RESEARCH DOSAGE MANUAL

GHK-Cu FlexPen

Copper Tripeptide-1 · 100 mg / 3 ml · Research Grade

Glycyl-L-histidyl-L-lysine copper complex — Manufactured in the Netherlands under cGMP

INN / IUPAC	Glycyl-L-histidyl-L-lysine-Cu(II)
CAS Number	49557-75-7
Formula	C14H23CuN6O4+ (MW 340.84 g/mol)
Concentration	100 mg / 3 ml cartridge — 33.33 mg/ml
Pen Dose Scale	1 unit = 0.01 ml = 0.333 mg | 6 units = 2 mg
Total Pen Doses	300 units per cartridge (100 mg total)
Purity	≥ 99.2% HPLC · Endotoxin < 1 EU/mg
Storage	2–8 °C · protect from light · do not freeze
Batch / Expiry	NL-2026-A · Expires 10/2029
Administration	Subcutaneous injection (research)

1. Compound Overview

GHK-Cu (copper tripeptide-1) is a naturally occurring tripeptide first isolated from human plasma albumin by Pickart & Thaler (1973). It is found endogenously at ~200 µg/ml in young adults, declining to ~80 µg/ml by age 60. GHK-Cu activates over 4,000 human genes associated with tissue remodelling, collagen and elastin synthesis, anti-inflammatory signalling, angiogenesis promotion, and antioxidant defence. Its copper-chelate structure enables direct DNA-binding and transcription factor modulation at concentrations as low as 1 nM.

Key biological actions include: TGF-β1-driven upregulation of collagen type I and III synthesis (70% increase in fibroblast collagen production), VEGF-mediated capillary formation, hair follicle Wnt/β-catenin activation, and SOD1/catalase-dependent antioxidant protection. It has no known LD50 at research doses and a well-characterised safety profile in preclinical models.

2. Mechanism of Action

GHK-Cu signals through a multifactorial network. The copper ion coordinates with plasma membrane receptors to trigger intracellular signalling cascades. Key mechanisms include:

- **TGF-β1 pathway:** Upregulates transforming growth factor-β1 to drive fibroblast collagen and elastin deposition, accelerating wound healing.
- **VEGF signalling:** Promotes vascular endothelial growth factor expression, supporting neovascularisation and oxygen delivery to healing tissue.

• **NF-κB suppression:** Reduces pro-inflammatory cytokines (IL-1β, TNF-α) via NF-κB pathway inhibition, limiting chronic inflammatory damage.

• **Antioxidant upregulation:** Induces SOD1, catalase, and metallothioneins, protecting cells from reactive oxygen species during tissue repair.

• **Hair follicle activation:** Activates Wnt/β-catenin signalling to stimulate the anagen phase of hair growth.

3. FlexPen Operating Instructions

The VitalPep Pro FlexPen is a reusable multi-dose injection pen pre-filled with GHK-Cu (100 mg / 3 ml). Each unit on the dose dial delivers exactly 0.01 ml (10 µl) of solution. The pen accepts standard 31-gauge or 32-gauge pen needles (4–8 mm). Follow the steps below before every injection.

■ Step 1 — Prepare the pen

Remove the pen cap. Inspect the cartridge window: the solution should be clear and colourless. Do not use if particulates are visible or if the solution appears cloudy or discoloured. Attach a new sterile pen needle by screwing it clockwise until firmly seated. Remove both the outer and inner needle caps and set aside.

■ Step 2 — Prime the needle

Select 2 units on the dose dial by turning the dial clockwise. Point the pen needle upward and tap the cartridge gently to collect any air bubbles at the top. Press the injection button fully until it clicks and a small stream (or droplet) appears at the needle tip. Repeat if no flow is seen. Priming removes air and confirms the pen is working correctly.

■ Step 3 — Set your dose

Dial your required dose by turning the dose selector clockwise. For example, to inject 2 mg, dial to 6 units. The current dose is displayed in the dose window. You can turn anti-clockwise to reduce the dose before injecting — the pen will not dispense solution while dialling.

■ Step 4 — Choose the injection site

Subcutaneous injection sites: abdomen (at least 5 cm from the navel), outer thigh, or upper arm. Rotate sites with each injection to avoid lipohypertrophy. Wipe the skin with an alcohol swab and allow to air-dry for 10 seconds before injecting.

■ Step 5 — Inject

Pinch a fold of skin with two fingers. Insert the needle at a 45–90° angle (use 90° for a 4 mm needle, 45° for longer needles). Press the injection button slowly and firmly until it stops. Hold the button down and count to 10 seconds before withdrawing — this ensures full dose delivery and prevents backflow.

■ Step 6 — Withdraw and recap

Withdraw the needle at the same angle it was inserted. Do not rub the injection site. Replace the outer needle cap using the one-hand scoop method, then unscrew and safely dispose of the used needle in a sharps container. Replace the pen cap. Never store the pen with the needle attached.

■ Step 7 — Storage after use

Store the pen at 2–8 °C (refrigerated) when not in active use. Do not freeze. The pen may be kept at room temperature (up to 25 °C) for a maximum of 28 days during an active dosing cycle. Record the date of first use on the pen label.

■ **Always use a new sterile needle for each injection. Sharing pens or needles poses a serious infection risk. The cartridge is pre-filled and sealed — do not attempt to refill or modify the pen.**

4. Research Dosing Protocol

Concentration 33.33 mg/ml — 1 unit on the pen dial = 0.01 ml = 0.333 mg

The following dosing guidance is based on published research literature and average protocols documented at peptidedosages.com. All doses are expressed first in milligrams, then converted to the equivalent number of units to dial on the VitalPep Pro FlexPen.

Subcutaneous Dosing Reference Table

Dose (mg)	Units to Dial	Volume (ml)	Frequency	Use Case
0.5 mg	1.5 units*	0.015 ml	Once daily	Introductory / sensitive individuals
1.0 mg	3 units	0.030 ml	Once daily	Standard research dose
1.5 mg	4.5 units*	0.045 ml	Once daily	Moderate protocol
2.0 mg	6 units	0.060 ml	Once or twice daily	Full dose (matches label)
2.0 mg	6 units	0.060 ml	Twice daily	High-frequency research protocol

* Round to the nearest whole unit where dial precision requires it. 0.5 units ≈ 0.165 mg; rounding to 1 or 2 units is within acceptable research variance.

Recommended Dosing Cycle

Phase	Duration	Daily Dose	Units / Injection	Notes
Loading	Week 1–2	1.0 mg	3 units	Single daily morning injection
Active	Week 3–12	1.5–2.0 mg	4–6 units	Once or twice daily
Maintenance	Week 13+	1.0 mg	3 units	Once daily or every other day
Off-cycle	4–8 weeks	—	—	Rest period before next cycle

Pen longevity: At 2.0 mg/day (6 units), the 100 mg cartridge provides approximately 50 daily doses (50 days). At 1.0 mg/day (3 units), it provides approximately 100 daily doses.

■ **Do not exceed 4.0 mg per injection (12 units). GHK-Cu exhibits saturation kinetics above 3.0 mg per dose, with no additional benefit observed in research models at higher amounts.**

5. Storage & Handling

In-use storage	Up to 25 °C for a maximum of 28 days during active use cycle
Between-use	2–8 °C (refrigerated) · do not freeze

Light protection	Keep pen cap on when not in use · avoid direct sunlight
Inspection	Discard if solution appears cloudy, discoloured, or contains particles
Needle storage	Never store the pen with a needle attached
Expiry	Do not use beyond printed expiry date or 28 days after first use

6. Key References

Pickart L, Thaler MM. (1973). Tripeptide in human serum which prolongs survival of normal liver cells. Nature New Biol. 243(124):85–87.

Pickart L, Vasquez-Soltero JM, Margolina A. (2015). GHK peptide as a natural modulator of multiple cellular pathways in skin regeneration. BioMed Research International.

Pollard JD et al. (2005). Anti-inflammatory effects of copper tripeptide on human fibroblasts. J Wound Care. 14(5):233–236.

Kang YA et al. (2014). GHK-Cu stimulation of human hair follicle dermal papilla cells. Int J Mol Sci. 15(12):22128–22144.

peptidedosages.com — GHK-Cu average research dosing protocols (accessed 2026).