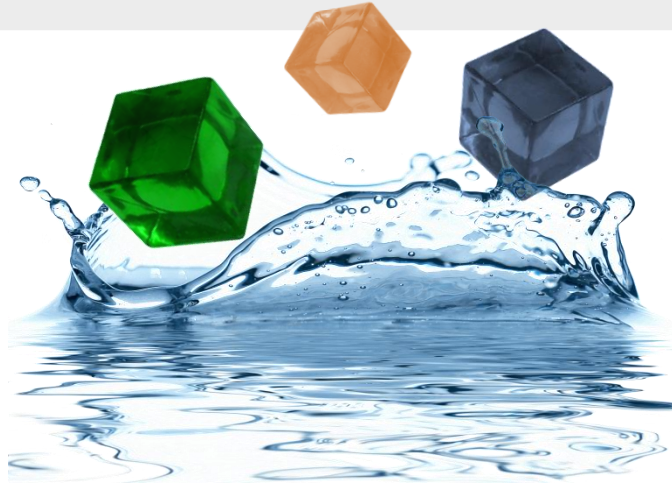


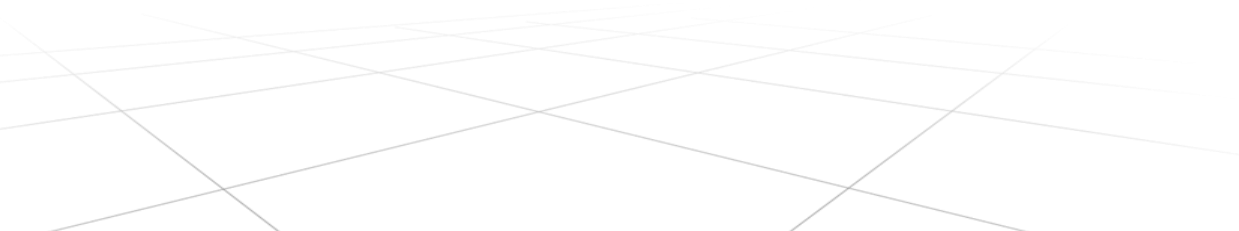


AMICOGEN

Collagen-Tripep20S



1



What is it?

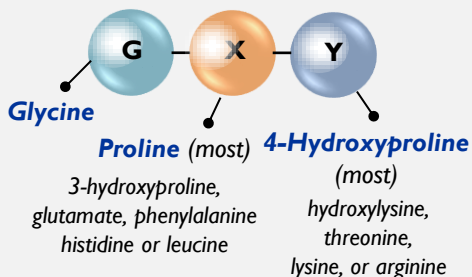
Collagen tripeptide

approx. 3,000 amino acids

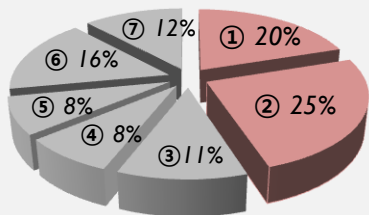


3 amino acids

Collagen tripeptide



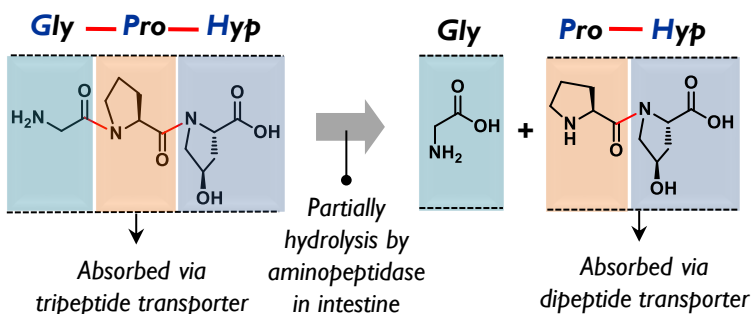
Collagen amino acids composition



- ① **Glycine**, ② **Proline & hydroxyproline**
- ③ Glutamic acid, ④ Arginine, ⑤ Alanine,
- ⑥ Essential amino acids, ⑦ Others

- Structure of collagen is in the form of **a triple helix**, a set of three polypeptide strands with the same axis, held together in a helical conformation by hydrogen bonds.
- A **minimum unit** of collagen is **tripeptide**, composed of **3 amino acids**, sized 1/1000 of collagen
- The most abundant amino acids in collagen is **Glycine (Gly, G)**, **Proline (Pro, P)** and **Hydroxyproline (Hyp)**.
- The most common primary motifs in the amino acid sequence of collagen are **glycine-proline-X** and **glycine-X-hydroxyproline**, where X is any amino acid other than glycine, proline or hydroxyproline.

Gly-Pro-Hyp hydrolysis and absorption



: Orally supplemented **GPH** passes through the stomach, reaches the intestine and then is absorbed into the body in the form GPH itself or as dipeptide, **PH**.

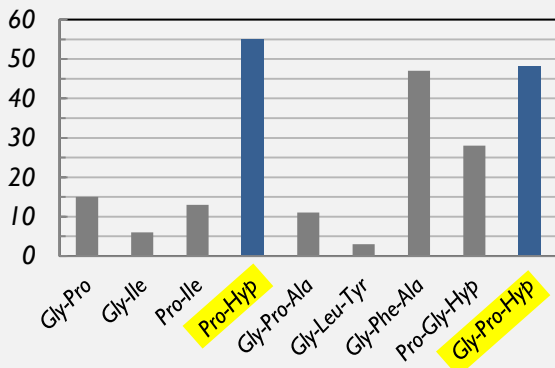
— : Amide bond

Gly-Pro-Hyp

The crucial role of GPH and PH

► Proc.Natl. Acad. Sci. 1978; 75(2): 871-875

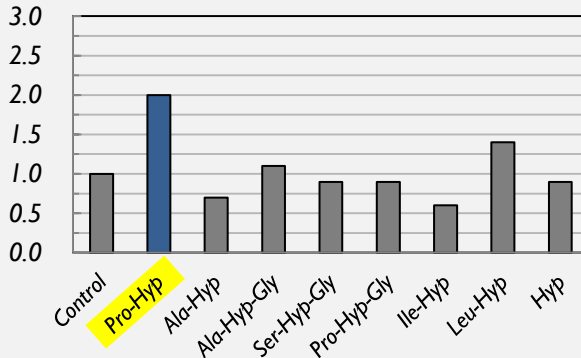
Chemotactic activity of fibroblasts



: **GPH** and **PH**, dipeptides hydrolysed from tripeptide functions as **chemotactic stimuli for fibroblasts in skin to repair the damaged tissue**.

► J Dermatol. 2010; 37, 330-338

Relative HAS2 mRNA expression (fold increase)



: **PH**, increased the expression of hyaluronan synthase 2 (HAS2) by 2.3-fold, the indicator of **skin moisture content**.

The Amicogen, Inc. → High content of **GPH**

• 3 Types of collagen tripeptide product in **AMICOGEN**

Collagen-Tripep20S

>20%
collagen tripeptide

GPH: 3.2%

Collagen-Tripep30S

>30%
collagen tripeptide

GPH: 4.2%

Collagen-Tripep60S

>60%
collagen tripeptide

GPH: 12.0%

- Strengthens body structure, such as skin, hair, nail, corneas, cartilage, bones, blood vessels, gut, intervertebral discs, and the dentin in teeth
- Prevents any signs of skin aging by inhibiting wrinkle formation and Improves skin moisture retention
- Repairs the damaged tissues and injuries through reconstruction of body matrix

Competitiveness

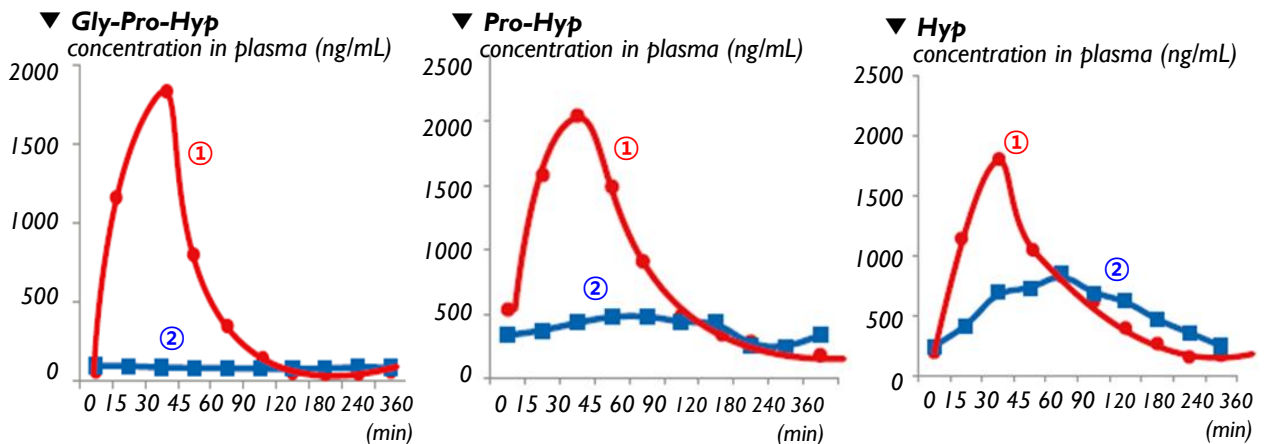
Collagen-Tripep20S of **AMICOGEN** has **great and fast absorption**

► J. Agric. Food Chem. 2016; 64:7127-7133

- Orally available collagen tripeptide: tripeptide dramatically increased the stability, intestinal permeability, and absorption of Gly-Pro-Hyp and Pro-Hyp

Animal test | ① **Collagen-Tripep20S** (MW <500Da, GPH content >3.2%) 500mg/kg (rat, n=12)

② **Collagen peptide** (MW <500Da, GPH content none) 500mg/kg (rat, n=12)



GPH, PH, and Hyp were better absorbed and reached higher plasma levels after the oral administration of **Collagen-Tripep20S** in rats compared to **Collagen peptide**.

Higher and faster absorption of ① **Collagen-Tripep20S** than other ② **Collagen peptide**

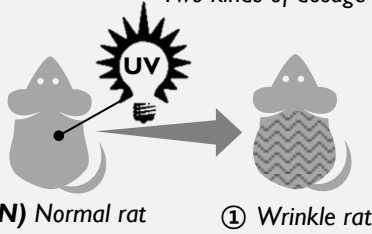
► Researches in progress by the Amicogen, Inc.

• Effect of oral **Collagen-Tripep20S** supplementation on skin **wrinkle** and **hydration**

I. **Animal test** | By irradiation of ultraviolet B on rats, wrinkles were formed.

Retinoic acid was treated via peritoneal injection as positive group.

Two kinds of dosage of Collagen-Tripep20S were administered orally.

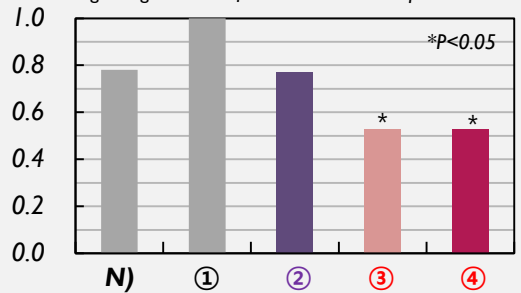


- ① Control: UVB-induced
- ② Positive: UVB-induced+ **Retinoic acid** 0.5mg/kg
- ③ CTP17: UVB-induced +Collagen-Tripep20S 17mg/kg for 14 weeks
- ④ CTP34: UVB-induced+Collagen-Tripep20S 34mg/kg for 14 weeks

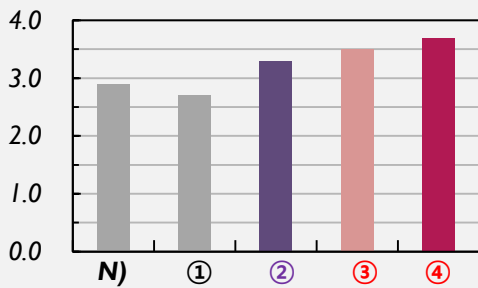


▼ **MMP-1/GAPDH**

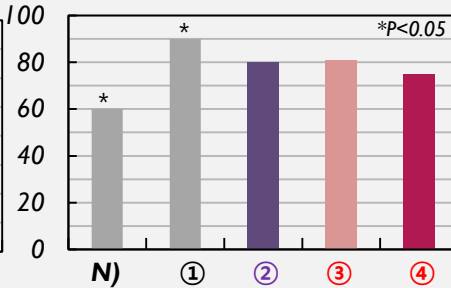
: which reflects the activity of matrix metalloprotease degrading all kinds of extracellular matrix proteins



▼ **Skin Moisture index**



▼ **Transepidermal water loss (g/nm² per hour)**



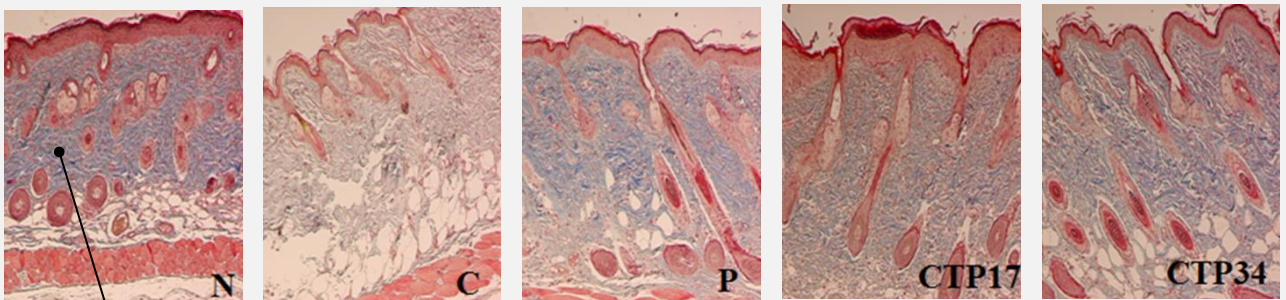
Collagen-Tripep20S

1. **Wrinkles** on skin reduced
2. **MMP-1** activity **reduced** which means **degradation** of extracellular matrix **reduced**
3. Skin **moisturized**
4. Loss of **water** reduced

II. **Histological observation** | on Balb/C mouse and NC/Nga Tnd mouse skin

after treatment of **Collagen-Tripep20S**, ③ 17mg/kg and ④ 34mg/kg (Masson's trichrome, X100)

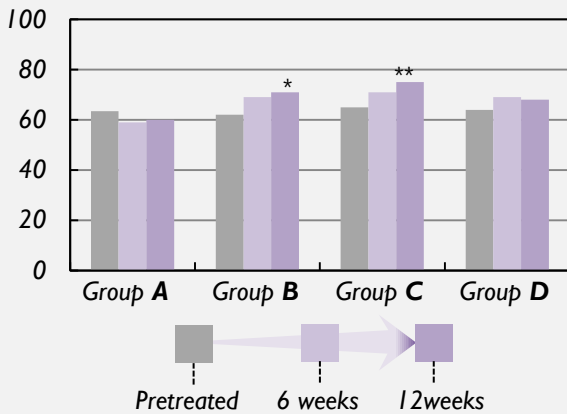
N: normal Balb/C mice, **C**: NC/Nga Tnd mouse model for atopic dermatitis, **P**: positive control, N-acetyl-glucosamine 17mg/kg, **CTP17**: Collagen-Tripep20S 17mg/kg, **CTP34**: Collagen-Tripep20S 34mg/kg, feeding duration: 4 weeks



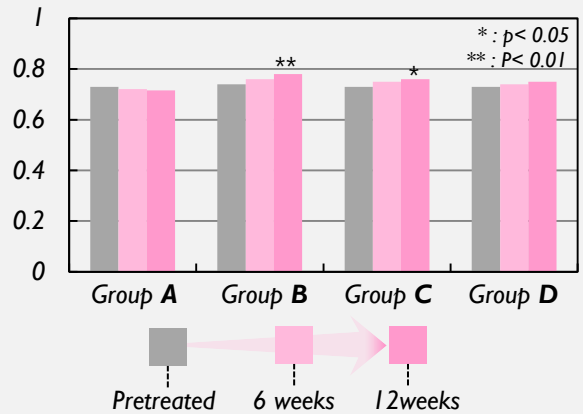
Blue stained parts indicate **collagen**, disrupted collagen structure in (C) recovered by taking **Collagen-Tripep20S** in a dose-dependent manner showing the thick blue staining

• Effects of **collagen tripeptide** supplementation on **skin properties**: A prospective, randomized, controlled study

▼ Corneometer (skin hydration)



▼ Cutometer (elasticity)



Clinical trial | 32 healthy volunteers were oral treated either A, B, C, or D daily for 12 weeks. Skin properties evaluated including hydration and elasticity by corneometer and cutometer, respectively

- Group A: no collagen
- Group B: **collagen tripeptide** 3 g
- Group C: **collagen tripeptide** 3 g + vitamin C 500 mg
- Group D: vitamin C 500 mg

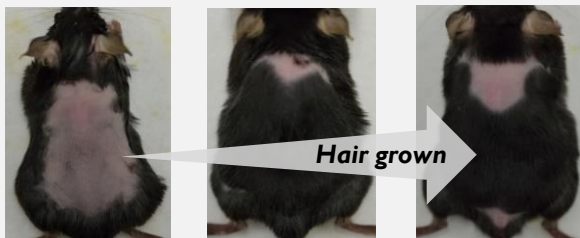
- **Significant changes** between control group and collagen tripeptide-supplemented group
- Daily collagen tripeptide supplementation improves **skin hydration** and **elasticity**.

Effect on hair growth

▶ Researches in progress by the Amicogen, Inc.

Animal test |

- ① Control mice: hair removed in degenerative status
- ② Drug for treatment of androgenic alopecia
- ③ Orally treated **Collagen-Tripep20S** for 17 days



- ① Control
- ② Minoxidil (Positive control)
- ③ **Collagen-Tripep20S**

Application

1 Skin beauty: Prevents and improves any signs of skin aging

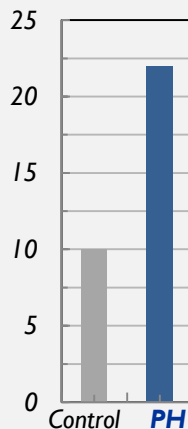
2 Joint health: Improves joint comfort

3 Hair & nail care: Promoting regeneration

Effect on joint health

▶ J Dermatol. 2010; 37(4), 330-338

▼ Hyaluronic acid (µg/well)



• Collagen-derived dipeptide, **PH**(proline-hydroxyproline) stimulates **hyaluronic acid synthesis** at a dose of 50 µg/mL for 48min in the synovium cell

• In patients with degenerative arthritis, **hyaluronic acid synthesis factor** of joint synovial membrane decreased, while hyaluronidase 2 increased



▼ Available dosage form



And can be used as food & beverage additives

▶ **Recommended dosage** | 1.0~1.5g/day



AMICOGEN

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