spermidine LIFE®

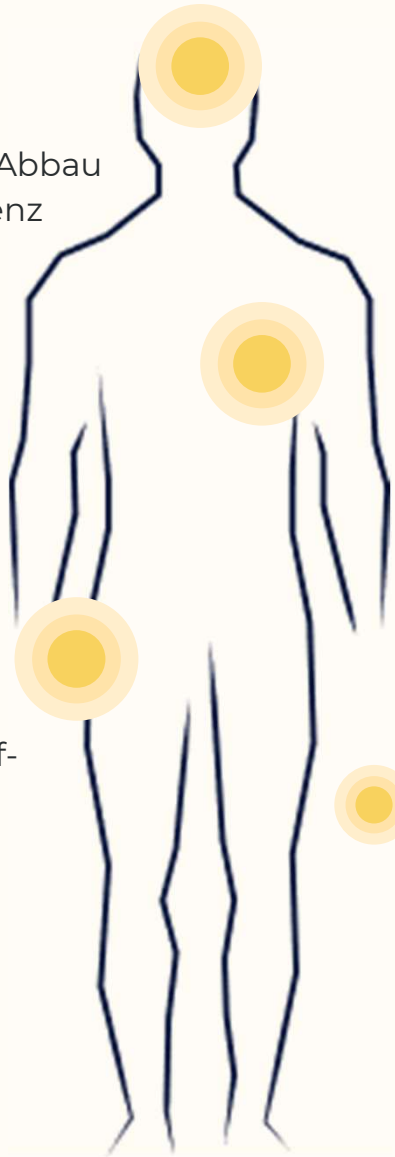
Longevity Labs

Ein Studienüberblick:
Ein Überblick über die Auswirkungen von Autophagie und Spermidin auf alters-bedingte Krankheiten

Die genannten Studien sind nur eine kleine Auswahl an wissen-schaftlichen Studien über Spermidin. Eine größere Auswahl befindet sich am Ende dieser Präsentation.

Neurodegeneration [1,2,3]

- Schutz vor kognitivem Abbau
- Vorbeugung von Demenz und Alzheimer
- Verringerung von Entzündungsfaktoren



Herz-Kreislauf-Systems [4,5,6]

- Senkung des Bluthochdrucks
- Kräftigung des Herzmuskels
- Vorbeugung von Herzinsuf-fizienz
- Erhöhung der Zellatmung

Metabolismus [7,8]

- Förderung des Fettstoff-wechsels
- Stärkung des Immun-systems

Altern und Langlebigkeit [9,10]

- Verringerung von alters-bedingten Krankheiten
- Verlängerung der gesunden Lebensspanne

Spermidin fördert die Regeneration von Zellen nach starker Belastung

Die genannten Studien sind nur eine kleine Auswahl an wissenschaftlichen Studien über Spermidin. Eine größere Auswahl befindet sich am Ende dieser Präsentation.

Studie zur Muskelregeneration:
Eine Studie von Eisenberg et al. (2009) zeigt, dass Spermidin die Autophagie stimuliert und dadurch die Regeneration von Muskelzellen nach Verletzungen fördert. Dies könnte für Sportler von Vorteil sein, da Muskelregeneration nach intensiven Trainingseinheiten wichtig ist.

Verbesserung der Herz-Kreislauf-Gesundheit:
Eine Studie von Madeo et al. (2018) legt nahe, dass Spermidin die Herz-Kreislauf-Gesundheit verbessern kann, was indirekt die sportliche Leistung und Regeneration unterstützen könnte. Ein gesundes Herz-Kreislauf-System ist entscheidend für die Erholung nach dem Sport.

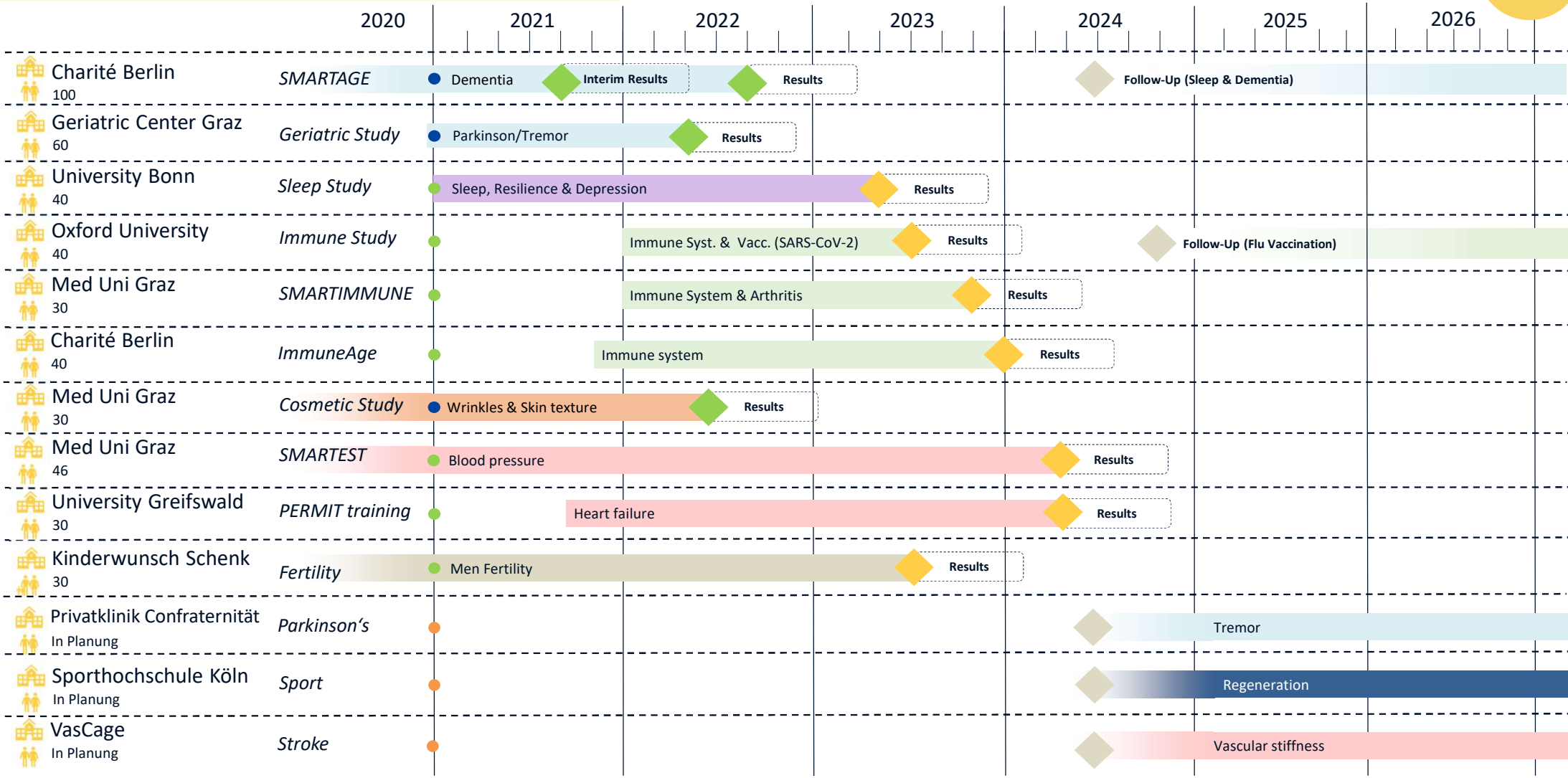
Reduktion von Entzündungen:
Forschungsergebnisse, wie die von LaRocca et al. (2013), deuten darauf hin, dass Spermidin entzündungshemmende Eigenschaften hat. Entzündungen sind ein natürlicher Teil der Regenerationsprozesse nach dem Sport, aber eine übermäßige Entzündung kann die Erholung verzögern. Spermidin könnte helfen, diese Entzündungen zu regulieren.

Zelluläre Gesundheit und Langlebigkeit:
Eine Übersichtsarbeit von Eisenberg et al. (2016) beschreibt, dass Spermidin die Lebensdauer von Zellen verlängern und ihre Gesundheit fördern kann. Dies könnte langfristig auch die Fähigkeit des Körpers verbessern, sich nach sportlicher Belastung zu regenerieren.

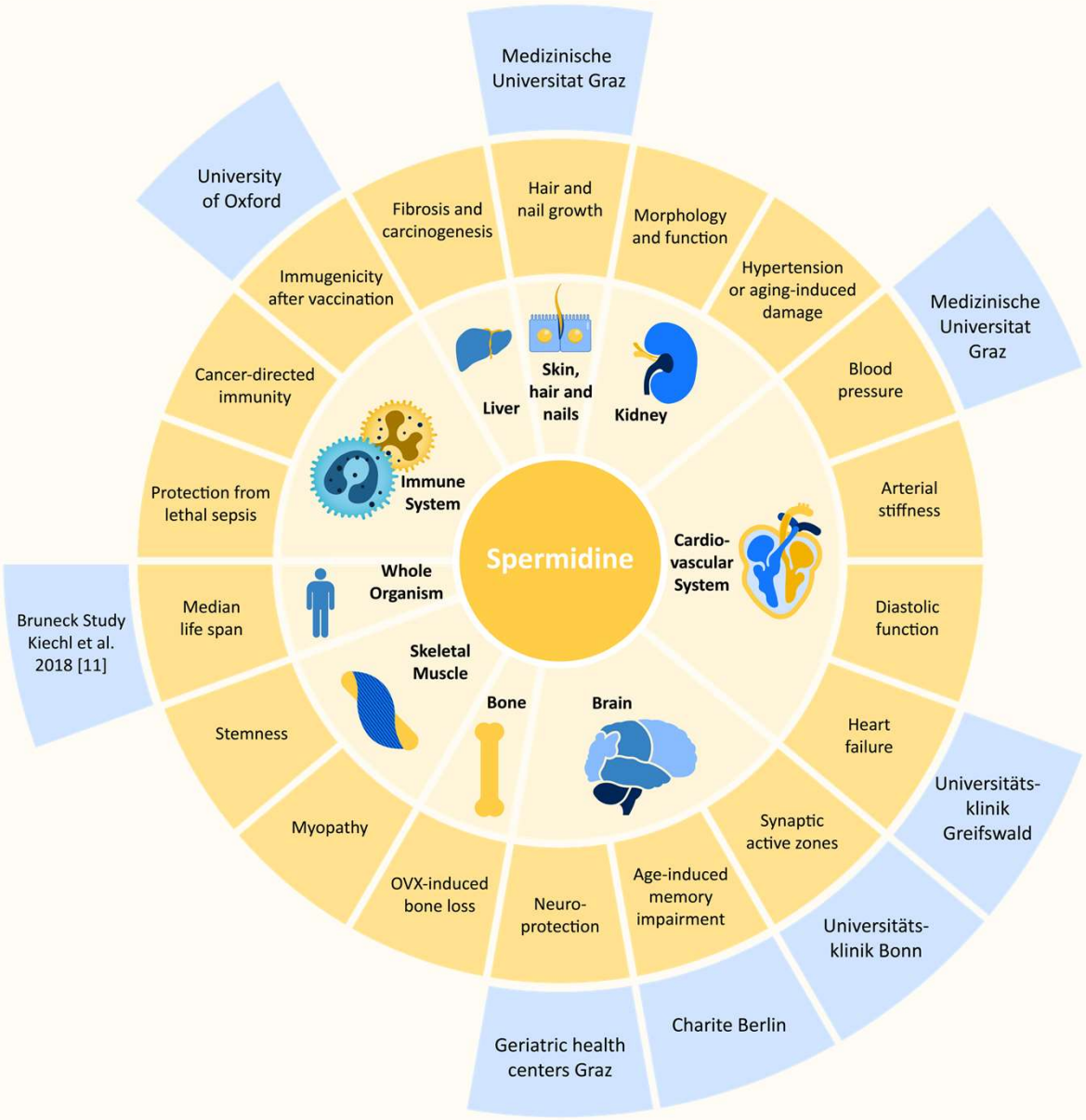
19. Bardócz S, Duguid TJ, Brown DS, et al. The importance of dietary polyamines in cell regeneration and growth. Br J Nutr. 1995;73(6):819-828. DOI: 10.1079/bjn19950087

Study Status 2024

started
planned
on hold
finished



Übersicht über publizierte und laufende klinische Studien mit spermidineLIFE®



Publizierte Studien zu **spermidine**LIFE®

- Toxikologische Studie und Sicherheit des Produktes **spermidine**LIFE®: https://pubmed.ncbi.nlm.nih.gov/29315079/

- SmartAge - Studie untersucht die positive Wirkung von Spermidin auf die Gedächtnisleistung von älteren Menschen. In Zusammenarbeit mit der Charité Berlin.
  Protokoll: https://pubmed.ncbi.nlm.nih.gov/31039826/
  Erste Teilergebnisse: https://pubmed.ncbi.nlm.nih.gov/30388439/

- Hippocampus-Volumen und allgemeine „Gehirn-Gesundheit“ auf Basis von Kohorten der SmartAge Studie: https://pubmed.ncbi.nlm.nih.gov/32629145/

- Pflegepatienten Studie an den Geriatrische Gesundheitszentren in Graz mit Fokus auf Parkinson und Tremor: https://ggz.graz.at/de/content/download/4924/64919/version/3/file/GGZ_Magazin_2022_web.pdf

Aktuelle laufende klinische Studien mit **spermidine**LIFE®

- Improving Vaccination in Older Adults by Inducing Autophagy With Spermidine
  https://clinicaltrials.gov/ct2/show/NCT05421546term=spermidine&draw=2&rank=1

- Spermidine Anti-Hypertension Study (SMARTEST)
  https://clinicaltrials.gov/ct2/show/NCT04405388term=spermidine&draw=2&rank=3

- An Exploratory Clinical Study on Autophagy and Multi-level Molecular Profiling During Spermidine Supplementation
  https://clinicaltrials.gov/ct2/show/NCT04823806?term=spermidine&draw=2&rank=2

- Spermidine supplementation on Metabolic, Neuronal and Cardiovascular Response to Exercise TRAINING (PERMIT_EX)
  https://clinicaltrials.gov/ct2/show/NCT05128331?term=spermidine&draw=2&rank=6

Was macht unser Produkt so einzigartig?

spermidineLIFE® ist Weltmarktführer und das weltweit einzige offiziell zugelassene Spermidinpräparat (Novel Food in der EU).

Die Zulassung von **spermidine**LIFE® hat die Humanforschung erst ermöglicht. Bis dato wurde es in 8 klinischen Studien eingesetzt.

spermidineLIFE® wird aus natürlichen Weizenkeimen aus Mitteleuropa extrahiert und in Graz mittels eigens entwickeltem Extraktionsverfahren hergestellt.

Aufgrund der Zulassung gibt es Sicherheits- und Verträglichkeits-studien, die essentiell für eine therapeutische Intervention sind.

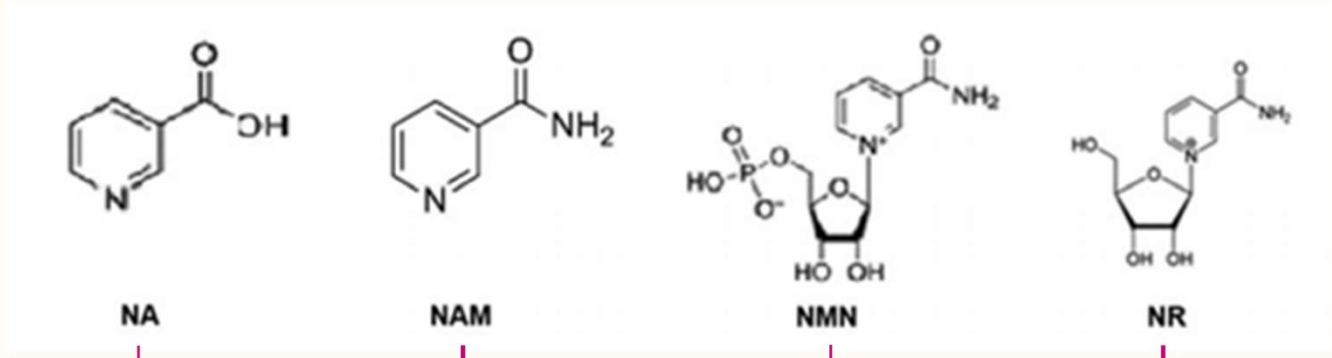
Andere Spermidinpräparate garantieren oftmals nicht die Qualität und Spermidin-konzentration. Sie sind zumeist aus Soja (Methionin im Soja kann die Zellerneu-erung hemmen) oder mit synthetischem Spermidin versetzt (z.B. Buchweizen - enthält selbst kaum Spermidin)

Der natürliche **CelVio® Complex** in **spermidine**LIFE® ist einzigartig. Neben Spermidin enthält er weitere Polyamine (Spermin, Putrescin), gesunde Fette, Vitamine und Mineralien.

Gibt es Alternativen zu spermidineLIFE®?

Soy (Soja)	Seedling flour (Weizen-/Buchweizenkeimlingsmehl)	CelVio® spermidineLIFE® ✓
~ **Unclear** legal situation	✘ **No legal approval**	✓ Approved as **Novel Food**
✘ From **GMO modified raw material** ✘ Acquisition of various raw material traders	✘ Raw material spiked with **synthetic spermidine** ✘ Purchase of synthetic spermidine from **China**	✓ **All natural** from local wheat germ ✓ Manufactured and tested (3x) in **Austria**
✘ **No clinical tests** for safety and tolerability ✘ No clinical tests for efficacy	✘ **No clinical tests** for safety and tolerability ✘ No clinical tests for efficacy	✓ **Clinical tests** for **safety and tolerability** ✓ Various clinical tests for **efficacy**
! Soy contains high amounts of **phytoestrogens** ! Soy contains Methionin – a substance that may have the effect of an **autophagy blocker**	! Synthetic spermidine is **only approved for laboratory use** ! There is no 100% pure synthetic spermidine - the by-products are **potentially hazardous to health**	! Our **unique extract** is a polyamine and ingredient complex ! Based on preclinical data, we know that **CelVio®** is **more effective** than synthetic spermidine!

NAD und ähnliche Verbindungen

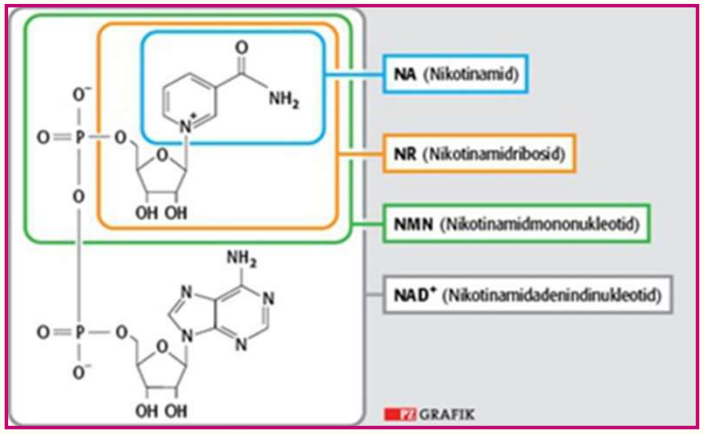


Nicotinsäure (Niacin, Vitamin B3)

(Nicotinamid): Säureamid der Nicotinsäure

Nicotinamid-mononucleotid

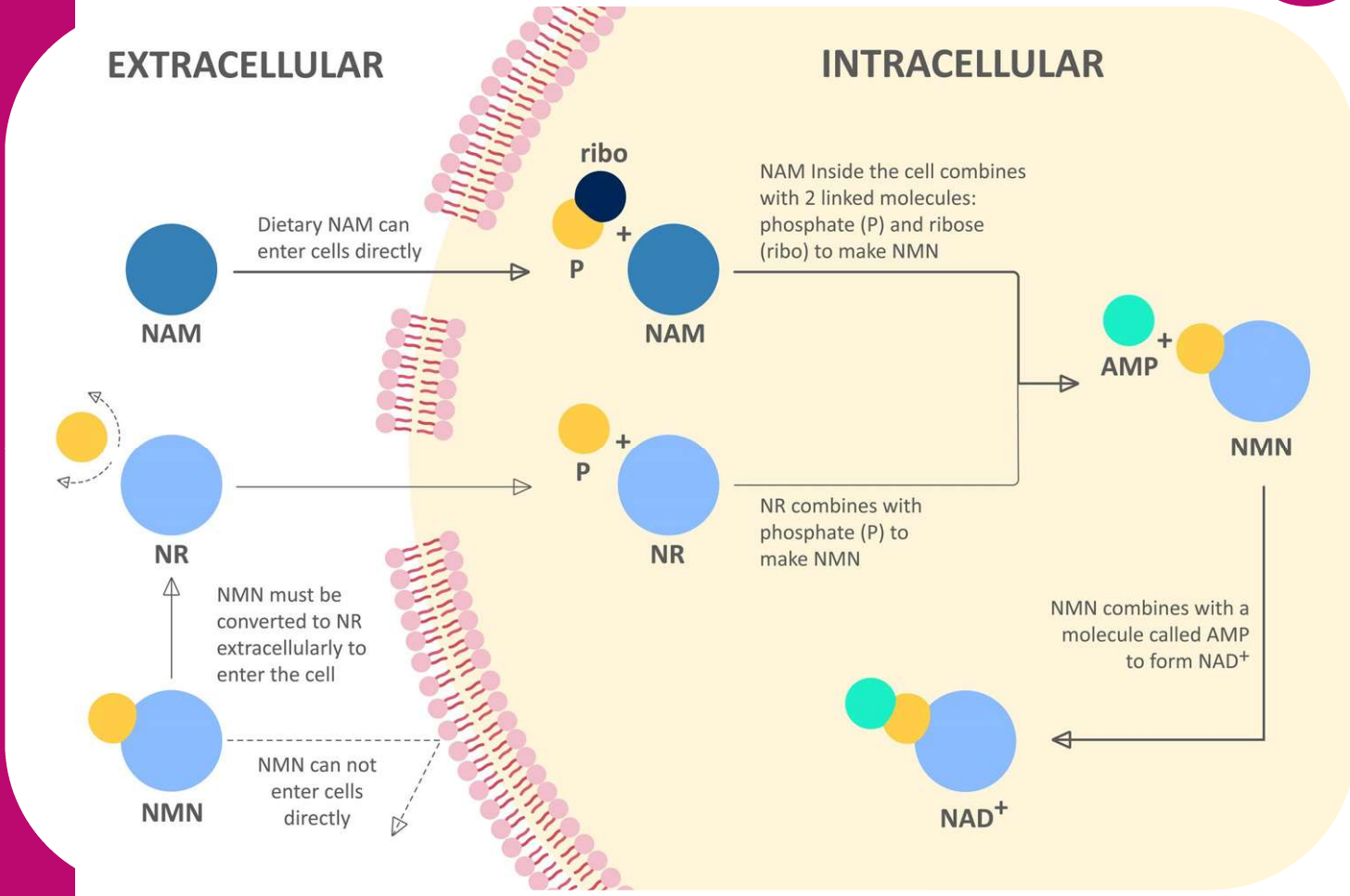
Nicotinribosid



- NAD/NADP (Nicotinamid Adenin Dinukleotide/Phosphat): Biologisch aktives Coenzym
- NAD+/NADH und NADP+/NADPH: Halten das Niveau zwischen Oxidations- und Reduktionsmittel

Der leichte Weg zu NAD+

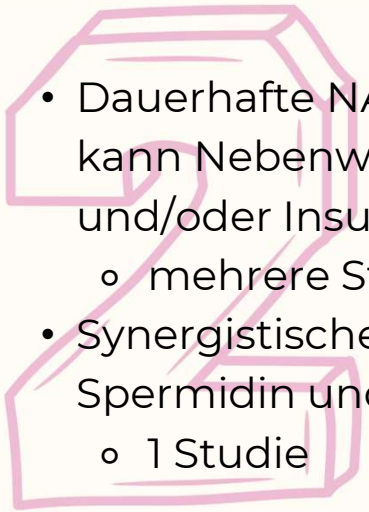
NAM kann direkt in unsere Zellen gelangen und zusammen mit Ribose und Phosphor weiter zu NMN und anschließend NAD+ umgewandelt werden



Patente

Kommunikation der Patente für Journalisten und B2B Partner

- Spermidin erhöht die mitochondrielle Aktivität, d.h. Spermidin verbessert die mitochondrielle Respiration
- Durch die Mitophagie werden alte Mitochondrien (Kraftwerke der Zelle) erneuert



- Dauerhafte NAD Supplementation kann Nebenwirkungen auf die Glukose- und/oder Insulinhomöostase haben
  - mehrere Studien
- Synergistische Kombination von Spermidin und NAD+ zur Prävention
  - 1 Studie

https://patents.google.com/patent/WO2022043515A1/en
https://patents.google.com/patent/EP3320899A1/en
https://pubmed.ncbi.nlm.nih.gov/33568522/

Spermidine could be supportive/preventive for the following indications/diseases:

Category	Indication/disease	Source
Neurodegeneration	Parkinson, Dementia, Alzheimer	1,2,3,4,5,6,7,8, 55,56,57
Immune system	Immunization failure in immune senescence, SARS-CoV-2/COVID-19 (risk groups), regenerative capacity of epithelia in lung tissue.	9,10,11,12,13,14,15,16,17,18,54,62
Aging & Longevity	Life extension, senescence delay of cells, better mitochondrial function.	19.20,21,22,23,24,25,26
Liver	Hepatic fibrosis, hepatocellular carcinoma, liver damage by alcohol, liver protection by NRF2 signaling, nonalcoholic steatohepatitis.	27,28,52,53,58
Digestion	Inflammation in the intestine	27,28,52,53,58
Skin & Hair	Neurodermatitis, creatine production, hair loss, restoration of skin barrier function, accelerated wound healing, hypopigmentation, increase melanin production.	29,30,59
Heart	Atherosclerosis, Aortic Aneurysm, Cardiovascular Disease, Peripheral Arterial Disease, Systemic Inflammation	31,32,33,34,35,36,37,38,60
Bones & Cartilage	Bone density, intervertebral disc degeneration (IDD), SPD increases cartilage mass.	39,40,41,42,43,61
Muscles	Age-related muscular atrophy	44,45
Diabetes & Obesity	Metabolic disturbance in overeating, glucose tolerance, regulation of lipid metabolism, reduction white adipose tissue, decreased inflammatory cytokines and chemokines.	46,47,48,49,50,51,65

Overview of the most recent studies on spermidine

1. Neurodegeneration[1,2,3,4,5,6,7,8, 55,56,57]

By activating autophagy, toxic protein aggregates in cells can be removed, which are responsible for diseases such as Parkinson's, dementia, Alzheimer's or ALS. This has been demonstrated both in mice and by human studies. The degradation of neurons and associated disease patterns can be curbed. Spermidine activates the autophagic process and can be both preventive and protective. Spermidine protects the brain from premature aging and mitochondrial dysfunction. Higher spermidine intake is also associated with greater hippocampal volume. Spermidine can cross the blood-brain barrier, where it improves mitochondrial function. This reduces the risk of cognitive impairment. A low concentration of spermidine protected against neuronal toxicity caused by paraquat, while both low and high concentrations provided protection against cytotoxicity caused by overexpression of amyloid precursor protein.

2. Immune system[9,10,11,12,13,14,15,16,17,18,54, 62]

Spermidine supplementation reduces inflammatory cytokines and leads to increased memory cell formation. It also promotes the differentiation of T immune cells, resulting in better vaccination success in the elderly. Autophagy plays an important role in immune defense and on the one hand can help to dispose of pathogenic microorganisms. On the other hand, autophagy still fulfills an important function in mediating immunological memory and improves it in old age. Autophagy induced by spermidine can reduce the viral load of SARS-CoV-2 infected cells by 85%. Spermidine leads to a protective effect against inflammatory bowel diseases such as acute colitis. The polyamine metabolism of pneumococci has far-reaching effects on its capsular stability, thus influencing the pathogenicity of the virus. Spermidine treatment induces autophagy and increases the regenerative capacity of epithelia harvested from mouse lung tissue. Spermidine could thus reduce allergic/asthmatic lung reactions. Spermidine & Eugenol is an innovative combination therapy capable of stimulating autophagy and reducing inflammation in vitro. This may be promising for COVID-19 risk groups.

Overview of the most recent studies on spermidine

3. Aging and Longevity[19.20,21, 22,23, 24, 25, 26]

Spermidine and autophagy levels decrease with older age in the human body. Spermidine supplementation can replenish the spermidine pool, induces autophagy in the body and leads to life extension in mice. In addition, a long-term epidemiological study (20 years) demonstrated that higher consumption of spermidine-containing foods correlated with reduced mortality and 5 years longer life expectancy. Oral administration of spermidine greatly increases mitochondrial function in high-fat diet mice and reduces inflammatory markers. Spermidine can delay cell senescence and senescence-induced inflammatory processes. The life-prolonging effect of spermidine is thought to be due in part to its protection of nuclear DNA.

4. Digestion and liver[27,28,52,53,58]

Liver damage caused by excessive alcohol consumption could be reduced or even reversed by spermidine. Spermidine acts as an antioxidant and can thus break down harmful reactive substances. Spermidine also appears to prevent intestinal inflammation, which also suggests that it has an antioxidant effect. Spermidine mediates liver protection by enhancing NRF2 signaling via a MAP1S-mediated non-canonical mechanism. Spermidine prolongs lifespan and prevents both liver fibrosis and hepatocellular carcinoma by activating MAP1S-mediated autophagy. Spermidine treatment partially restores protein synthesis and mitochondrial function in non-alcoholic steatohepatitis (NASH) and prevents NASH progression in vivo by restoring the translation factor EIF5AH.

Overview of the most recent studies on spermidine

5. Skin and hair[29,30,59]

Spermidine may be a potential therapeutic agent for the treatment of atopic dermatitis. Spermidine also has a positive effect on keratin production, and influences the expression profile of hair follicles. In cell culture, it also had a proliferating effect on epithelial stem cells. Spermidine secreted by streptococci contributes to the upregulation of collagen and lipid synthesis in aged cells to restore skin structure and barrier function. Systemic and topical spermidine treatment significantly accelerates skin wound healing. Spermidine increases melanin production and could serve as a potential natural product to alleviate hypopigmentation.

6. Cardiovascular system[31,32,33,34,35,36,37,38,60]

Spermidine has a preventive effect on age-associated cardiovascular diseases. In addition, spermidine improves cellular respiration by increasing mitochondrial content in cardiac cells. Cardiac muscle cells, the so-called cardiomyocytes, which are responsible for the contraction of the heart, take up spermidine via a specific cellular transporter, whereby the positive autophagic effect can also take place in these cells. Increased NO availability in these cells results in reduced systemic inflammation. The function of blood vessels can be improved by spermidine, which can prevent atherosclerosis in the long term. Spermidine supplementation may also limit experimental abdominal aortic aneurysm formation which may make spermidine a promising treatment for this condition. Furthermore, spermidine inhibits vascular calcification in chronic kidney disease through enzyme regulation. Treatment with a mixture of trehalose, spermidine, nicotinamide, and polyphenols improves maximum walking distance (MWD) in patients with peripheral arterial disease (PAVD), with the mechanism possibly related to NOX2-mediated reduction of oxidative stress and increase of autophagic flow.

Overview of the most recent studies on spermidine

7. Bones and cartilage[39,40,41,42,43,61]

Spermidine can increase stem cell production and has a positive effect on bone density. The natural polyamine spermidine prevents bone loss by preferentially disrupting osteoclastic activation in ovariectomized mice. In aged mice, low levels of spermidine in chondrocytes could be restored by spermidine supplementation, thereby restoring cartilage mass. By ensuring autophagic flux, spermidine contributes to the protection of chondrocytes. Spermidine could serve as a therapeutic agent for intervertebral disc degeneration (IDD)

8. Muscles[44,45]

Age-related muscle atrophy can be reduced via spermidine-induced autophagy. This protective effect has been demonstrated in mice by stress-inducible metabolic regulators.

9. Diabetes and obesity[46,47,48,49,50,51, 65]

Polyamines, such as spermidine have the potential to reduce white adipose tissue and stimulate fat oxidation. Induction of autophagy by spermidine protects against the deleterious effects of a high-fat diet in wild-type mice. In obese mice, spermidine supplementation was shown to increase glucose tolerance. Spermidine leads to regulation of lipid metabolism and improvement of antioxidant capacity and gut barrier function, and decreased expression of inflammatory cytokines and chemokines. Autophagy inducer spermidine protects against metabolic disorders during overeating.

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