BIOMOD LABS · RESEARCH PEPTIDE CO.

RESEARCH COMPOUND MONOGRAPH · SERIES 1 · NO. SOF-003

GHK-Cu + AHK-Cu + Astaxanthin + Vitamin E (Softgel Preparation)

A four-component enteric-coated SEDDS softgel preparation combining the canonical Pickart GHK-Cu copper-tripeptide, the structurally related AHK-Cu copper-tripeptide, the xanthophyll carotenoid Astaxanthin, and α-tocopherol Vitamin E — supplied in a violet shell with pH > 6.0 enteric coating for distal small intestine release.

CATALOG REFERENCE	FORM FACTOR	PACK SIZE	DATE OF ISSUE
BM-SOF-003	Enteric-coated softgel · pH > 6.0	60 capsules · 150 mL bottle	May 2026

*This research preparation is a four-component enteric-coated softgel formulation combining two endogenous tripeptide-copper complexes (**GHK-Cu** and **AHK-Cu**), the carotenoid antioxidant **Astaxanthin**, and the lipid-soluble antioxidant **Vitamin E**. The softgel employs a pH > 6.0 enteric coating, releasing the active components in the more distal small intestine. The combination assembles two structurally related copper-peptide chemistries (the canonical Pickart GHK-Cu and the related AHK-Cu) with two complementary antioxidant excipients in a SEDDS lipid vehicle.* ***This monograph summarises published cellular pharmacology and preclinical findings for laboratory research reference only.***

01 Component Composition

COMPONENT A — GHK-CU	5 mg · Glycyl-L-histidyl-L-lysine copper(II) complex · CAS 49557-75-7 · Pickart endogenous tripeptide-copper
COMPONENT B — AHK-CU	2.5 mg · Alanyl-L-histidyl-L-lysine copper(II) complex · CAS 89030-95-5 · structurally related copper-peptide
COMPONENT C — ASTAXANTHIN (10% OIL)	60 mg of 10% astaxanthin oil (6 mg active astaxanthin) · CAS 472-61-7 · xanthophyll carotenoid antioxidant
COMPONENT D — VITAMIN E	7.5 mg · α-tocopherol antioxidant excipient
PACK SIZE	60 softgels per 150 mL bottle
SHELL	Violet softgel (provides light protection for the photo-reactive Cu(II) complexes)
ENTERIC COATING	pH > 6.0 trigger — releases contents in distal small intestine
VEHICLE	SEDDS lipid-based fill
ANALYTICAL SPECIFICATION	Component-level peptide ≥ 95 % purity by HPLC; carotenoid and vitamin actives ≥ 95 %; content uniformity per softgel verified to USP standards

02 Rationale for Combined Composition

The four-component combination engages multiple parallel mechanisms relevant to extracellular matrix biology and oxidative stress. **GHK-Cu** is the canonical Pickart endogenous tripeptide-copper complex with characterised effects on MMP/TIMP regulation, fibroblast collagen synthesis stimulation, and copper-dependent lysyl oxidase cofactor function. **AHK-Cu** is a structurally related copper-tripeptide differing from GHK-Cu by replacement of the N-terminal Gly with Ala; preclinical work has reported similar but not identical receptor-pharmacology and extracellular-matrix effects. **Astaxanthin** is a xanthophyll carotenoid with substantial lipid-soluble antioxidant activity; the 10% astaxanthin oil format provides 6 mg active per 60 mg oil. **Vitamin E** contributes additional lipid-soluble antioxidant capacity supporting SEDDS oxidative stability.

03 Critical Chemistry-Handling Notes for the Combined Preparation

CRITICAL: GHK-CU AND AHK-CU COPPER CHELATE PRESERVATION

The two copper-peptide components retain their characteristic chemistry-handling constraints. Both GHK-Cu and AHK-Cu depend on intact Cu(II) chelation for biological activity. In the softgel formulation context, this is supported by the SEDDS lipid vehicle (which does not disrupt the chelate as bacteriostatic water can) and by the violet shell colour (which protects the photo-reactive copper complexes). The lipid antioxidant excipients (Astaxanthin, Vitamin E) protect both the copper-peptide actives and the lipid vehicle from oxidative degradation during shelf life. The enteric pH > 6.0 trigger releases contents in the distal small intestine, providing extended residence in the proximal intestine while protecting the actives from gastric acidity.

F Softgel Formulation Considerations

SEDDS-CLASS SOFTGEL CHEMISTRY

The softgel form factor employs a self-emulsifying drug delivery system (SEDDS) lipid-based vehicle inside a gelatin or modified-gelatin shell. SEDDS formulations consist of isotropic mixtures of oils, surfactants, co-surfactants, and the active compound, which spontaneously form fine oil-in-water emulsions upon contact with aqueous gastrointestinal fluids. This formulation strategy is particularly useful for poorly water-soluble actives, supporting dissolution and absorption from the gastrointestinal lumen. Key softgel-formulation considerations are (a) **shell composition** — gelatin shells are sensitive to moisture and temperature; modified-gelatin and plant-based shell alternatives are sometimes used; (b) **enteric coating** — pH-dependent polymer coatings (e.g., methacrylic acid copolymers) delay capsule disintegration until passage through the acidic stomach, releasing the contents in the more neutral environment of the small intestine; (c) **shell colour** — opacifiers and colourants protect light-sensitive actives and provide product identification; (d) **fill volume** — typical softgel fill volumes range from 0.3 to 1.5 mL per capsule, with corresponding shell sizes selected for the formulation.

04 Laboratory Handling and Storage

Sealed softgels held at controlled room temperature (15–25 °C), protected from moisture, direct light, and excessive heat. The violet shell colour provides light protection for the copper-peptide actives. Working quantities are determined by the investigator's experimental design.

05 References

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