



Collagen Peptides –  
Innovative technologies  
for innovative ideas!



# What are collagen peptides?

Collagen peptides are short chain protein building blocks produced by hydrolysis of native collagen. Depending on the applied enzymatic process, a characteristic pattern of collagenic fragments will be generated.

These peptides are defined and classified by their average molecular weight distribution and peptide profile. Independent from their molecular weight all collagen peptides are rapidly absorbed by the body by virtually 100% and provide high

bioavailability. They are non-allergenic, easily digestible, and due to the fact they are classified as food, suitable for clean label products.

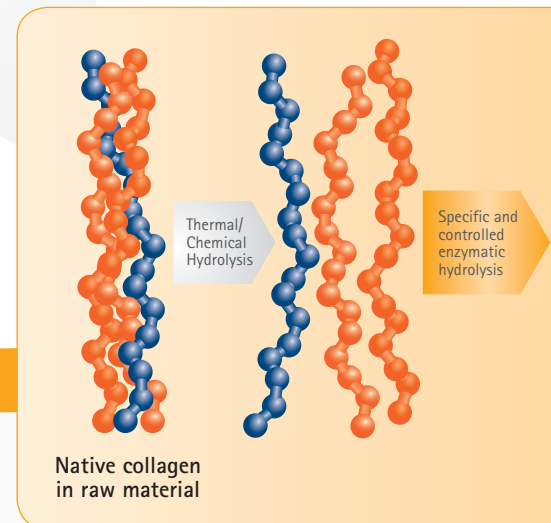
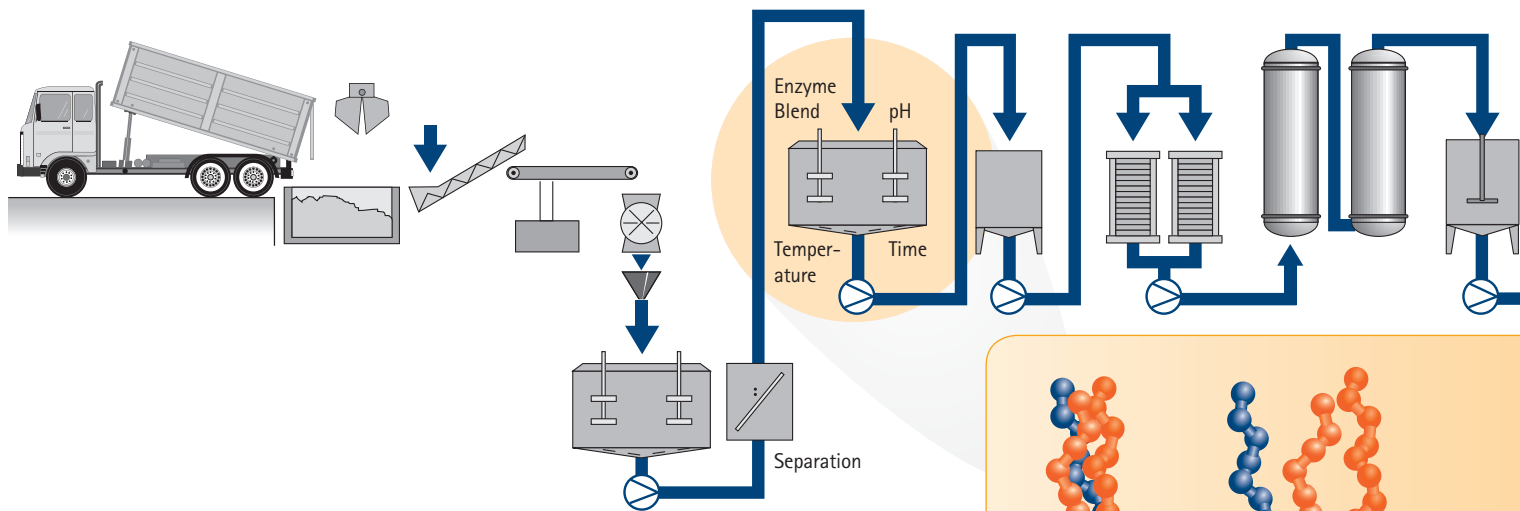
Collagen peptides are a pure source of protein that originates from collagen, a mammalian extracellular matrix protein. GELITA offers a versatile portfolio of different collagen peptides classified in Bioactive Collagen Peptides® which are optimized for a specific life science solution e. g. FORTIGEL® for Joint Health or FORTIBONE® for Bone Health and PEPTIPLUS® for protein enrichment and food technological purposes.

Due to their various chemical and physical properties GELITA® Collagen Peptides are ideal proteins to combine with other food ingredients for a variety of food applications.

## Pretreatment of the Raw Material

## Enzymatic Process (cutting of collagen into specific peptides)

## Purification (Filtration, Desalination)



### Technological properties

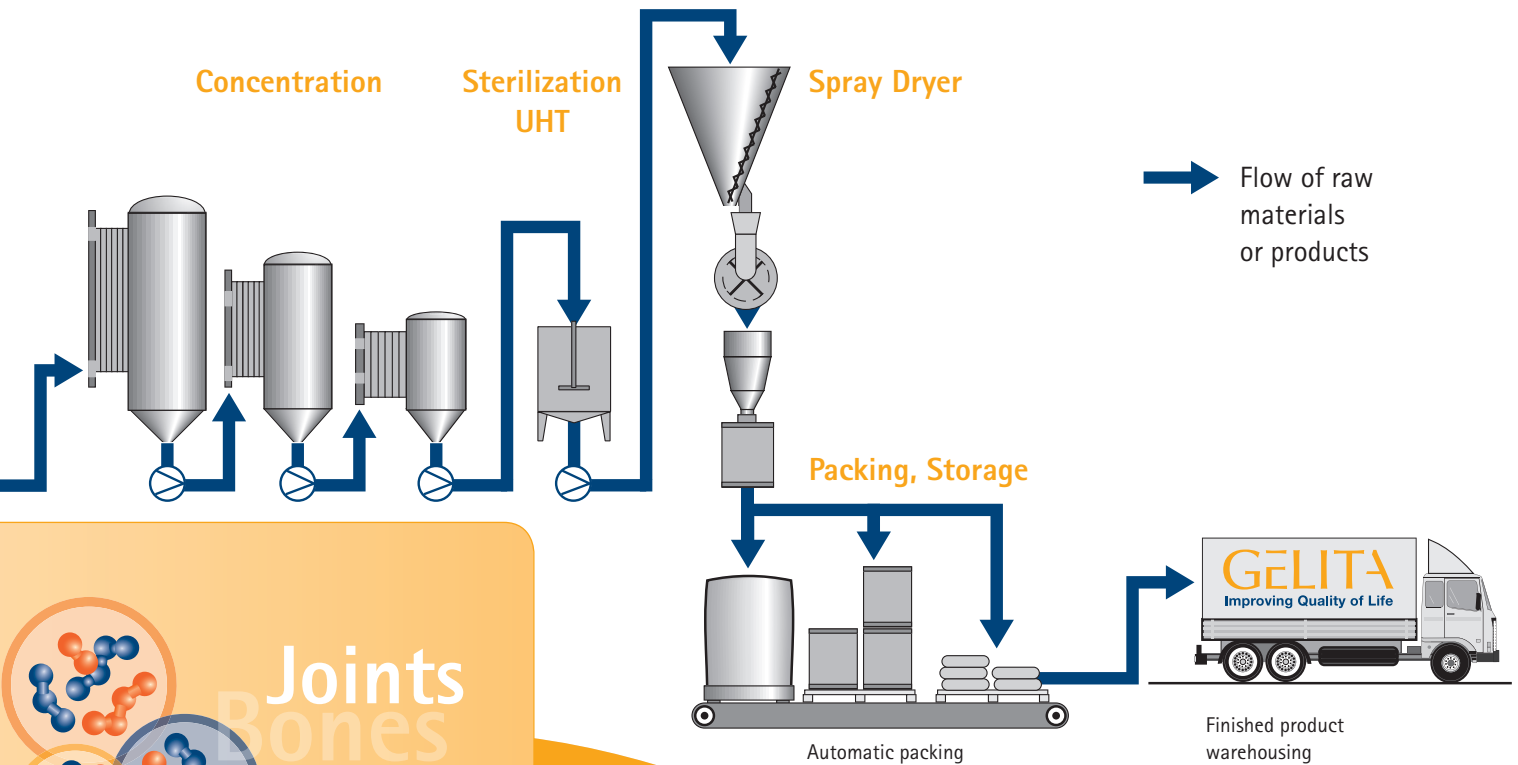
- Excellent solubility
- Heat-stability
- Stable against food acids
- Brilliant clarity
- No precipitation or flocculation in liquid applications
- Low viscosity
- Neutral in taste and odor

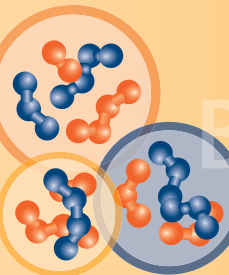
GELITA® Collagen Peptides are tailor made proteins run through a safe and certified production process (ISO 9001, ISO 14001, ISO 50001 & FSSC 22000).

The key of this technology is the enzymatic step cutting the collagen into specific peptides.

Protein Enrichment		PEPTIPLUS® Collagen Protein
<b>Bioactive Collagen Peptides®</b>		
Joint Health	Human	FORTIGEL® The Joint Health Revolution
	Pet	PETAGILE® Feeding Mobility
Bone Health		FORTIBONE® Collagen Matrix Stimulation
Beauty from Within		VERISOL® Beauty from Within
Body Toning		BODYBALANCE® Performance Peptides
Ligaments & Tendons		TENDOFORTE® For Maximum Tension

GELITA's portfolio also includes high molecular weight collagen peptides such as GELITA Collagel™ or GELITA Sol® DA, collagen peptides with high binding properties used for example as partial glucose replacer in cereal bars or for foam stabilization in smoothies.




  
**Joint**s  
**Bone**s  
**Muscle**s  
**Skin**  
**Ligament**s

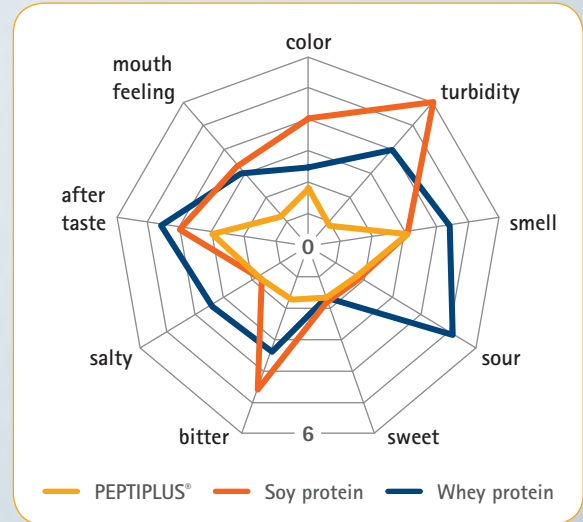
Bioactive Collagen Peptides®

# Why to use GELITA® Collagen Peptides?

- Pure Food Protein (up to 98% protein in dry substance)
- Reg. (EC) No 853/2004
- Non Allergenic (Mammalian Source)
- Clean label
- Non GMO Products
- FDA GRAS status (Docket Number 77N-0232)
- KOSHER/HALAL (bovine origin)

GELITA® Collagen Peptides have a typical amino acid and nutritional profile and are free from fat, sugar, cholesterol, purines and additives (clean Nutritional Profile). They offer clean-label opportunities.

GELITA® Collagen Peptides have an excellent sensorial profile



Sensorial evaluation of PEPTIPLUS®, Whey and Soy on a scale of: 0 = not noticeable to 6 = strong

The powder and liquid form of collagen peptides show an excellent sensorial profile suitable for sophisticated applications like beverages or powder products.

**TECHNICAL INFORMATION**  
**Typical Amino Acid Composition of Collagen Peptide\***

	g/100 g	Amino Acid/100 Amino Acid
ALANINE	8.6	10.2
ARGININE	2.3	4.5
ASPARTIC ACID	9.8	4.8
GLUTAMIC ACID	10.2	32.8
GLYCINE	1.9	0.8
HISTIDINE	11.9	10.5
HYDROXYPROLINE	1.4	2.3
ISOLEUCINE	2.7	0.7
LEUCINE	0.9	1.4
METHIONINE	2.1	1.4
PHENYLALANINE	12.7	3.4
PROLINE	3.2	1.7
SERINE	1.8	2.6
THREONINE	3.6	1.1
LYSINE	1.6	0.4
HYDROXYLYSINE	0.8	2.3
TYROSINE	2.4	0.2
VALINE	2.4	0.2

\* Including the following branded products: FORTIGEL®, VERISOL®, FORTIBONE®, PETAGLE®, BODYBALANCE™, TENDROF-CITE®, PEPTIPLUS™  
 \*\* g amino acid per 100 g crude protein

**Method:**  
 The amino acid composition was determined by amino acid analysis as described in the Pham et al. 2006 (Version 8).  
 The proteins were hydrolysed for 24 h in their individual amino acid constituents in the presence of 6 N HCl and 0.1% phenol at 110 °C. The amide links in the side chains of glutamine and asparagine are hydrolyzed to form glutamic acid and aspartic acid. Following the hydrolysis, the amino acids are consistently labelled with 6-aminocaproic N-hydroxy-succinimidyl carbamate (AOC-AcCo-Flour reagent, Waters Inc.) using a pre-column derivatization technique. L-2-Aminobutyric acid (AABA) with a final concentration of 10 pmol/ml was used as internal standard. The derivatives are separated by C<sub>18</sub>-reversed-phase HPLC and quantified by fluorescence detection. (Determination of data PROTAGEN AG, Dortmund, Germany).

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 ISO 9001:2015

**PEPTIPLUS®**  
 Collagen Protein

**NUTRITIONAL DATA**  
 GELITA Collagen Peptides

Nutrient	Values*
Energy per 100 g portion	1,502 kJ / 359 kcal
fat	0 g
protein	0 g
carbohydrate	0 g
fiber	0 g
sodium	0 g
potassium	90 g
calcium	0.50 g

\* based on average GELITA monitoring data (2004-2014) at the time of the products described or their suitability for a specific application.

Information only. Therefore it should not be construed as a recommendation. The calculation of the salt content (NaCl) is based on the sodium levels.

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 Nutritional Data, UD Chemie, GELITA Collagen Peptide, PEPTIPLUS®  
 Status: 05.11.2015

**PEPTIPLUS®**  
 Collagen Protein

**Product Data**

**PEPTIPLUS® XB**  
 Art. No. 219070

**Description:** Highly purified collagen peptides from bovine skin, which are specifically neutral in taste and odour. The average molecular weight is approx. 3,000 g/mol. PEPTIPLUS® XB is suitable for protein enrichment in food such as bars, gams, and beverages.

**Appearance:** Light coloured, fine powder with a bulk density of approx. 420 g/L.

**Solubility:** Soluble in cold and warm water.

**PEPTIPLUS® XB** is pure collagen protein with an extremely low mineral content and is free of fat, cholesterol, carbohydrates, and dietary fibres. The product is in compliance with regulation (EC) No. 853/2004 on the hygiene of foodstuffs and with regulation (EC) No. 1825/2003 on specific hygiene rules for food of animal origin. According to regulation (EC) No. 1825/2003 and regulation (EC) No. 1831/2003 the product has not to be labelled as "GMF".

Parameter and Analytical Data	Value	Test Method
Protein content of dry substance	minimum 97 %	Kjeldahl (N <sub>62.5</sub> )
Dry substance (105 °C, 16 h)	91 - 96 %	GME
Ash (550 °C)	≤ 0.8 %	USP/GME
pH (20 °C, room temperature)	5.0 - 6.4	Potentiometer
Viscosity (20 °C, 25 °C)	3 - 5 mPa s	GELITA method
Phenolics	≤ 10 mg/kg	Ph. Eur. JUSP
Sulphur dioxide	≤ 10 mg/kg	Ph. Eur. JUSP
Arsenic	≤ 1 mg/kg	ICP-OES
Cadmium	≤ 0.1 mg/kg	ICP-OES
Chromium	≤ 10 mg/kg	ICP-OES
Copper	≤ 30 mg/kg	ICP-OES
Mercury	≤ 0.1 mg/kg	AMS
Lead	≤ 0.1 mg/kg	ICP-OES
Zinc	≤ 30 mg/kg	ICP-OES
Microbiological		
Total aerobic microb. count	< 1000/g	Ph. Eur. JUSP
Total yeast/mould count	< 100/g	Ph. Eur. JUSP
Sulfite re. anion: Spores	< 10/g	ANON NF V59-106
Escherichia coli	negative/10 g	Ph. Eur. JUSP mod.
Salmonella	negative/25 g	ISO 6579

\*The parameter is monitored according to an internal quality programme.

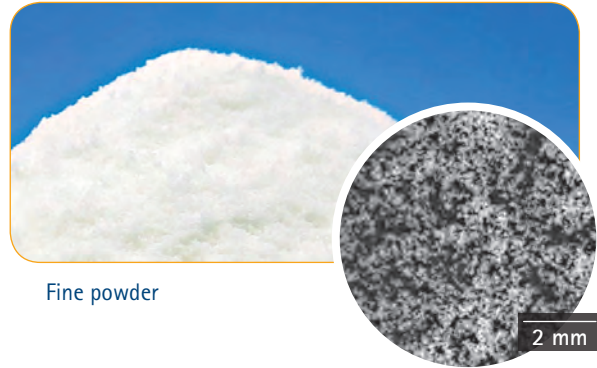
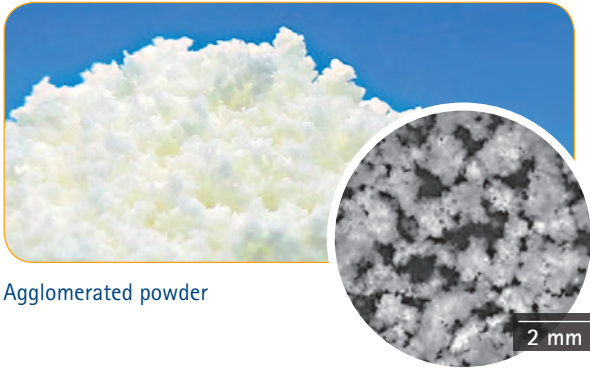
**Self Life** Under dry and odourless conditions PEPTIPLUS® XB can be stored in the original unopened packaging at ambient temperature (c. 20 °C) for 5 years without loss of quality.

**Packages** Multi-ply REPA paper bags with PE-liner containing 15 or 20 kg net.

This information is based on our present state of knowledge and is intended to provide general information on our products and their uses. It should not be construed as a guarantee of specific properties of the products described or their suitability for a specific application. Any existing industrial property rights must be observed. The quality of our products is guaranteed under our General Conditions of Sale, and our quality assurance system is in accordance with ISO 9001 and ISO 22000.

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 PM MW - PGP-SDX - Version 1 - Date of issue: 11/2015

# What to know about collagen peptides?

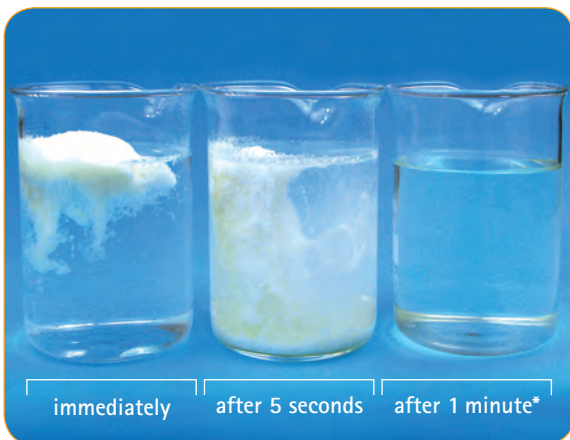


## Collagen peptides in powder form

Collagen peptides are delivered as agglomerated or fine powder. Both powder forms show excellent blending properties. Agglomerated powders offer the advantage of an improved solubility behavior.

Due to its coarse powder structure the agglomerated powders offer several advantages in food processing:

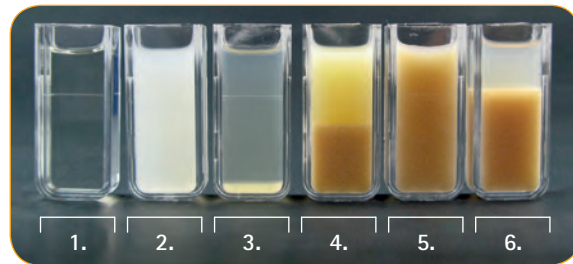
- Rapid dissolution
- No lump formation
- Dust-free handling
- Excellent flowability
- No cohesion or clogging
- High storage stability
- High batch-to-batch consistency



Excellent wettability and solubility of agglomerated powder.

## Collagen peptides in liquids

In liquid applications collagen peptides are clear soluble compared to other proteins. They can be used over a wide range of concentrations and pH without loss of quality and performance.

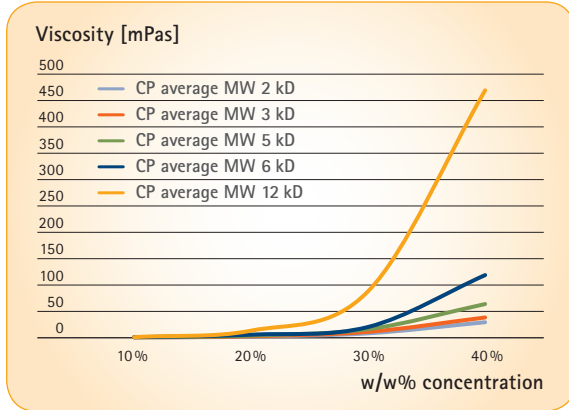


Comparison of solubility of different protein solutions (10 %, pH = 3,6): 1. collagen peptide, 2. whey protein, 3. potatoe protein, 4. lupine protein, 5. soy protein, 6. pea protein.

At low protein concentrations all collagen peptides show almost the same low viscosity, independent from average molecular weight (or degree of hydrolysis). With increasing concentrations the viscosity increases, from watery to syrup like liquids. This allows them to be used as variable agent e.g. for protein bars and beverages.

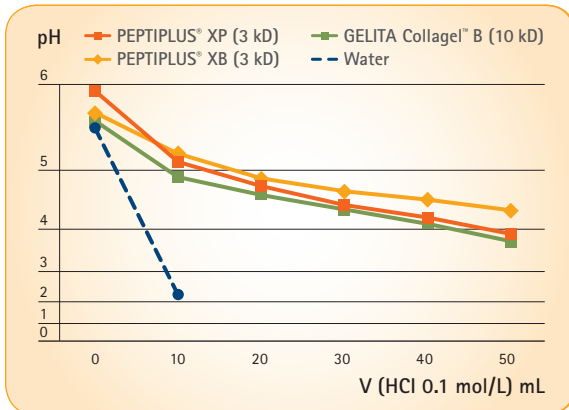
With GELITA® Collagen Peptides it is possible to adapt individual mouthfeel and texture!





Viscosity of different collagen peptides at 25°C.

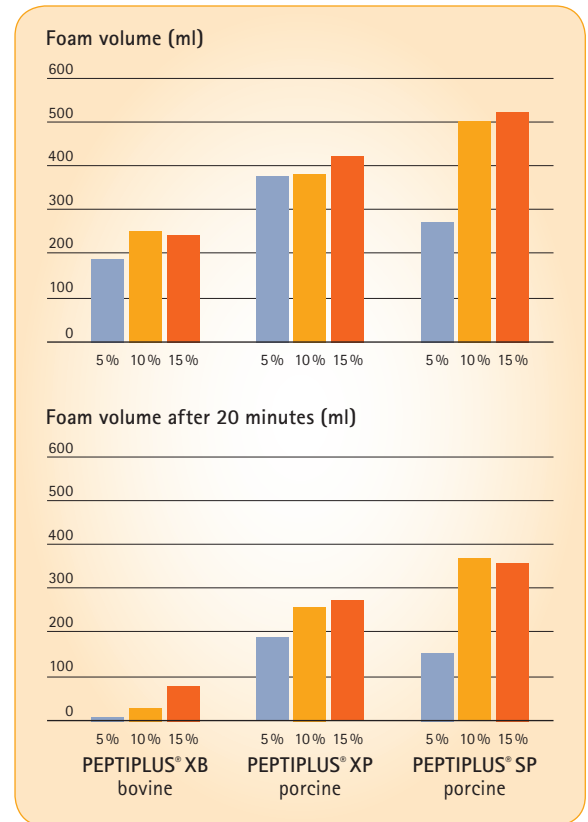
Due to their high buffer capacity collagen peptides in liquids guarantee pH stability when adding acidic or basic components.



Buffer capacity of collagen peptides. pH after adding acid (HCL 0.1 mol/L) to the system.

The isoelectric point of collagen peptides ranges between 5 – 6. This is a typical value for proteins which means that collagen peptides can be combined with all other proteins in beverage applications.

The foaming of collagen peptides is dependent on the origin of the product. Bovine materials show a lower initial foam volume and foam stability compared those from porcine sources.

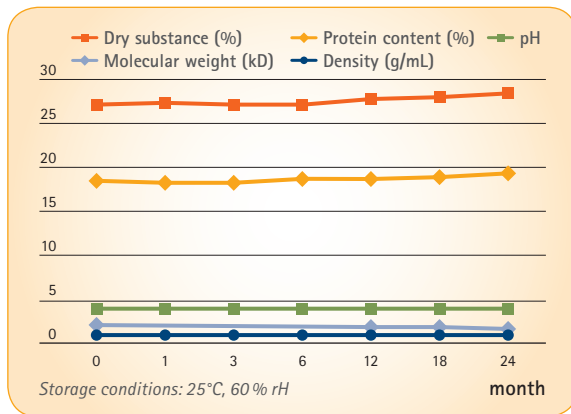


Foam volume and stability (foam volume after 20 minutes) for different PEPTIPLUS® types with protein concentrations of 5%, 10% and 15%.



## Collagen peptides are stable in food products and food supplements

There is no hydrolysis of collagen peptides over a longer period of time, across a pH range from pH = 3.8 to 7.0, common for most food products. Even at higher storage temperatures caused by climate conditions they are hydrolysis stable.



Stability test over a period of 24 month of a market product (protein shot) with 25% VERISOL® and other ingredients like sucrose, tartaric acid, citric acid, beta-carotene, potassium sorbate, sodium benzoate, flavor, zinc citrate, retinyl acetate, biotin, sodium selenite.

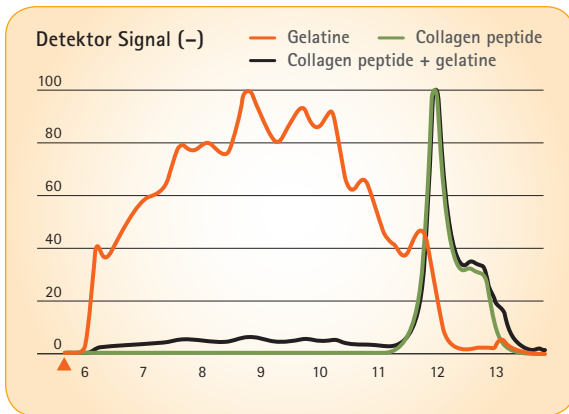
Due to these physicochemical properties GELITA® Collagen Peptides offer a wide spectrum to be used in food applications either in solid or liquid form. Even at high concentrations collagen peptides show hydrolysis stability and comparably high resistance against Maillard reactions.

Collagen peptides show excellent recovery rates in food products gone through the thermal and mechanical stress during the production process.



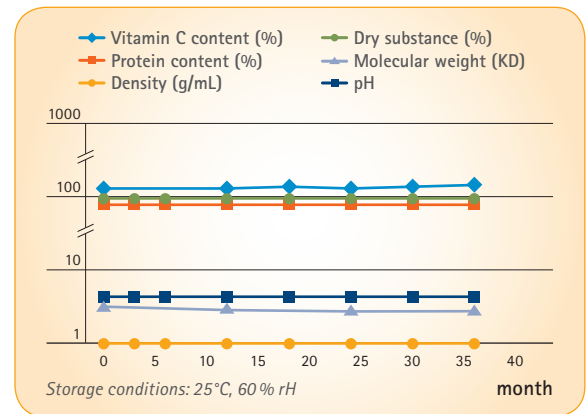
In various food applications e. g. soups, extruded products or gummy bears fortified with GELITA® Collagen Peptides, the protein was tested for degradation and was found to be stable both qualitatively and quantitatively.

The diagram below shows there is no loss or degradation of the collagen peptide after going through the food production process.



Chromatographic profile of fruit gummy sample. GELITA® Collagen Peptides show no change in fruit gum applications compared to samples only with gelatine – neither in quantity nor in quality.

Collagen peptides powder can be combined with micronutrients like vitamins and minerals. In powder blends, long stability tests proved that all the ingredients are stable over at least a period of 3 years.



Long term stability test of a powder blend with vitamin C (market product). Ingredients: 90 % FORTIGEL®, flavor + beta-carotene, citric acid, orange flavor, ascorbic acid, sucralose.





## Beverage applications

Collagen peptides can be used for different beverage applications like near water drinks, carbonated drinks and drinkable yogurt or whey beverages in concentrations up to 25%. In carbonated variants, carbon dioxide concentrations were tested up to 5 g/l with protein concentrations up to 10%.



## Bar applications

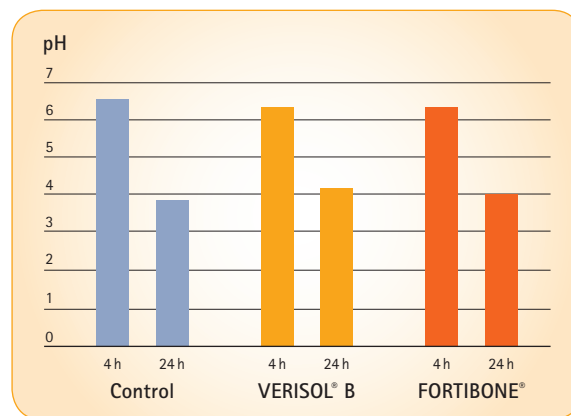
In bar manufacturing the GELITA® Collagen Peptides portfolio offers a wide range of possibilities to produce bars with different and special textures. For high protein, cereal or fruit bars – any of these applications are possible with collagen peptides.

**GELITA® Collagen Peptides are used for:**

- Protein fortification
- Water binding and texturizing effects
- Sugar reduction  
(low Glycemic Index, high protein)

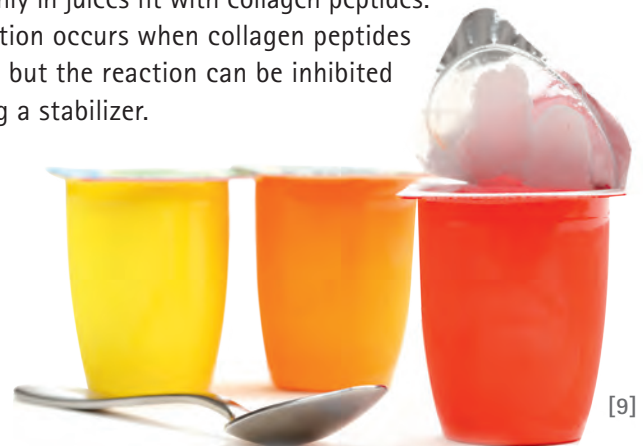
## Fermented products

In fermented products like yogurt or alcoholic beverages collagen peptides do not affect the fermentation process up to a concentration of 5%. The combination of collagen peptides with ferments is suitable and reveals excellent sensorial profile and texture of the food. Therefore collagen peptides can be added before or after the fermentation process as required by the production process.



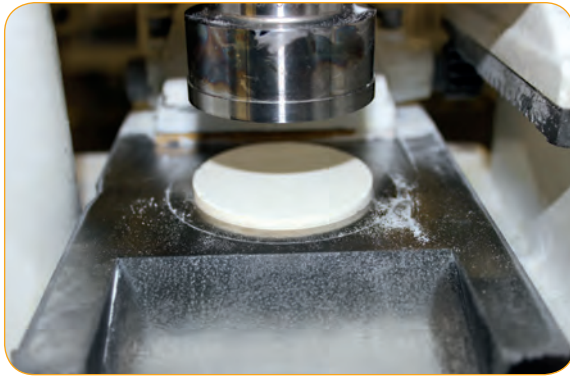
5% GELITA® Collagen Peptides in milk was tested and fermented with a commercial available culture to yogurt. After 4 h and 24 h the pH was detected. Compared to the control (no added collagen peptide) the yogurt with collagen peptides showed similar fermentation times.

Also combinations with ingredients like polyphenols which are commonly used in healthy food mainly in juices fit with collagen peptides. Precipitation occurs when collagen peptides are used, but the reaction can be inhibited by adding a stabilizer.

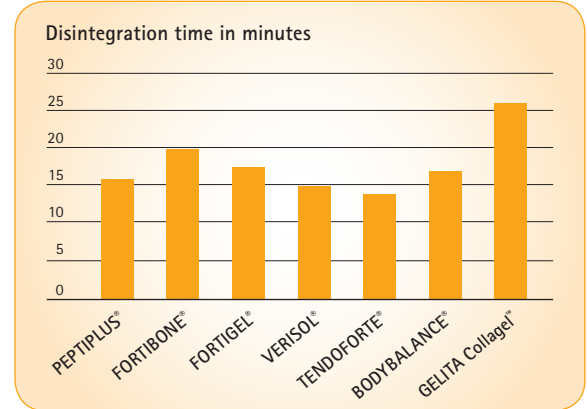


## Comprimates and capsules

Microencapsulation of vitamins or other water insoluble micronutrients is a well established technology possible in combination with collagen peptides.

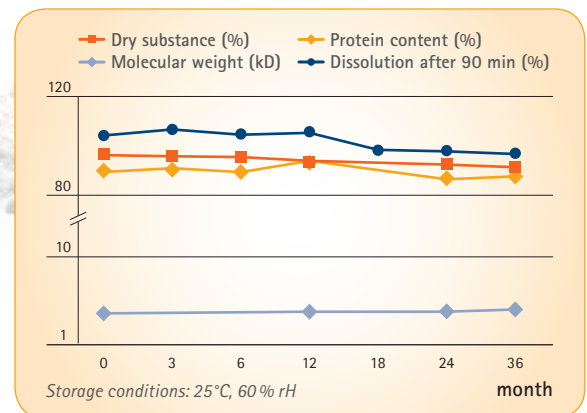


Tableting of GELITA® Collagen Peptides performs well because of the powder structure and high bulk density. Tablets with 99% collagen peptides and 1% lubricant revealed very good dissolution and disintegration profiles.



Release profile – Disintegration of the tablet within 30 minutes in 0.2 N HCl, pH = 1.3; T = 37°C.


Long term stability tests of tablets revealed excellent dissolution profiles even after 3 years. Also no protein hydrolysis was detectable.



Long term stability test of a market product (tablet).  
 Ingredients core: 90% VERISOL®, 1% Magnesium Stearate;  
 coating: coating agent pink-red, Hydroxypropyl-methyl-cellulose, water, colour.



## Stability Overview

 Collagen peptides are hydrolysis stable under the following conditions.

Process	State	Collagen peptide concentration	Temperature/Time	pH
Extrusion	Liquid (Aqueous)	up to 10 %	174°C/1 s (pressure > 1 bar)	≥ 3.8
UHT	Liquid (Aqueous)	up to 60 %	140°C/3 s	≥ 3.8
Pasteurisation	Liquid (Aqueous)	up to 60 %	70°C – 90°C/5 min	≥ 3.8
Heating	Solid (Powder)	90 - 100 %	up to 80°C	5 - 6
Baking	Solid (Blend)	up to 10 %	180°C/20 min	5 - 6

# Make innovative product ideas a reality!

**!** Profit from GELITA's know-how and ask your service contact to provide you with the desired information.

GELITA offers a variety of basic recipes for innovative food technology solutions.

Application	Use level*
Protein-Shots	30.0 - 45.0 %
Beverages – Powder Blends	0.5 - 50.0 %
RTD – Beverages – Carbonated	1.0 - 10.0 %
RTD – Beverages – Near Water	0.5 - 3.0 %
RTD – Beverages – Drinkable Yogurts/Whey	0.5 - 3.0 %
Smoothies	1.0 - 20.0 %
Squeezer	up to 50.0 %
Bars – Cereal	1.0 - 10.0 %
Bars – Protein	10.0 - 25.0 %
Powder	up to 100.0 %
Comprimates (e.g. Tablets, Lozenges)	50.0 - 99.0 %
Confectionary (Gummy Bears)	0.5 - 20.0 %
Yogurt	0.5 - 5.0 %
Desserts (Mousses, Puddings)	0.5 - 10.0 %
Ice Cream	0.5 - 10.0 %
Whipped Creams	0.5 - 5.0 %
Chocolate	5.0 - 10.0 %
Soups & Sauces	0.5 - 10.0 %
Bakery (Muffins, Bread)	1.0 - 10.0 %

\*Usage dependent on final product (e.g. desired texture, protein content)

**VERISOL®**  
Beauty From Within

Beauty from within with VERISOL®

- Comprising optimized Bioactive Collagen Peptides
- Improving skin elasticity
- For fewer wrinkles and smooth skin
- New opportunities for Nutraceuticals
- Perfect sensory profile

**GELITA**  
Improving Quality of Life

**FORTIBONE®**  
Collagen Matrix Stimulation

Healthy, strong and stable bones

- Improves bone stability and flexibility
- Promotes biosynthesis of bone extracellular matrix
- Reduces degenerative effects

**GELITA**  
Improving Quality of Life

**Mobility Bar**

**FORTIGEL®**  
The Joint Health Revolution

Ingredients: Glucose syrup, fructose syrup, dark chocolate coating (cocoa sugar, cocoa butter, emulsifier, soy lecithin, flavor), milk protein, FORTIGEL® (collagen hydrolylysate 5g), protein enriched whey powder, hazelnut cream, vegetable fat, low-fat cocoa powder, flavor, caramel

One bar contains 5g FORTIGEL®. This product does not replace a healthy diet. May contain traces of peanuts, other nuts and gluten. Store in a dry cool place. Keep out of reach of children.

Nutritional data	100g	45g 1 serving
Energy value	1731 kJ / 412 kcal	779 kJ / 185 kcal
Protein	22.0g	12.0g
Carbohydrates of which sugars	44.0g / 31.0g	20.0g / 14.0g
Fat of which saturated fatty acids	14.0g / 6.8g	6.3g / 3.1g
Sodium	1.5g	0.7g
FORTIGEL®	0.5g	0.2g
	11.1g	5.0g

Best before end: see front. Sample, not for commercial use.

**FORTIGEL® for sustainable mobility**

- Bioactive Collagen Peptides® proven to stimulate joint cartilage regeneration
- Addressing the root cause of joint problems

GELITA AG · Berlebach, Germany  
www.gelita.com

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