SS-31

History and Background

SS-31 (Elamipretide/Bendavia) is a mitochondrial-targeting peptide developed in the early 2000s at Cornell University. It was specifically designed to concentrate in mitochondria and protect cardiolipin, a phospholipid critical for mitochondrial function. SS-31 has undergone clinical trials for heart failure, mitochondrial diseases, and age-related conditions. It represents a new class of therapeutic agents targeting mitochondrial dysfunction, a key driver of aging and disease.

Primary Uses

SS-31 is investigated for mitochondrial protection and optimization, treatment of heart failure and cardiovascular disease, neurodegenerative disease prevention (Alzheimer's, Parkinson's), improved exercise capacity and endurance, reduced oxidative stress and cellular damage, anti-aging through mitochondrial health, and treatment of mitochondrial myopathies.

How It Works

SS-31 selectively targets mitochondrial inner membranes where it binds to and protects cardiolipin, a phospholipid essential for optimal mitochondrial function. By stabilizing cardiolipin, SS-31 improves electron transport chain efficiency, reduces ROS (reactive oxygen species) production, and enhances ATP generation. It also prevents cytochrome c release, reducing apoptosis. Unlike antioxidants that scavenge ROS after formation, SS-31 prevents ROS generation at the source.

Standard Protocol

Dosing: Research dosing: 2-5mg daily subcutaneous. Clinical trials used IV administration at 0.25mg/kg. Optimal subcutaneous dosing extrapolated from clinical data.

Administration: Subcutaneous injection in research contexts. Clinical studies used intravenous infusion. Comes as lyophilized powder requiring reconstitution.

Timing: Daily dosing most common. Can dose morning or pre-exercise for performance benefits. Consistent daily use recommended.

Titration Schedule:

Clinical Trials: 0.25mg/kg IV for heart failure studies

Research Use: 2-5mg daily subcutaneous (estimated based on clinical data)

Duration: 12+ weeks for cardiovascular/mitochondrial benefits

Cycling: Can be used continuously or in 12-week cycles

Duration: Minimum 8-12 weeks to assess cardiovascular/mitochondrial benefits. Can be used long-term with medical monitoring. Some users cycle 12 weeks on, 4 weeks off.

What to Expect

Positive Effects (Week 1-2)

Improved exercise capacity and endurance within weeks. Enhanced recovery from physical exertion. Better cardiovascular function in those with heart issues. Improved energy and reduced fatigue. Potential cognitive benefits. Reduced muscle soreness. Better mitochondrial health markers if tested.

Timeline to Results

Exercise improvements: 2-4 weeks. Cardiovascular benefits: 4-8 weeks (measured via testing). Mitochondrial optimization: ongoing process over months. Optimal effects: 12+ weeks of consistent use. Results more pronounced in those with mitochondrial dysfunction.

Dose Response

Clinical trials show dose-dependent cardiovascular improvements. Higher doses (up to 5mg daily) may enhance benefits. Individual response varies based on baseline mitochondrial health.

Pros

Targets root cause of aging (mitochondrial dysfunction)
Backed by clinical trials for heart failure
Improves exercise capacity and cardiovascular function
Reduces oxidative stress at the source
Well-tolerated in clinical studies
Potential benefits for neurodegenerative diseases
May improve healthspan and longevity
Selective mitochondrial targeting (minimal off-target effects)
Enhances energy production at cellular level
Promising for age-related decline

Cons

Expensive compared to other peptides
Optimal dosing for research use not firmly established
Clinical trials used IV administration (subcutaneous less studied)
Effects subtle and may require testing to confirm
Limited availability from research suppliers
Long-term safety data still emerging
May not produce noticeable subjective effects for all users
Requires consistent long-term use for benefits
Quality control critical (difficult to synthesize)
Not FDA-approved outside clinical trials

Who Should Consider It

Individuals with cardiovascular disease or heart failure, those focused on longevity and mitochondrial health, athletes seeking enhanced endurance, people with mitochondrial dysfunction or myopathies, individuals interested in cutting-edge anti-aging interventions, users willing to commit to long-term protocols.

Who Should Avoid It

Those seeking immediate dramatic results, individuals unable to commit to consistent long-term dosing, people on tight budgets (relatively expensive), pregnant or breastfeeding women, those without access to quality-tested suppliers.

SS-31 is in clinical trials for heart failure and mitochondrial diseases but not FDA-approved. Research use should be under medical supervision with appropriate monitoring. Individual results vary. This information is for educational purposes only.