Nutra Botanics Protein+ Collagen in the Human Body

- Collagen – the most abundant protein in humans
  - About 30% of the body’s protein is collagen
- Structural protein
  - Up to 80% of dry skin mass
  - Main component of tendons (>85%) and ligaments (>70%)
  - Up to 70% of dry cartilage mass (joints)
  - About 20% of bone structure
  - Abundant in blood vessels & intervertebral discs
  - Accounting for about 6% of the weight of strong, tendinous muscles
Collagen Peptides: Highly Available Protein Source

- 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

Collagen Peptides – Unique Amino Acid Profile

- About 30% of body’s protein is collagen
- Collagen is the main component of connective tissue
- High content of conditionally essential & glycogenic amino acids, e.g.:
  - Arginine → precursor for nitric oxide (Nitric Oxide NO; i.a. an important mediator in satellite cell stimulation)
  - Glycine → most simple amino acid and building block / precursor for several molecular pathways, e.g. of glutathione (endogenous anti-oxidant)
  - Glycine & Arginine → Creatine precursor (nitrogenous organic acid that helps to supply energy to all cells in the body, primarily muscle)
Bioactive Collagen Peptides®

Special composition of collagen peptides

• Obtained by specific enzymatic hydrolysis
• Optimized to stimulate extracellular matrix formation = physiological functionality
• Scientifically substantiated by clinical studies
All Collagen Peptides ≠ Bioactive Collagen Peptides®

• Collagen Peptides with similar specification sheets don’t have a similar physiological functionality

Significant variance in peptide composition of different collagen peptides, which are often very unspecific

≠

Bioactive Collagen Peptides®
Optimized to stimulate specific tissue formations
Bioactive Collagen Peptides®

Preclinical Research Path

- Excellent and rapid absorption of collagen peptides after oral uptake (Iwai et al. 2005)
- Significant and continuous increase of collagen-specific amino acids in human blood after collagen peptide supplementation (Beuker et al. 1993)

Rapidly absorbed, partially in intact form

Distribution & accumulation in the target organ

Stimulatory and regulatory effect in bones, joints and the skin
**Bioactive Collagen Peptides®**

**Preclinical Research Path**

- **Rapidly absorbed, partially in intact form**
- **Distribution & accumulation in the target organ**
- **Stimulatory and regulatory effect in bones, joints and the skin**

![Absorption profile of SCP graph](chart.png)
**Bioactive Collagen Peptides®**

**Preclinical Research Path**

Rapidly absorbed, partially in intact form

Distribution & accumulation in the target organ

Stimulatory and regulatory effect in bones, joints and the skin

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Accumulation of Bioactive Collagen Peptides® in mice cartilage

![Graph showing accumulation of BCP Peptides and Proline over time](chart.png)


P < 0.01
Bioactive Collagen Peptides®

Preclinical Research Path

Rapidly absorbed, partially in intact form

Distribution & accumulation in the target organ

Stimulatory and regulatory effect in bones, joints and the skin
**Bioactive Collagen Peptides®**

Mode of Action (as in cartilage)

FORTIGEL® (Specific Bioactive Collagen Peptide®)

**Composition of Joint Cartilage**

- **~ 25%** Proteoglycans
- **~ 70%** Collagen
- **Cells (Misc.)**

**Joint Cartilage**

- **Increase of Cartilage Mass**
- **Stimulation**
- **Production**
- **Regeneration**
All Collagen Peptides ≠ Bioactive Collagen Peptides®

- Stimulation effect on in-vivo collagen synthesis widely varies between different collagen peptides
- each clinical study is conducted with respective dedicated Bioactive Collagen Peptides®
Collagen Peptides for Specific Solutions

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

10  20  30  40  50  60  70  80  Age
Collagen Peptides for Specific Solutions

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

Age:
10 20 30 40 50 60 70 80

Presentation
Skin Aging

Why Collagen is Important

- Major structural component of skin, comprising ~80% of dry skin weight
- Influences skin's water binding capacity, elasticity and outside appearance (wrinkles)
- Loss begins at ~30 years old and significantly increases after menopause (~2% per year)*

Collagen Peptides for Specific Solutions

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

Age:
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80
Nutra Collagen  Clinical Scientific Substantiation

- Studies in >2,500 patients showing Nutra Collagen® effects in joint cartilage
- Bioactive Collagen Peptides® proven to stimulate growth of connective tissue in joints with an effective dose of 5g to 10g/day

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Tufts Medical Center Study (2011): Visual Effect

Study Design
- Prospective, randomized, double blind, placebo controlled
- 30 individuals with mild osteoarthritis (Kellgren grade 1–2)
- 10g FORTIGEL® or placebo
- 11 months trial
- dGEMRIC data

Results
- Proteoglycan density in knee joint cartilage significantly increased after FORTIGEL® treatment
GELITA Collagen Peptides for Specific Solutions

healthy joints | weight management | beauty | bone stability

bone density | increased performance | sarcopenia

10 20 30 40 50 60 70 80 Age
Penn State Study (2008): ® in Athletes

Study Design
- 147 student athletes, randomized, placebo-controlled, double-blind
- Therapy: 10g FORTIGEL® or placebo over 24 weeks
- Parameters: pain, mobility, flexibility in different joints

Results
- Significant improvements in joint problems (especially in the knee)
- Increase of performance & mobility
- Decrease of alternative therapies (massages / ice packs)
Tendons and Ligaments – Crucial for Performance

Tendons subject to many types of injuries. […] The extrinsic factors are often related to sports and include excessive forces or loading, poor training techniques, and environmental conditions.

Human Cruciate and Hip Ligament Cells

A significantly increased collagen and elastin expression measured with treatment nuta protein and collagen® (n > 14; *p < 0.05) data: In-vitro test; RNA expression with FORTIGEL®
Extracellular Matrix molecules in Tenocytes

Significant increases of collagen, proteoglycan expression after treatment (n > 12; *p < 0.05)