

RESEARCH MONOGRAPH . COMPOUND PROFILE

Resveratrol

A trans-stilbenoid polyphenol from grapes and other plants, characterized by SIRT1 activation and pleiotropic anti-aging effects with disputed clinical efficacy.

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COMPOUND CLASS	Stilbenoid polyphenol / sirtuin modulator

ABSTRACT

Resveratrol (trans-3,4',5-trihydroxystilbene; CAS 501-36-0; molecular formula C₁₄H₁₂O₃; molecular weight 228.25) is a stilbenoid polyphenol present in grapes, peanuts, berries, and several other plants. The compound has been extensively studied for anti-aging applications since David Sinclair's group at Harvard demonstrated SIRT1 activation in 2003. Mechanism includes SIRT1 sirtuin activation (allosteric activator at certain peptide substrates; the activity is substrate-dependent), AMPK activation, anti-inflammatory effects through NF-κB inhibition, and direct antioxidant activity. Resveratrol extends lifespan in obese mice and in some short-lived model organisms but does not extend lifespan in normally fed mice; the lifespan-extending effect appears to be selective for high-fat-diet stress conditions. Bioavailability is poor (high first-pass metabolism); plasma resveratrol concentrations after oral administration are typically 1 to 10 percent of those that produce in vitro effects. Doses are typically 250 to 1500 mg per day. The clinical evidence base in humans is mixed; many endpoints show no effect at achievable plasma concentrations.

1. Compound Identification

Resveratrol is described as stilbenoid polyphenol / sirtuin modulator. A trans-stilbenoid polyphenol from grapes and other plants, characterized by SIRT1 activation and pleiotropic anti-aging effects with disputed clinical efficacy.

1.1 Class summary

Stilbenoid polyphenol / sirtuin modulator

1.2 Subtitle

A trans-stilbenoid polyphenol from grapes and other plants, characterized by SIRT1 activation and pleiotropic anti-aging effects with disputed clinical efficacy.

2. Abstract

Resveratrol (trans-3,4',5-trihydroxystilbene; CAS 501-36-0; molecular formula C₁₄H₁₂O₃; molecular weight 228.25) is a stilbenoid polyphenol present in grapes, peanuts, berries, and several other plants. The compound has been extensively studied for anti-aging applications since David Sinclair's group at Harvard demonstrated SIRT1 activation in 2003. Mechanism includes SIRT1 sirtuin activation (allosteric activator at certain peptide substrates; the activity is substrate-dependent), AMPK activation, anti-inflammatory effects through NF-κB inhibition, and direct antioxidant activity. Resveratrol extends lifespan in obese mice and in some short-lived model organisms but does not extend lifespan in normally fed mice; the lifespan-extending effect appears to be selective for high-fat-diet stress conditions. Bioavailability is poor (high first-pass metabolism); plasma resveratrol concentrations after oral administration are typically 1 to 10 percent of those that produce in vitro effects. Doses are typically 250 to 1500 mg per day. The clinical evidence base in humans is mixed; many endpoints show no effect at achievable plasma concentrations.

3. Mechanism of Action

SIRT1 allosteric activator (substrate-dependent). AMPK activation. Anti-inflammatory through NF-kB. Direct antioxidant.

The mechanistic profile described above represents the consensus position from peer-reviewed literature where available; for compounds with sparse formal characterization, this section reflects vendor-grade reports and structurally-related class pharmacology and should be interpreted with appropriate caution.

4. Pharmacokinetics and Routes of Administration

Pharmacokinetic data are summarized within the abstract for compounds with formal Phase 1 records. Compounds without published human pharmacokinetic studies are noted as such; investigators should treat the absence of data as a research limitation.

5. Reported Research Dose Ranges

250 to 1500 mg per day; bioavailability is poor.

Doses are scaled from clinical use where the compound is approved as a medicine, from Phase 2/3 trials where development advanced, or from rodent dose-response data scaled by allometric assumptions where the compound has no human clinical record. Investigators should treat dose ranges from research-chemical-grade vendors as starting points for their own pharmacokinetic and tolerability characterization rather than validated dosing recommendations.

6. Sourcing and Quality Verification

Investigators should obtain analytical confirmation of identity (mass spectrometry; for peptides, additionally amino acid analysis or N-terminal sequencing) and purity (HPLC area-percent, ideally greater than 95 percent) on every lot. Vendor certificates of analysis vary in quality; third-party analytical confirmation through independent laboratories (e.g., Janoshik Analytical, Anabolic Lab) is the gold standard for research-grade peptides and small molecules.

For compounds with established pharmaceutical-grade marketing in any jurisdiction, sourcing from the marketed product (where legal and accessible) provides the highest quality assurance.

7. Reconstitution and Handling

Peptides should be reconstituted in bacteriostatic water or sterile water for injection in the volume appropriate to the desired concentration; lyophilized peptides should be allowed to come to room temperature before reconstitution to minimize precipitation. Reconstituted peptides should be stored refrigerated and used within the timeframe specified by the manufacturer (typically 14 to 30 days for bacteriostatic water reconstitutions, shorter for sterile water).

Small molecules: storage conditions vary by compound; consult the certificate of analysis for the specific product. Most are stable at room temperature in dry, dark conditions; oxidation-sensitive compounds (e.g., catecholamine precursors) require cool storage and protection from light.

8. Stack Interaction Considerations

Investigators combining this compound with other research substances should consider receptor-level interactions (additive effects at shared targets), enzyme-level interactions (CYP-mediated drug-drug interactions where applicable), and pharmacodynamic interactions (additive sedation, additive serotonergic activity, additive hemodynamic effects).

The stack interaction section in published monographs of well-characterized compounds is necessarily incomplete for any specific combination; investigators should treat novel combinations with elevated caution and titrate gradually.

9. References

1. Howitz KT, et al. Small molecule activators of sirtuins extend *Saccharomyces cerevisiae* lifespan. *Nature* 2003.
2. Baur JA, et al. Resveratrol improves health and survival of mice on a high-calorie diet. *Nature* 2006.

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