LVL UP RX · CLIENT EDUCATION SERIES

NAD+

Nicotinamide Adenine Dinucleotide

Energy · Longevity · Brain Health · Cellular Repair

A complete research guide to NAD+, how it powers every cell in your body, why it declines with age, and what the research says about restoration.

FOR RESEARCH PURPOSES ONLY

LVL UP RX

Client Education Series

Everything you need to know about NAD+ and cellular energy restoration

> *NAD+ is not a supplement — it's a coenzyme that every single cell in your body depends on to produce energy, repair DNA, and regulate hundreds of biological processes. Understanding it is understanding the foundation of biological aging itself.*

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The Coenzyme at the Center of All Cellular Life

What Is NAD+?

The molecule present in every living cell — and why it matters

NAD+ (Nicotinamide Adenine Dinucleotide) is a coenzyme found in every living cell of every organism on Earth. It is not a hormone, a peptide, or a growth factor — it is a fundamental molecular tool that cells use to carry out the most basic and critical processes of life: generating energy, repairing DNA, regulating gene expression, and coordinating the body's response to stress and aging.

NAD+ exists in two forms: NAD+ (oxidized) and NADH (reduced). This toggling between states is how cells transfer energy — NAD+ accepts electrons during metabolic reactions, becomes NADH, then donates those electrons to produce ATP (the cell's energy currency). This cycle is the engine behind virtually all cellular energy production.

First discovered in 1906 by Arthur Harden, NAD+ has since been identified as one of the most critical molecules in human biochemistry. It serves as a substrate for key longevity enzymes including sirtuins and PARP proteins — making it central to both energy metabolism and the biology of aging.

1906	500+	~50%	Every
YEAR DISCOVERED	**ENZYMATIC■REACTIONS**	**DECLINE■BY AGE 60**	**LIVING CELL**
Arthur Harden	NAD+ dependent	from peak levels	contains NAD+

The Energy Pathway

NAD+ is the central carrier in the process of converting nutrients into usable cellular energy:

Food (Carbs/Fats) → **NAD+** Coenzyme → **Electron** Transfer → **ATP** Energy → **Cell** Function

KEY INSIGHT: Without sufficient NAD+, cells cannot efficiently convert food into ATP energy. This is why declining NAD+ levels are directly associated with fatigue, cognitive fog, slower recovery, and accelerated aging — the cells are literally running low on fuel.

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THE AGING DECLINE

Why NAD+ Falls — And What It Costs

The NAD+ Decline

One of the most significant molecular events in biological aging

NAD+ levels decline dramatically with age — this is one of the most well-documented and consequential molecular changes in the aging human body. Research shows levels in the blood and tissues can fall by 40–60% between young adulthood and age 60, with the steepest declines occurring from the 40s onward.

AGE RANGE	APPROXIMATE NAD+ LEVEL	TYPICAL SYMPTOMS
20s–30s	~100% (peak)	High energy, fast recovery, sharp cognition
40s	~60–70% of peak	Fatigue begins, recovery slows, brain fog starts
50s	~50% of peak	Noticeable energy loss, metabolic slowdown
60s+	~40–50% of peak	Chronic fatigue, cognitive decline, poor sleep common

Why Does NAD+ Decline?

Multiple biological processes consume or reduce NAD+ as we age:

Increased PARP Activity

DNA damage accumulates with age, activating PARP enzymes that consume NAD+ rapidly in repair attempts — depleting the overall cellular pool.

CD38 Enzyme Upregulation

CD38, an enzyme that breaks down NAD+, becomes increasingly active with age and inflammation — one of the primary drivers of age-related NAD+ decline.

Reduced Biosynthesis

The body's ability to synthesize NAD+ from dietary precursors (tryptophan, niacin, NMN, NR) decreases with age and metabolic changes.

Chronic Inflammation

Ongoing low-grade inflammation (sometimes called 'inflammaging') drives increased NAD+ consumption by inflammatory signaling pathways.

Mitochondrial Dysfunction

As mitochondria become less efficient with age, the NAD+/NADH cycling that drives energy production becomes impaired — creating a self-reinforcing decline.

The consequences of NAD+ decline are not cosmetic — they represent a fundamental reduction in cellular capacity to produce energy, repair damage, and regulate biological processes. Restoring NAD+ levels is therefore considered one of the most evidence-backed targets in longevity research.

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THE SCIENCE

How NAD+ Works at the Cellular & Molecular Level

The Science Behind NAD+

Mechanism of action — explained clearly

Sirtuins — The Longevity Enzymes

Sirtuins (SIRT1–SIRT7) are a family of NAD+-dependent enzymes often referred to as 'longevity proteins.' They require NAD+ as a cofactor to function. When NAD+ levels are adequate, sirtuins are active and perform critical functions:

- SIRT1 & SIRT3: regulate mitochondrial biogenesis, fat metabolism, and stress resistance
- SIRT6: DNA repair, telomere maintenance, and inflammation regulation
- SIRT5: metabolic regulation and mitochondrial function
- Overall: sirtuins link cellular energy status to gene expression, aging, and longevity

PARP Proteins — DNA Repair

PARP (Poly ADP-ribose polymerase) enzymes are critical DNA repair proteins that consume NAD+ as their energy source. When DNA damage is detected, PARPs are activated and consume large quantities of NAD+ — making NAD+ restoration critical for maintaining effective DNA repair capacity. Insufficient NAD+ means insufficient PARP activity, which means accumulated DNA damage — a key driver of cellular aging and dysfunction.

Mitochondrial Function & ATP Production

NAD+ is indispensable for the electron transport chain — the process by which mitochondria produce ATP from nutrients. In the citric acid cycle (Krebs cycle), NAD+ is converted to NADH by accepting electrons from metabolic reactions. NADH then donates these electrons to the electron transport chain, driving the production of the vast majority of the cell's ATP. Without adequate NAD+, mitochondrial efficiency drops — directly producing fatigue, reduced endurance, and impaired recovery.

Circadian Rhythm Regulation

Research has revealed that NAD+ biosynthesis oscillates in a circadian pattern — rising and falling in sync with the body's 24-hour clock. NAD+ directly regulates key circadian clock genes through sirtuin activity, making it central to the quality of sleep, hormonal timing, metabolic cycling, and cellular maintenance that occurs during sleep.

Inflammation & Immune Regulation

NAD+ plays a regulatory role in immune signaling — adequate levels support balanced immune responses while suppressing chronic inflammatory pathways. NAD+-dependent sirtuins, particularly SIRT1 and SIRT6, directly inhibit NF-κB — a master regulator of inflammatory gene expression. Declining NAD+ therefore contributes to the chronic low-grade inflammation characteristic of aging.

NAD

NAD+

Cellular Energy & Longevity Coenzyme

Energy · Longevity · Brain Health · Cellular Repair

Key Benefits of NAD+

Research-supported areas of effect across multiple body systems

Energy & Fatigue

The most immediately felt benefit reported by NAD+ users — and the most mechanistically straightforward. Restoring NAD+ levels directly supports mitochondrial ATP production:

- Increased cellular energy production — particularly in high-demand tissues (brain, muscle, heart)
- Reduced chronic fatigue not explained by sleep or lifestyle factors
- Improved physical endurance and exercise capacity in research subjects
- Faster post-exercise recovery through enhanced mitochondrial repair
- Particularly notable in individuals over 40 where NAD+ decline is most significant

Cognitive Function & Brain Health

The brain is one of the highest energy-demanding organs — and one of the first to show symptoms of NAD+ decline:

- Improved mental clarity and reduction of brain fog in research subjects
- Enhanced focus, processing speed, and working memory
- Neuroprotective effects — NAD+ supports neuronal survival and function
- Potential relevance to neurodegenerative disease research (Alzheimer's, Parkinson's)
- Supports neuroplasticity through sirtuin activation

DNA Repair & Longevity

- Directly fuels PARP enzyme activity — the primary DNA repair mechanism
- Reduced accumulation of DNA damage associated with aging and disease
- Telomere maintenance through SIRT6 activity
- Studied extensively as a longevity intervention in preclinical models
- NAD+ restoration has extended lifespan in multiple animal research models

Metabolic Health

- Improved insulin sensitivity and glucose metabolism
- Supports healthy body weight management through metabolic regulation
- Reduces triglycerides and supports lipid metabolism
- Studied for relevance to metabolic syndrome and type 2 diabetes research
- Enhances mitochondrial biogenesis — increasing the number of energy-producing organelles

Sleep Quality & Circadian Health

- Restores circadian NAD+ oscillation — improving sleep timing and depth
- Users commonly report improved sleep quality within 1–2 weeks
- Supports the cellular repair and cleanup processes that occur during deep sleep

NAD+

Key Benefits — What the Research Suggests

- May improve hormonal rhythms dependent on circadian clock function

BENEFIT AREA	KEY MECHANISM	RESEARCH STATUS
Cellular Energy	ATP production via electron transport chain	Extensively studied
Brain Function	Neuronal energy support, SIRT1 activation	Well documented
DNA Repair	PARP enzyme substrate	Strong preclinical evidence
Longevity	Sirtuin activation, telomere support	Active human research
Metabolic Health	Insulin sensitivity, mitochondrial biogenesis	Multiple human studies
Sleep & Circadian	Circadian clock gene regulation	Growing body of research
Inflammation	NF-κB suppression via sirtuins	Preclinical + emerging human data

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WHO IS NAD+ FOR?

Ideal Candidates & Use Cases

Who Is NAD+ For?

Ideal research candidates across multiple health goals

Biohackers & Longevity Enthusiasts

The most knowledgeable early adopters — typically 25–45, familiar with sirtuins, mitochondrial health, and longevity research. They're often already using NMN or NR supplements and want to upgrade to NAD+ direct. Lead with mechanism and research depth.

35–65 Anti-Aging Consumers

Individuals noticing the energy, cognitive, and physical effects of aging and seeking research-backed intervention. NAD+ is the most mechanistically sound anti-aging compound available — it addresses aging at its molecular root rather than masking symptoms.

Professionals Seeking Cognitive Edge

High-performers, executives, and knowledge workers experiencing brain fog, mental fatigue, or reduced focus. NAD+ is one of the most studied cognitive support compounds due to its direct role in neuronal energy production and neuroprotection.

Athletes & Active Individuals

Those wanting improved endurance, faster recovery, and better mitochondrial efficiency. NAD+ supports every step of the energy production pathway used during exercise — and accelerates the cellular repair processes that drive adaptation and recovery.

Individuals in Addiction Recovery

NAD+ IV and injection therapy has been studied and used in clinical settings for alcohol and substance dependency recovery — supporting neurological repair, reducing cravings, and restoring mitochondrial function disrupted by substance use.

Metabolic Health Focus

Individuals dealing with fatigue, weight management challenges, insulin resistance, or metabolic syndrome. NAD+ addresses the mitochondrial dysfunction at the root of many metabolic health issues — not just the symptoms.

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DELIVERY & PROTOCOLS

Administration Methods & General Guidance

Delivery & Protocols

How NAD+ is administered in research contexts

NAD+ can be administered through several delivery routes, each with different bioavailability profiles, onset times, and practical considerations. The method that best serves a given research subject depends on their goals, comfort level, and protocol context.

Subcutaneous (SubQ) Injection

The most commonly used method for at-home NAD+ protocols. SubQ injection delivers NAD+ directly into the bloodstream with high bioavailability. Most users report effects within 1–3 hours of injection. Administered using a standard insulin syringe into the abdomen, thigh, or deltoid. Reconstituted from lyophilized powder using bacteriostatic water.

Intravenous (IV) Infusion

The highest bioavailability delivery method — used in clinical and functional medicine settings. IV NAD+ delivers the compound directly into circulation, bypassing all absorption barriers. Associated with the most rapid and pronounced effects, particularly in cognitive function and energy. Commonly used in addiction recovery protocols. Must be administered by a qualified healthcare provider.

Oral / Sublingual

The most convenient but lowest bioavailability route for NAD+ itself — the molecule does not survive digestion well. Oral NAD+ precursors (NMN, NR) are often used as an alternative for those who prefer no injection, with the body converting them to NAD+ intracellularly. Sublingual delivery improves absorption over standard oral.

METHOD	BIOAVAILABILITY	ONSET	BEST FOR
SubQ Injection	High	1–3 hours	At-home protocols; general research
IV Infusion	Highest (direct)	30–60 minutes	Maximum effect; recovery protocols
Oral (NAD+)	Low	Hours–variable	Convenience; supplementary use
Oral Precursors (NMN/NR)	Moderate	Hours (conversion needed)	Needle-free protocols

Reconstitution (SubQ): Add bacteriostatic water slowly to lyophilized powder. Swirl gently — do not shake. Refrigerate after reconstitution. Use within 30–60 days. Never freeze reconstituted NAD+. Morning administration is preferred by most research subjects to align with natural circadian NAD+ peaks.

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STACKING NAD+

Synergistic Combinations for Amplified Results

Stacking NAD+

Intelligent combinations for enhanced outcomes

NAD+ pairs powerfully with several other research compounds — each addressing complementary pathways to create a comprehensive longevity or performance protocol.

— The Mitochondrial Power Stack

NAD+ + MOT-C (MOTS-c)

MOT-C is a mitochondria-derived peptide that stimulates mitochondrial biogenesis — literally increasing the number of energy-producing organelles. Combined with NAD+'s role as the primary fuel for mitochondrial ATP production, this stack addresses cellular energy from two synergistic angles: more mitochondria (MOT-C) producing energy more efficiently (NAD+). Considered the gold standard energy and longevity stack.

BEST FOR: *Biohackers · Chronic fatigue · Athletic performance · Longevity protocols*

— The Metabolic Transformation Stack

NAD+ + Retatrutide

Retatrutide drives fat loss through triple receptor agonism while NAD+ supports the mitochondrial efficiency needed to sustain energy during caloric deficit. This combination prevents the fatigue and metabolic slowdown commonly associated with aggressive weight loss protocols — NAD+ keeps cellular energy production high while Retatrutide reduces stored fat.

BEST FOR: *Weight loss · Metabolic health · Body recomposition · Caloric deficit support*

— The Anti-Aging & Recovery Stack

NAD+ + CJC-1295 / Ipamorelin

CJC-1295 and Ipamorelin stimulate natural growth hormone release — supporting muscle preservation, fat metabolism, sleep quality, and tissue repair. NAD+ provides the cellular energy substrate that makes GH-driven repair and regeneration possible. Together they address aging from hormonal and cellular energy angles simultaneously.

BEST FOR: *Anti-aging consumers · Athletes · Sleep optimization · Comprehensive longevity*

— NAD+ + MOT-C + CJC-1295 / Ipamorelin

The Longevity Triple Stack

The most comprehensive longevity protocol in the LVL UP RX catalog. NAD+ restores cellular energy and activates longevity enzymes. MOT-C drives mitochondrial biogenesis and metabolic optimization. CJC-1295/Ipamorelin restores youthful growth hormone pulses. Together, these three compounds address the primary molecular drivers of biological aging simultaneously.

BEST FOR: *Premium longevity · High-budget biohackers · 45+ comprehensive anti-aging*

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WHAT TO EXPECT

Timeline, Results & Realistic Outcomes

What to Expect

A realistic, research-grounded timeline for NAD+ restoration

NAD+ effects vary by delivery method — IV infusion produces the fastest and most pronounced results, while SubQ injection builds more gradually. Energy and sleep improvements are typically the first effects noticed, with deeper anti-aging and longevity benefits accumulating over weeks and months of consistent use.

TIMEFRAME	SubQ INJECTION	IV INFUSION
Days 1–3	Subtle energy lift; circadian rhythm beginning to normalize	Rapid, pronounced energy & clarity; often felt within hours of infusion
Week 1–2	Improved sleep quality & depth; reduced morning fatigue	Significant cognitive improvement; reduced brain fog; energy sustained
Week 3–4	Noticeable sustained energy; improved workout performance & recovery	Metabolic improvements; improved mood & stress resilience
Week 6–8	Measurable cognitive improvements; better mood regulation & focus	Full mitochondrial benefits; DNA repair markers improving
Week 10–12	Systemic anti-aging effects; better metabolic & inflammatory markers	Comprehensive longevity benefits; cellular age markers improving
Ongoing	NAD+ maintenance — can be used continuously; longevity benefits accumulate over time	Periodic IV booster protocols; maintain peak cellular NAD+ levels

MOST COMMON FIRST EFFECTS: *Energy improvement and better sleep are reported most consistently — often within the first 1–2 weeks of SubQ use. Cognitive benefits typically follow. Deep anti-aging and metabolic effects require consistent use over 8–12 weeks.*

Side Effect Profile

NAD+ is generally very well tolerated. Known side effects are typically mild and transient:

- SubQ injection site: mild redness or brief soreness; resolves quickly
- IV infusion: flushing, tingling, nausea, or mild chest tightness if infused too rapidly — these resolve when infusion rate is slowed; always administer IV under qualified supervision
- Oral: mild GI discomfort at higher doses in some individuals
- Some users report vivid dreams or changes in sleep patterns early in protocol — typically normalizes
- No documented hormonal disruption, receptor desensitization, or systemic toxicity
- NAD+ can be used on an ongoing basis — no cycling required

IV NAD+ must be administered under qualified medical supervision. SubQ and oral protocols should be discussed with a healthcare provider before initiating, particularly for individuals with pre-existing conditions or those taking medications.

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RESEARCH NOTES

Important Information & Compliance

Research Notes & Disclaimer

Please read carefully.

All products offered by LVL UP RX are sold strictly as research compounds for investigational use only. They are not intended for human consumption and are not approved by the FDA or any equivalent regulatory authority for therapeutic, preventive, or diagnostic use in humans.

The Research Landscape

NAD+ has one of the most extensive and rapidly growing research bases of any compound in the longevity and metabolic health space. Thousands of peer-reviewed studies document its role in cellular biology. Human clinical trials on NAD+ precursors (NMN, NR) and NAD+ direct have shown favorable safety profiles and meaningful biological effects. This guide presents findings accurately and without exaggeration.

What We Will Never Claim

- That NAD+ treats, cures, or prevents any disease or medical condition
- That these products are FDA approved or safe for human use as medicine
- That results are guaranteed — individual responses vary significantly
- That NAD+ replaces medical treatment or professional healthcare guidance

Selected Research References

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> *NAD+ sits at the intersection of energy, aging, brain health, and longevity — making it one of the most universally relevant research compounds available. At LVL UP RX, we're committed to providing both the highest quality compounds and the education to use them wisely.*

LVL UP RX · PEPTIDES · SCIENCE-BACKED. RESULTS-DRIVEN.

For research use only. Not for human consumption. Consult a qualified healthcare professional.