

NAD⁺

The molecule behind the spark.

What the evidence says about NAD⁺ - why every cell needs it, why levels fall with age, what human studies show, and what is still unknown.

1906

year NAD⁺ was first
identified, in yeast

Every cell

uses NAD⁺ to turn food into
energy

3

Lttl formats: injectable, oral
liquid, nasal spray

A coenzyme your cells run on – and one that gets harder to keep topped up with age.

NAD⁺ (nicotinamide adenine dinucleotide) is a coenzyme found in every living cell. It helps turn food into usable energy and powers enzymes involved in DNA repair and cell maintenance. The body makes it from vitamin B3 and recycles it constantly.

Studies in animals and human tissue show NAD⁺ levels tend to fall with age. Raising them is an active research area, but most human trials test oral precursors such as NR and NMN, not NAD⁺ itself. Evidence for injected, oral, or nasal NAD⁺ is early, and its benefits are not FDA-established.

KEY FINDINGS

- 1 Essential, everywhere.** NAD⁺ is needed for energy production and for enzymes that repair DNA and maintain cells.
- 2 Declines with age.** Tissue studies show lower NAD⁺ in older adults, partly because enzymes like CD38 use more of it.
- 3 Levels can be raised.** Oral precursors reliably raised blood NAD⁺ in small human trials.
- 4 Mixed health outcomes.** Some trials found metabolic benefits; others found none. Results depend on who was studied.
- 5 Generally well tolerated.** Side effects are usually mild; with injections, flushing and discomfort often relate to how fast it goes in.
- 6 Compounded, not approved.** NAD⁺ products are not FDA-approved drugs; Lttl's are prepared by pharmacy partners.

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01 *A helper molecule with two jobs.*

NAD+ shuttles electrons so cells can turn food into energy. It is also used up as fuel by enzymes that **repair DNA** and **regulate cell maintenance**. The body recycles it constantly to keep up.

MITOCHONDRIA

Energy

Carries electrons between NAD+ and NADH, a key step in making ATP, the cell's energy currency.

SIRTUINS

Maintenance

A family of enzymes that need NAD+ to regulate metabolism and stress responses.

PARPS

DNA repair

Repair enzymes that consume NAD+ each time they fix damaged DNA.

WHY LEVELS FALL

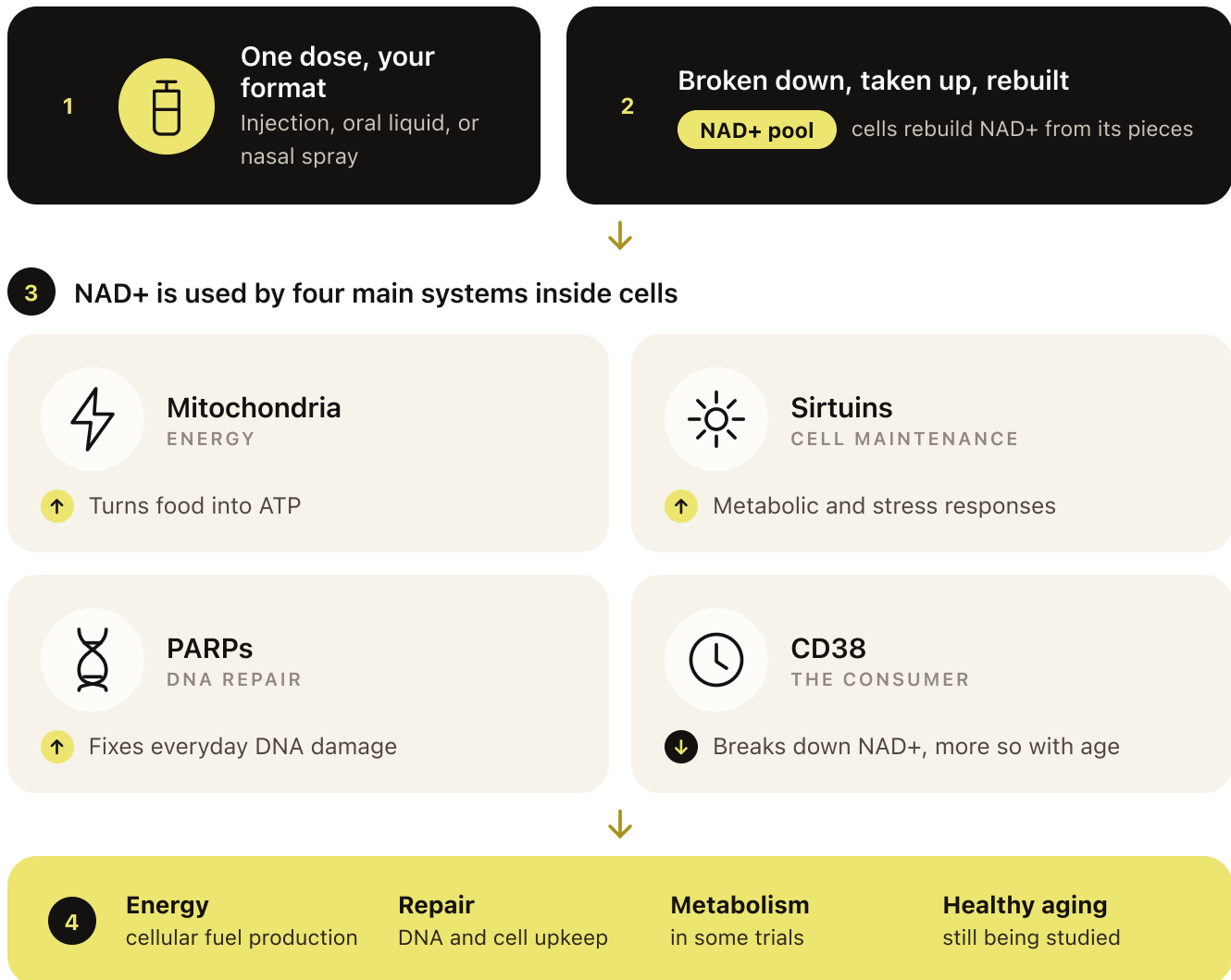
With age, demand rises and recycling slows. An enzyme called CD38, which breaks down NAD+, becomes more active with age and inflammation, and accumulated DNA damage keeps repair enzymes busy.

In animal studies, restoring NAD+ improved several markers of aging. Whether the same holds in people, and which route works best, is what current human research is testing.

"NAD+ supports the systems that keep you going. Sleep, movement, and good food keep those systems strong."

The Lttl care team

From one dose to the cell's working pool.



Simplified illustration. Effects vary by person and are not FDA-established for wellness or aging uses.

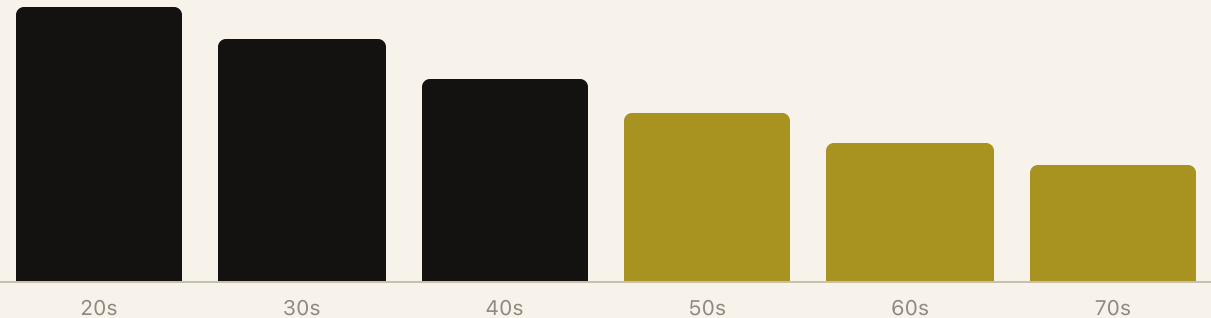
02

Levels rise. Outcomes vary.

Human trials so far are small and short. Most test oral precursors (NR and NMN) that the body converts into NAD+. They consistently raise NAD+ in blood; effects on health measures depend on the group studied.

Why interest is growing · NAD+ tends to fall with age

Illustrative



Studies of human skin, blood, and other tissues report lower NAD+ in older adults. The size of the drop varies by tissue and study; this chart shows the general direction, not exact values.

STUDY	WHO AND WHAT	WHAT WAS FOUND
Martens 2018	30 healthy adults aged 55-79; oral NR for 6 weeks	Blood-cell NAD+ up about 60%; well tolerated
Dollerup 2018	40 men with obesity; oral NR for 12 weeks	Safe, but no improvement in insulin sensitivity
Elhassan 2019	12 older men; oral NR for 3 weeks	Raised muscle NAD+ byproducts; lower inflammation markers
Grant 2019	11 healthy men; 6-hour IV infusion of NAD+	NAD+ was taken up and broken down quickly; blood levels rose only after about 2 hours
Yoshino 2021	25 postmenopausal women with prediabetes; oral NMN for 10 weeks	Improved muscle insulin sensitivity; no change in weight

NR = nicotinamide riboside; NMN = nicotinamide mononucleotide. Few published human studies test NAD+ given by injection under the skin, by mouth, or by nasal spray. Long-term outcomes have not been established.

03

Same molecule, different doors.

NAD+ is a large molecule that the gut and blood break down quickly, so the route matters. Each format trades off directness, convenience, and how much research sits behind it.

INJECTABLE

Most direct

Under the skin, skipping digestion. Inject slowly to limit flushing.

ORAL LIQUID

Needle-free

Liposomal liquid held under the tongue, then swallowed.

NASAL SPRAY

Quick

A small spray absorbed through the lining of the nose.

	INJECTABLE	ORAL LIQUID	NASAL SPRAY	ORAL PRECURSORS
What it is	NAD+ in a pre-mixed vial	NAD+ in a liposomal liquid	NAD+ in a metered spray	NR or NMN capsules
Digestion	Bypassed	Partly bypassed	Bypassed	Converted in the body
Human research	Limited; mostly IV data	Very limited	Very limited	Most studied
Common effects	Site discomfort, flushing	Mild stomach upset	Nasal irritation	Mild; similar to placebo
Available at Lttl	Yes	Yes	Yes	No

Precursors are shown for context because most human evidence comes from them. The right format depends on your comfort, routine, and goals; your clinician can help you choose.

04 *Mostly mild. Often about pace.*

In human studies, NAD⁺ and its precursors were generally well tolerated. With injections, the most common effects - flushing, warmth, chest tightness, or cramping - tend to be linked to how quickly the dose goes in, and usually pass within minutes.

Common

Stinging or redness at the site, flushing, warmth, mild nausea.

Less common

Headache, fatigue, muscle cramping, lightheadedness, nasal irritation with the spray.

What helps

Inject slowly, rotate sites, eat beforehand if you feel queasy, and stay hydrated.

TALK TO YOUR CLINICIAN FIRST IF YOU HAVE

Active or past cancer. NAD⁺ fuels all cells, including tumor cells; its effects in cancer are not well understood.

Heart or blood pressure conditions. Flushing and chest tightness can feel similar to other symptoms.

Other B3 products. Including niacin, NR, or NMN supplements, which add to the same pathway.

Cancer treatment. Including chemotherapy or PARP inhibitors, which work through NAD⁺-related pathways.

Kidney or liver disease. These organs process NAD⁺ byproducts; dosing may need care.

Allergy to any ingredient. Stop and seek care for hives, swelling, or trouble breathing.



Pregnancy and breastfeeding. NAD⁺ therapy is not recommended during pregnancy or while breastfeeding; safety data are lacking. Tell your clinician if you are pregnant or planning to be.

05 *No brand name. Know the source.*

There is no FDA-approved NAD+ drug. Prescription NAD+ is prepared by compounding pharmacies for individual patients, while precursors like NR and NMN are sold as dietary supplements. Each path carries different oversight.

	DIETARY SUPPLEMENTS	COMPOUNDED NAD+ (L TTL)
FDA status	Not reviewed for safety or effectiveness before sale	Not FDA-approved; not reviewed before use
Made by	Supplement manufacturers	A state-licensed or FDA-registered compounding pharmacy
Prescription	Not needed	Required, after clinician review
Format	Mostly capsules and powders	Pre-mixed liquid vials, liposomal oral liquid, nasal spray
Evidence	Small trials for NR and NMN	Wellness and aging benefits are not FDA-established

QUESTIONS TO ASK ANY PROVIDER

- Which pharmacy prepares it, and is it licensed or FDA-registered?
- What is the concentration, and how much is my dose?
- How should I store it, and what is the beyond-use date?
- Who can I reach with questions, and when?

THE DOSING DETAIL THAT MATTERS

NAD+ doses are measured in milligrams, and concentrations differ between pharmacies and formats. Always confirm your dose in milligrams **and** the exact syringe marking, dropper, or number of sprays with your care team, especially with each new supply.

06 *Support, not a switch.*

NAD+ works in the background of everyday cell function, so there is no single moment it "kicks in." Some people report more energy or clearer focus; others notice little. Human trials ran for weeks to months, so it is worth giving it time and reviewing with your clinician.

WEEKS 1-2

Finding your pace

Flushing or site stinging is most common now and often eases with slower injections.

WEEKS 2-6

Settling in

Some notice changes in energy or recovery. Many studies measured results around here.

MONTHS 2-3

Check in

Review how you feel, your routine, and whether the format suits you.

ONGOING

Review

Reassess benefit and goals with your clinician.

HOW Lttl SUPPORTS TREATMENT

Board-certified clinicians

Licensed providers review your history and help you choose a format.

FDA-registered pharmacy partners

Prepared by certified U.S. pharmacies and shipped to your door.

Unlimited 24/7 support

Reach the care team any time at (888) 847-7806 📞 or hello@lttl.com.



Where the findings come from.

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IMPORTANT INFORMATION

This whitepaper is educational and does not replace medical advice, diagnosis, or treatment. Study results describe specific populations under study conditions and may not reflect individual outcomes. Most human studies cited tested oral NAD+ precursors or IV infusion, not the formats Lttl offers. Compounded medications are not FDA-approved, and the wellness and healthy-aging benefits of NAD+ are not FDA-established. NAD+ is not right for everyone; discuss your full health history and all medications and supplements with a licensed clinician before starting.

Questions? Talk to our care team.

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