Collagen Peptides - Promising Ingredient for the Anti-Ageing Market

Dr. Stephan Hausmanns
Food Matters Live, GB, Nov. 18th, 2014
GELITA at a glance.

- **Legal Form:** GELITA is an independent, unlisted stock ingredient company owned by the founding families.
- **Founding Year:** 1875
- **Headquarters:** Eberbach, Germany
- **Production Plants:** 21
- **Sales Offices:** 4
- **Market Share:** ~ 22% (Collagen Protein Market Leader)
- **Employees:** ~ 2,650

**Turnover in Mio. €**

- 2009: 395
- 2010: 460
- 2011: 510
- 2012: 640
- 2013: 709
Target of Healthy Aging:

Gaining of Quality in Life, Rather than Living Longer
Life Means Constant Metabolic Turnover & Renewal
## Different Aging Mechanisms

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hormonal aging</td>
<td>Decreased hormone production, High levels of stress hormones</td>
</tr>
<tr>
<td>2. Inflammatory aging</td>
<td>Chronic silent Inflammation (Rheumatism, Asthma) (Skin and cartilage degeneration)</td>
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<tr>
<td>3. Glycolytic aging</td>
<td>High intake of carbohydrates, Glycation of body proteins</td>
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<tr>
<td>4. Oxidative aging</td>
<td>Increased Oxidative stress, LDL Oxidation, UV-Aging, Decreased antioxidative defense shield, DNA Telomer reduction, Cancer development, Membrane damage, Mitochondrial membrane damage</td>
</tr>
<tr>
<td>5. Nutritional aging</td>
<td>Malnutrition or over nutrition, Micronutrient deficiencies</td>
</tr>
</tbody>
</table>

**Nutrition and supplements can influence all aging processes and contribute slowing down said mechanisms**
Hollywood’s Anti-Aging Secret: Collagen Peptides 😊

- Angelina Jolie reportedly eats collagen peptides enriched marshmallows to look youthful
- Jolie prefers the collagen candy to plastic surgery
Collagen Peptides: Solution to Excellent Functionality in Protein Fortification

Collagen peptides are animal derived, collagen based clean label food proteins with zero allergenic potential.

Suitable in manifold applications
- Protein fortification up to 50 % protein content
- Excellent and clearly water soluble
- High pH and temperature resistance
- Superior sensorial profile, almost neutral in taste
- Combinations with other food proteins (like whey, soy, pea, etc.) and in blends with single amino acids for supplement applications
- Multiple recipes and market examples available
Collagen Peptides Derived by Hydrolysis of Collagen

Collagen → Enzyme → Collagen Peptide

Water is forced into a peptide bond → Bond is broken
The Role of Collagen in the Human Body

“Adding stability to life” - Collagen is a structure protein and the main component of connective tissue

Collagen in the musculoskeletal system:
- Up to 70% of dry cartilage mass (joints, meniscus)
- Main component of tendons (>85%) and ligaments (>70%)
- Also abundant in bone, blood vessels and intervertebral disc
- Accounting for 6% of the weight of strong, tendinous muscles

Collagen in the skin:
- Up to 75% of dry skin mass

Others: Blood-Brain Barrier, Eye (Cornea), Dentin etc.

With ~ 30% of the whole body protein content, collagen is the most abundant protein in humans
Collagen – Adding Stability to Life

**Collagen Molecule**
- A right handed triple helix.
- Length of approximately 300 nm, diameter of 1.5 nm
- Typical AS pattern: Gly-Pro-X

**Physiological functionality**
- Collagen fibers tensile strength > steel
  - Connecting movable parts of human body (ligaments, tendons, cartilage, fascia etc.)
- Collagen matrix: Very high water binding capacity
  - Contributes managing bodies water household (skin, blood vessels etc.)
- High in Conditionally Essential Amino Acids
**Mode of Action**

- Collagen Peptides are rapidly absorbed, partly in intact form
- Amino acids act as building blocks
- Intact peptides stimulate collagen producing human cells to increase production
  - Fibroblasts → Skin, Fascia
  - Chondrocytes → Joints
  - Osteoblasts / Osteoblasts → Bones

Before  

After
Collagen: From Ancient Know-how to Modern Science

“Collagen glue” can Contribute to Rebuild and Maintain Collagen Structures and could cause an Increase in Collagen Mass

Hildegard von Bingen (1098–1179)

The Nutritional Therapy of Saint Hildegard of Bingen (1098 – 1179)

“He who has stabbing pain in his limbs and joints as well as stomach and intestinal pain, should frequently eat plenty of well-cooked beef trotters, including fat and calluses. That soon gets rid of the pain.”

Paris, National Library, Cod. 6952

Justus von Liebig (1803 – 1873)

Published Human Clinical RCT Trials according to GCP

2014

Oral Intake of Specific Bioactive Collagen Peptides Reduces Skin Wrinkles and Increases Dermal Matrix Synthesis

2013

Oral Supplementation of Specific Collagen Peptides Has Beneficial Effects on Human Skin Physiology: A Double-Blind, Placebo-Controlled Study

2011

Osteoarthritis and Cartilage

2009

24-Week study on the use of collagen hydrolysate as a dietary supplement in athletes with activity-related joint pain

GCP: Good clinical practice

Functional Ingredient Requirements for Successful Consumer Products, i.e.

- Claims according to consumer demand and local legislation
  - EFSA
  - FSMP
- Claims measure along the general rule (VO 1169/2011 EU; s.c. „beauty claims“)
- Human clinical studies (RCT, GCP) accepted by scientific community → published in peer review journals
- Clear patents situation
- Points of differentiations (e.g. Trademarks)
- Price and consisted high product quality

Result

- PepsiCo
  - USA & UK
- Abbott
  - USA
- Red Bull
  - Thailand
- Nutricia / Danone
  - North America
- Herbalife
  - USA
- Sanofi Aventis
  - Mexico / Brazil
- IHS / Merck
  - Germany
- Monster
  - USA
Target Group Specific Solutions

- bone density
- increased performance
- beauty
- body toning
- weight management
- healthy joints
- sarcopenia
- bone stability
- cellulite
- body toning
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Reduce Weight and Increase Satiety

- Proteins are known to be the most satiating macronutrient
- ‘Not all proteins are equal’ → calorie intake during lunch was decreased up to 30% after consuming a breakfast containing collagen peptides with tryptophan compared to a breakfast containing the same amount of soy or whey-GMP1
- Collagen peptides influence the secretion of hormones (PYY) that promote satiety → reduction of calorie intake during the following meal2
- High protein-low glycemic diets help maintaining weight after weight loss3

1 Veldhorst M.A.B. et al “A breakfast with alpha-lactalbumin, gelatin, or gelatin + TRP lowers energy intake at lunch compared with a breakfast with casein, soy, whey, or whey-GMP”, Clinical Nutritin J 28 (2009) 147-155
Collagen Peptides Showing a Higher Satiating Effect Compared to Other Proteins

Ad libidum energy intake at lunch after the consumption of a breakfast containing 20% of daily energy requirements, 25% made up from protein

*statistically significant

Veldhorst M.A.B. et al “A breakfast with alpha-lactalbumin, gelatin, or gelatin + TRP lowers energy intake at lunch compared with a breakfast with casein, soy, whey, or whey-GMP”, Clinical Nutrition J 28 (2009) 147-155
Weight Loss vs. Body Toning

- Weight loss → Reduction of body weight
- Body toning: Weight management by developing a physique with a large emphasis on musculature → leanness in the body, low body fat level, noticeable muscle definition and shape, but not significant muscle size.

- Advantage:
  - Turning fat into muscle mass
  - Muscles help managing daily calorie intake
  - Increased fitness
  - Increased stability (specially for old people)
Target Group Specific Solutions

- bone density
- increased performance
- body toning
- healthy joints
- sarcopenia
- beauty
- weight management
- bone stability

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Sarcopenia Study (2009)

Study Design:
- Blinded comparative, cross-over study, whey protein vs. tryptophan fortified collagen peptide (fCP) diet
- 9 woman, 71 +/- 1 year, no exercise
- Protein supplementation: 0,8 g/kg body weight, 15 days, ~ 1 week washout in-between trials

Result:
- Whey protein group showed significant higher nitrogen excretion and body weight decrease with no difference on body fat
- fCP diet maintained nitrogen balance and preserved lean body mass
Sarcopenia & Body Toning Study (2013 & 2014)

- Prof. Dr. Daniel König, University of Freiburg.
- Medical specialist in internal medicine, cardiology, diabetology, sport and nutrition medicine
- Head of the Division of Nutrition and Sports at the Department of Sports Science.

- DXA (Dual-energy X-ray absorptiometry)
- Two X-ray beams with different energy levels are aimed at the patient's body. When soft tissue absorption is subtracted out, the body composition can be determined from the absorption of each beam.
# Body Composition Study I (2013)

**Study Design**

- Double blind, randomized, placebo controlled study
- **Subjects:** n = 60 men aged 65 +, (Sarcopenia class I & II)
- 15g Collagen Peptide or placebo – daily intake
  No protein deficiency in both groups
- Duration: 3 months
- Including 3x60min training per week
- Primary outcome: gain of fat and fat free mass

# Body Composition Study II (2014)

**Study Design**

- Double blind, randomized, placebo controlled study
- **Subjects:** n = 60 men aged 35 - 65
- 15g Collagen Peptide or placebo – daily intake
  No protein deficiency in both groups
- Duration: 3 months
- Including 3x60min training per week
- Primary outcome: gain of fat and fat free mass

Unpublished data, 2014
Effect of Resistance Exercise Only – Placebo Groups Muscle Studies

Body Composition Study I
(Age > 65 years)

Body Composition Study II
(Age > 35 years)

Δ Muscle
Δ Fat

Δ Muscle
Δ Fat
Effect of Resistance Exercise Collagen Peptide Supplementation – Collagen Peptide vs. Placebo

Body Composition Study I
(Age > 65 years)

Body Composition Study II
(Age > 35 years)

üz Muscle ü Fat

üz Muscle ü Fat

x 1.5

x 2

x 1.5

x 4

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Summary

- 2 RTC studies demonstrate efficacy of a daily intake of 15g Collagen Peptide for 3 months in addition to resistance training
- Fat free mass was statistically significantly increased and fat free mass statistically significantly decreased compared to placebo
- Data outperforms results from similar study designs with other protein sources in respect to body fat
Potential Mechanism

- Excellent and rapid absorption of collagen peptides after oral uptake
- Significant and continuous increase of collagen-specific amino acids in human blood after collagen peptide supplementation
- Rapid absorption important for post-exercise recovery
- Glycine → Creatine precursor
- Arginine → Creatine & NO precursor
- mTOR activation
- Fibroblast → Satellite Cell signaling
- NO; i.a. an important mediator in satellite cell stimulation

Target Group Specific Solutions

- Bone density
- Increased performance
- Beauty
- Body toning
- Healthy joints
- Weight management
- Bone stability
- Sarcopenia

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Saluto Injury Study (2011)

• 1,150 athletes were controlled over 2 years
• 3 categories of athletes
  • 398 Professional soccer and handball players (Training 14-18h per week)
  • 397 Endurance athletes (Training more than 10h per week)
  • 397 Weekend warriors (Training 4-6h per week)
• All categories were divided into 2 groups (6 groups in total):
• Nutritional intervention:
  • Collagen Peptides enriched with BCAA and Arginine (30-70g / day)
    plus Vitamins, Minerals and Trace elements
• Parameter:
  • Number of injuries on muscle, joint, ligaments and tendons without contact with a competitor
during the period of 2 years
Risk of Injuries in Tendons, Ligaments, Joints, and Muscles without External Impact (in%)
Tufts Medical Center Study, Boston (2011) Visualized the Joint Health Effect of Collagen Peptides

**Design:**
- Prospective, randomized, double blind, placebo controlled
- 30 individuals with mild grade of Osteoarthritis (Kellgrean grade 1 – 2)
- Therapy: 10 g Collagen or placebo
- 11 months trial
- dGEMRIC data

**Results:**
- Proteoglycan density in the knee joint cartilage was significantly increased after Collagen Peptide treatment

* FORTIGEL®

**Regeneration of Cartilage Tissue in Humans**

![Images showing diseased and healthy cartilage with dGEMRIC data over time.](attachment:image.png)
Claim Opportunities*

- Nutrition Contend Claim: “Contains Collagen”
- 13.5 Protein Claims**: Collagen as a source of protein contributes…
  - to growth in muscles mass
  - maintenance of normal bones
  - to children bone growth
- FSMP joint health claim
- FSMP Sarcopenia claim (tbd after publication)
- Beauty Claims, depending on science!
  - Improve appearance of wrinkles
  - Helps to improve skin elasticity
  - Helps to improve skin tonicity and firmness

* Statements are made to the best of our knowledge. Any claim needs to be confirmed according to national legislation and for the final consumer product.

** 12% of energy from protein and ~ 15% of recommended daily dose
The Ultimate Edge of Healthy Aging ;-)  

Fauja Singh (born in India 1911)  
Lives in UK since 1960  
1990 he lost his wife and his son
The Ultimate Edge - Running a Marathon at the age of 100 Years

Fauja Singh (born in India 1911)
Lives in UK since 1960
1990 he lost his wife and his son

Started running at the age of 80
With 88 years he finished his first 20 km race
With 89 years he finished his first Marathon
Toronto 2003: Fauja Singh sets record in the 90 Plus group: 5:40,01
Toronto 2011: Fauja Singh’s 8th marathon at the age of 100 years.
„Thank You“

„Add more life to your years, not more years to your Life.

“More quarters! For God’s sake, more quarters!”