RESEARCH DOSAGE MANUAL

NAD+ FlexPen

Nicotinamide Adenine Dinucleotide · 500 mg / 3 ml · Research Grade

C21H27N7O14P2 · MW 663.43 — Manufactured in the Netherlands under cGMP

Full Name	Nicotinamide Adenine Dinucleotide (oxidised form, NAD+)
CAS Number	53-84-9
Formula	C21H27N7O14P2 (MW 663.43 g/mol)
Concentration	500 mg / 3 ml cartridge — 166.67 mg/ml
Pen Dose Scale	1 unit = 0.01 ml = 1.667 mg | 30 units = 50 mg | 60 units = 100 mg
Total Pen Doses	300 units per cartridge (500 mg total)
Purity	≥ 99.5% HPLC · Endotoxin < 0.5 EU/mg
Storage	2–8 °C · protect from light · do not freeze
Batch / Expiry	NL-2026-D · Expires 10/2029
Administration	Intramuscular or subcutaneous injection (research)

1. Compound Overview

Nicotinamide adenine dinucleotide (NAD+) is the universal cellular redox cofactor and essential signalling molecule involved in over 500 enzymatic reactions across all living cells. NAD+ serves as an electron acceptor in glycolysis, the citric acid cycle, and oxidative phosphorylation, and as a substrate for three critical enzyme families: the sirtuin deacylases (SIRT1–7), the poly-ADP-ribose polymerases (PARPs), and CD38/CD157 NADases.

Cellular NAD+ levels decline with age by 40–60% between ages 20 and 60 (Yoshino et al. 2021), correlating with reduced mitochondrial function, impaired DNA repair, circadian clock dysregulation, and accelerated tissue senescence. Injectable NAD+ bypasses oral bioavailability limitations and rapidly restores intracellular NAD+/NADH ratios, making it the preferred research administration route for acute and subacute supplementation studies.

2. Mechanism of Action

- **Sirtuin activation (SIRT1–7):** NAD+ is the obligate co-substrate for all seven sirtuin isoforms. SIRT1 and SIRT3 deacetylate histones and PGC-1α to drive mitochondrial biogenesis and upregulate FOXO3a longevity pathways. SIRT6 maintains genome stability through telomere maintenance and

double-strand break repair.

• **PARP1/2 activation (DNA repair):** NAD+ fuels PARP-mediated poly-ADP-ribosylation at DNA double-strand break sites, the primary mechanism of rapid genomic repair. Elevated NAD+ accelerates repair kinetics and reduces mutational burden in stressed cells.

• **CD38 signalling (immune regulation):** CD38 consumes NAD+ to produce cyclic ADP-ribose (cADPR), a second messenger regulating intracellular calcium flux and immune cell activation. NAD+ replenishment sustains CD38 signalling without depleting the pool.

• **Mitochondrial bioenergetics:** NAD+ is the terminal electron acceptor in the mitochondrial electron transport chain. Restoring NAD+ pools improves Complex I activity, increases ATP production efficiency, and reduces mitochondrial ROS generation.

• **Circadian clock regulation:** SIRT1-mediated deacetylation of BMAL1 and PER2 links NAD+ levels to circadian periodicity — declining NAD+ in aged tissue contributes to circadian disruption observed in ageing models.

3. FlexPen Operating Instructions

The VitalPep Pro FlexPen is a reusable multi-dose injection pen pre-filled with NAD+ (500 mg / 3 ml). Each unit on the dose dial delivers exactly 0.01 ml (10 µl) of solution. The pen accepts standard 31-gauge or 32-gauge pen needles (4–8 mm). Follow the steps below before every injection.

■ **Step 1 — Prepare the pen**

Remove the pen cap. Inspect the cartridge window: the solution should be clear and colourless. Do not use if particulates are visible or if the solution appears cloudy or discoloured. Attach a new sterile pen needle by screwing it clockwise until firmly seated. Remove both the outer and inner needle caps and set aside.

■ **Step 2 — Prime the needle**

Select 2 units on the dose dial by turning the dial clockwise. Point the pen needle upward and tap the cartridge gently to collect any air bubbles at the top. Press the injection button fully until it clicks and a small stream (or droplet) appears at the needle tip. Repeat if no flow is seen. Priming removes air and confirms the pen is working correctly.

■ **Step 3 — Set your dose**

Dial your required dose by turning the dose selector clockwise. For example, to inject 50 mg, dial to 30 units; for 100 mg, dial to 60 units. The current dose is displayed in the dose window. You can turn anti-clockwise to reduce the dose before injecting — the pen will not dispense solution while dialling.

■ **Step 4 — Choose the injection site**

Subcutaneous injection sites: abdomen (at least 5 cm from the navel), outer thigh, or upper arm. Rotate sites with each injection to avoid lipohypertrophy. Wipe the skin with an alcohol swab and allow to air-dry for 10 seconds before injecting.

■ **Step 5 — Inject**

Pinch a fold of skin with two fingers. Insert the needle at a 45–90° angle (use 90° for a 4 mm needle, 45° for longer needles). Press the injection button slowly and firmly until it stops. Hold the button down and count to 10 seconds before withdrawing — this ensures full dose delivery and prevents backflow.

■ **Step 6 — Withdraw and recap**

Withdraw the needle at the same angle it was inserted. Do not rub the injection site. Replace the outer needle cap using the one-hand scoop method, then unscrew and safely dispose of the used needle in a sharps container. Replace the pen cap. Never store the pen with the needle attached.

■ **Step 7 — Storage after use**

Store the pen at 2–8 °C (refrigerated) when not in active use. Do not freeze. The pen may be kept at room temperature (up to 25 °C) for a maximum of 28 days during an active dosing cycle. Record the date of first use on the pen label.

■ **Always use a new sterile needle for each injection. Sharing pens or needles poses a serious infection risk. The cartridge is pre-filled and sealed — do not attempt to refill or modify the pen.**

4. Research Dosing Protocol

Concentration 166.67 mg/ml — 1 unit = 0.01 ml = 1.667 mg | 30 units = 50 mg | 60 units = 100 mg | 300 units = 500 mg (full pen)

Injectable NAD+ is typically administered by intramuscular (IM) or subcutaneous (SubQ) injection for research purposes. IM delivery is preferred for larger doses (≥50 mg) due to faster absorption and reduced local tissue accumulation. SubQ is appropriate for doses up to 50 mg. Protocols below are based on peptidedosages.com average research dosing guidelines.

Dose Reference Table (IM or SubQ)

Dose (mg)	Units to Dial	Volume (ml)	Route	Frequency
25 mg	15 units	0.150 ml	SubQ or IM	Daily (introductory)
50 mg	30 units	0.300 ml	SubQ or IM	Daily (standard)
75 mg	45 units	0.450 ml	IM preferred	Daily (escalated)
100 mg	60 units	0.600 ml	IM preferred	Daily (high dose)
150 mg	90 units	0.900 ml	IM	Every other day (advanced)
250 mg	150 units	1.500 ml	IM	Every other day (max)

Recommended Research Protocols

Protocol	Duration	Daily Dose	Units / Day	Route	Notes
Initiation	Days 1–7	25 mg	15 units	SubQ	Establish baseline tolerance
Standard	Weeks 2–4	50 mg	30 units	SubQ or IM	Core research dose
Intensive	Weeks 5–8	100 mg	60 units	IM preferred	Acute NAD+ replenishment
Maintenance	Ongoing	50 mg	30 units	SubQ or IM	Every other day
Off-cycle	2–4 weeks	—	—	—	Rest period

Pen longevity: At 50 mg/day (30 units), the 500 mg cartridge provides approximately 10 daily doses. At 100 mg/day (60 units), it provides approximately 5 daily doses. At every-other-day dosing of 50 mg, the pen provides approximately 10 injections (20 days).

■ **Flush sensation, mild hypotension, and a warm flushing feeling are common immediately after rapid NAD+ injection. Administer slowly (depress the pen button over 15–20 seconds). If significant discomfort occurs, reduce dose by 50% and re-escalate over 5–7 days.**

■ **For doses ≥ 100 mg administered IM, split the dose across two separate injection sites (e.g. 60 units per site, two sites) to minimise local tissue concentration and discomfort.**

5. IM Injection Site Guide

For intramuscular injections with the FlexPen, the preferred sites are the vastus lateralis (outer thigh) and the deltoid (upper arm). Use a minimum 6 mm pen needle for IM administration. Ensure the needle fully penetrates into muscle tissue before pressing the injection button.

Vastus lateralis	Middle third of outer thigh · safe for large volumes · preferred for ≥50 mg
Deltoid	Upper outer arm · suitable for ≤50 mg · avoid the radial nerve region
Ventrogluteal	Advanced site for large volumes · low nerve/vessel risk · research facility only
SubQ sites	Abdomen or outer thigh for doses ≤50 mg · inject at 45° angle

6. Storage & Handling

In-use storage	Up to 25 °C for a maximum of 28 days during active dosing cycle
Between-use	2–8 °C (refrigerated) · do not freeze
Light protection	Keep pen cap on at all times when not injecting
Inspection	Solution must be clear, colourless, and free of particles
Expiry	Do not use after printed expiry or 28 days post first puncture
Light sensitivity	NAD+ degrades rapidly under UV light — keep pen capped at all times
Inspection	Clear pale yellow solution is normal · discard if brown or cloudy

7. Key References

Yoshino M et al. (2021). Nicotinamide mononucleotide increases muscle insulin sensitivity in prediabetic women. Science. 372(6547):1224–1229.

Mills KF et al. (2016). Long-term administration of nicotinamide mononucleotide mitigates age-associated physiological decline in mice. Cell Metab. 24(6):795–806.

Martens CR et al. (2018). Chronic nicotinamide riboside supplementation is well-tolerated and elevates NAD+ in healthy middle-aged and older adults. Nat Commun. 9(1):1286.

Rajman L, Chwalek K, Sinclair DA. (2018). Therapeutic potential of NAD-boosting molecules. Cell Metab. 27(3):529–547.

peptidedosages.com — NAD+ average research dosing protocols (accessed 2026).