

Abbott Nutrition

Lean Body Mass, Wound Healing and The Impact of Therapeutic Nutrition

Therapeutic Nutrition Drink Mix for Wound Healing*

- Clinically shown to support wound healing in as little as 2 weeks^{†,1}
- Clinically shown to build lean body mass in 4 weeks^{‡,2}



Use under medical supervision as part of a complete, balanced diet.

* Has arginine and protein for wound healing.

† In healthy elderly adults.

‡ In patients with cancer cachexia.

1. Williams JZ, et al. *Ann Surg.* 2002;236:369-375.

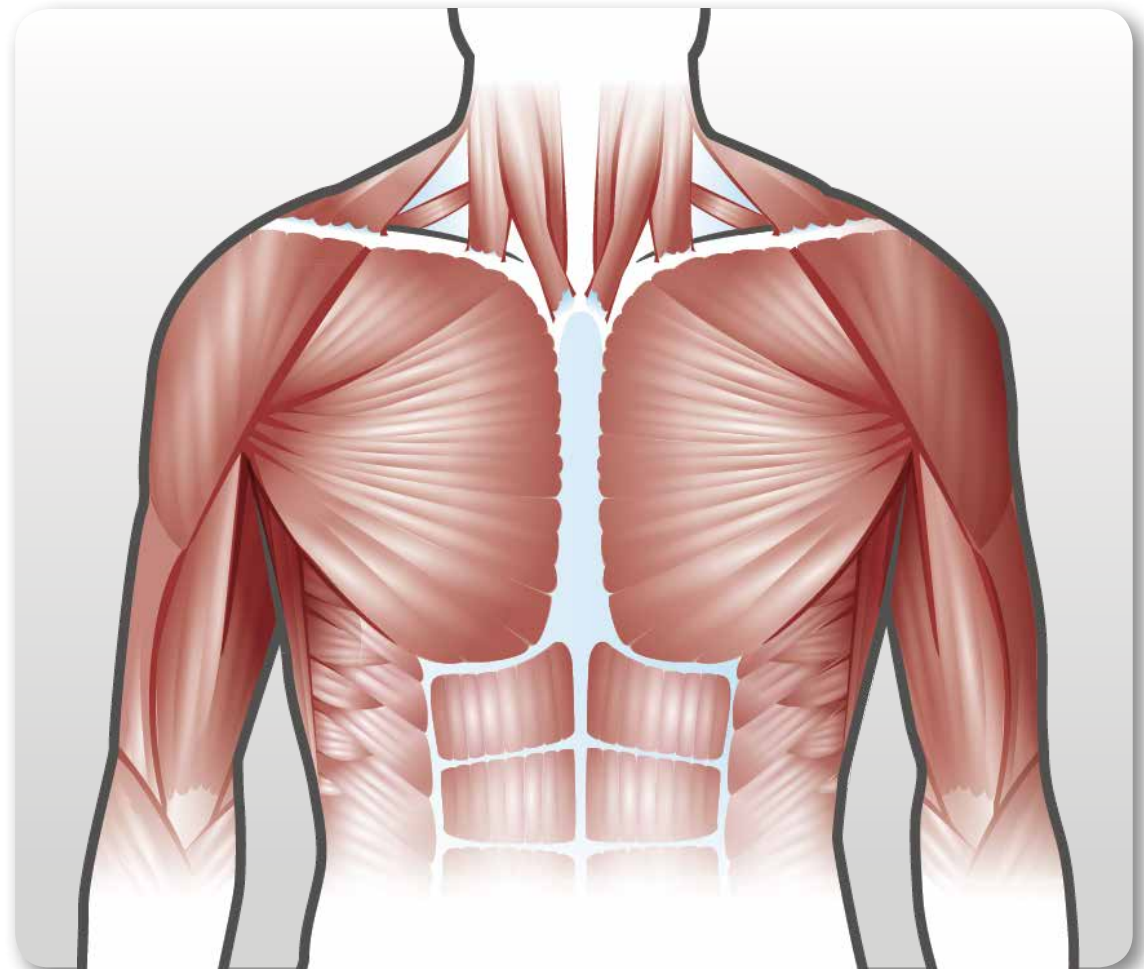
2. May PE, et al. *Am J Surg.* 2002;183:471-479.

Lean Body Mass (LBM)

- Includes muscle, skin, bone, and organs
- Essential for:
 - Wound healing
 - Whole-body protein metabolism
 - Immune function
 - Organ function
 - Physical strength
 - Activities of daily living

Muscle is the largest component of LBM and plays a central role in protein metabolism^{1,2}

- Absent adequate nutrition, muscle is the primary source of amino acids used in protein synthesis¹
- Preserving muscle protein is important to:
 - Ensure adequate availability of amino acids during illness or injury
 - Support wound healing^{1,2}



1. Wolfe RR. The underappreciated role of muscle in health and disease. *Am J Clin Nutr* 2006;84:475-482.
2. Demling, R. Nutrition, anabolism, and the wound healing process: an overview. *ePlasty* 2009;9,65-94.

Causes of Lean Body Mass Loss¹

Normal



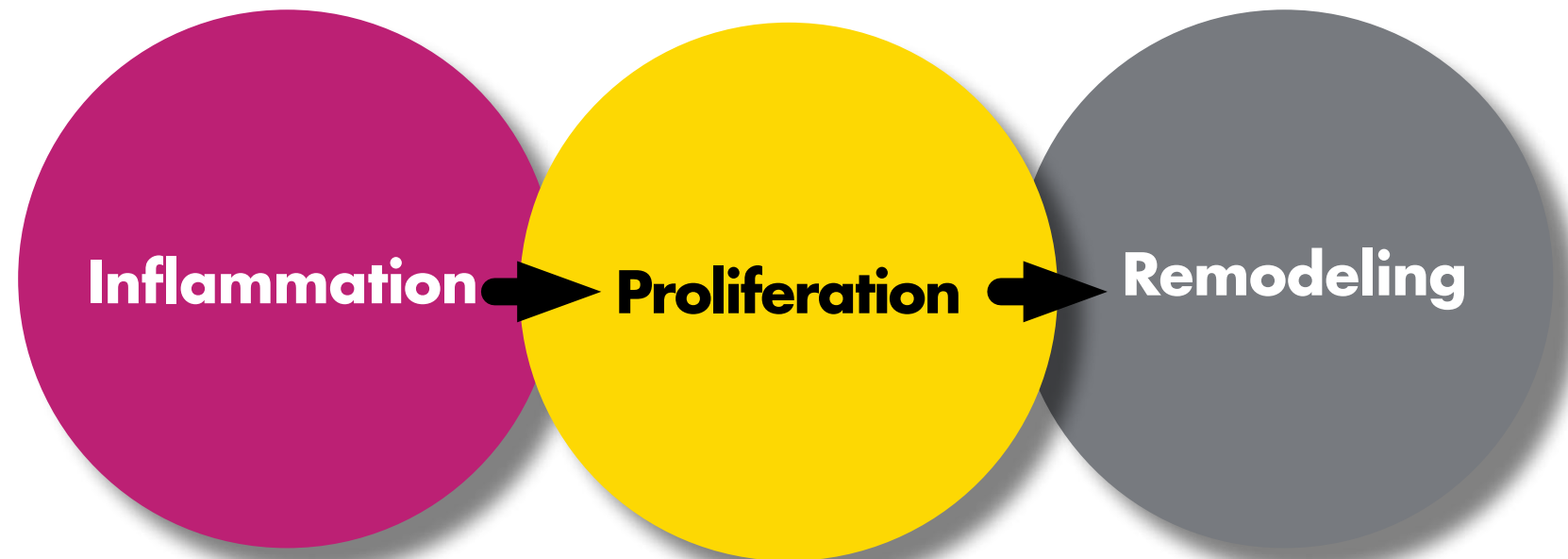
Aging
Bed rest
Poor diet
Cyclical dieting
Lack of physical activity

Abnormal—stressed state



Chronic diseases
Cancer, Diabetes, COPD
Acute illnesses/complications
Flu, Sepsis, Wounds
Surgical healing/immobilization
General, Orthopedic, Cardiac
Acute injuries/immobilization
Sports-related, Trauma/accidents, Burns

The Stages of Wound Healing



Normal healing process¹



Impaired wound healing

(LBM loss due to inflammation from chronic illness or acute conditions)^{1,2}

1. Stechmiller JK, Childress B, Cowan L. *Nutr Clin Pract* 2005;20:52-61.

2. Jensen, GL. *JPEN* 2009;30:453-463.

Increasing Loss of LBM Leads to Increasing Complications

Loss of Total LBM	Complications	Associated Mortality
10%	Decreased immunity, increased infections	10%
20%	Decreased 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%

Juven® is a Unique Blend of Key Ingredients to Support Wound Healing

- HMB
- Arginine
- Glutamine
- Hydrolyzed collagen protein
- Micronutrients



Use under medical supervision.

Juven[®] is a Unique Blend of Key Ingredients to Support Wound Healing

Build Lean Body Mass to Support Healing

HMB is a metabolite of the amino acid leucine¹

Slows protein breakdown and enhances tissue growth

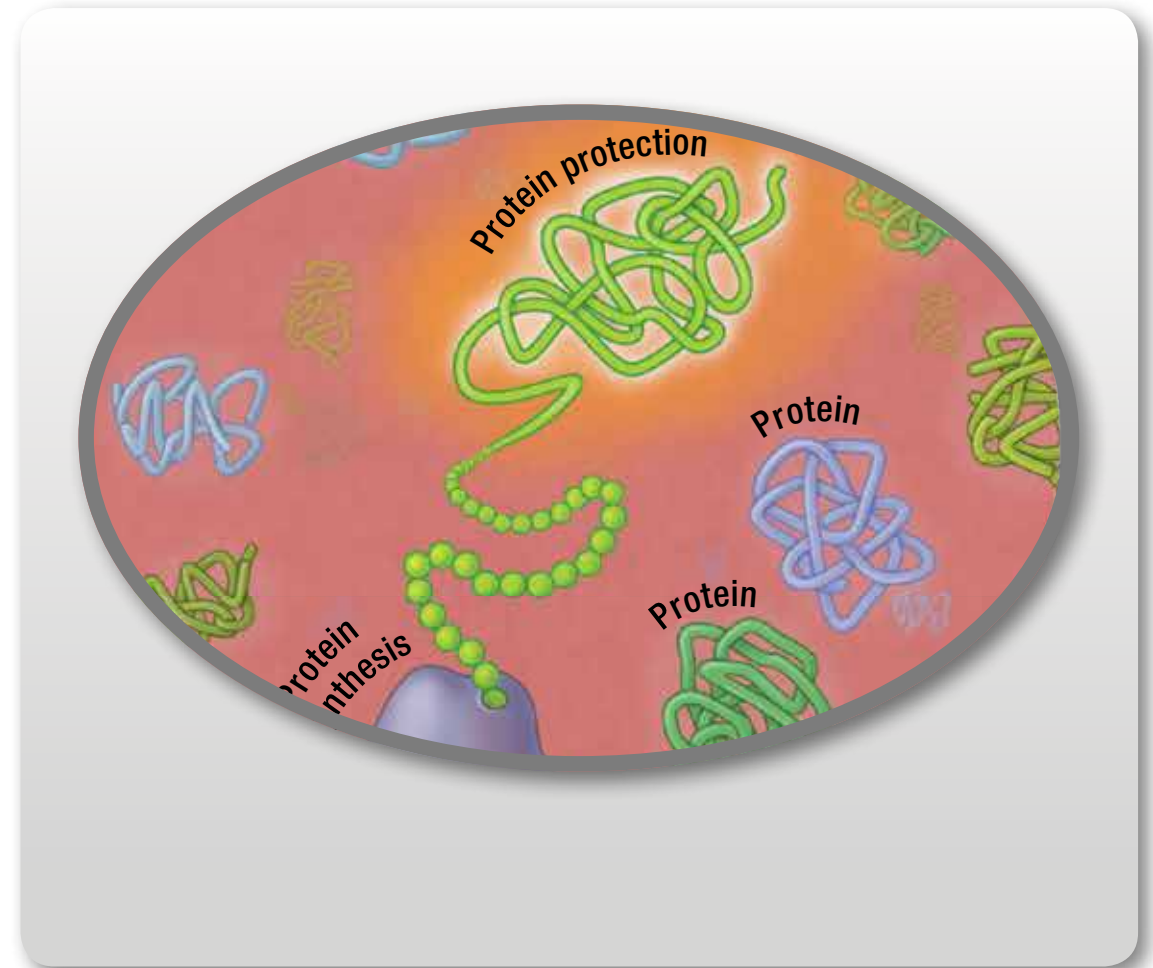
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Enhances protein synthesis

+

Stabilizes muscle cell membrane

1. Wilson GJ, Wilson JM, Manninen AH. *Nutr Metab (Lond)* 2008;5:1.



Juven[®] is a Unique Blend of Key Ingredients to Support Wound Healing

Build Lean Body Mass to Support Healing

Arginine is a conditionally essential amino acid^{1,2}

Precursor of nitric oxide

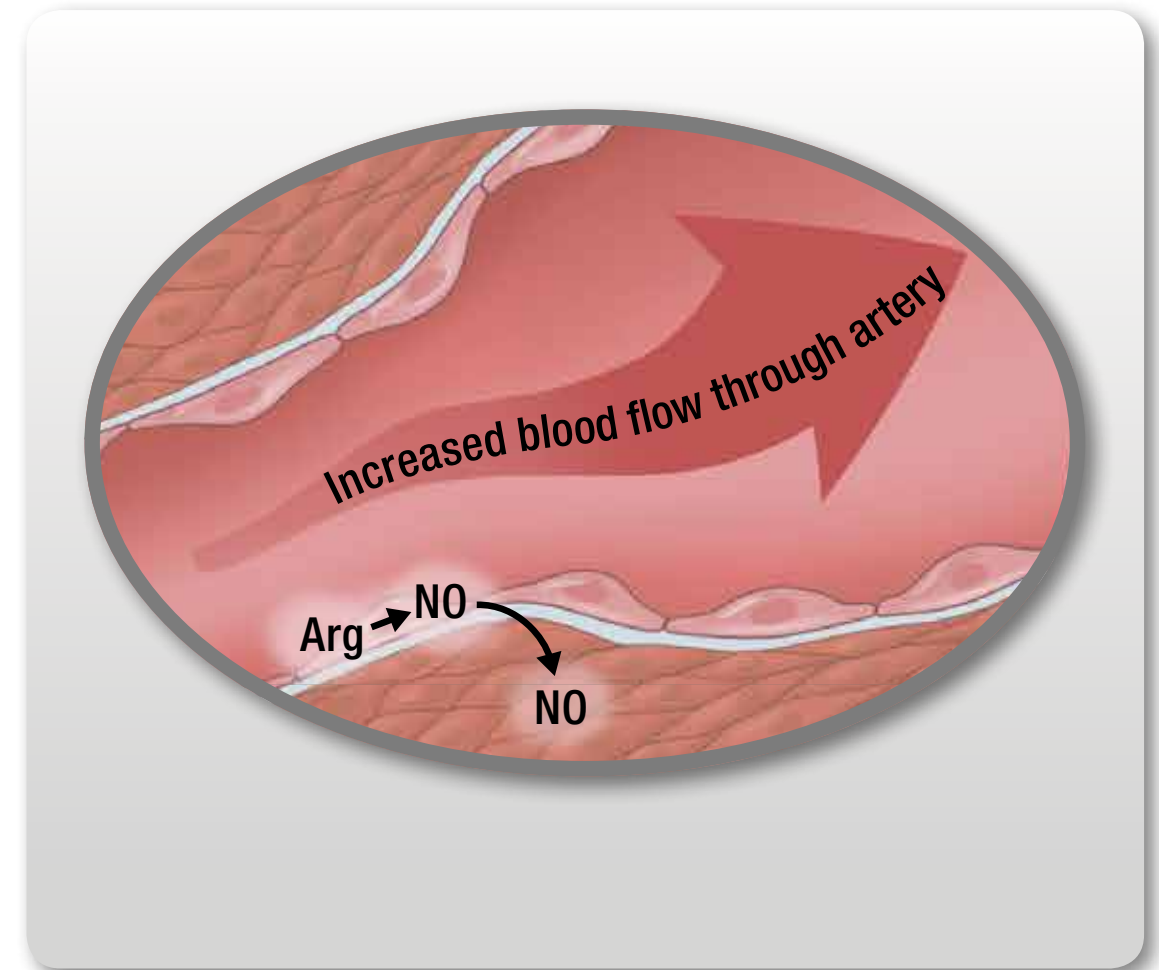


Vasodilation



Support blood flow

1. Schäffer MR, Tantry U, Gross SS, et al. *J Surg Res* 1996;63:237-240.
2. Schäffer MR, Tantry U, van Wesep RA, et al. *J Surg Res* 1997;71:25-31.



Juven[®] is a Unique Blend of Key Ingredients to Support Wound Healing

Build Lean Body Mass to Support Healing

Glutamine is a conditionally essential amino acid¹⁻⁵

Role in collagen production

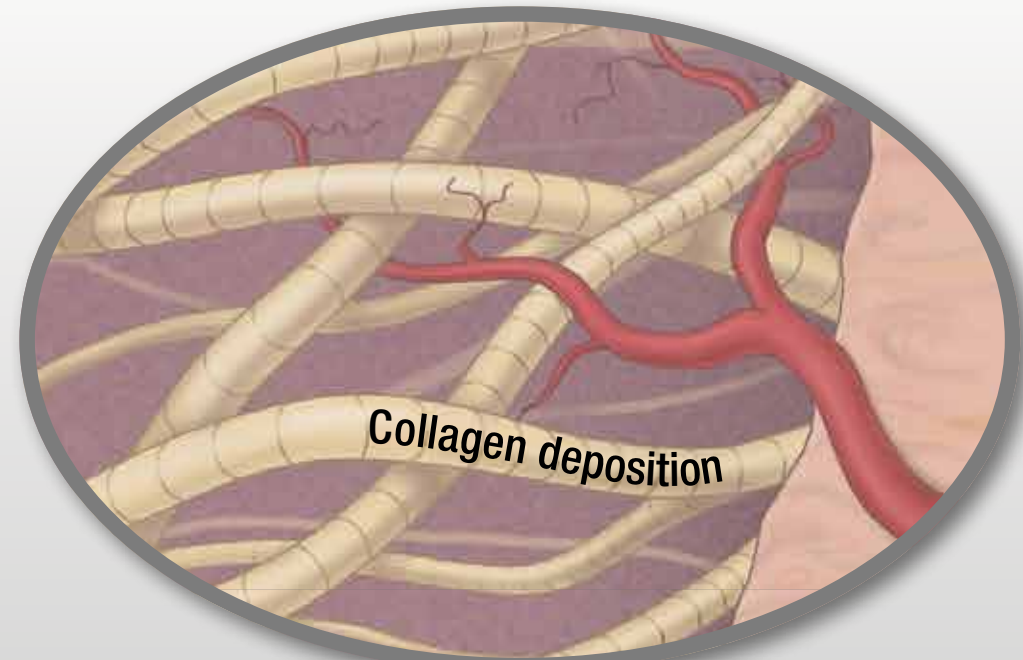
+

Supports nitrogen metabolism

+

Supports immune system

1. Stechmiller JK, Childress B, Cowan L. *Nutr Clin Pract.* 2005;20:52-61.
2. Karna E, Mityk W, Wolczynski S, et al. *Comp Biochem Physiol B Biochem Mol Biol.* 2001;130:23-32.
3. Bellon G, Chaqour B, Wegrowski Y, et al. *Biochim Biophys Acta.* 1995;1268:311-323.
4. Schoemann MB, et al. *Nutrition and Wound Healing Molnar JA.* 2007: 65-86.
5. Andrews FJ, et al. *British J Nutr.* 2002; 87 (Suppl. 1):S3-S8.

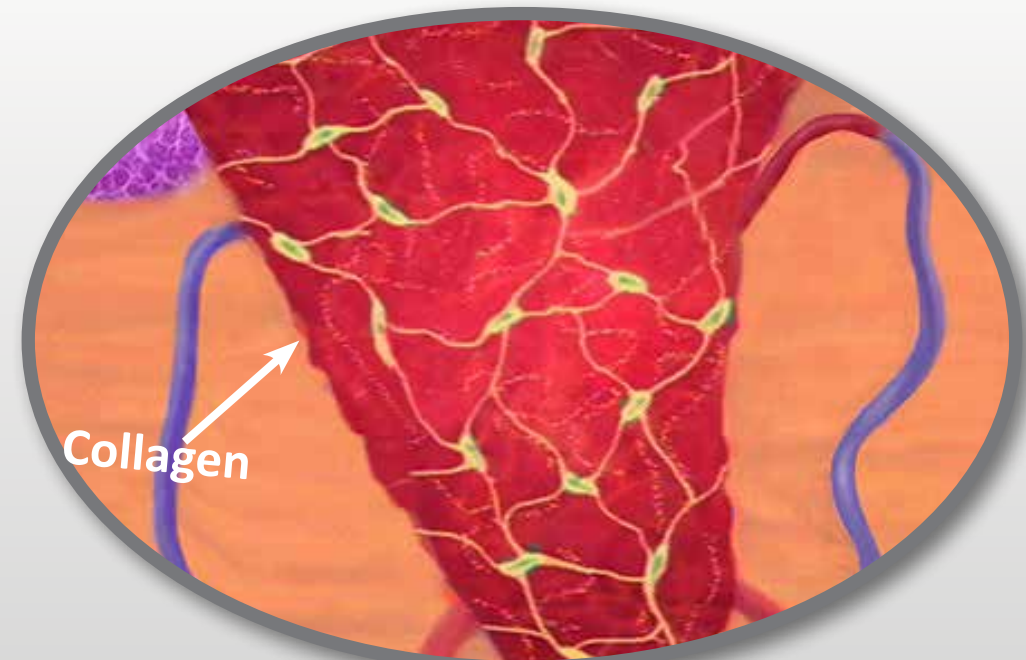


Juven® is a Unique Blend of Key Ingredients to Support Wound Healing

Build Lean Body Mass to Support Healing

Hydrolyzed collagen protein – **stimulates internal collagen production increasing the rate of wound healing**^{1,2}

1. Lee SK, et al. *Advances in Skin and Wound Care*. 2006;19(2)92-96.
2. Sugihara F, et al. *Jpn Pharmacol Ther*. 2015;43:1323-28.



Juven[®] is a Unique Blend of Key Ingredients to Support Wound Healing

Build Lean Body Mass to Support Healing

Micronutrients – **important in the wound healing process**¹

- **Zinc** – important for skin integrity, mucosal membranes and immune response^{2,3}
- **Vitamin C** – promotes collagen synthesis for tensile strength, modulates immune function and acts as an antioxidant⁴
- **Vitamin E** – role in immune response and inflammation⁵
- **Vitamin B12** – important in the maintenance of red blood cells^{3,6}

1. Molnar JA, *Nutrition and Wound Healing*. CRC Press, 2007.
2. Lansdown AB, et al. *Wound Repair Regen*. 2007;15:2-16.
3. Wintergerst ES, et al. *Ann Nutr Metab*. 2007;51:301-23.
4. Peterkofsky B. *Am. J. Clin. Nut.* 1991;54, 1135S.
5. Gottschlich MM. *Nutrition and Wound Healing*. (Ed. Joseph Molnar). 2007;159.
6. Liepa GU, et al. *Nutrition and Wound Healing*. (Ed. Joseph Molnar). 2007;99.



Key Benefits of New Ingredients

Hydrolyzed Collagen Protein

- Stimulates internal collagen production increasing the rate of wound healing¹

Vitamin C

- Promotes collagen synthesis for tensile strength, modulates immune function and acts as an antioxidant¹
- When vitamin C intake is inadequate, collagen synthesis is reduced¹

Vitamin B12

- Is important in the maintenance of red blood cells¹

Vitamin E

- Plays a role in immune response and inflammation¹
- May decrease damage to the wound induced by excessive free radicals¹

Zinc

- Is important for skin integrity, stabilizing mucosal cell membranes and immune response¹
- Is involved in DNA synthesis, protein synthesis, and cellular proliferation¹

1. Molnar, J.A. *Nutrition and Wound Healing*. 2007.

	Wound Healing Specific Recommendations¹	Daily Dietary Intake^{2,3}	Juven (2 per day usage)	Juven + Daily Dietary Intake = Total Intake	Tolerable Upper Intake⁴
Protein	80-102 g (per 68 kg)	46-56 g	5 g hydrolyzed collagen*	46-61 g*	No upper limit identified
Vitamin C	500-1,000 mg	75-90 mg	600 mg	675-690 mg	2,000 mg/d
Vitamin B12	Daily Recommended Value or more	2.4 mcg	2.4 mcg	4.8 mcg	No upper limit identified
Vitamin E	Daily Recommended Value or more	15 mg	30 mg	45 mg	1,000 mg/d
Zinc	16 mg	8-11 mg	19 mg	27-30 mg	40 mg/d

* Hydrolyzed collagen is not considered a complete protein

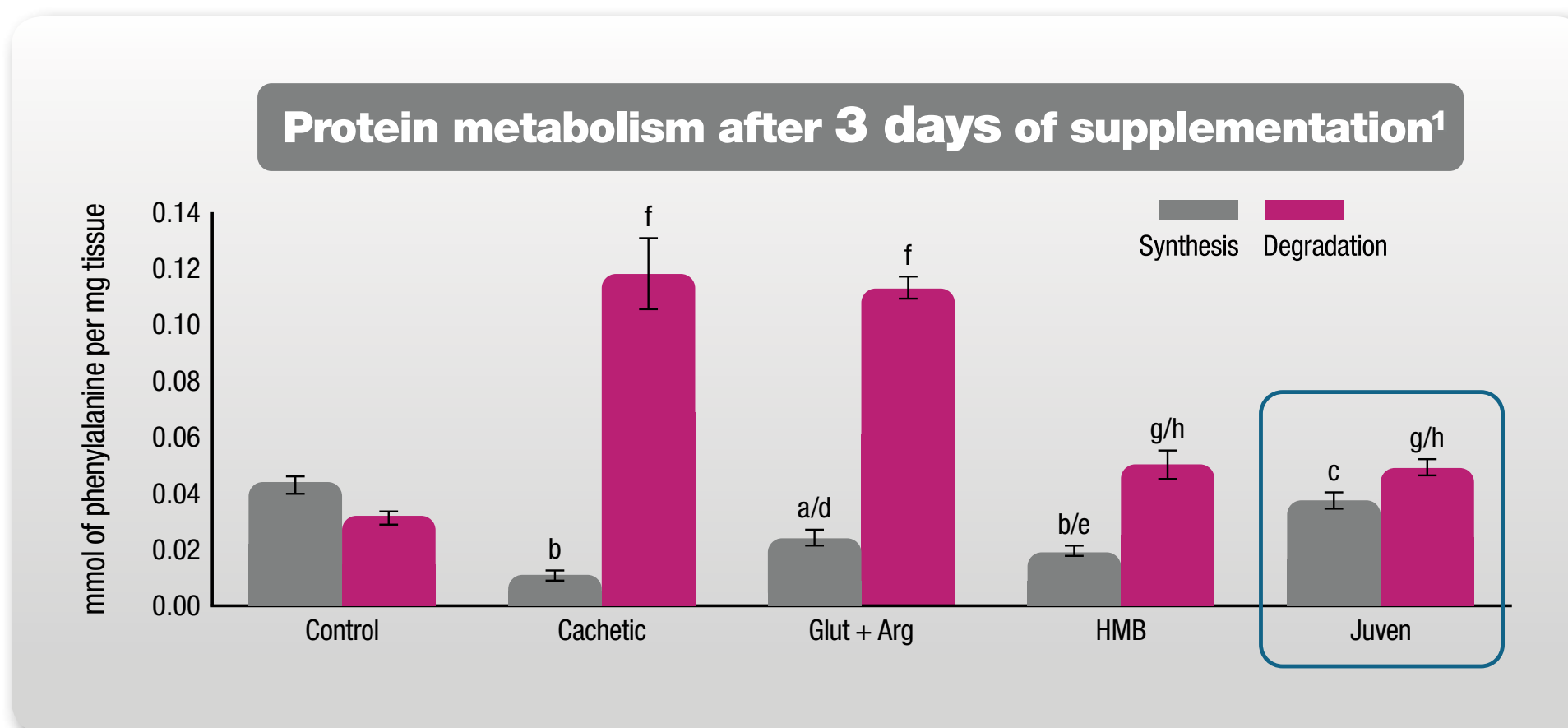
1. Molnar JA, Nutrition and Wound Healing, CRC Press, 2007.

2. http://nationalacademies.org/hmd/~media/Files/Activity%20Files/Nutrition/DRI-Tables/2_%20RDA%20and%20AI%20Values_Vitamin%20and%20Elements.pdf?la=en

3. http://nationalacademies.org/hmd/~media/Files/Activity%20Files/Nutrition/DRI-Tables/1_%20EARs.pdf?la=en

4. http://nationalacademies.org/hmd/~media/Files/Activity%20Files/Nutrition/DRI-Tables/4_%20UL%20Values_Vitamins%20and%20Elements.pdf?la=en

Shown to Maintain Protein Metabolism



Results from a mouse model in which mice were implanted with a tumor to induce cachexia. Mice were divided into 4 treatment groups: no supplementation, glutamine and arginine, HMB, and Juven. Mice were treated with test materials for 3 days, and then tissue was collected for assessment.²

In an animal study:

- Supplementation with glutamine and arginine impacts protein synthesis but not breakdown²
- HMB has significant impact on protein synthesis and protein breakdown²
- Only Juven maintained protein metabolism closer to the healthy control group²

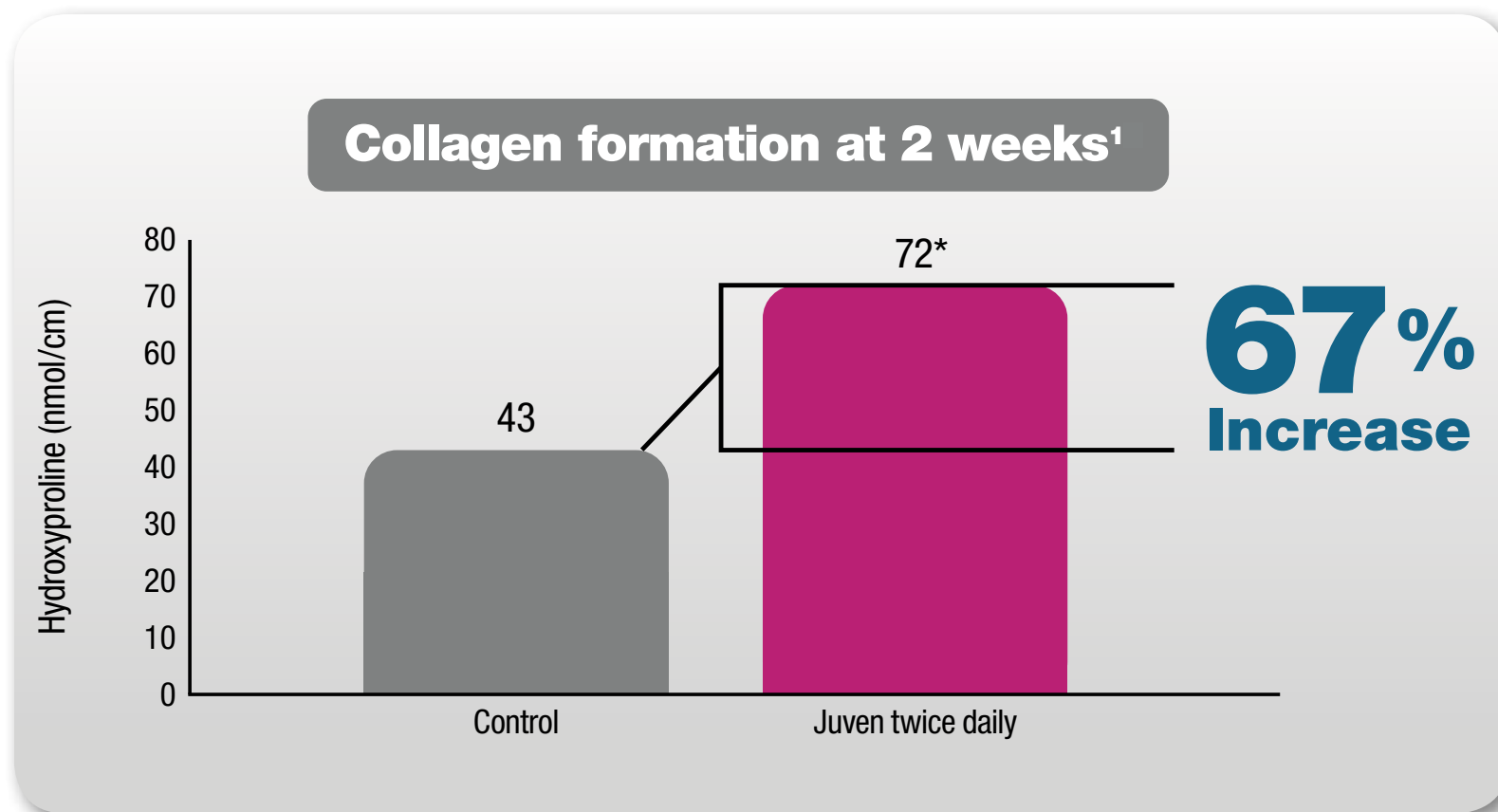
Use under medical supervision.

1. Wilson GJ, Wilson JM, Manninen AH. *Nutr Metab (Lond)* 2008;5:1.

2. Data on file, Abbott Nutrition.

Juven[®] Clinically Shown to Improve Wound Healing

Significantly increased collagen formation at 2 weeks in healthy elderly adults (n=18) compared to controls (n=17)¹



*P<0.03. Study of 35 healthy elderly subjects with a mean age of 75.4 years, implanted with a PTFE tube in the deltoid region. Hydroxyproline was measured at 7 and 14 days.¹

- Yielded a 67% increase in hydroxyproline (a precursor to collagen) vs control¹
- Hydroxyproline is an indicator of collagen accumulation, which is essential for tissue building¹

Use under medical supervision.

1. Williams JZ, Abumrad N, Barbul A. *Ann Surg* 2002;236:369-375.

Add 2 Packets of Juven Per Day to Wound Protocol

- Clinically shown to support wound healing in as little as 2 weeks^{*,1}
- Clinically shown to build lean body mass in 4 weeks^{†,2}
- Available in Unflavored, Fruit Punch, and Orange



Use under medical supervision as part of a complete, balanced diet.

* In healthy elderly adults.

† In patients with cancer cachexia.

1. Williams JZ, et al. *Ann Surg*. 2002;236:369-375.

2. May PE, et al. *Am J Surg*. 2002;183:471-479.