BIOMOD LABS · RESEARCH PEPTIDE CO.

RESEARCH COMPOUND MONOGRAPH · SERIES 1 · NO. SOF-004

O-304 + GW-0742 (Softgel Preparation)

A two-component SEDDS softgel preparation combining the direct AMPK activator O-304 (ATX-304) with the selective PPARδ agonist GW-0742 — engaging two mechanistically complementary metabolic regulatory pathways (post-translational kinase activation and nuclear receptor transcriptional regulation) converging on substrate utilisation and mitochondrial biology.

CATALOG REFERENCE	FORM FACTOR	PACK SIZE	DATE OF ISSUE
BM-SOF-004	Softgel · O-304 50 mg + GW-0742 5 mg per capsule	60 capsules · 150 mL bottle	May 2026

*This research preparation is a two-component softgel formulation combining **O-304** (also designated ATX-304), a direct AMP-activated protein kinase (AMPK) activator developed by Atrogi AB / Karolinska Institute researchers, and **GW-0742**, a selective PPARδ (peroxisome proliferator-activated receptor delta) agonist developed at GlaxoSmithKline. Both compounds are small-molecule research tools engaging distinct metabolic regulatory pathways: O-304 activates AMPK in skeletal muscle and other tissues, supporting glucose uptake and fatty acid oxidation; GW-0742 activates PPARδ with downstream effects on fatty acid oxidation, mitochondrial biogenesis, and gene expression of metabolic enzymes. The preparation is supplied at 50 mg O-304 + 5 mg GW-0742 per softgel capsule, 60 capsules per 150 mL bottle in an amber shell. **This monograph summarises published cellular pharmacology and preclinical findings for laboratory research reference only.***

01 Component Composition

COMPONENT A — O-304 (ATX-304)	50 mg · Direct AMPK activator small molecule · CAS 1261289-04-6 · Atrogi / Karolinska development
COMPONENT B — GW-0742	5 mg · Selective PPARδ agonist small molecule · CAS 317318-84-6 · GlaxoSmithKline development
PACK SIZE	60 softgels per 150 mL bottle
SHELL	Amber softgel (light protection for the small-molecule actives)
ENTERIC COATING	None (immediate-release configuration)
VEHICLE	SEDDS lipid-based fill
ANALYTICAL SPECIFICATION	Component-level ≥ 98 % purity by HPLC; content uniformity per softgel verified to USP standards

02 Rationale for Combined Composition

The two-component combination engages two mechanistically complementary metabolic-regulatory pathways. **O-304** is a direct allosteric activator of AMP-activated protein kinase (AMPK), the master cellular energy-status sensor that responds to elevated AMP:ATP ratios under conditions of metabolic stress. AMPK activation by O-304 drives downstream effects on glucose uptake (via GLUT4 translocation), fatty acid oxidation, mitochondrial biogenesis (via PGC-1α), and inhibition of anabolic pathways including lipogenesis and protein synthesis. **GW-0742** is a selective high-affinity agonist of peroxisome proliferator-activated receptor delta (PPARδ), a nuclear receptor that regulates transcription of genes involved in fatty acid oxidation, mitochondrial biogenesis, and lipid metabolism. The combination thereby engages both an immediate post-translational kinase activation pathway (AMPK) and a longer-timescale transcriptional regulation pathway (PPARδ) converging on metabolic substrate utilisation.

03 Cellular Pharmacology

Steneberg, Lindahl and colleagues at Umeå University and Karolinska Institute characterised O-304 in cell-culture and rodent metabolic preparations, reporting AMPK pathway activation in skeletal muscle and adipose tissue and corresponding effects on glucose handling and lipid metabolism in diet-induced obese mouse models. GW-0742 has been characterised extensively at PPARδ with reported EC_{50} values in the low nanomolar range and over 1000-fold selectivity over PPARα and PPARγ. Sznaidman and colleagues at GlaxoSmithKline characterised the structure-activity work on GW-0742 and the related PPARδ tool compound GW-501516; subsequent preclinical work has used GW-0742 as a selective PPARδ activator in metabolic-research preparations.

04 Critical Chemistry-Handling Notes

SMALL-MOLECULE SEDDS HANDLING CONSIDERATIONS

Both components are small-molecule research compounds rather than peptides — peptide-specific handling considerations (disulfide preservation, peptidase resistance) do not apply. Both compounds are amenable to SEDDS lipid-based formulation. The amber shell colour provides light protection. The immediate-release configuration (no enteric coating) supports release in the upper gastrointestinal tract.

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.

05 Laboratory Handling and Storage

Sealed softgels held at controlled room temperature (15–25 °C), protected from moisture and direct light. Working quantities are determined by the investigator's experimental design.

06 References

1. Steneberg P, Lindahl E, Dahl U, et al. PAN-AMPK activator O304 improves glucose homeostasis and microvascular perfusion in mice and type 2 diabetes patients. *JCI Insight.* 2018;3(12):e99114. PMID: 29925686
2. Sznaidman ML, Haffner CD, Maloney PR, et al. Novel selective small molecule agonists for peroxisome proliferator-activated receptor delta (PPARdelta)—synthesis and biological activity. *Bioorg Med Chem Lett.* 2003;13(9):1517–1521. PMID: 12699745
3. Wang YX, Lee CH, Tiep S, et al. Peroxisome-proliferator-activated receptor delta activates fat metabolism to prevent obesity. *Cell.* 2003;113(2):159–170. PMID: 12705865

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