BEGINNERS GUIDE TO PEPTIDES

BRAINIQ® Health Sciences

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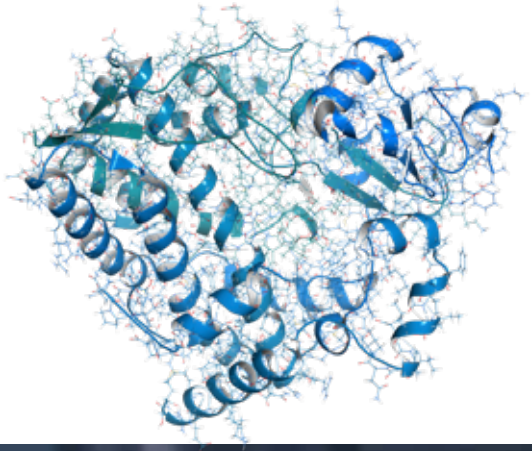
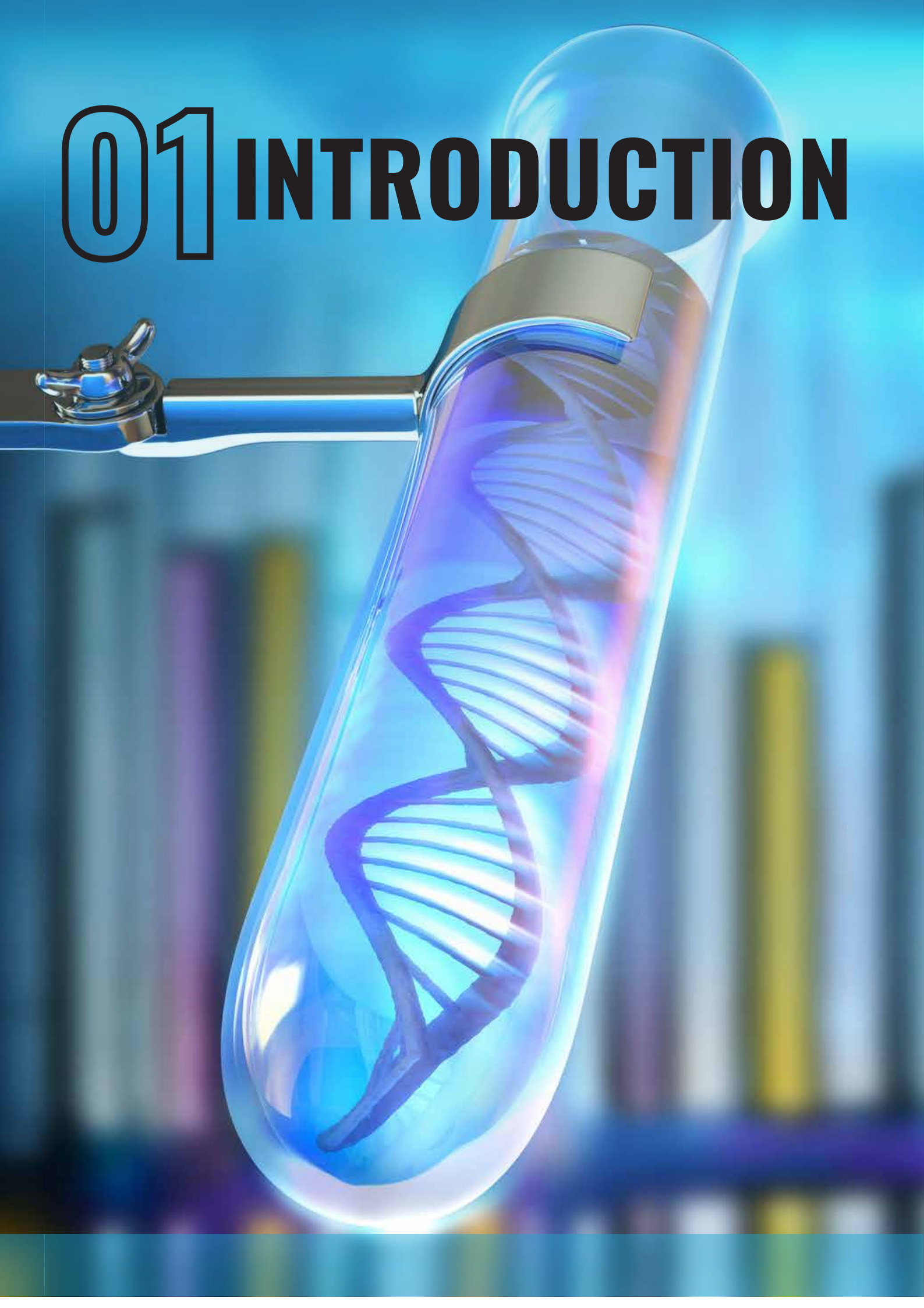


Unveiling Promising Research Peptides

TABLE OF CONTENTS



01 INTRODUCTION

MOTIVATION

Welcome to this journey into the world of peptides. Our mission is to offer you an understanding of these unique molecules that are believed to hold solutions to various diseases.

This book is designed with purely educational intent, exploring a variety of peptides currently under research for their medicinal potential. It is our hope that this introductory exploration will foster a deep appreciation for the potential peptides, and you may also continue this research to advance our future healthcare landscape.

PEPTIDE HISTORY

Peptides, ever since their discovery in the 20th century, have been subjects of great scientific interest. From initially understanding their fundamental role in biological processes, scientists have gradually uncovered the diverse potential of these small protein fragments.

The landmark synthesis of insulin in the 1960s paved the way for peptide therapeutics and today, peptides continue to shape therapeutic research. They are believed to have potential applications for a broad array of diseases and medical conditions.

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ABOUT US

Ageless Pep, a trusted name in the peptide market, is the proud author of this ebook.

We provide an online platform to buy different research peptides. As an esteemed provider of high-purity peptides, we prioritize accuracy in all our endeavors.

Our dedicated team, lauded for their exceptional customer service, is ready to assist with your needs and we stand out with our commitment to providing top-tier, lab-tested products.

Ageless Pep is not just a platform but a vibrant community of researchers and scientists. We strive to be your catalyst for innovation and a reliable partner in advancing scientific understanding.

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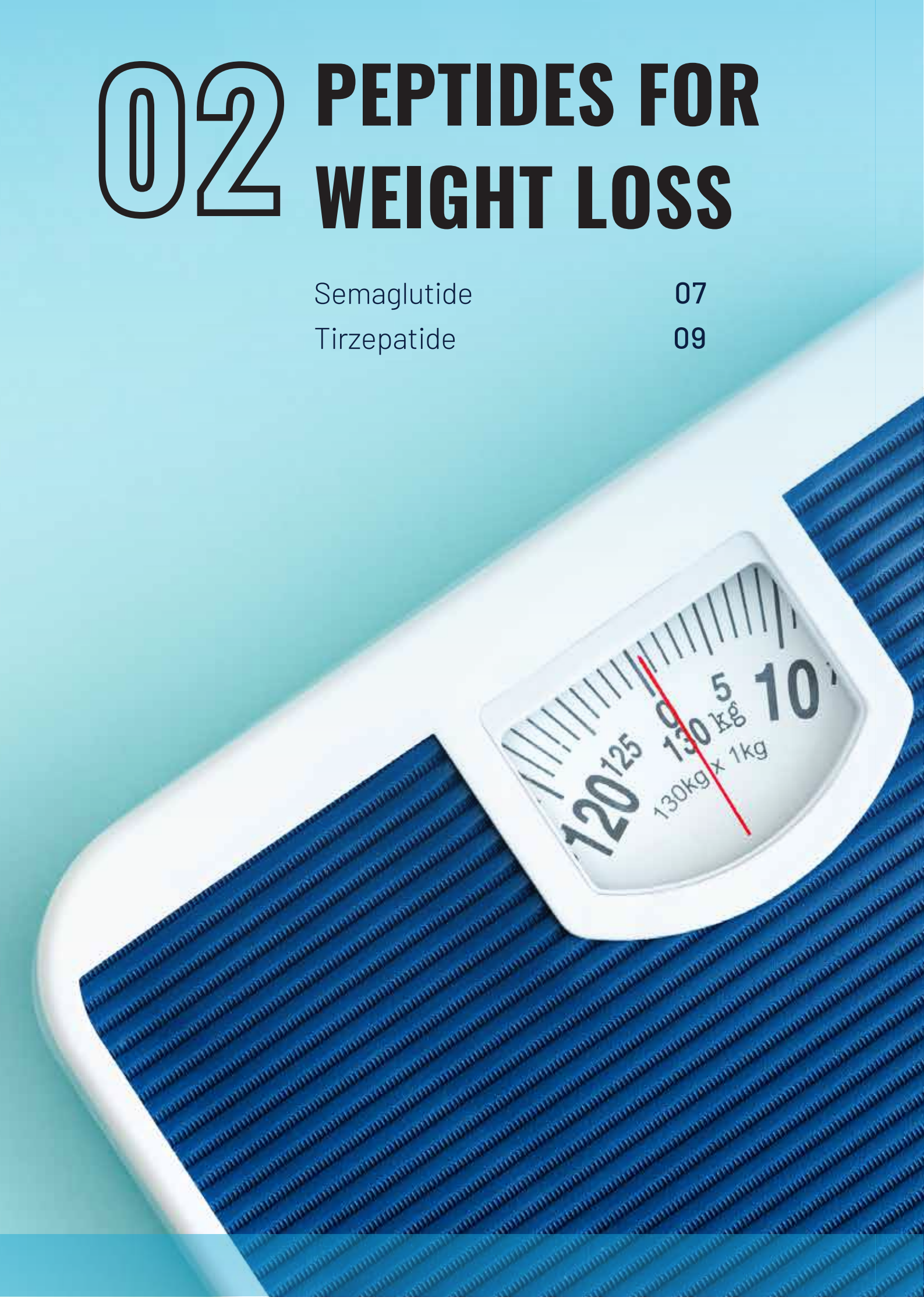
02 PEPTIDES FOR WEIGHT LOSS



SEMAGLUTIDE

Semaglutide is a recently approved GLP-1 receptor agonist. It's available in both subcutaneous and oral formulations. This peptide is used for improving glycemic control and inducing weight loss in individuals with type 2 diabetes. Extensive clinical trials have been conducted to ensure its safety profile.

BENEFITS

Semaglutide benefits include treating obesity, overweight individuals, and glycemic control in type 2 diabetics.

- **Obesity & Overweight**

Significant weight loss (14.9%-17.4%) and improved cardiometabolic factors. The quality of life is also enhanced. (Bergmann et al. 2022)

- **Glycemic Control**

Significant reductions in HbA1c levels with oral and subcutaneous Semaglutide compared to placebo. (Davies et al. 2017)

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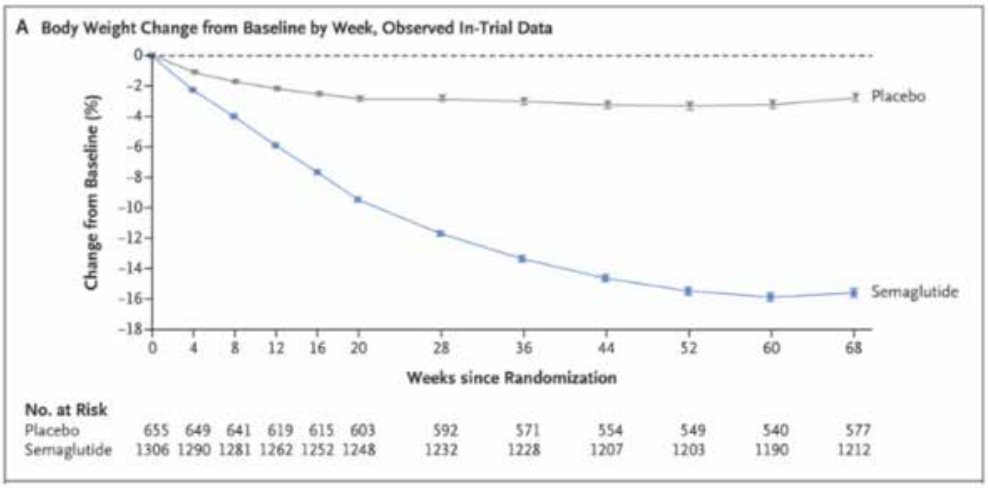
Once-Weekly Semaglutide

- Substantial and sustained weight reduction (-14.9% vs. -2.4% at week 68), improved cardiometabolic factors, increased physical functioning.

(Wilding et al. 2021)



- **Cardiovascular Outcomes**

Reduced cardiovascular death rates, nonfatal myocardial infarction, and stroke; lower nephropathy rates.

(Marso et al. 2016)

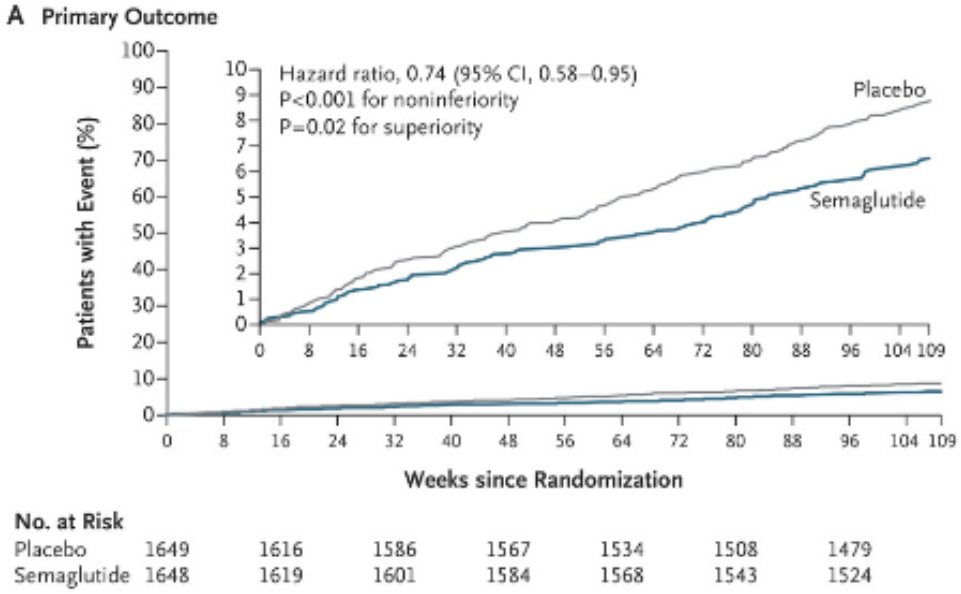


Fig: Primary cardiovascular outcome of Semaglutide vs placebo

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TIRZEPATIDE

Tirzepatide is a man-made peptide that activates two important receptors in the body: the GIP receptor and the GLP-1 receptor. It has a higher affinity for GIP receptors. Its unique structure includes a fatty di-acid component, allowing for once-weekly subcutaneous administration. This peptide is taken once a week to provide longer-lasting effects.

BENEFITS

Tirzepatide benefits include managing type 2 Diabetes and improving insulin sensitivity.

Managing Type 2 Diabetes with Tirzepatide:

- Reduced HbA1c levels
- Dose-dependent weight loss
- Outperformed other GLP-1 receptor agonists
- Comparable safety profile
- Superior glycemic control and weight reduction compared to basal insulin and once-weekly GLP-1 receptor agonists
- Consideration of gastrointestinal adverse events and need for long-term research.

(Karagiannis et al. 2022)

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Improved Beta-cell Function and Insulin Sensitivity:

- Increased HOMA2-B indices.
- Reduced proinsulin levels and proinsulin/insulin ratio.
- Lowered glucose-adjusted glucagon levels.
- Decreased HOMA2-IR indices and fasting insulin levels.
- Increased adiponectin levels.
- Elevated levels of IGFBP-1 and IGFBP-2.
- Insulin-sensitizing effects are not solely attributed to weight loss.

(Thomas et al., 2020)

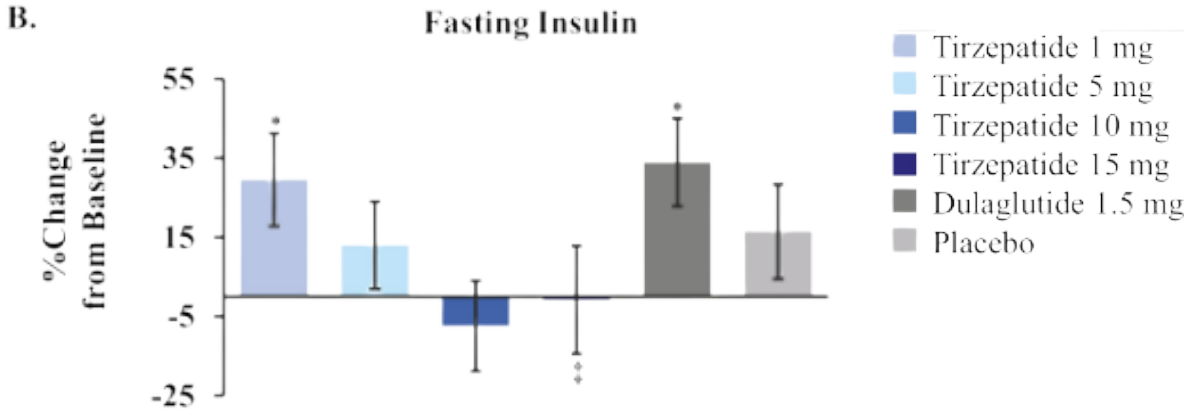

Fig: Percent change in baseline of fasting insulin with different drugs

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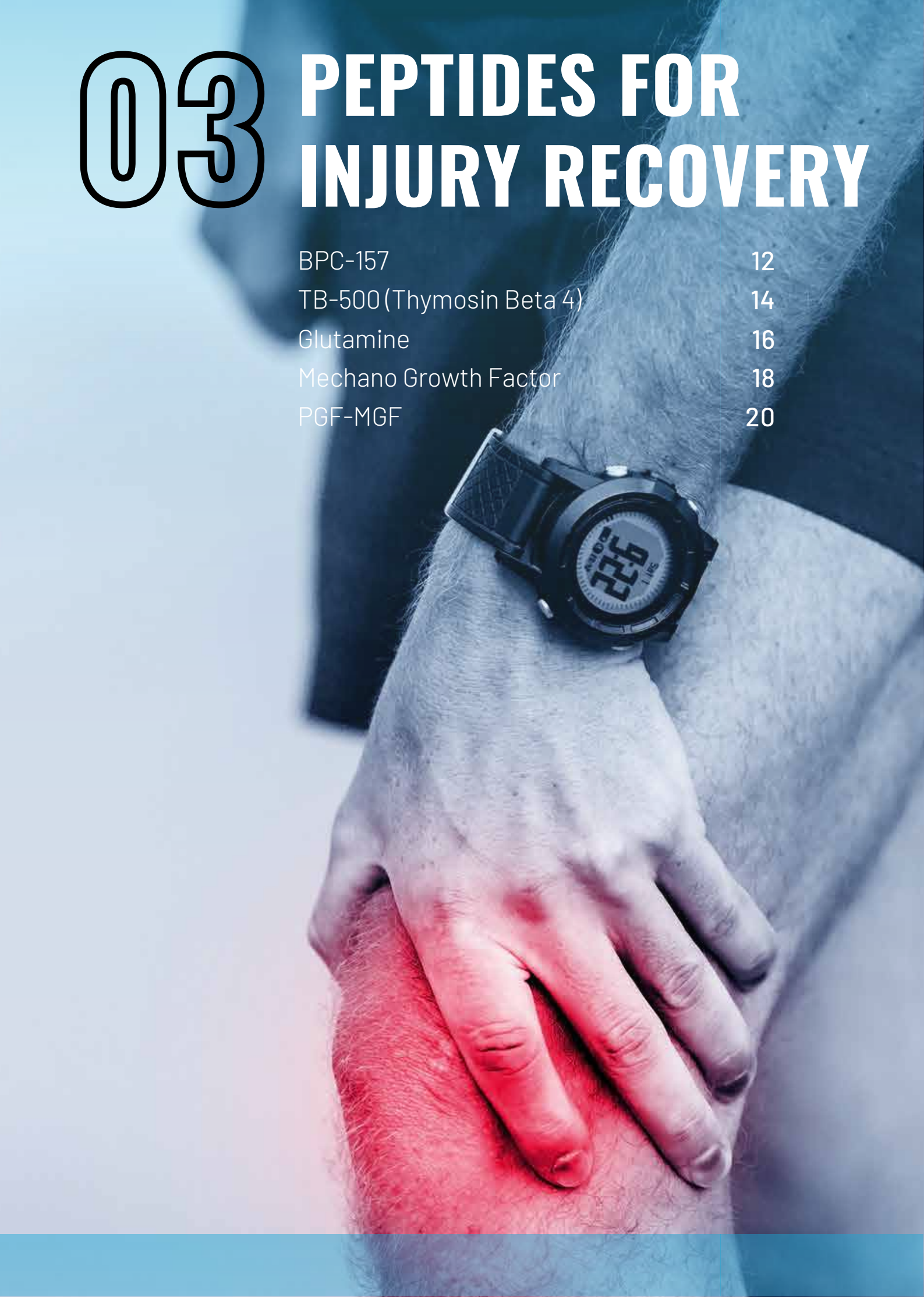
03 PEPTIDES FOR INJURY RECOVERY



BPC-157

BPC 157 is a 15-amino acid peptide found in gastric juice. It has potent organ-protective effects at low doses. It promotes healing in various organs, including the gastrointestinal tract, pancreas, liver, and heart. Surprisingly, it has no significant side effects, is water-soluble, resistant to gastric acid, and has anti-inflammatory properties.

BENEFITS

BPC 157 peptide has shown promising benefits in non-human studies like Tendon Healing, Wound Healing, Joint, Muscle, and Gut Health, and also in Digestion.

Improved Joint and Muscle Health

- Helps heal different kinds of tissue damage, like tendons, ligaments, and muscles.
- Can also be useful for injuries caused by accidents.
- May help fix soft tissues that have less blood flow and fewer cells.
- (Gwyer et al., 2019)

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Wound Healing:

- Enhances healing and reduces edema in burns.
- Made wounds heal faster in experiments with cuts in rats that had diabetes.
- Facilitates healing when administered orally or parenterally.
- Has a therapeutic influence on various wound types, offering potential advancements in wound care.

(Seiwerth et al. 2021)

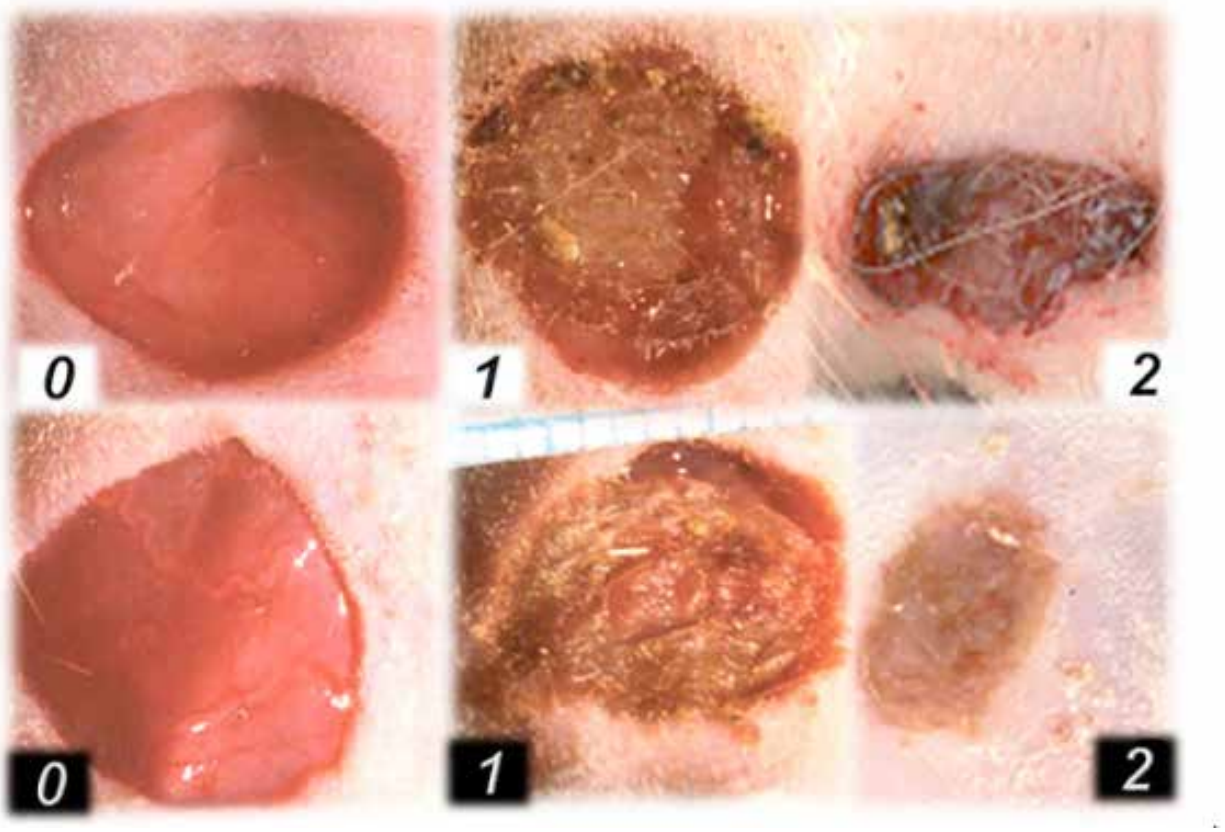

Fig: Excisional wound in diabetic rat bafore and after BPC-157

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TB 500 (THYMOSIN BETA 4)

TB 500 is a synthetic peptide derived from Thymosin Beta 4. It aids in cell migration, tissue repair, and wound healing. Its laboratory synthesis and subcutaneous administration make it valuable in regenerative medicine. With its healing properties, TB 500 has gained attention in diverse medical and research fields.

BENEFITS

TB 500 strongly shows tissue repair and recovery in many studies. Some studies also show angiogenesis after TB-500 administration. Here are the detailed benefits of TB 500

Neurological Recovery and Repair:

- Exhibits restorative effects on neurological injury.
- Promotes neurovascular remodeling, neurogenesis, and various regenerative processes.
- Modulates microRNA expression, potentially driving neurologic restoration.

(Chopp et al. 2015)

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Tissue Repair and Regeneration

- Peptide promotes the migration and survival of cardiac cells.
- Enhances vascular growth and activates a regenerative response in adult tissues.
- Has the potential to reverse aging.
- Has impressive results in helping tissues heal and recover.

(Bock-Marquette et al. 2023)

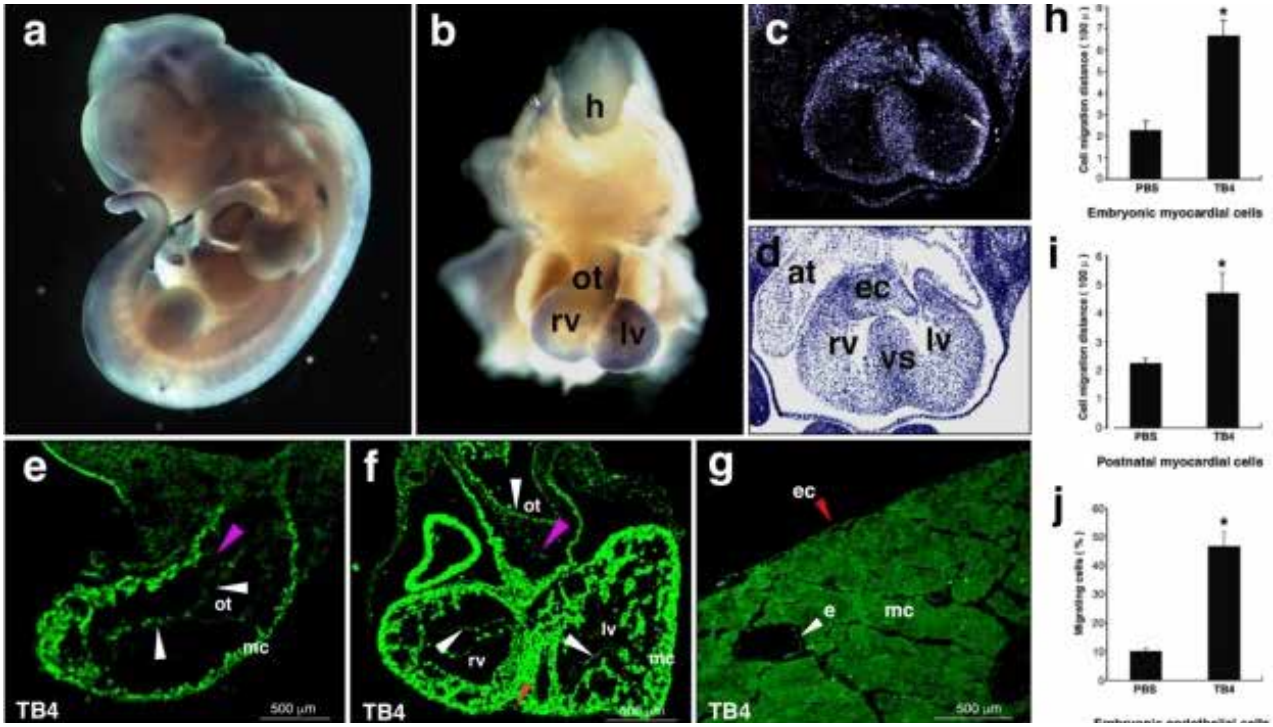

Fig: TB4 is expressed in the embryonic heart and accelerates cardiac cell migration in vitro

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GLUTAMINE

Glutamine is an amino acid considered essential for patients with catabolic disease. During critical illness and major surgery, glutamine levels decrease. Leading to increased infection risk, longer recovery time, and higher mortality rates. It aims to determine its effectiveness as a treatment option in medical settings.

BENEFITS

Glutamine is crucial for immune cell proliferation and function. It influences purine synthesis, cell volume, and signaling. Caution is needed for liver diseases.

Glutamine for Cancer Patients

- 7.5g oral glutamine for 3 weeks reduced oral mucositis in breast cancer patients.
- 30g oral glutamine reduced peripheral neuropathy in colorectal cancer patients.
- Increases liver enzymes in total parenteral nutrition.
- High total energy intake could have affected hepatic metabolism.

(Roth et al. 2008)

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Nucleotides syntheses from glutamine

- Essential for nucleotide biosynthesis in rapidly dividing cells.
- Utilized in de novo nucleotide synthesis.
- Involved in purine and pyrimidine biosynthesis pathways.
- Aspartate derived from glutamine transamination supports nucleotide synthesis.
- Crucial for cancer cell proliferation and nucleotide biosynthesis.

(Yoo et al., 2020)

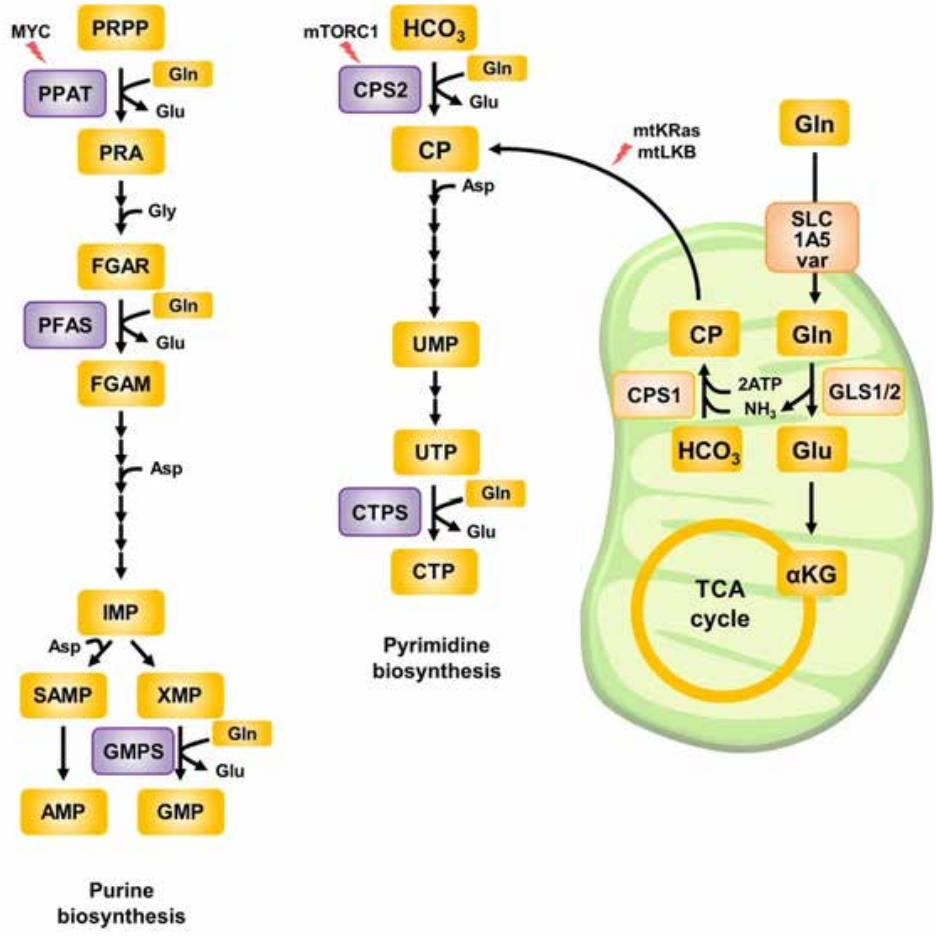

Fig: Glutamine metabolic pathways.

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PEG- MGF

PEG-MGF (Pegylated Mechano Growth Factor) is a synthetic peptide that is a modified version of Mechano Growth Factor (MGF). PEGylation involves the attachment of polyethylene glycol (PEG) molecules to the peptide. It enhances its pharmacokinetic properties and extends its duration of action.

BENEFITS

MGF is under investigation for its potential benefits in cellular health. Studies suggest MGF's role in satellite cell activation, tissue repair, and neuroprotection. The existence of endogenous MGF and its precise functions remain uncertain, which requires further research.

MGF as a Neuroprotective Agent

- Shows neuroprotective effects in rat facial muscles and SOD1G93A mice models.
- Protect neurons against neurotoxins and promote survival.
- Creates resistance to ischemic brain injury.

(Matheny et l. 2010)

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MGF functions in Chondrocytes and Cartilage Defect

- Increases MSC mobility but doesn't enhance proliferation in vitro.
- Alleviates chondrocyte apoptosis and inflammation.
- Promotes chondrocyte migration and proliferation.

(Liu et al., 2023)

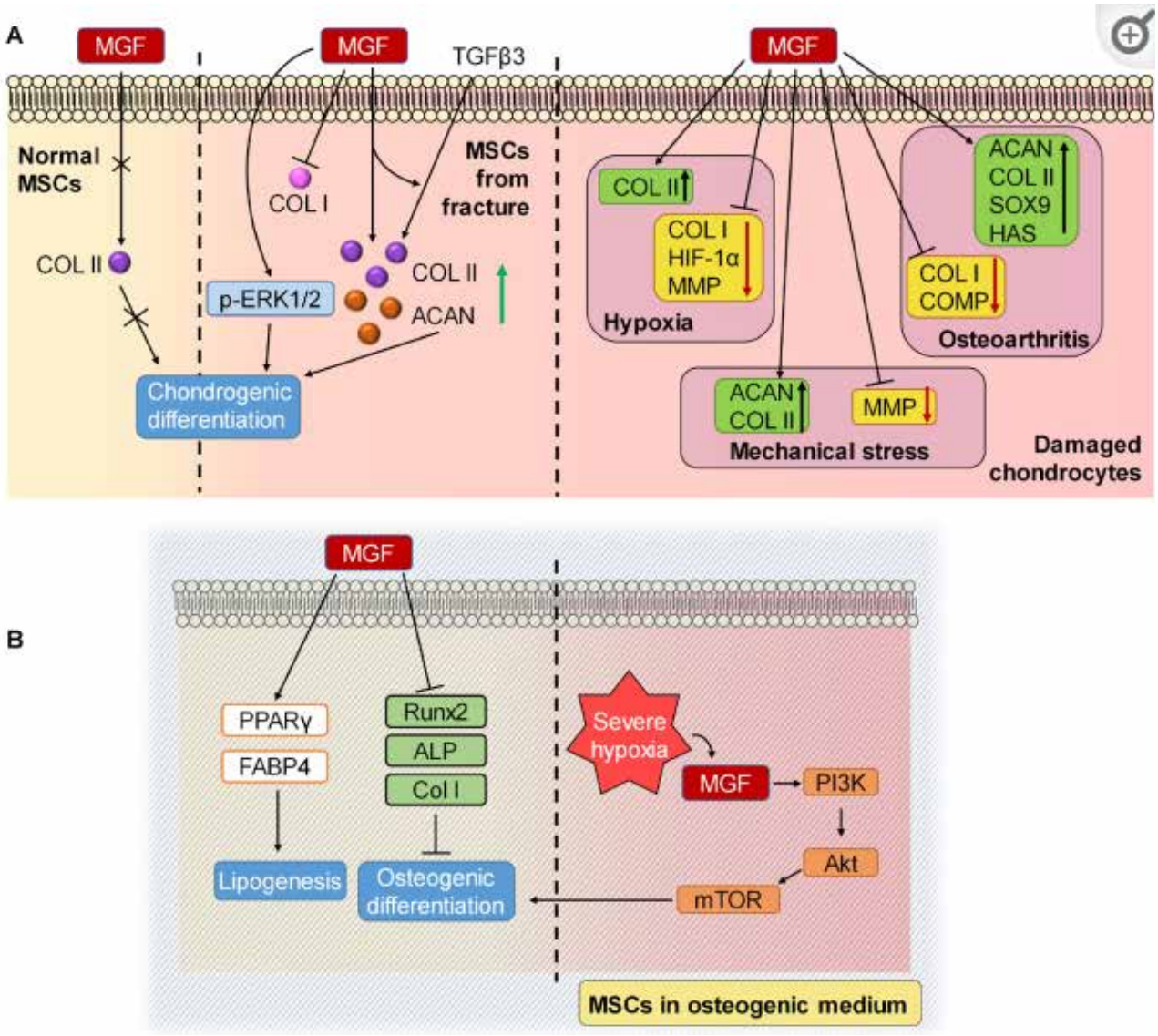

Fig: The mechanism of MGF in cell differentiation

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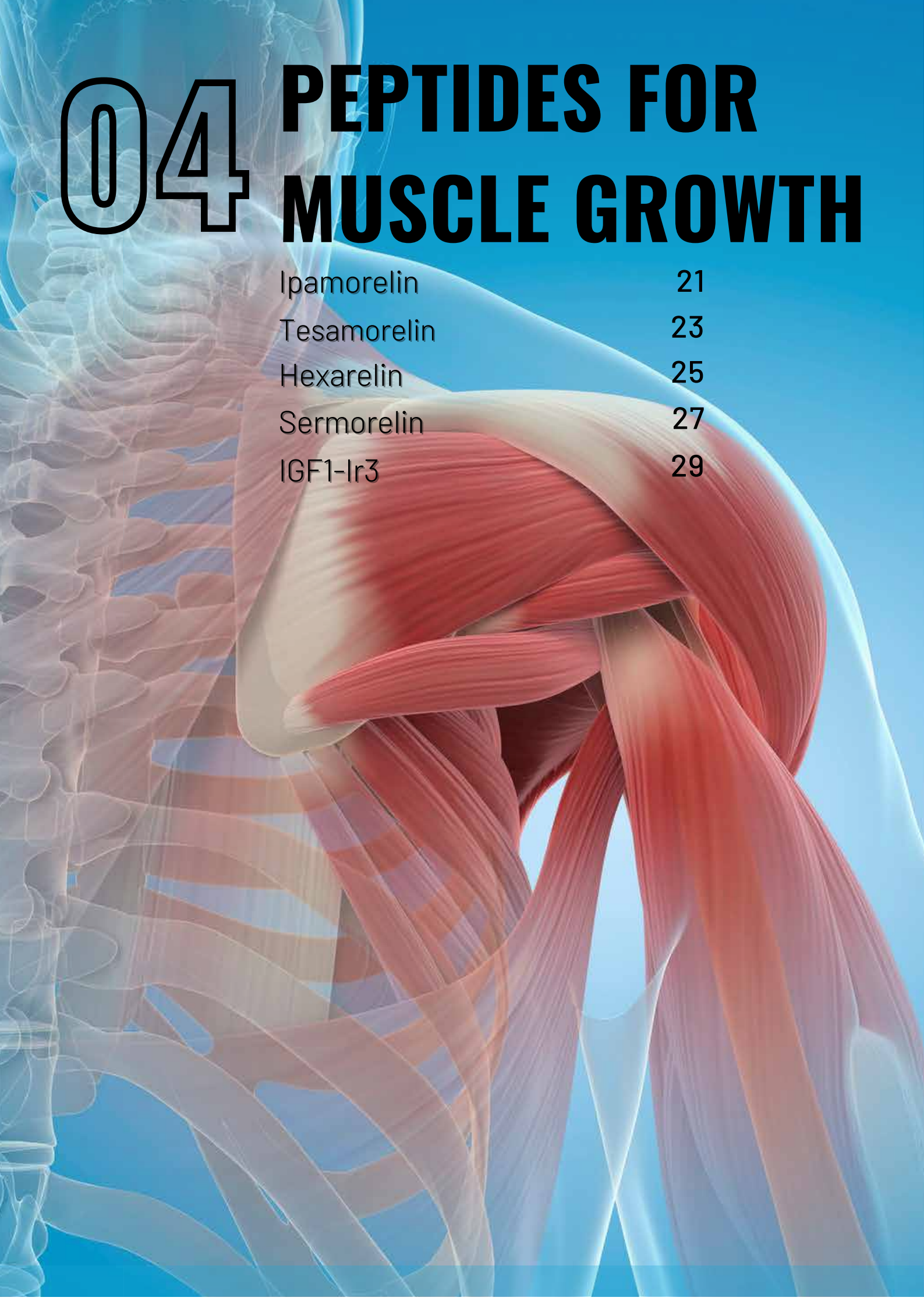
04 PEPTIDES FOR MUSCLE GROWTH



IPAMORELIN

Ipamorelin is a pentapeptide derived from GHRP-1 selectively stimulates growth hormone (GH). It increases plasma GH levels without affecting other hormones. Administered via IV, SC, and IN routes, Ipamorelin stands out for its specific GH-release properties.

BENEFITS

Ipamorelin has potential benefits in various medical fields. Studies showed its ability to enhance bone mineral content. Also, it stimulates longitudinal bone growth in rats and manages postoperative ileus effectively.

Ipamorelin for Postoperative Ileus Management

The results of a study showed that:

- 87.5% of patients receiving Ipamorelin experienced treatment-emergent adverse events. While 94.8% of the placebo group patients experienced such events.
- The Ipamorelin group tolerated the first meal faster (25.3 hours) than the placebo (32.6 hours).

(Beck et al. 2014)

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Ipamorelin to Increase Bone Mineral Content in Rats

- Enhances bone mineral content (BMC) without altering volumetric bone mineral density (BMD).
- Shows significant increase in cortical BMC driven by cross-sectional bone area rises.
- Promotes bone growth without affecting volumetric BMD. (Svenssen et al. 2000)

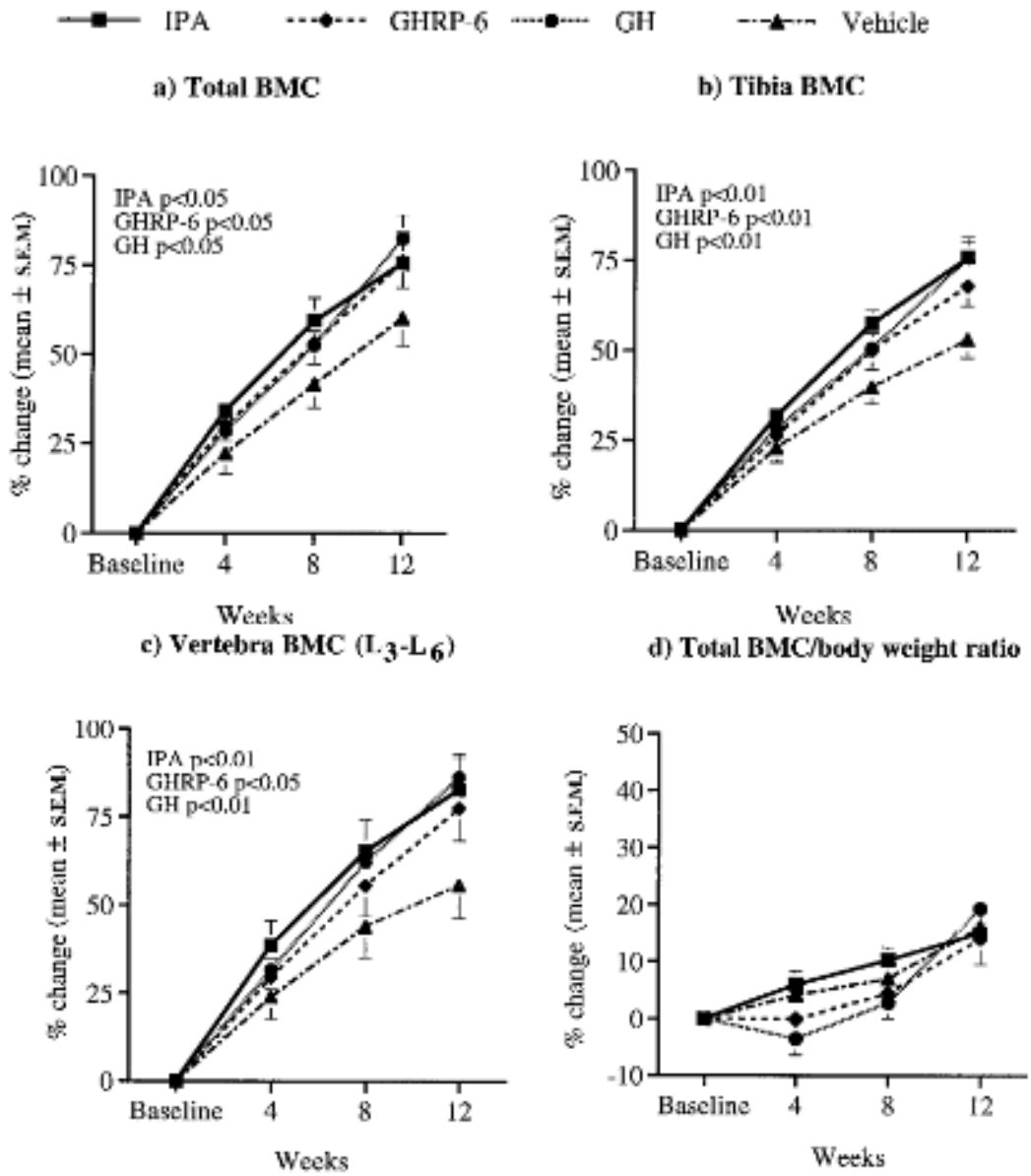

Fig: Percentage change in BMC during 12 weeks of treatment of female Sprague–Dawley rats with IPA, GHRP-6, GH or vehicle.

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TESAMORELIN

Tesamorelin is a synthetic version of the human growth hormone-releasing hormone. It stimulates the production and release of endogenous growth hormones. It is the only approved treatment for reducing excess abdominal fat in patients with HIV-associated lipodystrophy.

BENEFITS

Tesamorelin reduces excess abdominal fat in HIV-associated lipodystrophy patients. Pooled analysis shows a 15.4% VAT reduction over 26 weeks. It improves lipid profiles and body image distress. The overall safety profile is favorable.

Tesamorelin in the Management of HIV- Lipodystrophy

- Effectively reduces visceral adipose tissue (VAT) without a major impact on subcutaneous adipose tissue.
- Long-term therapy maintains VAT reduction and improves body composition measures.
- Shows promise in improving self-image and reducing visceral adiposity in HIV patients.

(Dhillon et al. 2012)

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Visceral Fat Reduction with Tesamorelin

- Reduces VAT in HIV patients with elevated liver enzymes.
- Decreases ALT by 18% and AST by 10% over 26 weeks in VAT responders.
- Improve hepatic steatosis and inflammation.
- Shows potential clinical benefits for HIV-infected patients with concomitant HCV and abdominal adiposity.

(Fourman et al. 2017)

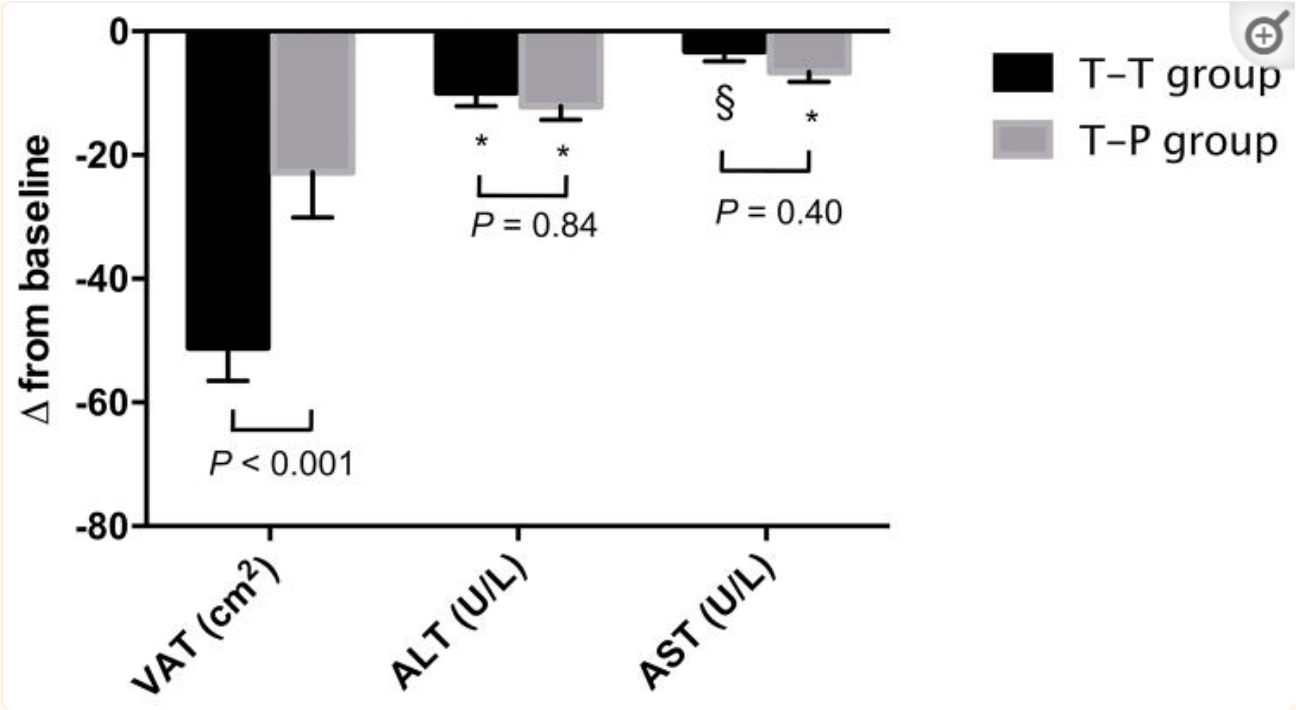

Fig: Changes among initial tesamorelin VAT responders

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HEXARELIN

Hexarelin is a synthetic hexapeptide, a type of growth hormone secretagogue (GHS). It is a nonnatural GHS and is known for its strong GH-releasing activity. Hexarelin binds to and activates the growth hormone secretagogue receptor (GHS-R) in the pituitary and hypothalamus, promoting the release of GH.

COMPARISON B/W GRELIN & HEXARELIN

Here's a study that compares the natural Grelin from Hexarelin: (Arvat et al. 2001)

Aspect	Hexarelin	Ghrelin
GH-Releasing Activity	Releases GH but less potent than ghrelin	Strongly stimulates GH secretion, releasing more GH than Hexarelin and GHRH
Specificity for GH	Specific for GH secretion	Stimulates GH, lactotroph, and corticotroph secretion; induces increase in cortisol and aldosterone levels
Interaction with GHRH	No interaction	Synergistic effect with GHRH on GH secretion
Specific Ligand	Nonnatural GHS	Natural GHS-R ligand
Lactotroph and Corticotroph Stimulation	Little to no effect	Stimulates lactotroph and corticotroph secretion

Fig: Comparison b/w Grelin & Hexarelin

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CARDIOPROTECTIVE EFFECTS OF HEXARELIN

Another study checked the cardioprotective effects of Hexarelin in rats. (Locatelli et al. 1999)

Here are the results of that study:

- Protects the hearts of hypophysectomized rats from ischemia-reperfusion damage.
- Prevents a marked aggravation of ischemic damage during the ischemic phase.

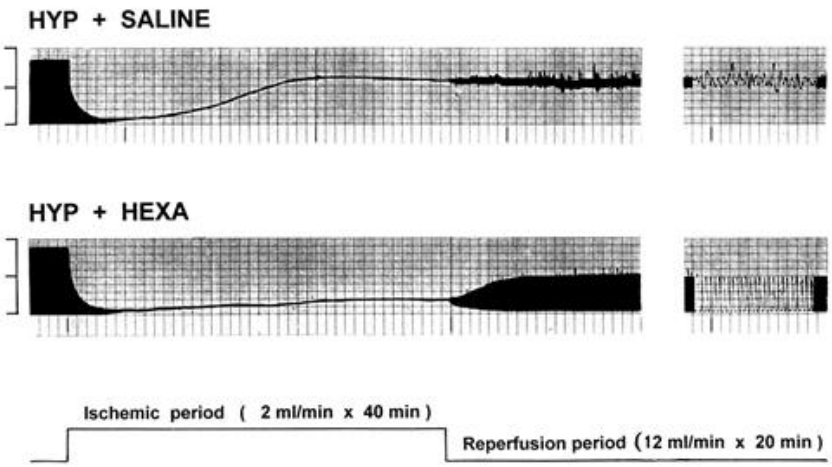

Fig: Representative ischemia-reperfusion tracings

- Maintains cardiac contractility during reperfusion.
- Significantly reduces the amount of creatine kinase (CK) released during reperfusion.
- Preserves the basal formation of cardiac prostacyclin (PGI2) and prevents its fall during early reperfusion.

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SERMORELIN

Sermorelin is a synthetic peptide derived from GHRH. It regulates growth through the GHRH receptor, stimulating growth hormone secretion. It is versatile in the nervous, immune, and endocrine systems, promoting cell proliferation and inhibiting tumor growth. Sermorelin serves as a potent tool in research and therapeutics.

BENEFITS

It shows potential in treating glioma and children with Growth Hormone Deficiency

Treating Growth Hormone Deficiency:

- Stimulates growth hormone secretion in children with GHD.
- Provides rapid and accurate results as a diagnostic tool.
- Enhances specificity if combined with arginine.
- Shows promising results in prepubertal children.

(Prakash et al. 2012)

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Sermorelin in the Treatment of Glioma:

- Shows promise for glioma patients, especially those with more malignant tumors.
- Easily penetrates the blood-brain barrier.
- Bolsters immune function and inhibits tumor cell proliferation.

(Chang et al. 2021)

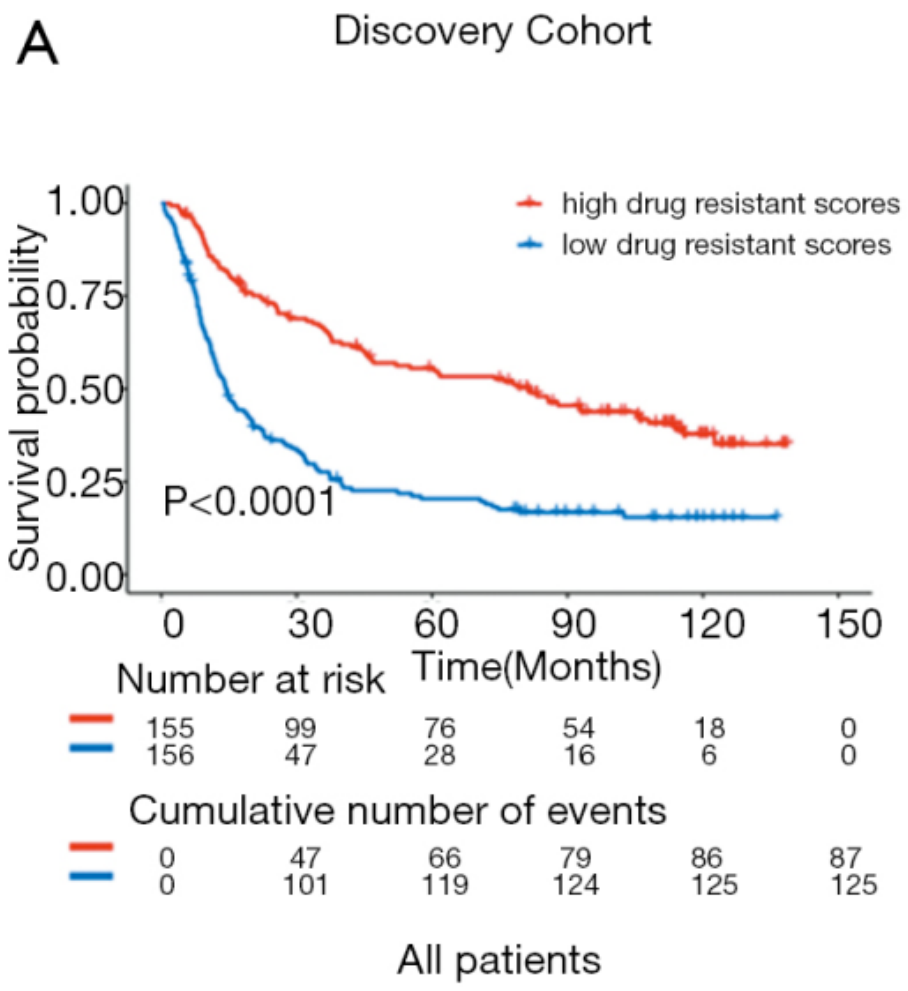

Fig: Patients with poor prognoses are more sensitive to sermorelin.

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IGF1-LR3

IGF-1 LR3 is also known as Insulin-like Growth Factor 1 Long R3. It is a synthetic analog of insulin-like growth factor 1 (IGF-1).

IGF1-LR3 is a modified version of IGF-1 with an extended half-life and increased potency. The "LR3" in its name refers to the addition of a unique 13-amino acid extension peptide at the N-terminus of the IGF-1 molecule.

BENEFITS

IGF-1 LR3 is commonly used in scientific research and bodybuilding communities. Its enhanced biological activity compared to natural IGF-1 is believed to have a more prolonged action in the body.

Some potential applications of IGF-1 LR3 include:

- Promoting muscle growth
- Enhancing recovery
- Stimulating overall cellular growth and repair processes.

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IGF1-LR3 IN FETAL CARDIOMYOCYTE DEVELOPMENT

Here are the results of a study that shows the effect of IGF1-LR3 in fetal Cardiomyocyte development.

- Stimulation of fetal cardiac growth matched coronary growth to myocardial growth.
- May be a potential therapeutic intervention to increase healthy fetal cardiomyocyte endowment.
- Treated fetuses autoregulated at a higher resting blood flow, utilizing more of their coronary reserve due to hypoxia.

(Jonker et al., 2019)

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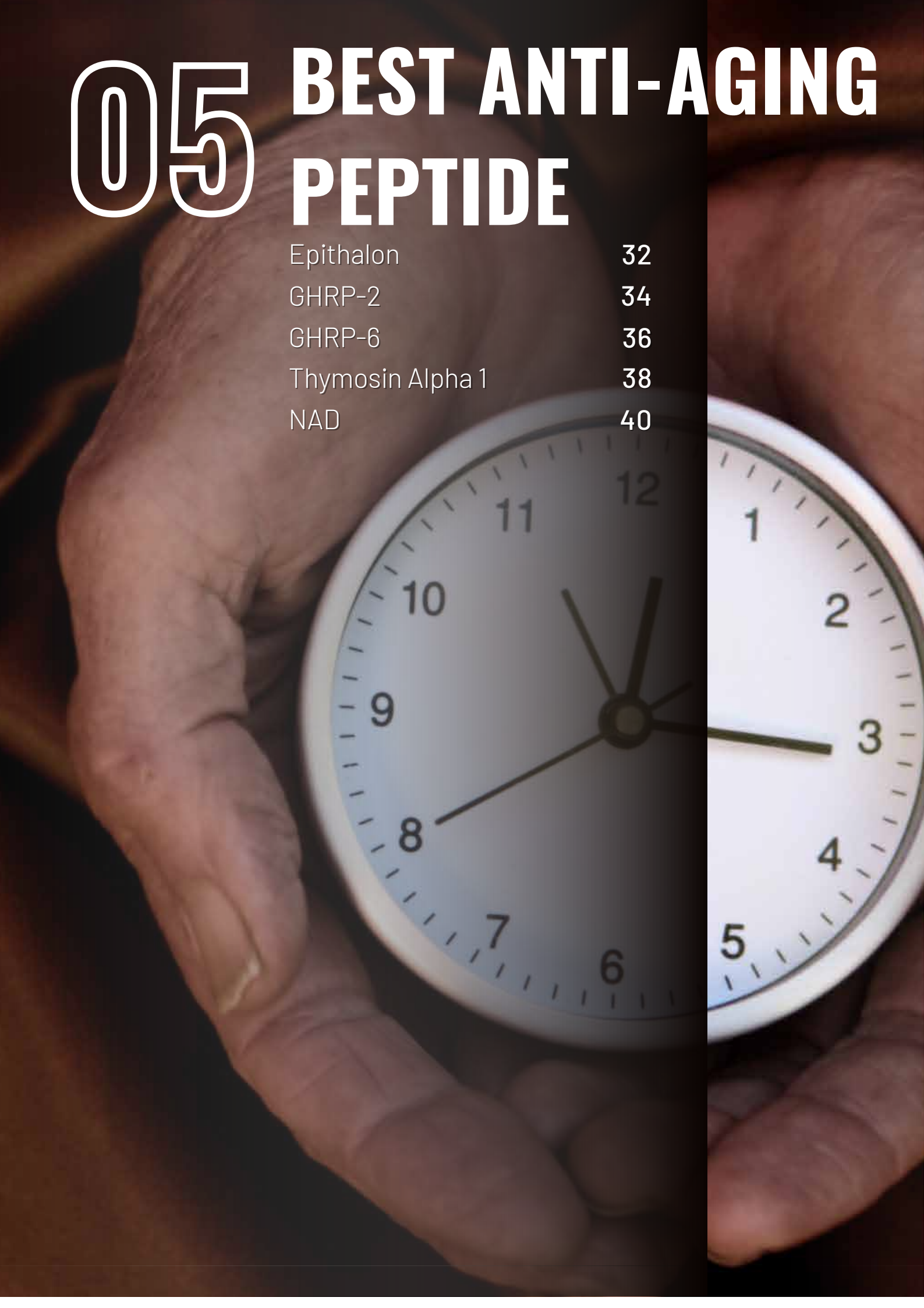
05 BEST ANTI-AGING PEPTIDE



EPITHALON

Epithalon is a synthetic peptide composed of four amino acids (alanine, glutamic acid, aspartic acid, and glycine). It is also known as Epitalon or Epithalone.
Epithalon was first isolated from the pineal gland of calves. But the synthetic version is commonly used for research purposes.

BENEFITS

Epithalon is believed to have potential anti-aging effects and has been studied for its impact on telomerase activity. Telomerase is an enzyme involved in protecting and extending the telomeres at the ends of chromosomes. They play a crucial role in maintaining cellular integrity and replication. The shortening of telomeres over time is associated with aging and age-related diseases.
Some potential effects and benefits of Epithalon include;

- Telomere elongation.
- Antioxidant properties.
- Immune system modulation.
- DNA repair stimulation.
- Improved sleep quality.
- Increased lifespan.

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A STUDY ON MICE

Epithalon was administered to female transgenic mice with the breast cancer gene HER-2/neu. It was given at a dose of 1 mg subcutaneously 5 times a week from the 2nd month of life to death.

So Epithalon:

- Prolonges the average and maximum lifetimes of mice by 13.5% ($p<0.05$) and 13.9%, respectively.
- Increases the average lifetime of mice without neoplasms by 34.2% ($p<0.05$).
- Decelerates the development of age-related disturbances in reproductive activity.
- Suppresses the formation of neoplasms.
- Increases the number of mice without breast tumors by 3.7 times ($p<0.05$).
- Reduces the number of animals with 6 or more breast tumors by 3 times ($p<0.05$).
- Prolonges the lifetime of mice with breast tumors by 1.4 times ($p<0.05$).

(Anisimov et al. 2002)

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GHRP-2

GHRP-2 is a synthetic compound that acts as an agonist of ghrelin. It is a recently discovered gut peptide that binds to this growth hormone secretagogue receptor.
GHRP-2 has shown promising results in animal studies, influencing food intake. And it is also expected to have anti-aging properties.

EFFECTS OF GHRP-2 IN CRITICAL ILLNESS

The results of a study performed on different critically ill patients shows that GHRP-2:

- Increases pulsatile and basal GH secretion during critical illness.
- Stimulates endogenous GH release, leading to a significant rise in serum IGF-I levels.
- May be as effective as exogenous GH in reversing the catabolic state in critical illness.
- Maintains peripheral responsiveness to endogenous GH during prolonged critical illness.

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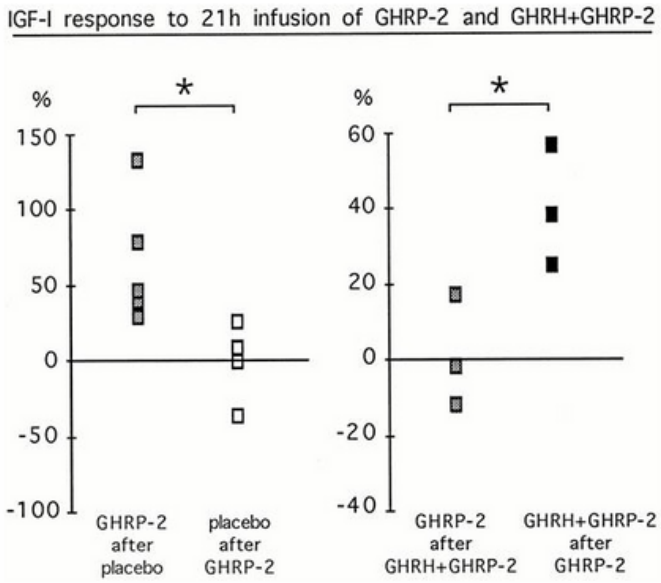
- Shows potential as an antagonist of the catabolic state in critical care medicine.

(Berghe et al. 1997)



ANTI-INFLAMMATORY EFFECT OF GHRP-2

A study showed that GHRP-2:

- Reduces external signs of inflammation in arthritic rats.
- Decreases serum levels of IL-6.
- Prevents LPS-induced IL-6 release from peritoneal macrophages in vitro.
- Shows potential as a therapeutic agent for inflammatory conditions, such as arthritis.

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GHRP-6

GHRP-6 is a specific type of Growth Hormone-Releasing Peptide (GHRP). It is a synthetic peptide compound made up of six amino acids.

This peptide has been studied for its potential therapeutic uses in the fields of growth promotion, muscle building, anti-aging, and improving overall health.

Here are two of these studies;

CARDIOTROPIC EVIDENCE

A study showed the amazing cardiotropic benefits of GHRP-6. It revealed that GHRP-6:

- Limits myocardial ischemia/reperfusion injury and counters multiple injurious operators.
- Improves left ventricular function post-ischemia.
- Attenuates cardiac fibrosis and reduces collagen accumulation.
- Controls cardiac action potential and reduces apoptosis of cardiomyocytes.
- Prevents sudden death in canine dilated cardiomyopathy with acute myocardial infarction. (Acosta et al. 2016)

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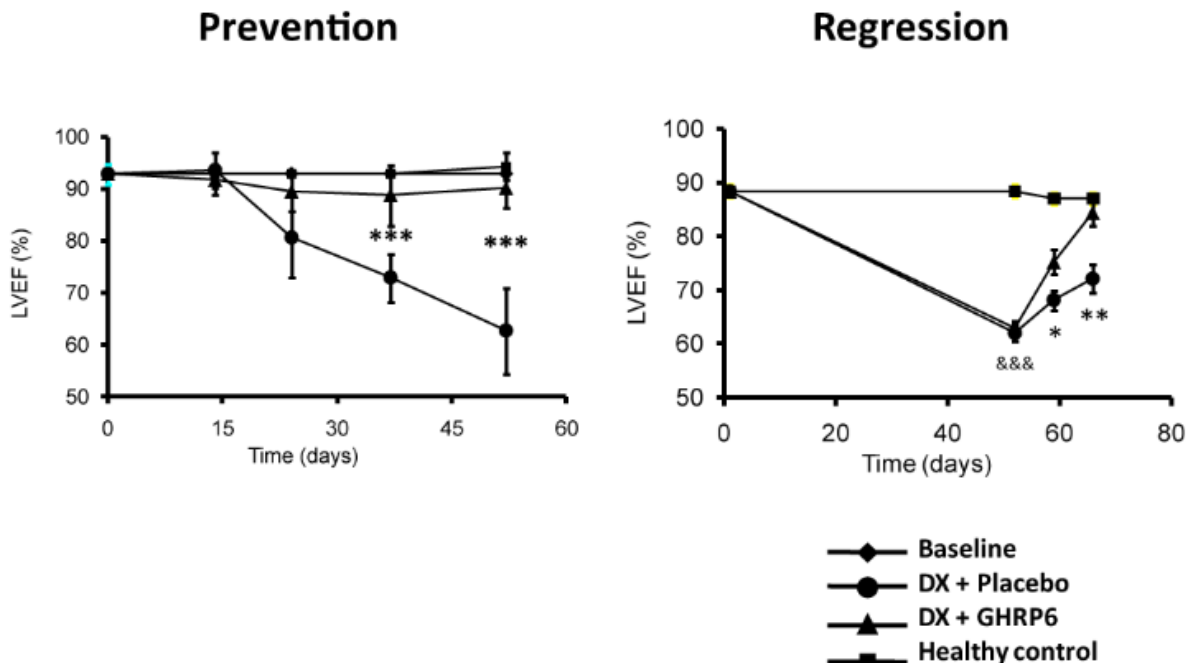

Fig: Effect of GHRP-6 on the left ventricle ejection fraction

HEALING OF WOUNDS

GHRP-6:

- Reduces inflammation and fibrosis in rats.
- Prevents hypertrophic scars in rabbits.
- Upregulates PPARG, counteracting fibrosis.
- Reduces TGFB1 and CTGF expression, mediating antifibrotic effects.
- May reduce fibroblast and myofibroblast activity.

(Mari et al. 2016)

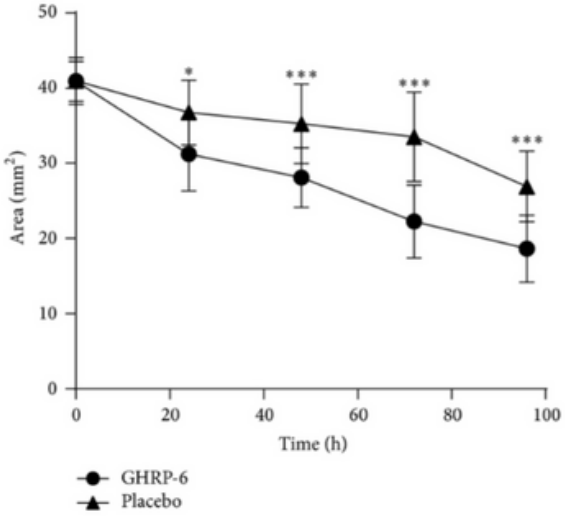

Fig: GHRP-6 accelerated wound closure.

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THYMOSIN ALPHA 1

Thymosin alpha 1 is a 28 amino acid peptide derived from the thymus. This peptide is short, positively charged, and has unregulated characteristics. Its nuclear magnetic resonance structure reveals a distorted helical configuration with stable regions.

HEALTH BENEFITS

- Functions as TLR-9 and TLR-2 agonists, stimulating an adaptive immune response.
- Increases IL-2, IL-10, IL-12, IFN-α, and IFN-γ levels.
- Reduces IL-1β, tumor necrosis factor-α, and inflammation.
- Restrains lung and liver tumor growth and metastases.

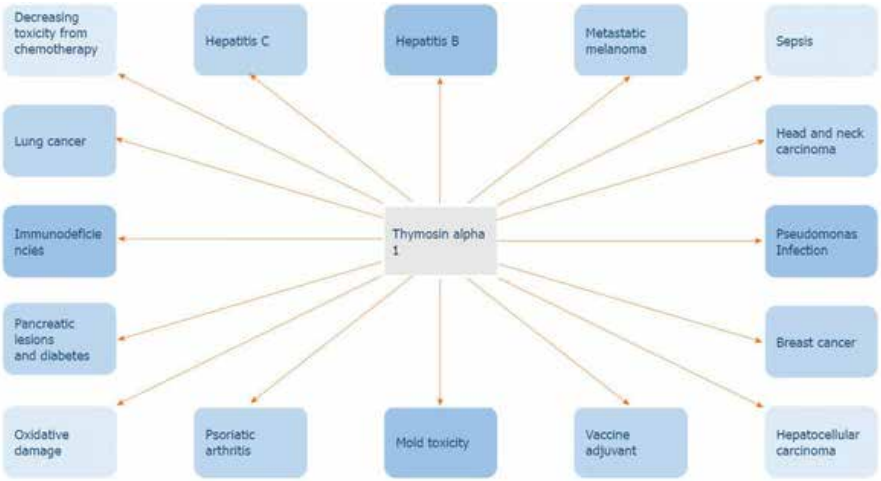

Fig: Thymosin alpha 1 has a wide range of biological activities.

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POSSIBLE APPLICATIONS

- **Psoriatic arthritis**: Regulates immunity, tolerance, and inflammation.
- **Influenza vaccine**: Acts as an adjuvant, improves response.
- **Chemotherapy**: Reduces toxicity, enhances immune function, and improves the quality of life.
- **Oxidative damage, pancreatic lesions, diabetes**: Provides protection and benefits treatment.
- **Oncologic patients** (melanoma, lung, breast, hepatocellular carcinoma): Shows promising results.
- **Chemotherapy-induced immune depression and insufficiency**: Acts as an adjuvant.
- **Non-small cell lung cancer**: Enhances survival rate with chemotherapy or radiation.
- (Dominari et al. 2020)

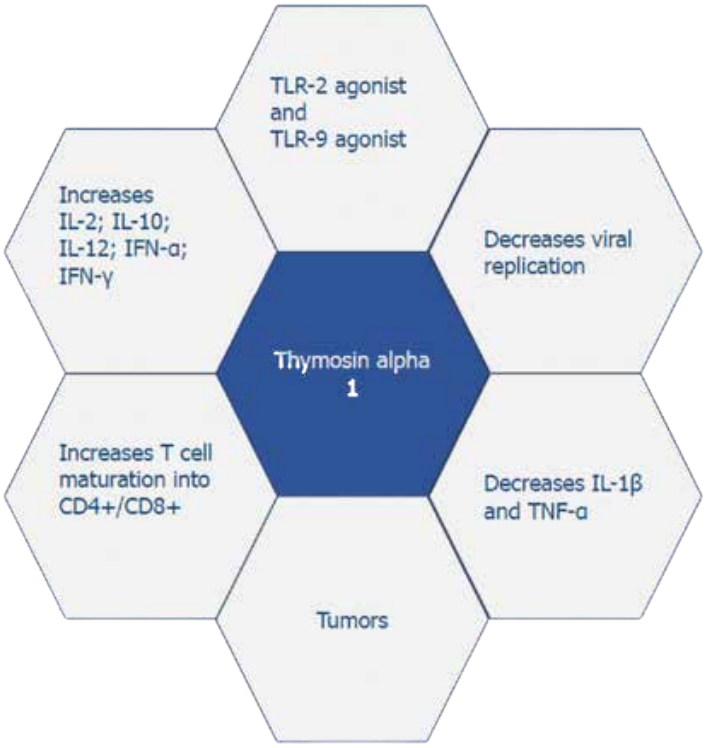

Fig: Clinical applications of thymosin alpha 1

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NAD

NAD, or nicotinamide adenine dinucleotide, is a crucial metabolic regulator in cells. It declines with age, affecting cellular function and aging processes.

So supplementing with NAD precursors shows promise in enhancing health and immune function. Clinical trials have also investigated NAD upregulation for aging-related conditions and immune decline.

SYNTHESIS PATHWAY OF NAD

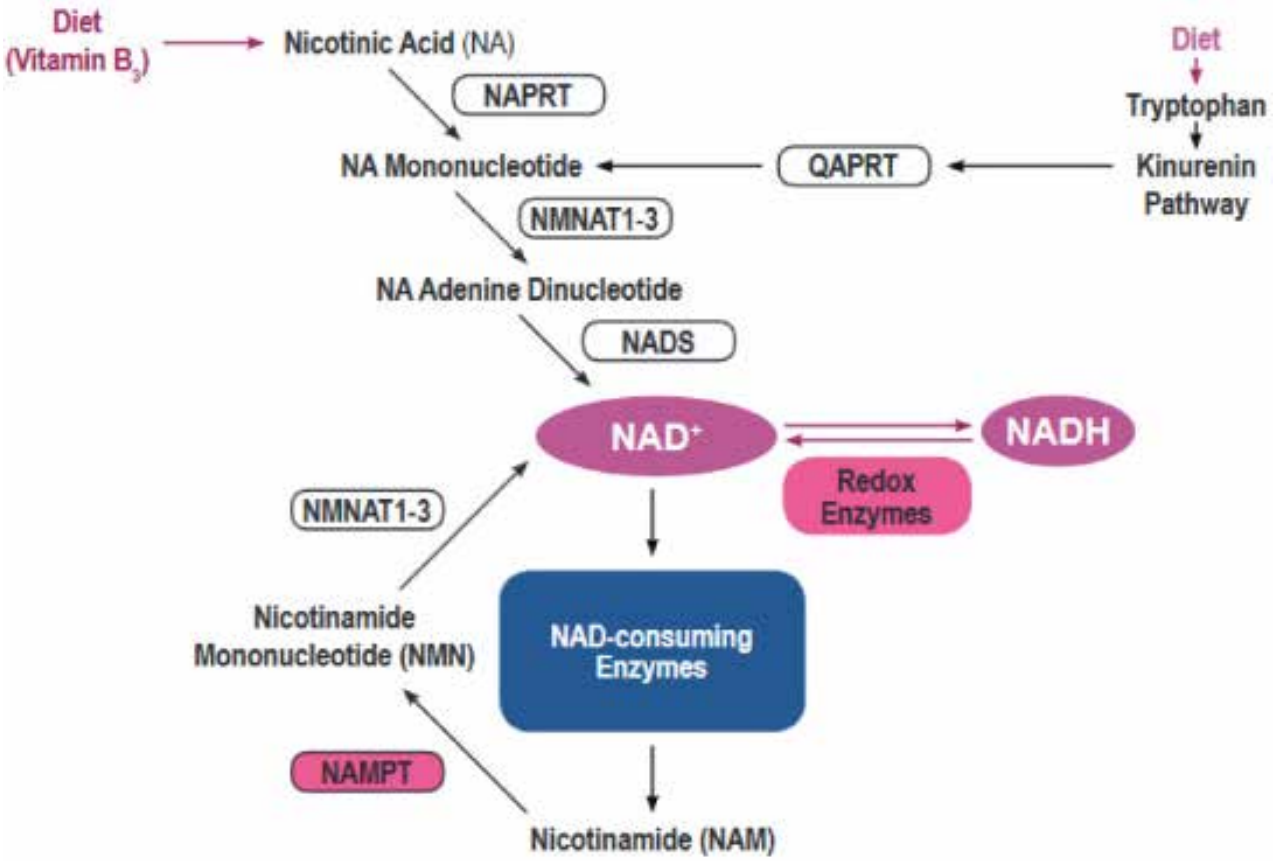

Fig: Regulation of the nicotinamide adenine dinucleotide (NAD) metabolism.

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ANTI-AGING BENEFITS

NAD upregulation has shown potential benefits in various age-related conditions. It:

- May improve neurological conditions like Parkinson's disease and Alzheimer's disease.
- Can prevent actinic keratosis and improve photoaging in the skin.
- Has potential benefits for metabolic conditions like obesity and metabolic syndrome.
- Generally considered safe with no severe side effects reported, but long-term effects need further study.

(Radenkovic et al. 2020)

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06 POSSIBLE SIDE EFFECTS

POSSIBLE SIDE EFFECTS

Peptides offer numerous potential benefits and have gained popularity for their various therapeutic applications.
However, like any other compound, peptides may come with potential side effects that users should be aware of. It is essential to understand the possible adverse reactions to make informed decisions when incorporating peptides into your health and wellness routine. Let's see the potential side effects associated with peptide usage.

- ## GASTROINTESTINAL DISCOMFORT:

Some individuals may experience gastrointestinal discomfort, such as nausea, bloating, or indigestion, when using certain peptides. This effect is often temporary and may vary depending on the specific peptide and individual tolerance.

- ## ALLERGIC REACTIONS:

As with any substance, allergic reactions to peptides are possible. Symptoms may include skin rashes, itching, swelling, or difficulty breathing. If you experience any signs of an allergic reaction, discontinue use immediately, and seek medical attention.

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- **INJECTION SITE REACTIONS:**

Peptides that are administered through injections may cause localized reactions at the injection site, such as redness, swelling, or mild pain. Ensuring proper injection techniques and site rotation can help minimize these effects.

- **WATER RETENTION:**

Some peptides may lead to water retention in the body, resulting in temporary weight gain or swelling. Monitoring fluid intake and adjusting peptide dosages under medical supervision can help manage this issue.

- **INSULIN SENSITIVITY:**

Certain peptides, particularly those related to growth hormones, may affect insulin sensitivity. Individuals with pre-existing insulin-related conditions, such as diabetes, should exercise caution and consult healthcare professionals before using such peptides.

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- **INTERACTIONS WITH MEDICATIONS:**

Individuals taking prescription medications should be cautious when using peptides, as there might be interactions that could affect the efficacy of both substances. Consulting a healthcare professional is crucial to assess potential drug interactions.

- **LIVER AND KIDNEY FUNCTION:**

In rare cases, peptides may impact liver and kidney function, especially with prolonged or excessive use. Regular monitoring of liver and kidney health is advised for individuals using peptides over extended periods.

- **HORMONAL IMBALANCES:**

Peptides that influence hormonal pathways, like growth hormone-related peptides, have the potential to cause hormonal imbalances if not used responsibly. Regular monitoring and medical supervision are essential when using these peptides.

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07 REFERENCES

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