



Improving Wound Care Through Targeted Nutritional Therapy

Insert Speaker Name and Affiliation



Disclosure Statement

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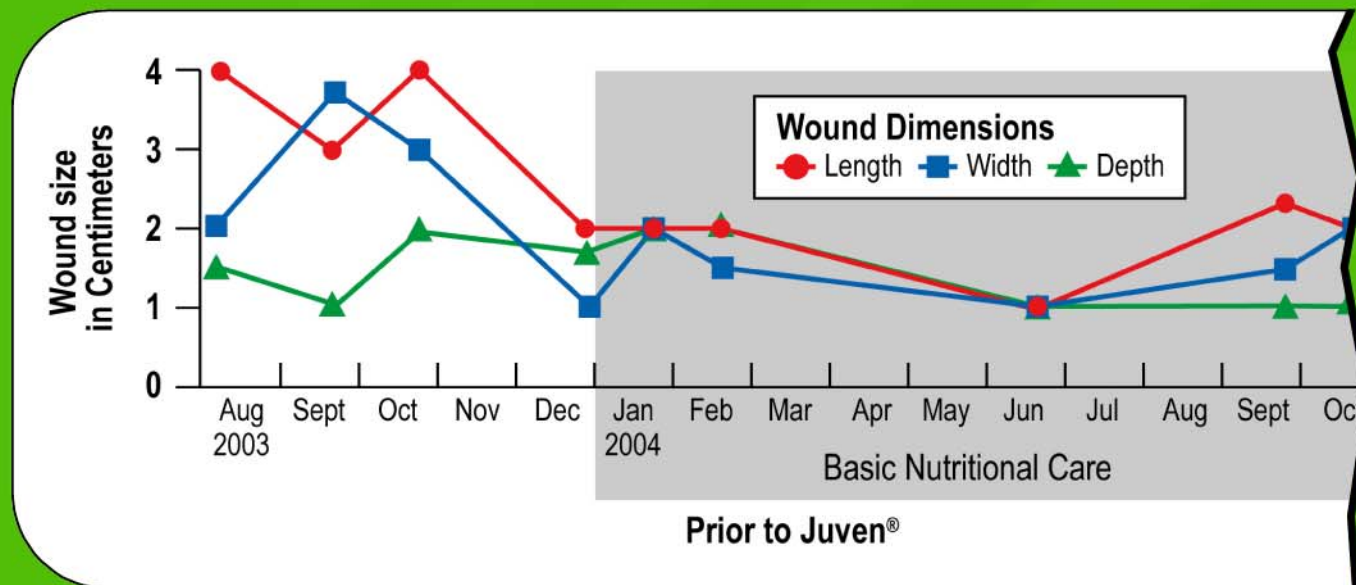
Today's Agenda

- Compare and contrast healing and chronic wounds
- Discuss the relationship between lean body mass loss and wound healing
- Explore functional amino acids
- Explain the role of Juven[®] in your plan of care



Case Study: SNF Pressure Ulcer Patient Care Utilizing Wound Protocol

- 84 year old female
- PMH: Diabetes mellitus, Alzheimer's with psychosis
- Stage IV pressure ulcer, right gluteal fold
- 14 months of standard treatment
- Transferred to hospice for 7 months in 2004; then returned to SNF





Scope of the Problem

- Each year nearly 1 million people develop pressure ulcers¹
- Resulting costs exceed \$1.3 billion¹
- Approximately 1.7 million people living with limb loss²
- 2- to 5-year life expectancy following amputation for chronic vascular disease for 60% of patients³
- Many other types of skin integrity problems that add to the burden of wound healing



Important Definitions Associated with Wound Care³

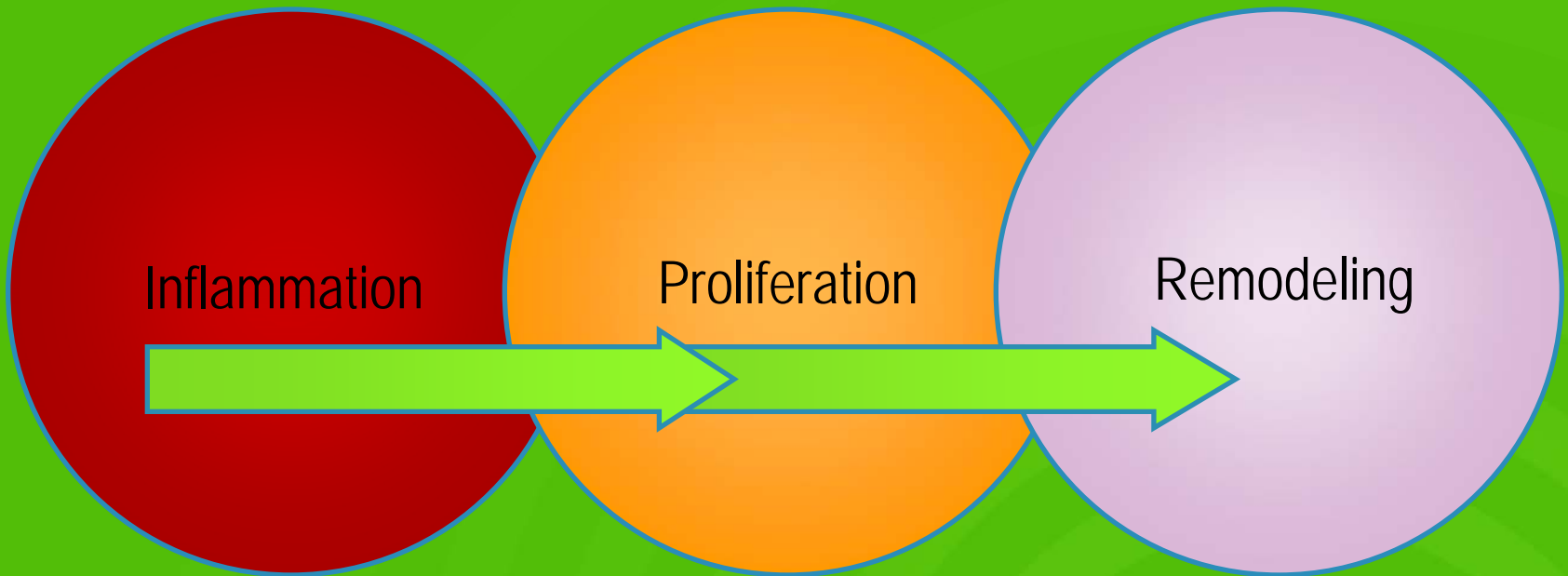
- Acute Wound
 - heals as expected and completely
 - **Chronic Wound**
 - fails to proceed through an orderly and timely process
 - usually considered 12 weeks
-
- Protein energy malnutrition (PEM)
 - deficiency of energy and protein
 - most common cause of malnutrition in patients
 - Lean body mass (LBM)
 - all body tissue except fat
 - metabolically active
 - accounts for 75% of normal body weight



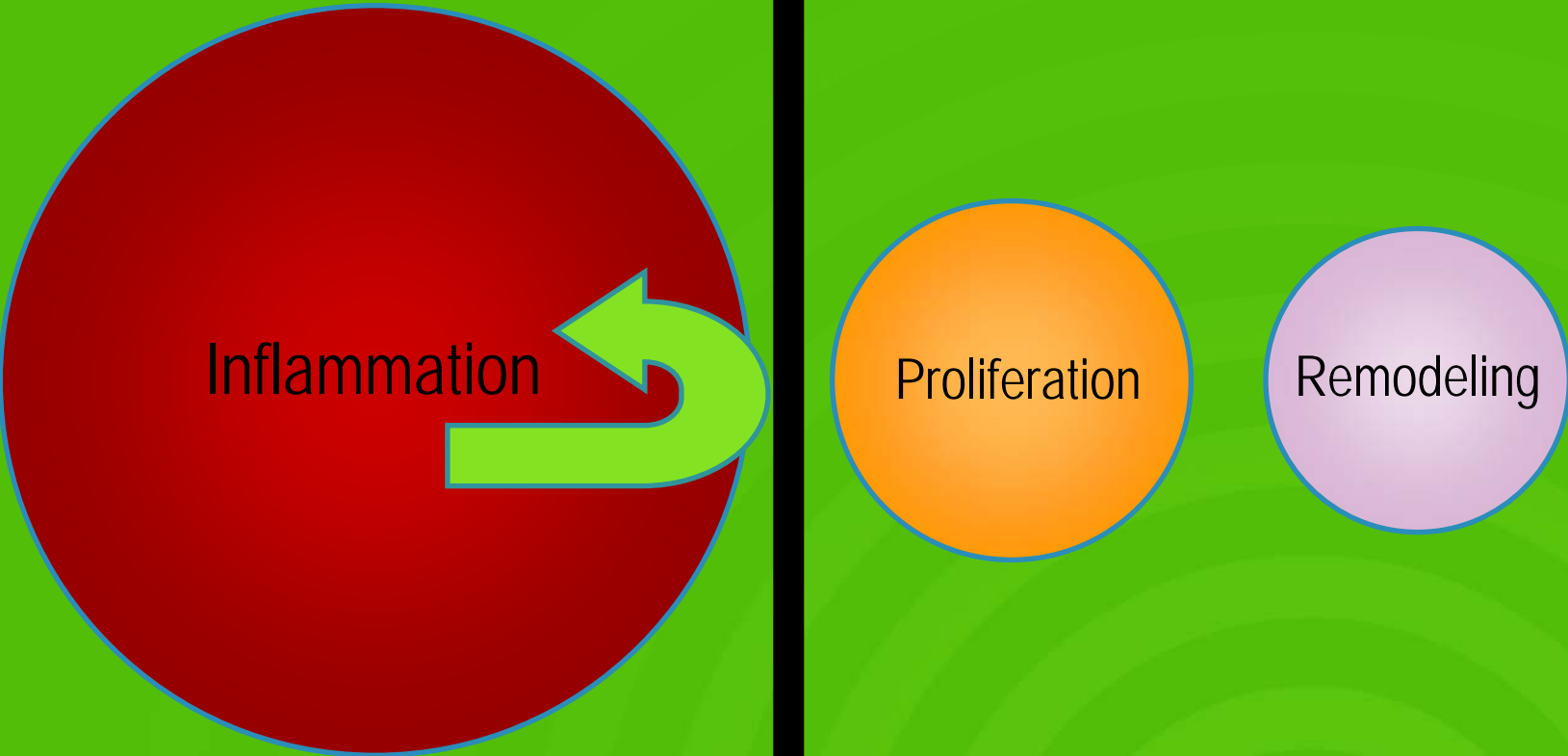


Normal Wound Healing Process⁴⁻⁵

Three predictable, overlapping phases:

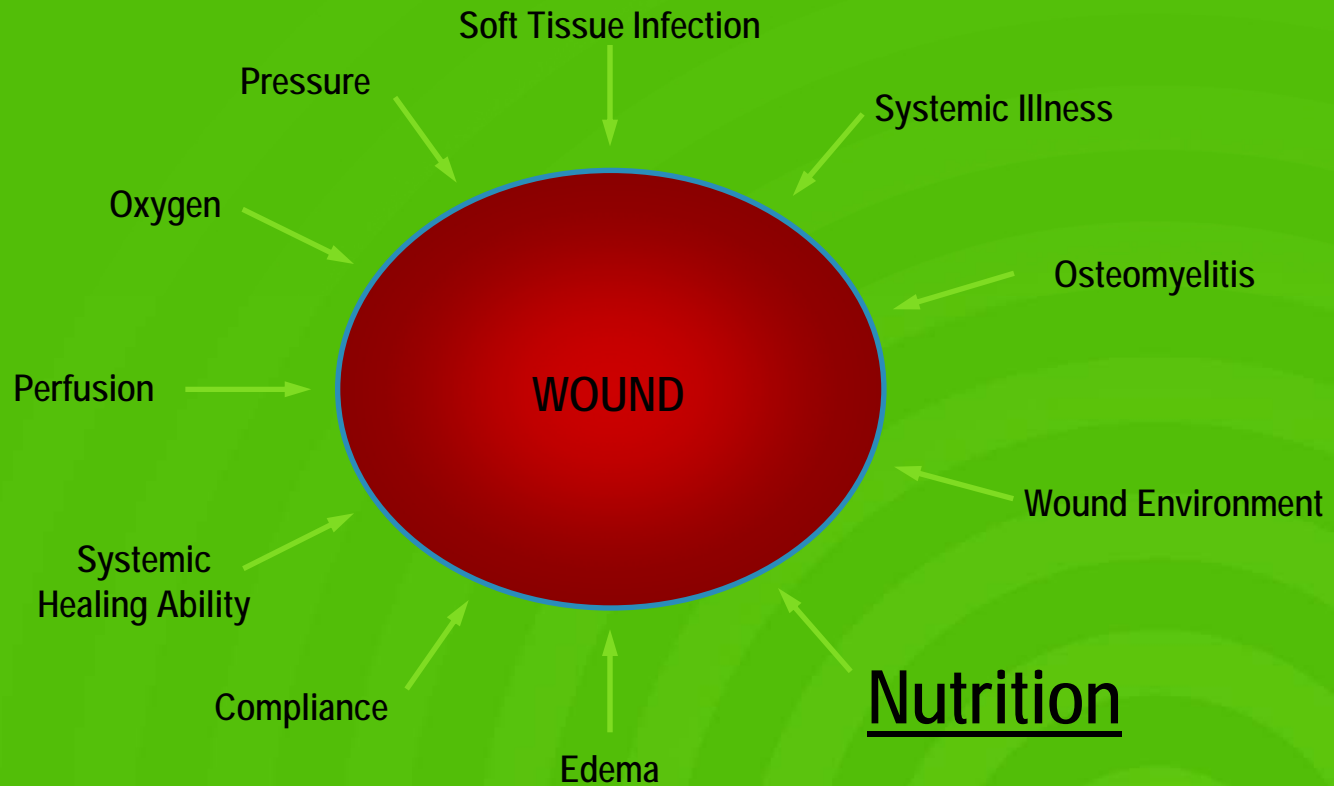


The Chronic, Non-healing Wound Process⁴⁻⁵

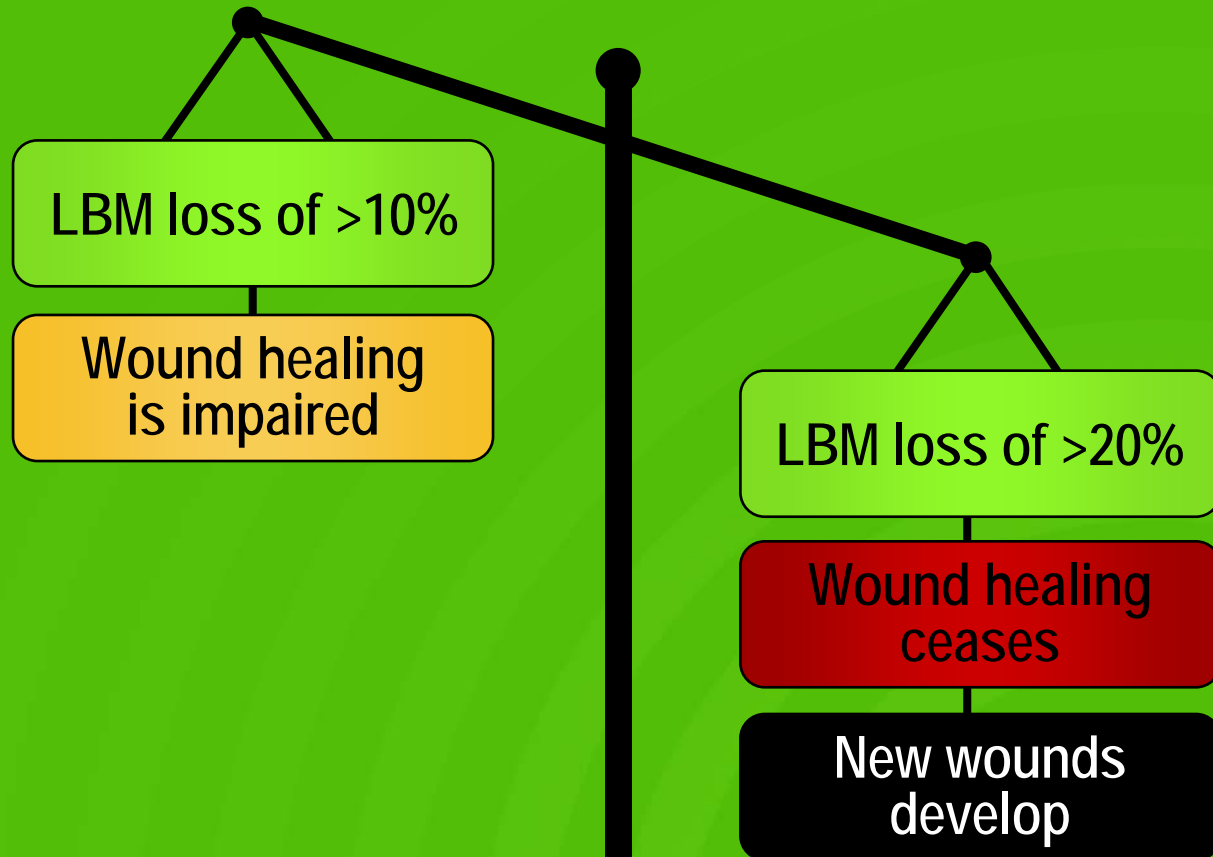


Factors That Affect Wound Healing⁶⁻⁹

Wound healing is a complex multifactorial process.



Relationship Between Loss of Lean Body Mass and Wound Healing¹⁰



Progressive Nature of Complications Related to Loss of LBM¹¹

Loss of Total LBM	Complications	Associated Mortality
10%	Decreased immunity, increased infections	10%
20%	Decrease in healing, increase in weakness, infection	30%
30%	Too weak to sit, pressure ulcers, pneumonia, lack of healing	50%
40%	Death, usually from pneumonia	100%



The Stress Response¹¹

- Amplified fight-or-flight reaction to injury, illness, or infection
- Hormonal response
 - Increased cortisol and catecholamines
 - Decreased growth hormones, anabolic hormones, and testosterone
- Energy demands increase; rapidly depletes lean body mass (protein stores)
- Results in catabolism and hypermetabolism



Prolonged Stress Response Results in Catabolism and Hypermetabolism¹²



Catabolic State:

A progressive loss of lean body mass in response to any significant insult, physiologic or psychologic



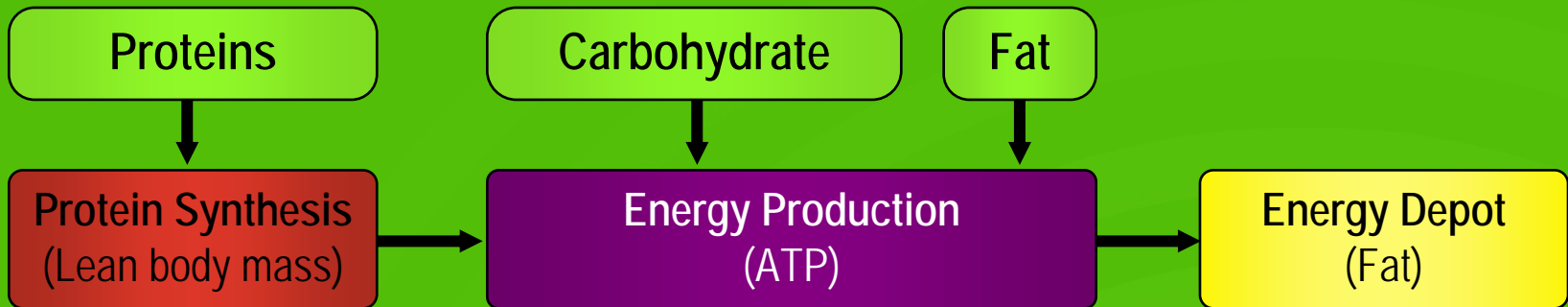
Hypermetabolic State:

An increase in energy demands that accompanies any significant physiologic and/or psychologic insult

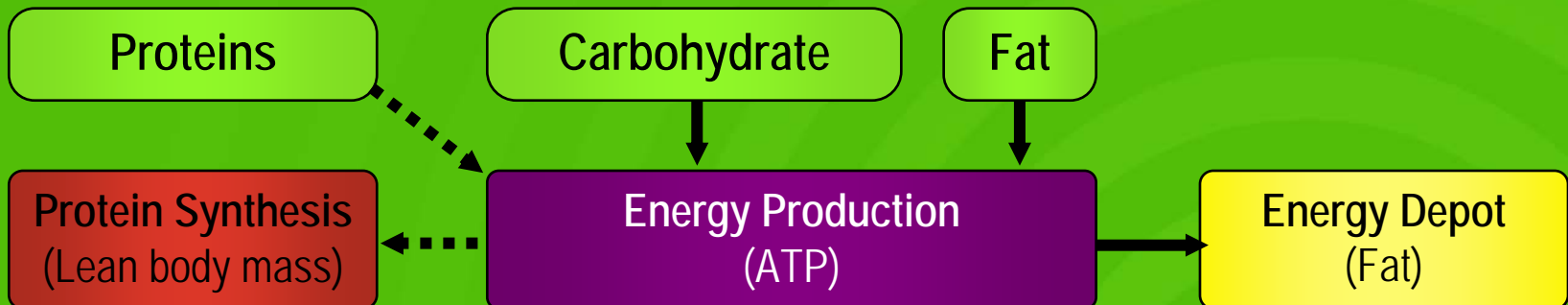


Nutrient Partitioning¹¹

Normal



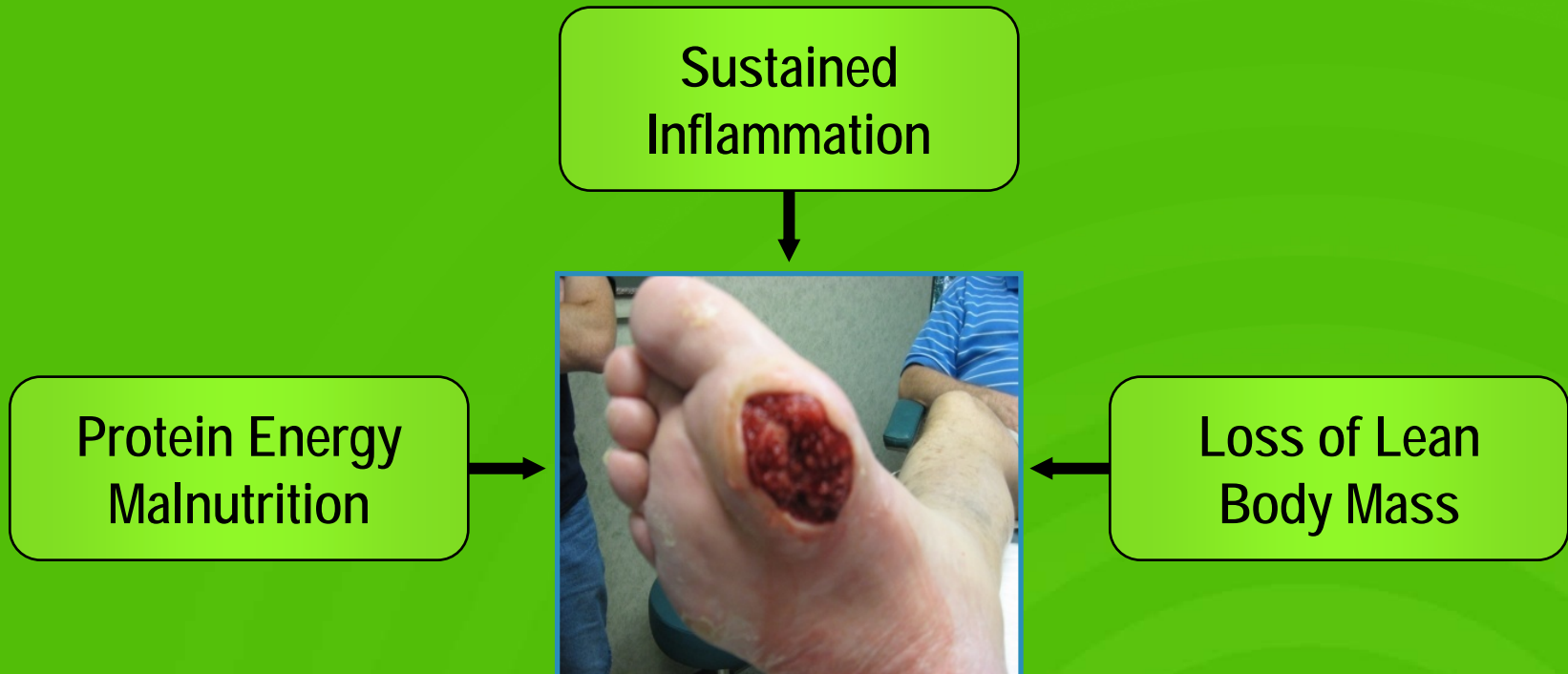
Defective



25% to 30% of the amino acids are misused.



Factors That Affect the Non-healing Wound⁴





Nutritional Interventions

Objectives of Medical Nutrition Therapy¹³

- Provision of adequate nutritional substrate on a daily basis
 - Calories
 - Protein
 - Fluids
 - Vitamins and minerals
 - Adjunctive therapy e.g. amino acids
- Goal: maintain and/or restore weight and lean body mass



General Guidelines for Calculation of Nutritional Requirements¹³

	General population	Protein calorie malnutrition (PEM)*	Seriously ill or injured*
Calories kcal/kg/day	25–30	30–35	35–40
Protein g/kg/day	0.8	1.5	1.5–2.0
Fat	< 30% kcals	< 30% kcals	< 30% kcals
Fluid Intake	Method 1: 30 mL/kg body weight Method 2: 1 mL/kcal	Method 1: 30 mL/kg body weight Method 2: 1 mL/kcal	Method 1: 30 mL/kg body weight Method 2: 1 mL/kcal

* Nutrition supplementation required.



Nutrient Needs in Real Terms

- 125 lb. (57 kg) female with Stage 2 pressure wounds
- 1710 – 1995 kcals/day (30 - 35/kg)
- 57 – 68 g protein/day
 - Real terms – about 8 – 9 oz. of meat per day
- 1710 – 1995 mL fluid/day
 - Real terms – about 7 – 8 fl oz. per day



Vitamin and Mineral Supplementation¹⁴

- **Vitamin A**
 - enhances cell proliferation
 - stimulates collagen synthesis
- **Vitamin C**
 - enhances collagen synthesis
 - increases formation of blood vessels
 - supports immune function
- **Vitamin E**
 - Stabilized cellular membranes
- **Zinc**
 - DNA synthesis
 - protein synthesis
 - cellular proliferation





Categories of Amino Acids¹⁴

- Indispensable Amino Acids (IAA)
 - Essential Amino Acids
- Dispensable Amino Acids (DAA)
 - Non-Essential Amino Acids
- **Conditionally Indispensable Amino Acids (CIAA)**
 - **Conditionally Essential Amino Acids**



Classification of Amino Acids¹⁵

IDAA

- Histidine
- Isoleucine
- **Leucine**
- Lysine
- Methionine
- Phenylalanine
- Threonine
- Tryptophan
- Valine

DAA

- Alanine
- Aspartic acid
- Asparagine
- Glutamic acid
- Serine

CIAA

- **Arginine**
- Cysteine
- **Glutamine**
- Glycine
- Proline
- Tyrosine

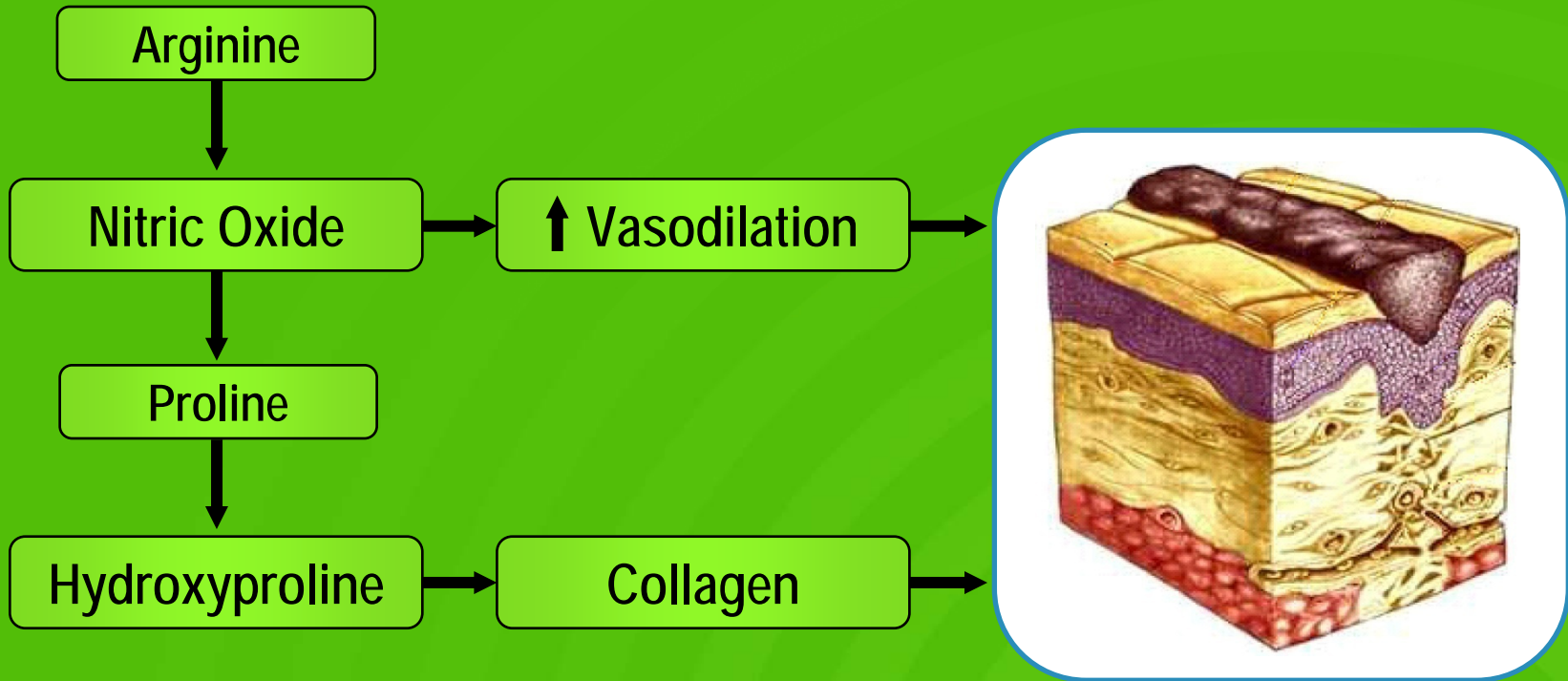


Arginine¹⁶

- Nitrogen rich – 32% nitrogen
- Helps support immune function
- Precursor to proline
- Improves IGF-1
- Precursor to polyamines
- Substrate for nitric oxide synthesis
 - Activates macrophages
 - Improves vasodilation
 - Increases collagen formation
- Stimulates phosphorylation of mTOR to activate downstream anabolic effects



The Function of Nitric Acid in Wound Healing¹⁷



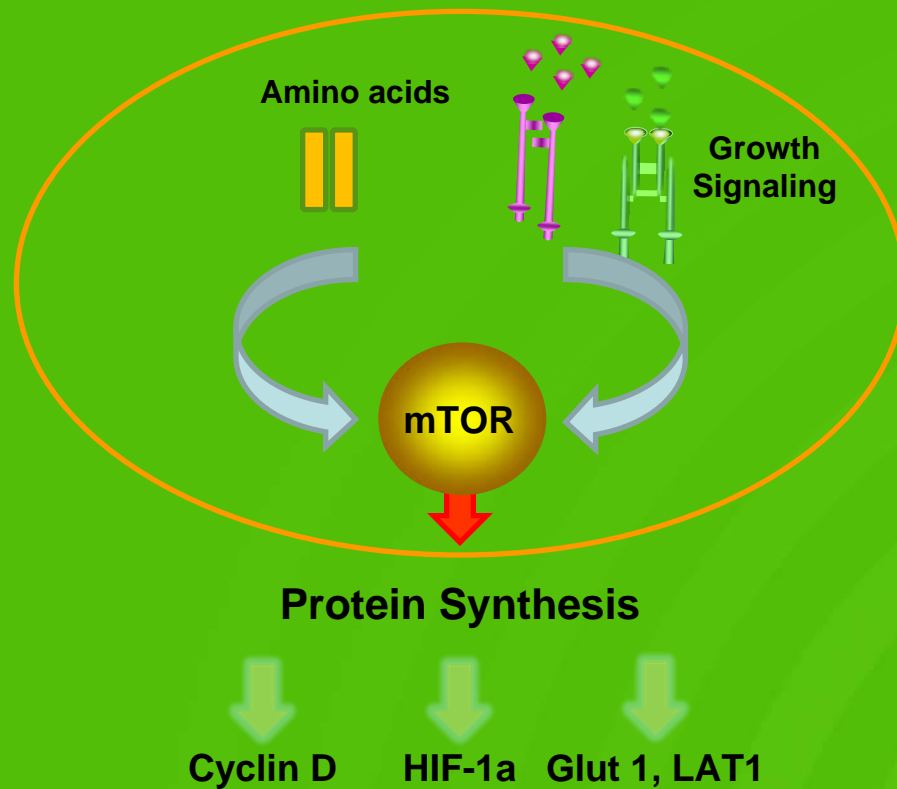
Cell Signaling¹⁸⁻¹⁹

- TOR (target of rapamycin)
 - protein kinase
 - central element in a signaling pathway, which controls cell growth and proliferation
- mTOR = mammalian target of rapamycin
- TOR signaling is activated by key functional amino acids:
 - Arginine
 - Glutamine
 - Leucine





mTOR Activation Supports Cell Growth²⁰

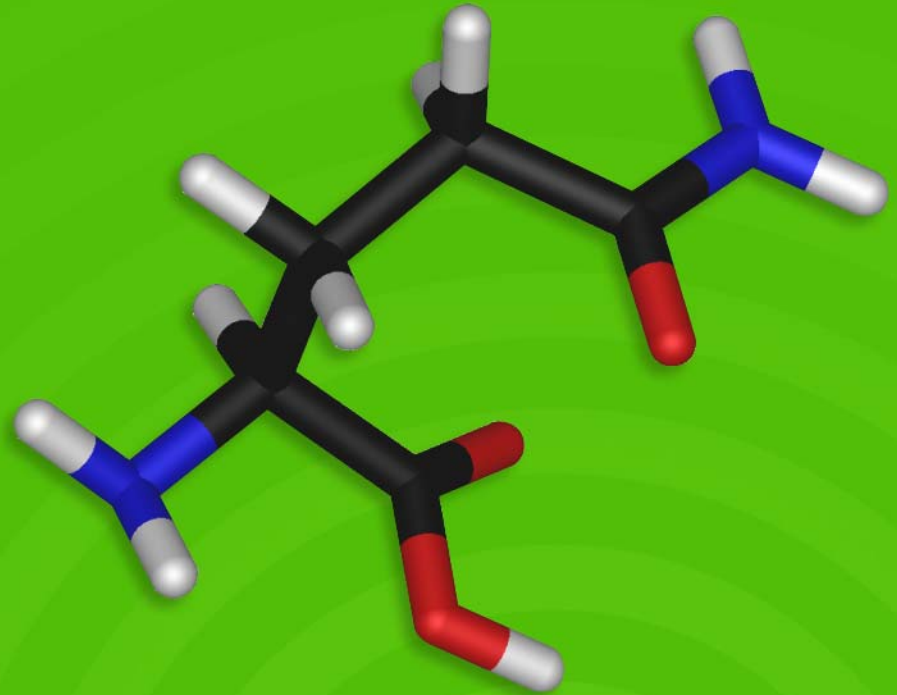


- Normal mTOR function is vital for wound healing
- Arginine, glutamine and leucine activate mTOR



Glutamine²⁰⁻²¹

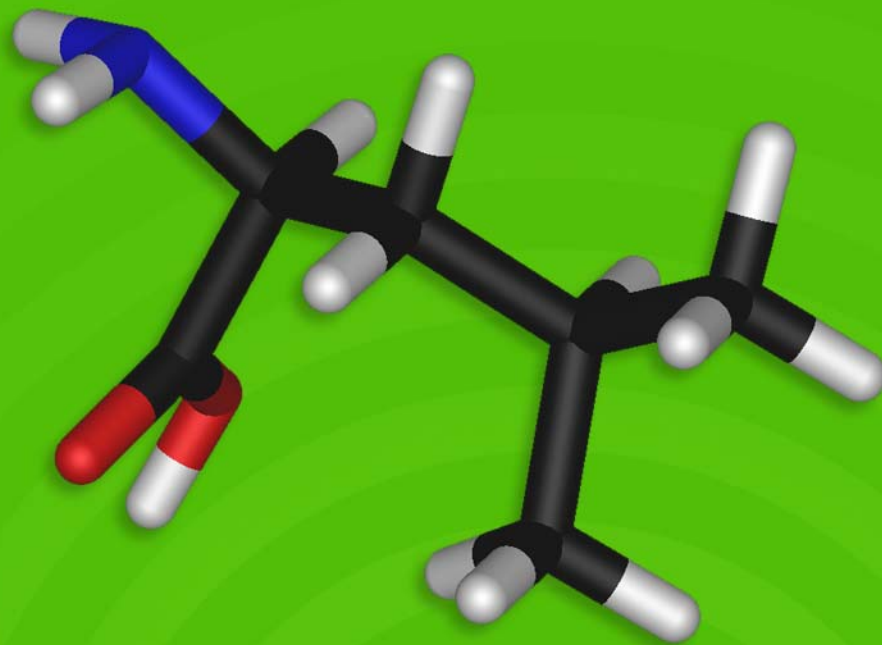
- Most abundant amino acid in the body
 - > 20% total circulating AA
 - > 60% free intracellular AA
- Increased needs in trauma and sepsis
- Benefits of supplemental glutamine include:
 - Stimulates collagen synthesis
 - Regulates nitrogen metabolism in catabolic states
 - Supports immunity
 - Supports gut integrity





Leucine²³⁻²⁴

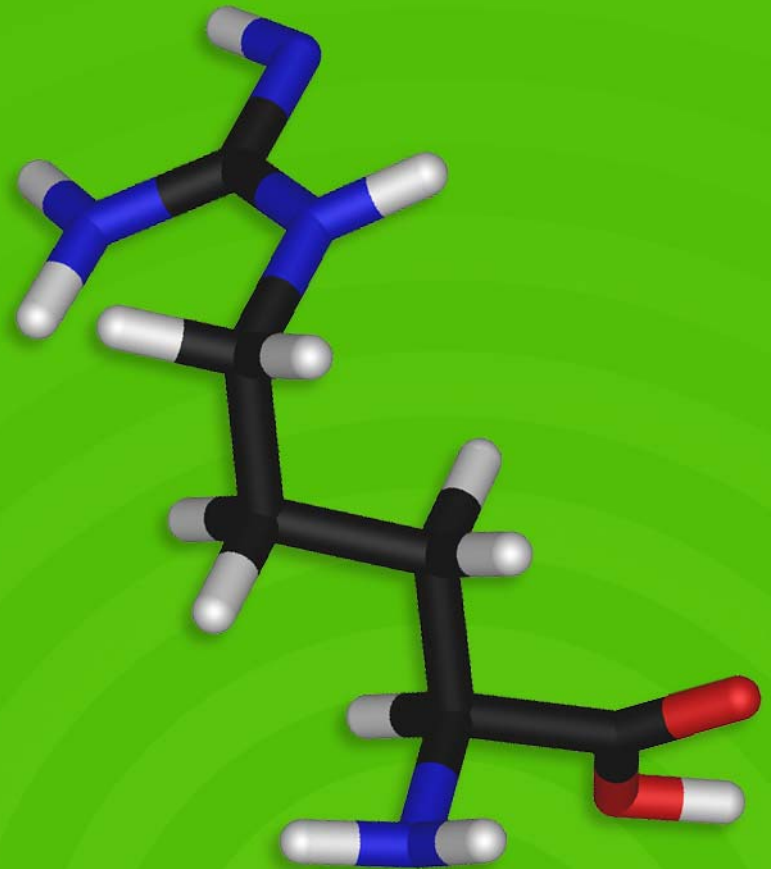
- Branched chain amino acid
- Stimulates mTOR signaling
- Inhibitor of protein degradation in incubated skeletal muscle and in perfused liver
- Stimulates muscle protein synthesis under both *in vitro* and *in vivo* experimental conditions
- 5% of leucine is converted to HMB



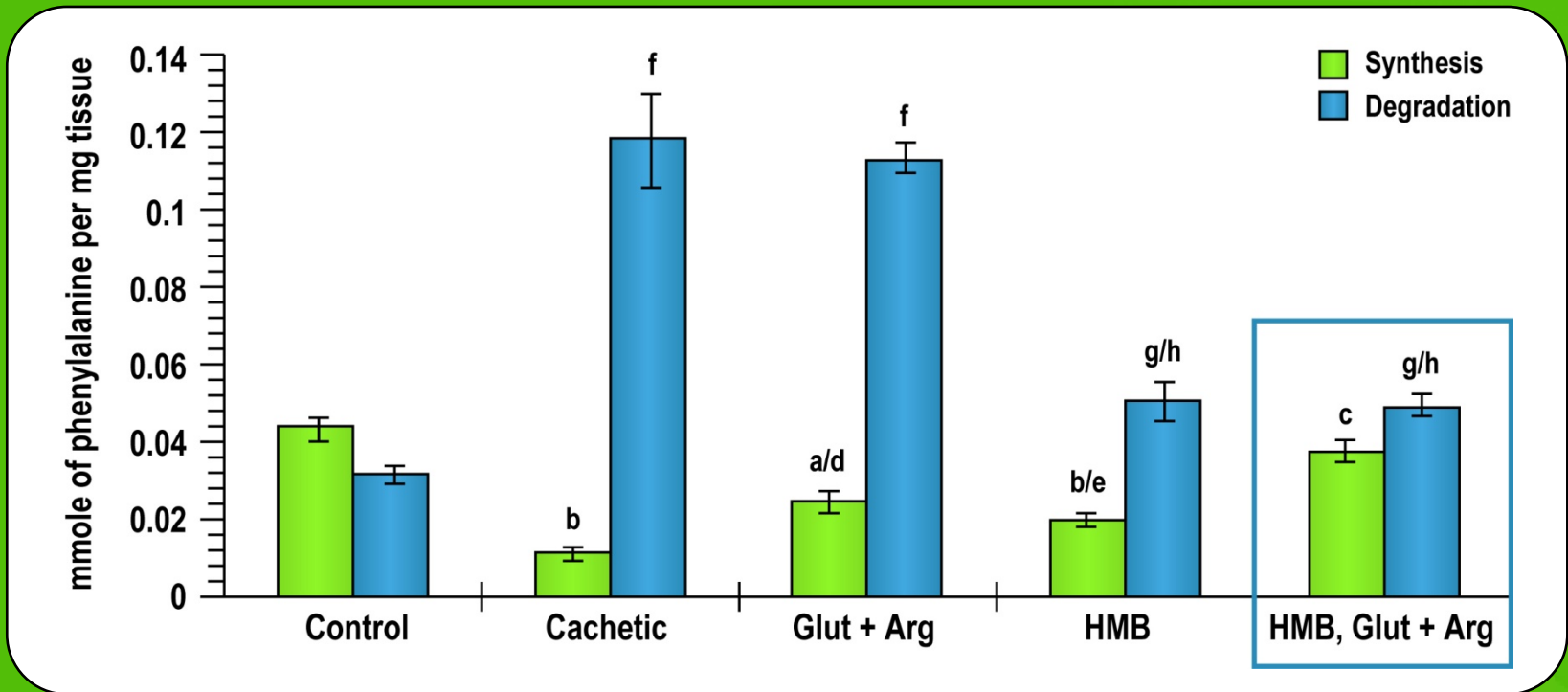


β -Hydroxy- β -methylbutyrate (HMB)²⁵⁻²⁸

- Metabolite of amino acid leucine
- Precursor for the manufacture of cholesterol
 - Helps maintain muscle membrane integrity
 - Slows muscle tissue breakdown
- Helps support immune function
- Anabolic Support
 - Reduces the inflammatory response
 - Decreases muscle breakdown
 - Builds LBM
 - Protects muscle from stress-related damage



Effect of HMB, glutamine and arginine on protein synthesis and degradation²⁹



f= $p < 0.001$ from Control degradation

g= $p < 0.001$ from Cachectic degradation

h= $p < 0.001$ from Glut+ Arg degradation, using one-way ANOVA with Tukey-Kramer Multiple Comparison Test (n=6)

a= $p < 0.01$ and b= $p < 0.001$ from Control synthesis

c= $p < 0.001$ from cachectic synthesis

d= $p < 0.05$

e= $p < 0.01$ from HMB, Arg + Glut synthesis using one-way ANOVA with Tukey-Kramer Multiple Comparison Test (n=6.)



Introducing Juven[®]

- Combination of arginine, glutamine and HMB
- Targeted nutrition therapy
 - Helps build and maintain lean body mass (LBM)
 - Supports healing

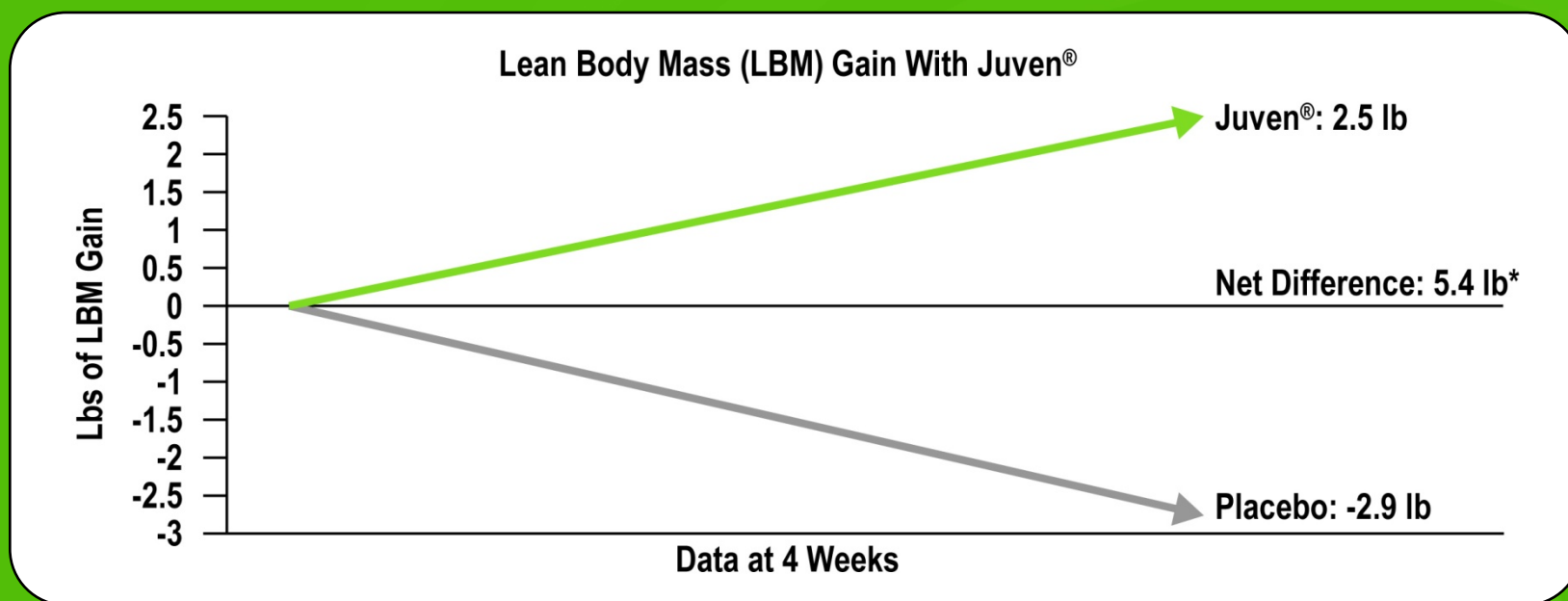


Use Juven under medical supervision and as part of a complete balanced diet



Reversal of cancer-related wasting using Juven[®]30

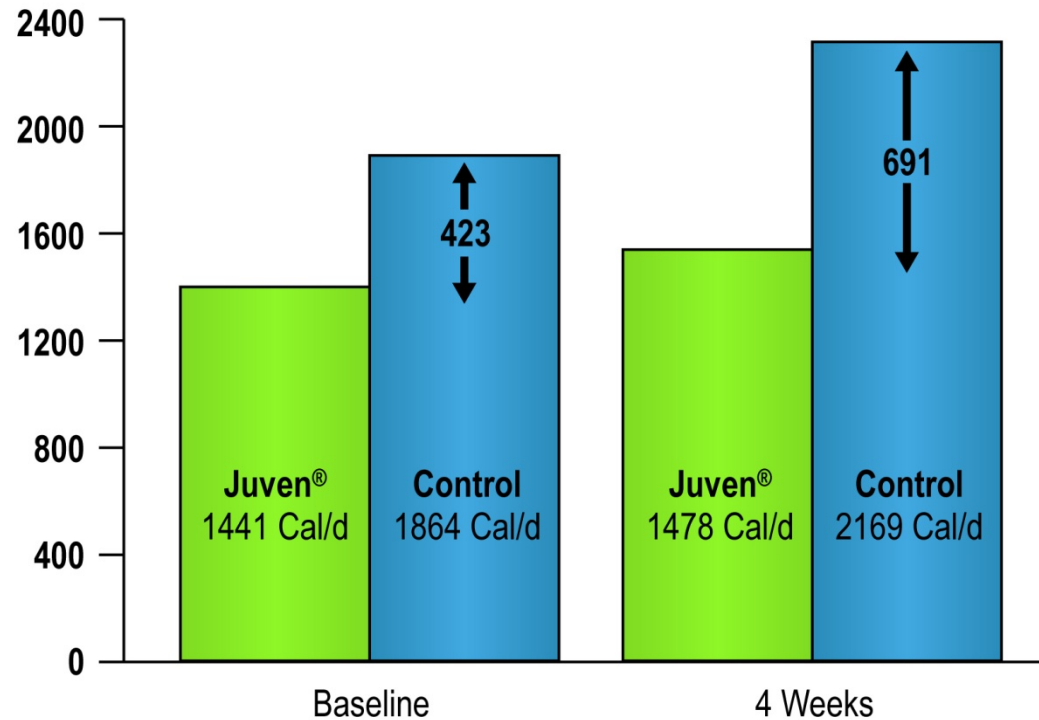
- **Objective:** Examine effect of Juven[®] on cancer related wasting
- **Subjects:** solid tumors with history of weight loss > 5%
- **Study design:** randomized, double-blind, placebo controlled
 - Juven[®] vs isonitrogenous control



Caloric Intake of Cancer Study Groups³⁰

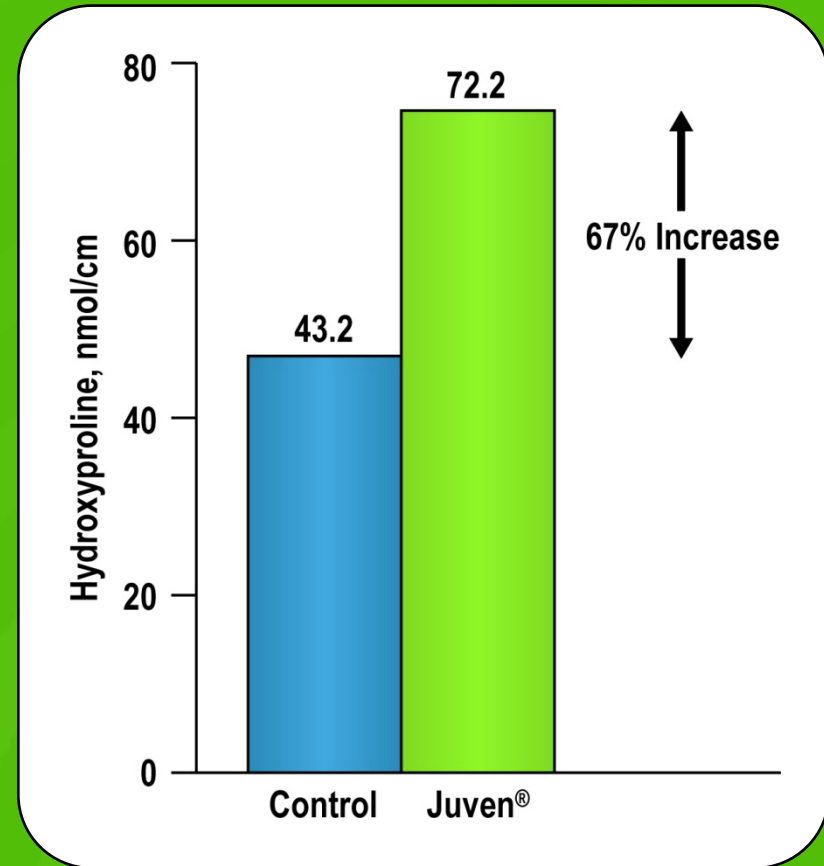
Juven[®] group consumed **423 kcal/day** less than control at baseline and **691 kcal/day** less than control at 4 weeks

Mean calorie intake at baseline and at 4 weeks



Effect of Juven[®] on Human Collagen Deposition³¹

- **Objective:** examine effect of Juven[®] on wound collagen accumulation (measured by hydroxyproline deposition)
- **Study design:** randomized, double-blind, placebo controlled; Juven[®] or control
- **Subjects:** healthy, elderly people (70+ years of age)
- **Methods:** implantation of catheter tubes in deltoid muscles to collect hydroxyproline

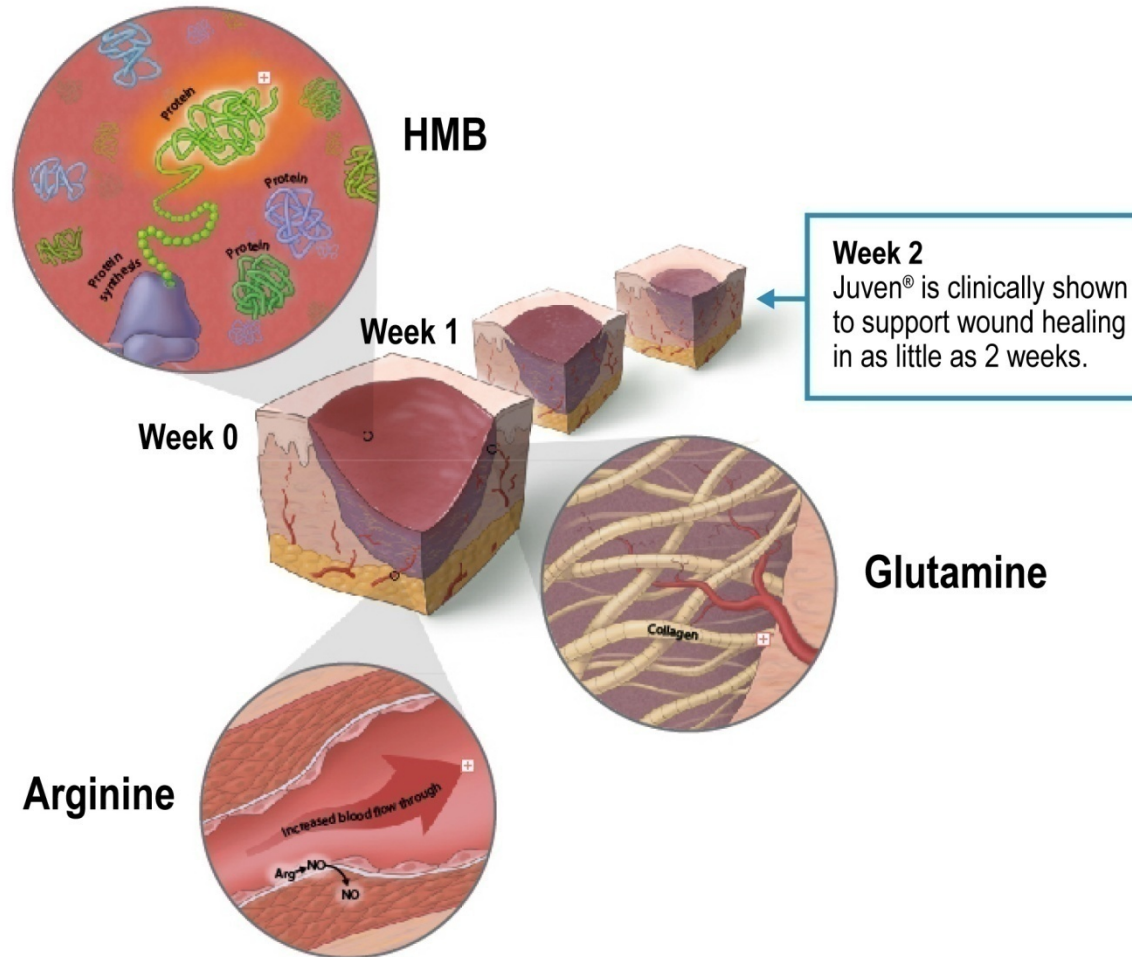


Data collected at 2 weeks

Standard errors: Juven[®] group: 72.2 +/- 10.6 nmol/cm, Placebo group: 43.2 +/- 7.2 nmol/cm

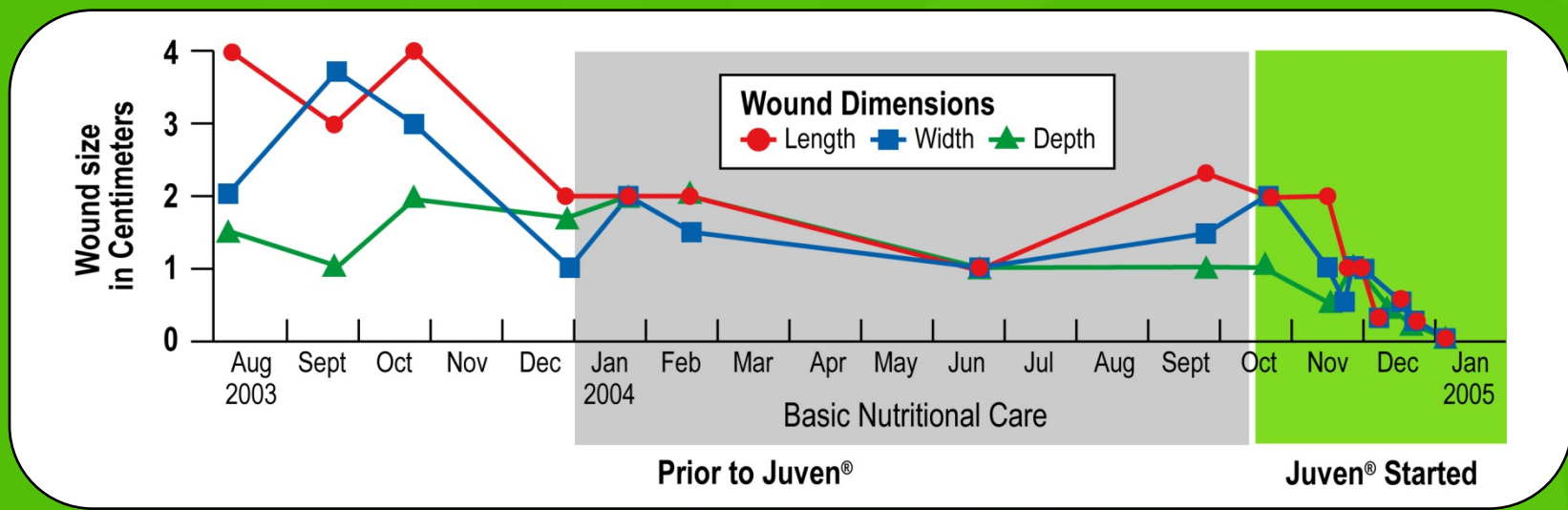


Juven[®]: A combination of HMB, arginine, and glutamine for a targeted nutritional therapy



Revisit Earlier Case Study: LTC Pressure Ulcer Patient with use of Juven[®]

Patient Background	14 Months of Treatment (Standard Protocol)	Outcomes After 10 Weeks with Juven [®] Added
<ul style="list-style-type: none"> • 84 year old female • Diabetes mellitus, Alzheimer's with psychosis • Stage IV wound, right gluteal fold 	<ul style="list-style-type: none"> • Routine wound care • Nutrition <ul style="list-style-type: none"> – oral supplements – Protein powder – Vitamin C – Zinc – Multivitamin supplement • Other <ul style="list-style-type: none"> – Specialty mattress – Foley catheter 	<ul style="list-style-type: none"> • Wound closed after just 10 weeks on Juven[®] – 2 packets per day • Patient ambulatory • Specialty mattress discontinued • Foley catheter discontinued



Case Study: Diabetic Foot Ulcer

- 62-year-old male
- 20-year history of diabetes mellitus
- Skin crack that developed on the bottom of his foot
 - Debridement
- Osteomyelitis
 - IV antimicrobial therapy
 - periodic debridement for 9 months.



Aug 27, 2007



Case Study: Diabetic Foot Ulcer

- Assessment
 - Osteomyelitis
 - poor circulation
 - deep ulcer
- Patient follow up plan:
 - clean the wound and change the dressing daily
 - oral antibiotic
 - diabetic diet
 - recommendation for hyperbaric oxygen therapy
 - Juven[®] 2 packets per day
- Possible Plan:
 - below-the-knee amputation.



Oct 5, 2007



Case Study: Diabetic Foot Ulcer

- 8 week follow up:
 - Wound closed
 - No measureable depth
 - No surgery
 - No hyperbaric oxygen



Dec 3, 2007



Summary

- Chronic wounds behave differently
- stress response is associated with hypermetabolism and can lead to protein catabolism
- Intervene with complete diet and targeted nutrition therapy
- Amino acids have many roles in the body
- Juven[®] addresses these issues



Frequently Asked Questions

- Can I use Juven[®] on a clear liquid diet?
- Can I use Juven[®] with dialysis patients?
- Can I use Juven[®] with tube feeding?
- How long can I use Juven[®]?
- Can two packets be taken at once?



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