Boosting mobility: promoting joint cartilage regeneration and reducing inflammation with collagen peptides

Evidence from new in vivo data (2016)

Dr. Elke De Clerck
Rousselot, global leader in gelatin and collagen peptides

**Pharma Gelatins**
- Hard capsules
- Soft gels
- Sensitive pharma applications

**Food Gelatins**
- Confectionery
- Dairy
- Desserts

**Synergy Systems**
- Confectionery

**Peptan®**
*Collagen peptides*
- Healthy aging
- Joint & bone health
- Skin beauty
- Sports nutrition

**ProTake**
- Protein enrichment
- Reformulation
Peptan® is the world’s leading collagen peptides brand

Backed by clinical studies, Peptan® is a natural, bioactive protein with proven health benefits. It’s the ingredient of choice for manufacturers looking to create exciting functional foods, drinks and supplements.
Collagen is a triple helix of chains of amino acids which build strong fibers used for the body’s structure.
Rousselot® technology based on a specific enzymatic hydrolysis process

**Peptan®** is a bioactive ingredient characterized by a **unique amino acid composition** and high bioavailability

- Collagen type 1 peptides high in the AA’s Glycine, Hydroxyproline, Proline and Glutamic acid
- 2,000 & 5,000 Da
- Highly digestible
- Soluble in cold water

100% in-house production in state-of-art plants (in France, Brazil)
A very specific amino acid composition gives the unique bioactive properties of Peptan® compared to other proteins.

Peptan® contains high levels of the amino acids Gly, Hyp, Pro, and Ala – providing specific health benefits not found with other protein sources.

<table>
<thead>
<tr>
<th>Amino acids</th>
<th>Peptan® average value</th>
<th>Whey protein conc.</th>
<th>Soy protein isolate</th>
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<tbody>
<tr>
<td>Alanine</td>
<td>8</td>
<td>4</td>
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</tr>
<tr>
<td>Arginine</td>
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<tr>
<td>Glutamic acid</td>
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<tr>
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<td>Hydroxy-proline</td>
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</tr>
<tr>
<td>Proline</td>
<td>13</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
High bioactivity and efficacy

- **High digestibility:**
  Over 90% of Peptan® collagen peptides are digestible.

- **Excellent absorption:**
  Collagen peptides are absorbed as small peptides, **appear 1 hour after ingestion in the blood**.
  More than 90% of ingested collagen peptides are absorbed.

- **High bioavailability:**
  Collagen-derived peptides appear in the targeted tissues, such as bone, cartilage and skin.

Peptides from Peptan are present in blood within 1 h

*Time course of free and bound hydroxyproline appearance in mouse plasma subsequent to an orally administered Peptan®B2000 bolus (50µg). Source: Rousselot*
Aging is linked to a decline of skin collagen, bone mass...

From the age of 30 ... less collagen is produced by the body

With age, less collagen is produced naturally by our body, and the first signs of aging starts to occur. Loss of collagen affects all the connective tissues, such as skin, joints and bones.

Skin collagen (μg collagen/mg protein) and bone mineral density (g hydroxyapatite/cm²) related to age. Figure adapted from: Castelo-Branco C. et al., Maturitas (1994) 18:199-206.
Joints, along with bones, muscles, tendons, ligaments and cartilage, form the **musculoskeletal system** that allows us to move freely!!

Consumers look for natural and safe solutions offering ‘mobility’ benefits:

- **Active, healthy lifestyle:** ‘feel good-look good’
- **Optimize performance:** ‘move freely, recover faster’
- **Healthy Aging:** ‘keeping active for as long as possible’

Collagen peptides can help maintain mobility as we age.
Most healthy individuals experience normal wear and tear on the joints as part of life. Also bones and muscles mass suffer from aging. 

### Healthy agers
- Joint discomfort and stiffness
- Age related bone density loss
- Age related muscle loss

### Sportspeople
- Athletes more prone to joint, tendons & ligaments problems- high impact and endurance sport
  - Acute stress placed on major joints-shoulders, hips, knees

- Efficient movement
- Recovery after exercise
- Injury risks e.g. soft tissue surrounding the joint

Source: Wholefoods Magazine, Natural Product Insider
Science behind an ingredient is increasingly important, regulators & consumers expect health claims to be backed by science.

**Mechanisms of action**
- Cell culture
- Target cell type / molecule

**Proof of principle**
- Animal studies (mice, rats)
- Well defined models in easily controllable conditions

**Proof of efficacy**
- Randomized, placebo-controlled, double-blind
- Target group

*Peptan® offers proven efficacy*
As we age and from prolonged use, we experience **wear and tear on our joints**. High impact activity also affects joint health with time. Symptoms may include **joint discomfort, tenderness, stiffness**

- Collagen makes up 70-95% of joint cartilage
- Peptan provides unique building blocks to build new collagen and regenerate cartilage

**Scientific studies have shown:**
- Peptan can act as a cellular trigger to increase collagen and aggrecan production
- Collagen production helps to rebuild cartilage and support healthy joints
Chondrocytes were cultured in the presence of Peptan or controls

**Dose-dependent increase of cartilage matrix molecule** expression: type II collagen and aggrecan

Collagen type 1 is proven effective to stimulate synthesis of collagen type 2 in joint cells

Dose-dependent induction of gene extracellular matrix component expression in primary rat chondrocytes assessed by quantitative real time PCR.

Rousselot data unpublished
Peptan® improves symptoms of osteoarthritis in a randomized, placebo-controlled, double-blind trial

- 100 women (40-70 years old) with mild knee osteoarthritis (KL 0-III)
- Daily oral intake of 8g/d Peptan or placebo for 6 months
- WOMAC score for joint pain, stiffness and function; Lysholm score for activity
- Significant improvement of joint pain and function already after 3 months and throughout the full treatment duration (6 months).

Jiang et al. Agro Foods 2014
Peptan® for joint health – what are the mechanisms?

- Peptan provides **symptom-relief** in humans suffering from osteoarthritis (clinical trial).

- Osteoarthritis is a **complex disease**:
  - Wear & tear of cartilage
  - Degradation of underlying bone
  - **Inflammation** of the encasing membrane (synovium)

  ⇒ **Can Peptan go beyond a symptom-modifying effect?**

- Get better mechanistic insight from *in vivo* models for osteoarthritis
Highly ranked academic partner in the USA

Mouse model of posttraumatic osteoarthritis induced by an operative damage of the knee

Preventive treatment with 2 dosages of Peptan

In early and mid-stage disease, assessment of
- Cartilage structure
- Cell function (chondrocytes)
- Inflammation (synovium)

Double-check efficient absorption by determining hydroxyproline levels in blood.
Healthy cartilage is smooth with an undamaged surface and rich in proteoglycans (grey bar).

At mid-stage disease cartilage erosion can be quantified as a significant reduction in cartilage area (white bar), associated with a reduced proteoglycan content.

Peptan significantly and dose-dependently preserves the cartilage area and proteoglycan content (red bars).

⇒ Peptan maintains cartilage healthy by promoting cartilage regeneration.
Healthy cartilage is rich in proteoglycan produced by an abundant number of chondrocytes (grey bar).

In osteoarthritis, the chondrocyte number and the proteoglycan content are strongly reduced (white bar).

Peptan significantly and dose-dependently increases the total number and the % of active chondrocytes that produce proteoglycans (red bars).

⇒ Peptan stimulates chondrocytes to produce cartilage matrix.
A healthy synovial membrane is very thin (grey bar).

In osteoarthritis, the synovial membrane significantly thickens and is heavily inflamed (white bar).

Peptan significantly and dose-dependently reduces the thickening and the inflammation of the synovial membrane (red bars).

⇒ Peptan is anti-inflammatory.
Peptan is **cartilage-regenerative**
- it preserves cartilage area during osteoarthritis development

Peptan is **chondro-regenerative**
- it stimulates chondrocyte proliferation (increased number) and stimulates proteoglycan synthesis.

Peptan is **anti-inflammatory**
- it normalizes synovial thickness and reduces production of the inflammatory marker TNF.
**Clinical Study**, 93 KOA patients. Joint pain reduction assessed by VAS scale. Comparison of analgesic activity over 3 months.

Daily intake of hydrolyzed collagen (10 g) resulted in **significantly lower pain scores** than observed with glucosamine (1.5 g).

Source: Results by Trc, Bohmova, 2011, in International Orthopaedics
**Innovation in Joint health supplements**

**1st generation ingredients:**

**Glucosamine/Chondroitin**
- Clinical studies meta-analysis & GAIT study, showed no overall proven effectiveness on joint health
- Question mark on glucosamine safety (side effects)
  
but
- Well known by consumers, large market today in US

**2nd generation ingredients:**

**Collagen peptides /hydrolyzed collagen**
- Growing clinical evidence, shown to be more effective than glucosamine
- Natural and safe, **body’s own protein**
  (connective tissues incl. cartilage)
- known by consumers

**Other ingredients:** Omega-3, Tumeric, Boswellia,..**Blends of several actives** are often used
Peptan® is suitable for all applications, incl. high concentration collagen & protein formulations

- Neutral
- Highly soluble
- pH stable
- Heat stable (UHT, baking, etc.)

Peptan® is available in different grades, raw material, molecular weight & powder specifications
Collagen peptides are used as the key bioactive ingredient across several segments.
Thank you for your attention

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Collagen peptides for a healthy lifestyle