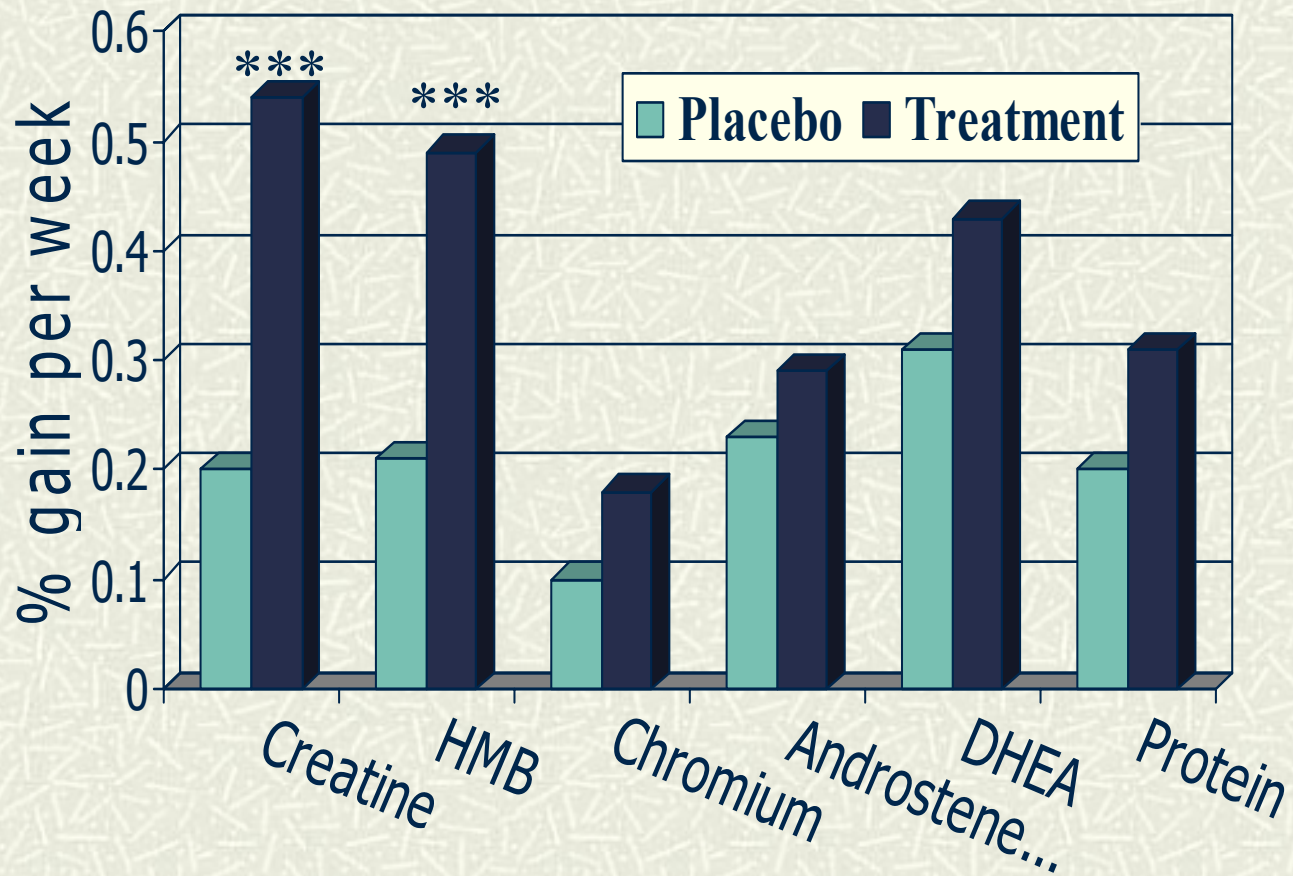
- # Body composition
- # Minimum 3-weeks
- # Minimum trained 2x per week
- # Placebo controlled
- # Statistical information for ES
- # Protein-(placebo issues)

# Meta-analysis: 250+ included

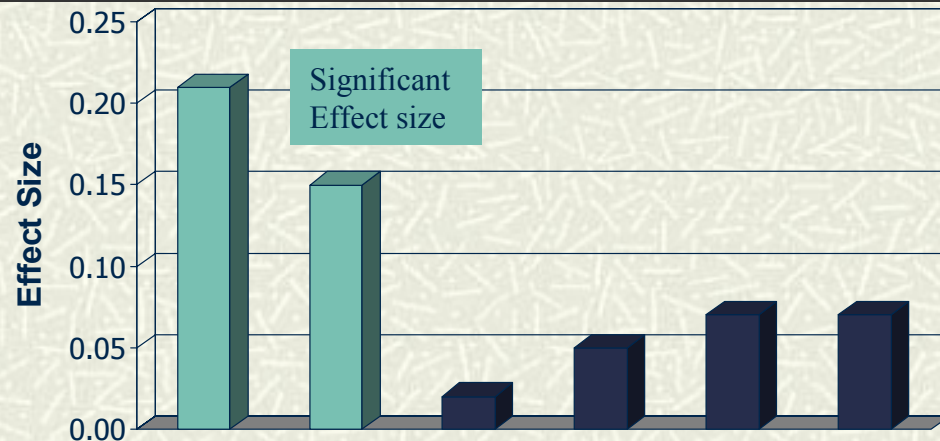
	Qualified studies	Quality score	
Creatine	15	37	
HMB	9	35	
Chromium	12	33	
Androstenedione	3	32	
DHEA	2	24	
Protein	4	27	



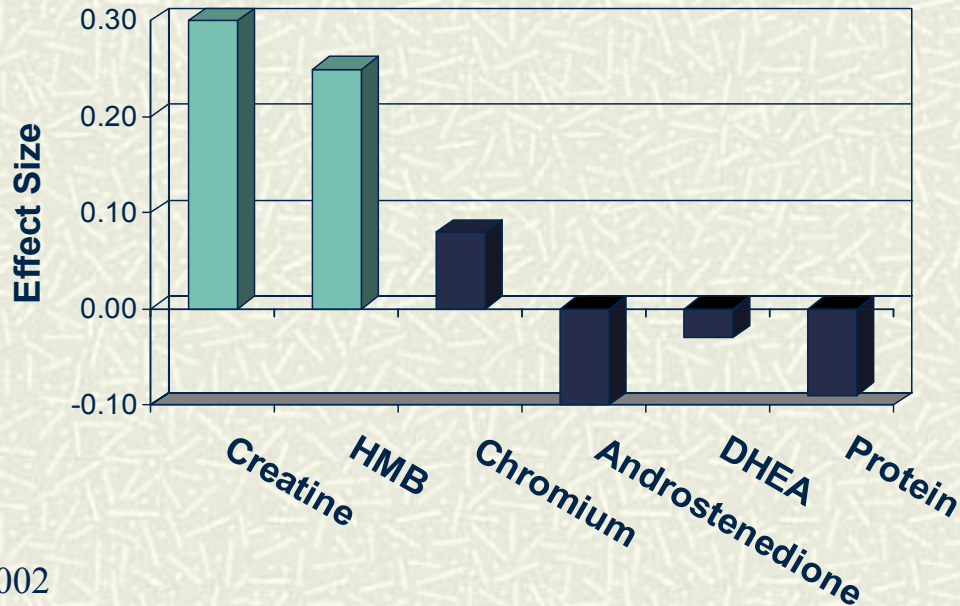
# Lean Tissue Gain



# Meta-Analysis



Lean Tissue Gain

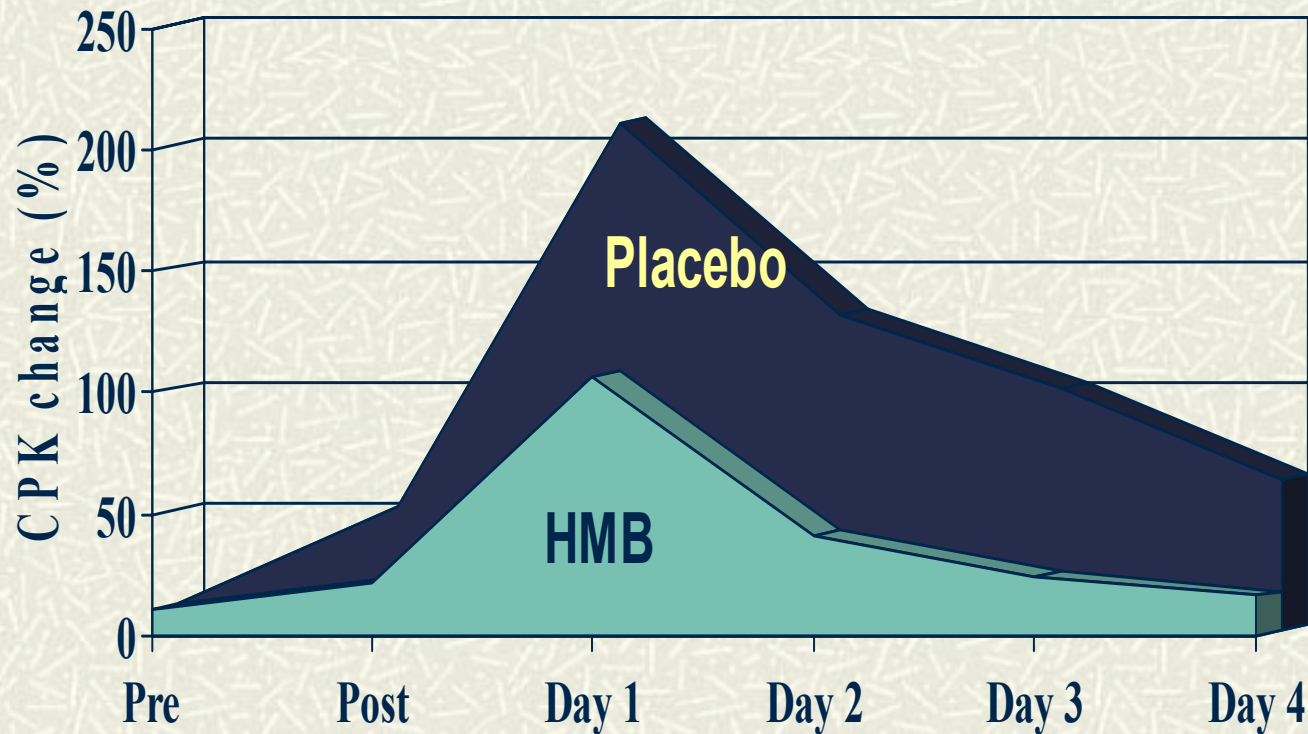


Strength Gain

# HMB and Creatine

	HMB	Creatine
<b>Lean gain</b> (weight training)	+++	++++
<b>Fat loss</b> (weight training)	++	+
<b>Health benefits</b> (BP and cholesterol lowered)	++++	+-
<b>Runner benefit</b> (protect muscle)	++	++-
		(risk of muscle damage)

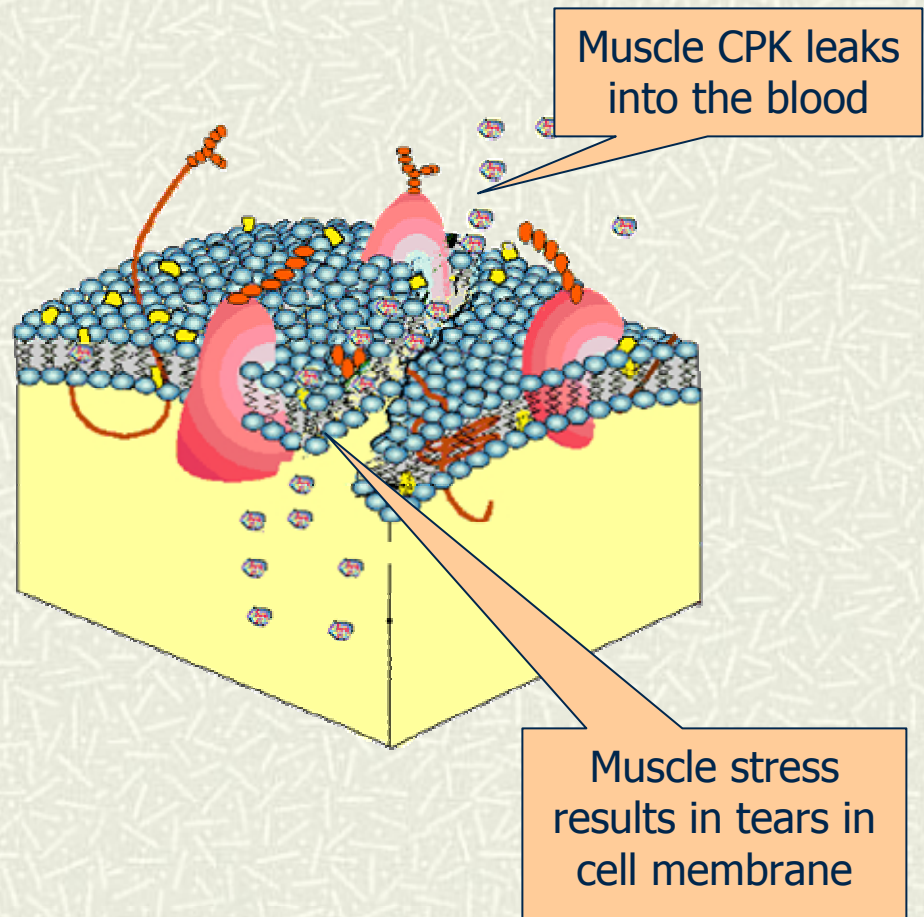
# Minimizing Muscle damage



**CPK after a 10K race**

# HMB effects on Damage

- # **CPK is 30-80% lower**
- # **Less muscle breakdown**
  - **Lower 3-methylhistidine**
  - **Lower proteases**
- # **Less soreness**



# Other observations

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- # Less Protein turnover (muscle)
- # Young and old: Men and women
- # Effect proportional to intensity
- # Immune function improved

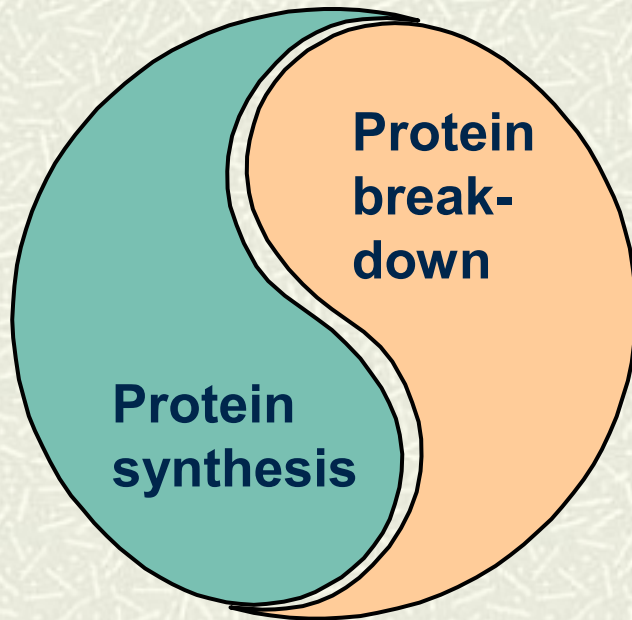
# Non exercising

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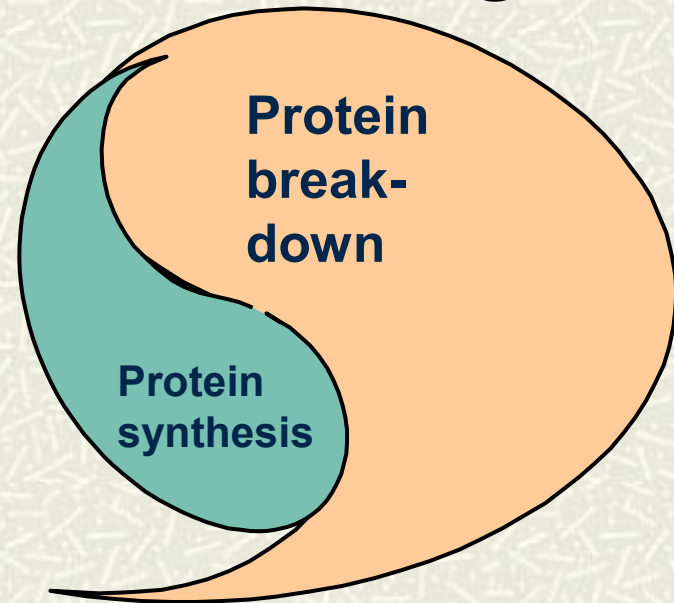
- # Sedentary young people
  - HMB: No demonstrable effect
  - Creatine: No demonstrable effect
  
- # Wasting?

# Mechanism of wasting

## Normal

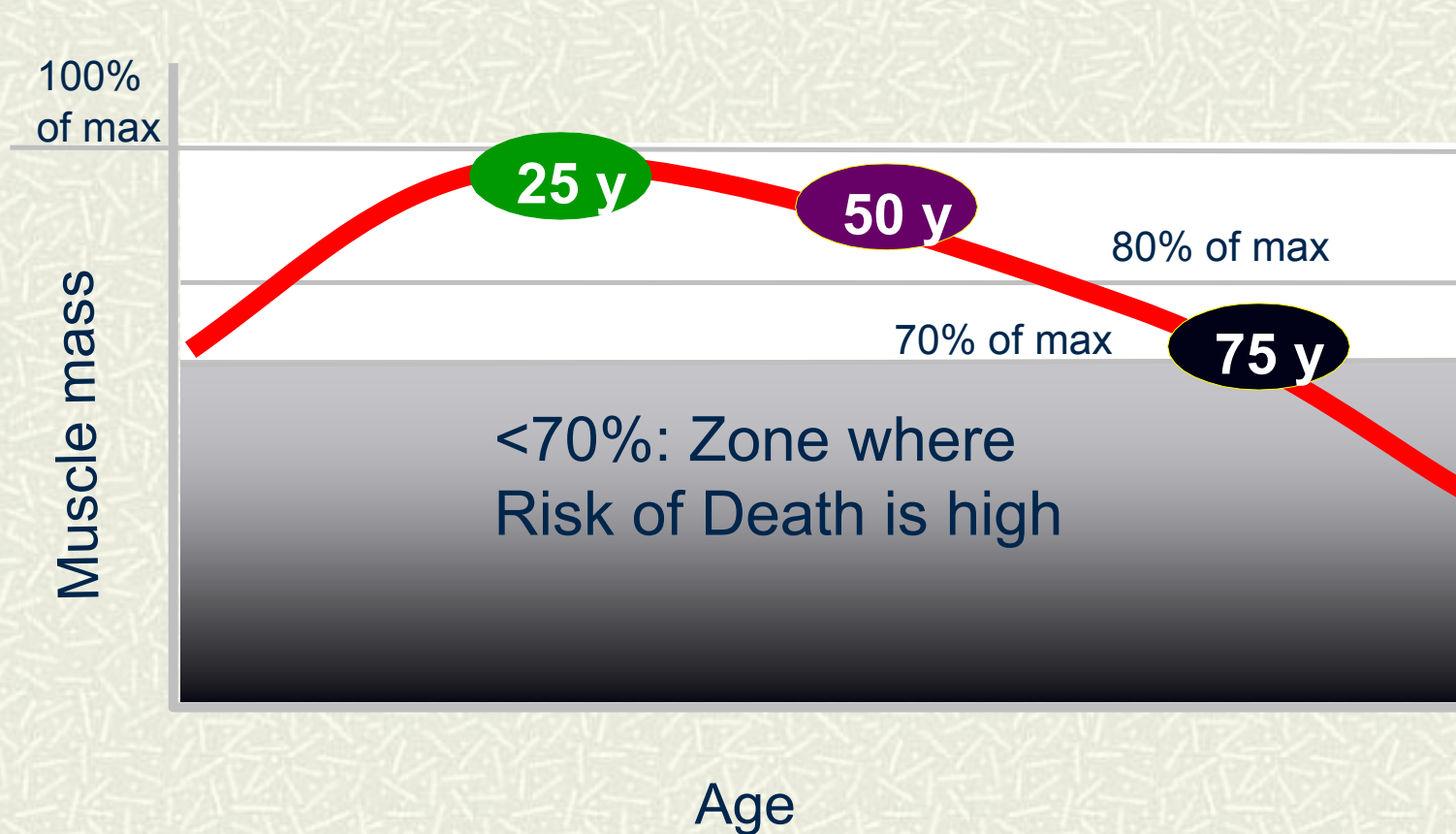


## Wasting





# Age-related muscle mass

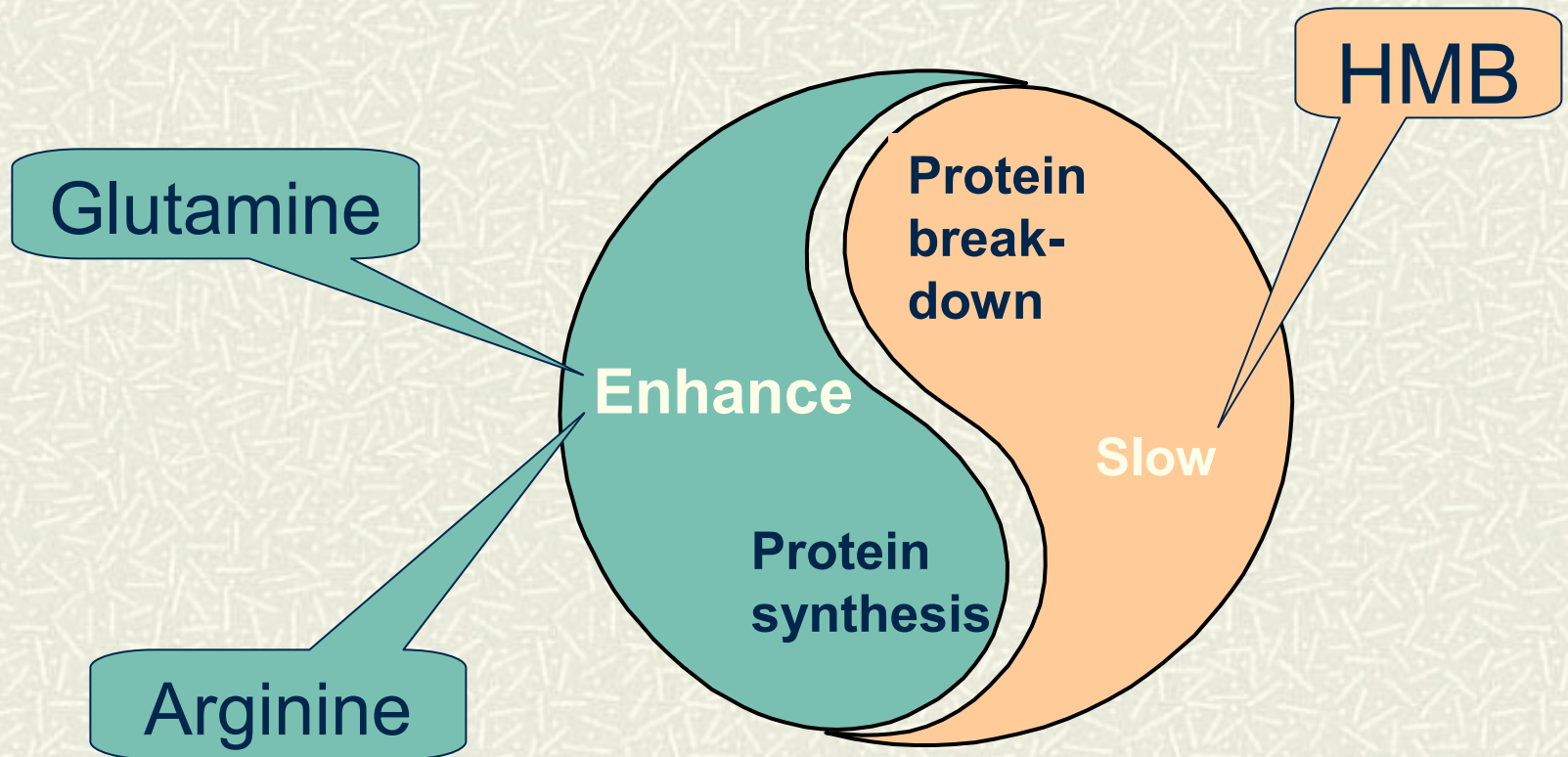


# Disease-related wasting

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- # Most AIDS patients waste
- # Nearly all stage 2-4 lung, pancreas, colon and upper GI cancers
- # >10% muscle loss=risk
  
- # Question: Can targeted nutrition reverse wasting?

# Targeted Nutritional Strategy



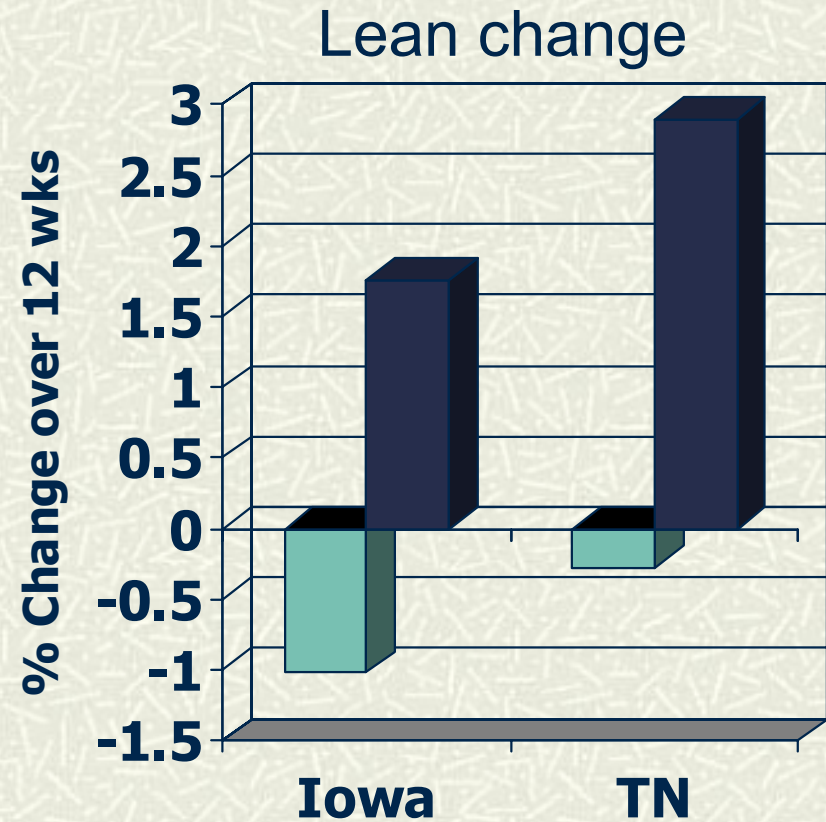
# Elderly protocol

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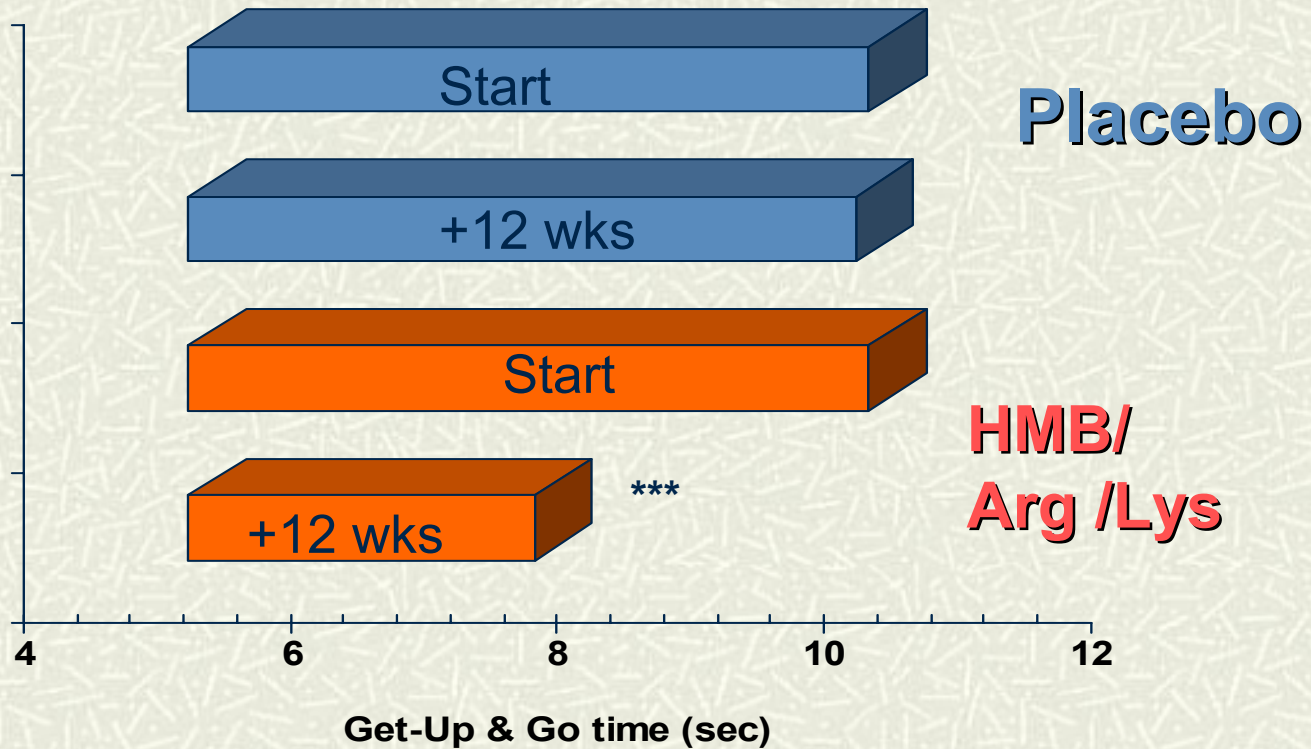
- # Age ~78 years
- # Two replicate experiments
- # Mostly women
- # 12 week study
- # Endpoints: lean tissue/mobility
- # Assisted living
- # 2 g HMB/5 g Arg/ 1.5 g Lysine
- # Once per day

# Body Composition changes

# Body lean: +1 kg



# Function (Get-Up & Go)



# AIDS/Cancer Protocols

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## # AIDS

- Lost >5% BW
- 36 subjects/8 wks

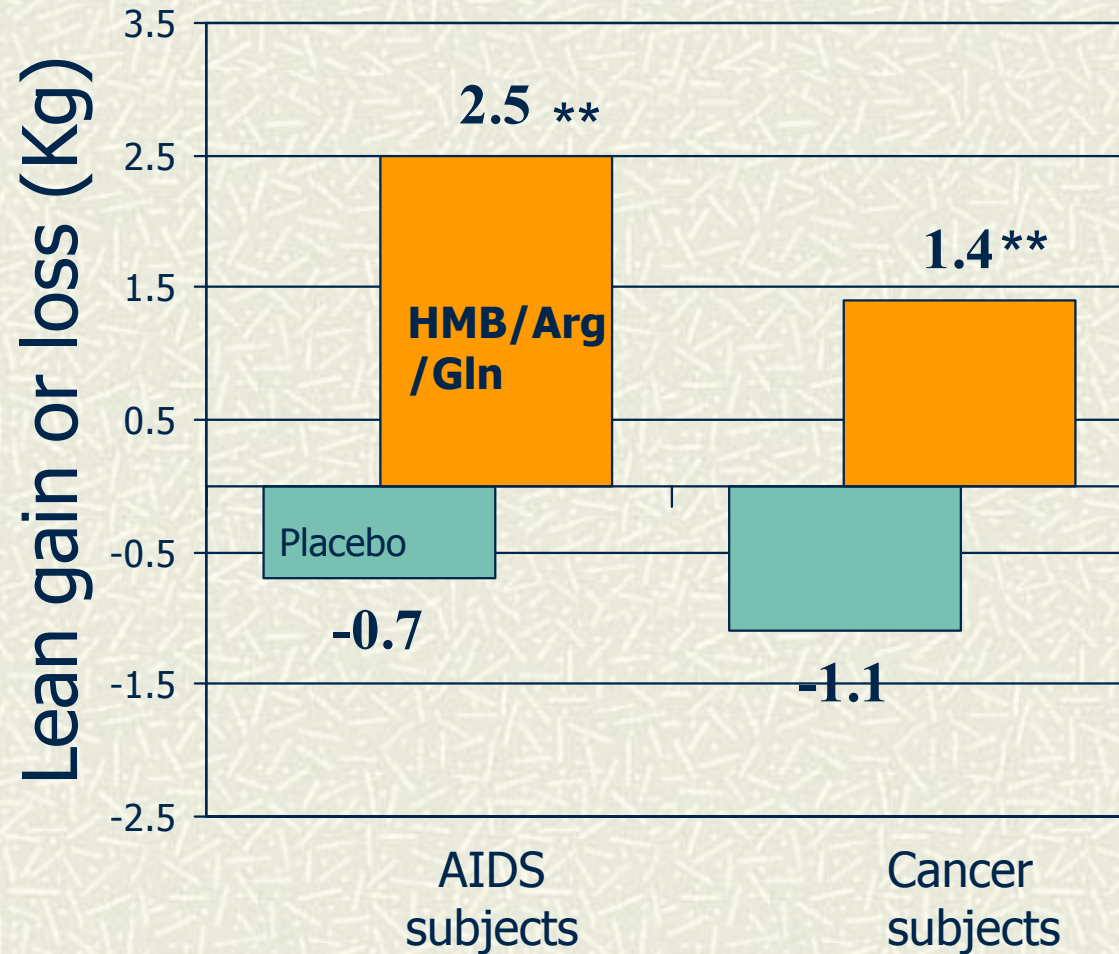
## # Cancer

- Lost 10% BW
- 40 subjects/8+wks

## # Mixture

- 3 g HMB
- 15 g Arginine
- 15 g Glutamine

# AIDS/Cancer comparison





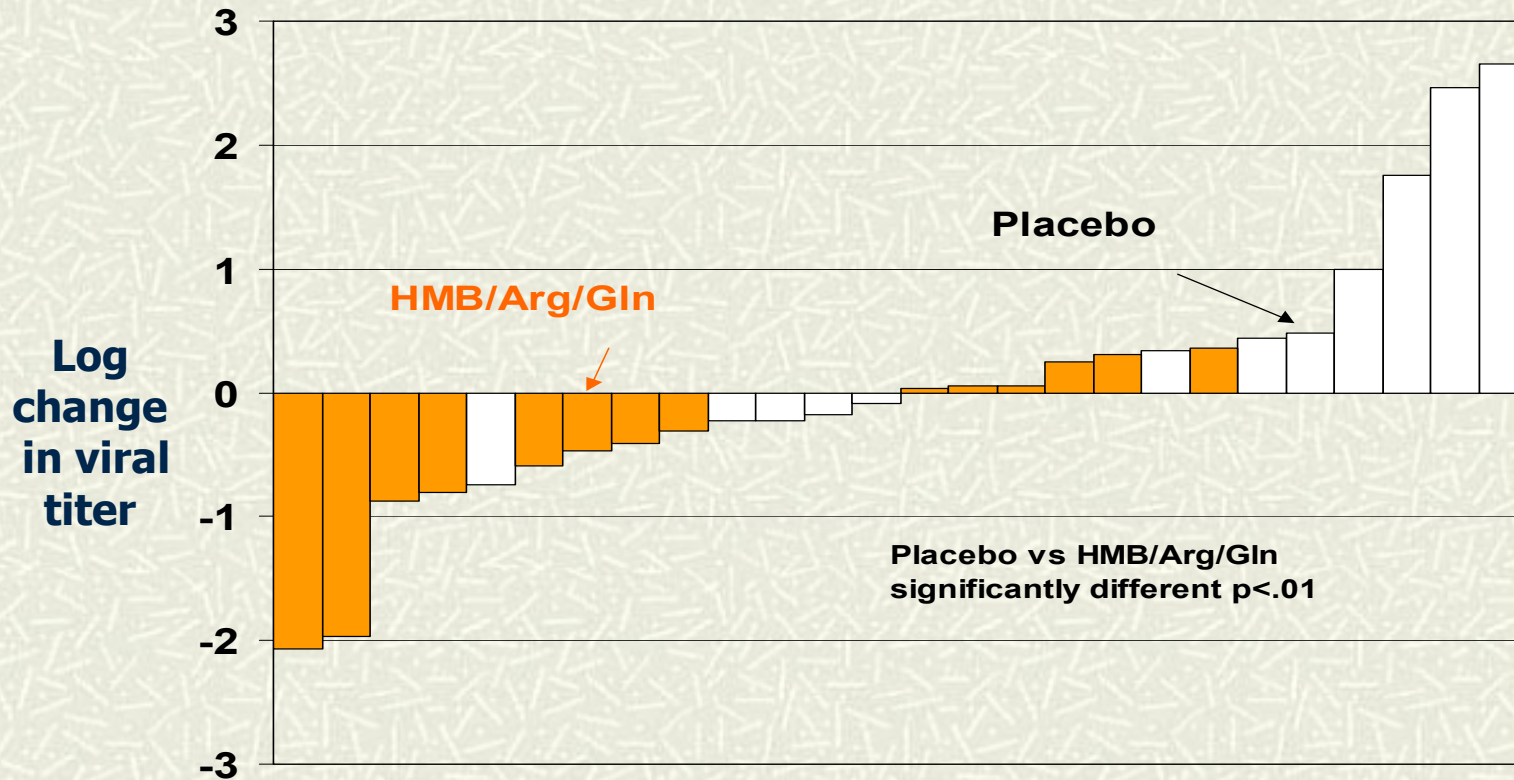
# HMB + amino acid

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- # Targeted nutritional strategy valid
- # Very slight wasting can be reversed
- # Very sever wasting can be reversed
- # Multi-center studies underway

# Muscle-Immune connection

Viral titers in AIDS subjects treated for wasting



# Summary

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- # 250+ nutrition supplements marketed:
  - Only creatine and HMB meet scientific threshold for resistance exercise
- # ~Double effect
- # Short-term safety
- # New applications:
  - Rational Combinations
  - Targeted