Peptides 102

Presented by John Tribble MD

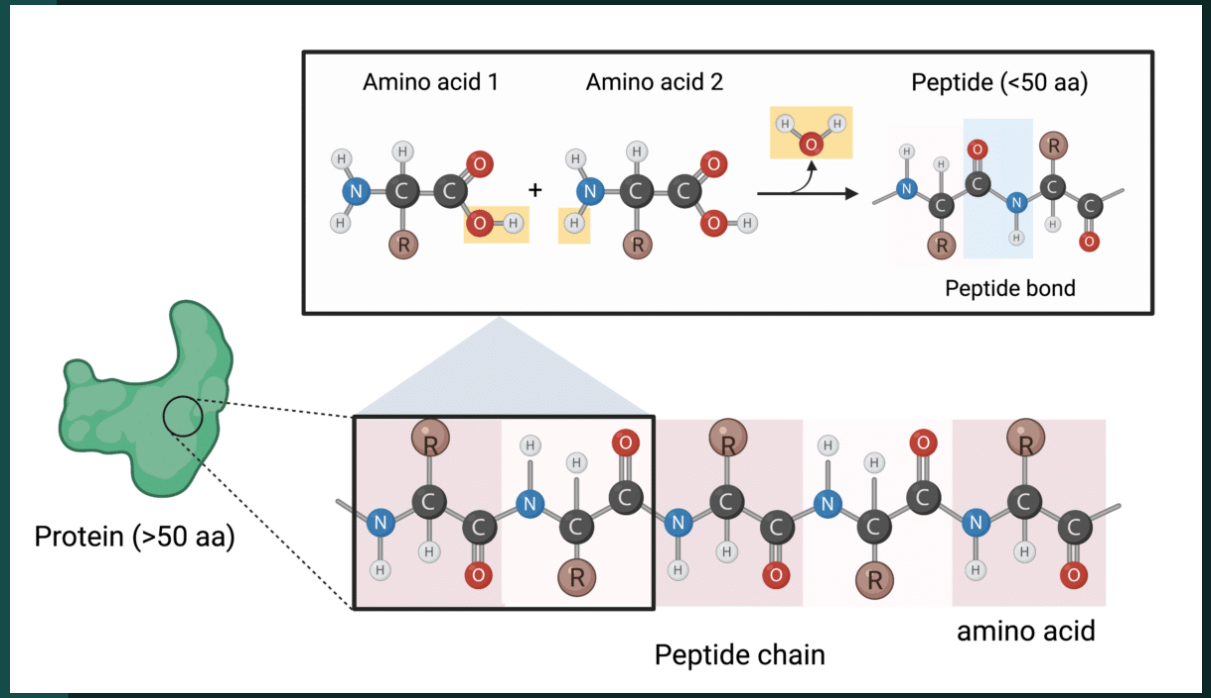
April 1, 2026

Agenda:

- What peptides are and their structure
- Biological functions
- How peptides are made, (natural and synthetic)
- Historical timeline
- Safety and efficacy overview
- List of top popular therapeutic peptides, (mechanism, benefits and efficacy)
- Conclusions and key take aways
- Question and Answer session

What are peptides??

- Short chains of amino acids 2-50 long
- Differentiated from proteins (>50-100aa)
- Building blocks of life.
- Naturally occurring in all organisms.
- Highly specific based on structure



What do Peptides do?

1

Act as hormones, growth factors, immune modulators, and cell signaling molecules

2

Core principle: Peptides work by amplifying the body's own repair, metabolic, and regulatory pathways..

3

Act as cellular communicators between all the cells in your body for all the processes of your body.

How peptides are made: Natural Synthesis

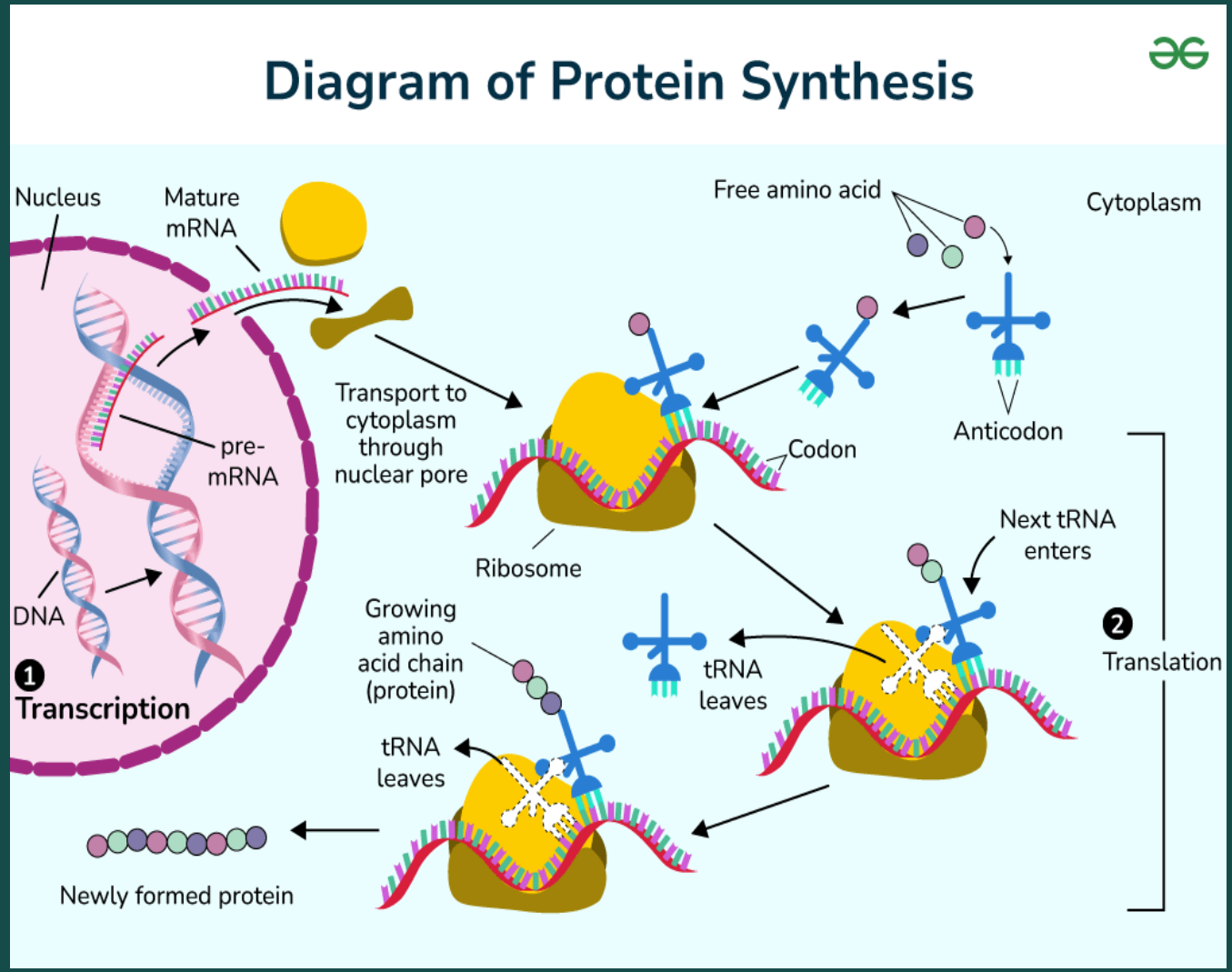
Ribosomal synthesis in cells

Post-translational modifications create mature peptides

Endogenous production tightly regulated

Short half-life in vivo due to rapid enzymatic aggregation

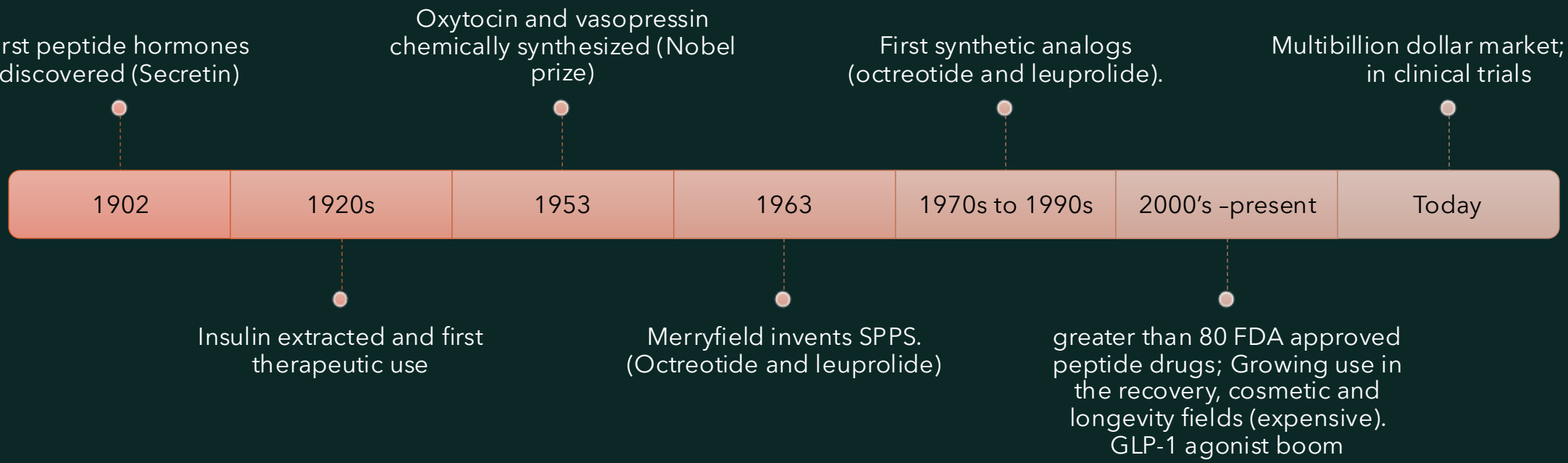
Metabolic dysfunction and aging slow or degrade this process.



How are peptides made? Synthetic and Recombinant methods.

- Solid Phase peptide synthesis:
  - Most common lab/industrial method
  - Developed in 1963 (Merrifield)
  - Amino acids added stepwise on a resin bead chain then excess reagents washed away.
  - Fast, automated,
  - Produces very high purity for <50 chain amino acids
  - Readily made in many compounding pharmacies

History of peptides: Key Milestones



Safety and Efficacy

Strengths: High Target specificity, low toxicity, predictable metabolism.

Generally excellent safety profiles

Common side effects: Mild GI (nausea) often transient

Efficacy: Proven in diabetes, obesity, osteoporosis, wound healing, immune modulation

Regulatory note: FDA approved peptides rigorously tested; many peptides are investigational/compounded. Wise to use under medical supervision.

Top 12 peptides!

GLP's

Mechanism: Glucose dependent insulin release, glucagon suppression, slowed gastric emptying, and central appetite suppression as well as neurocognitive improvement

Benefits and Evidence: 15 to 25% body weight loss, superior glycemic control, 20% plus reduction in major adverse cardiovascular events, and slowed kidney disease progression, strong evidence from large randomized trials and long-term real-world data.

Growth Hormone Secretagogues

Ipamorelin, tesamorelin, CJC -1295. AOD-9604 etc.

Mechanism: Stimulate natural pituitary growth hormone release.

Benefits and evidence: Increase lean muscle mass, targeted fat loss, faster recovery from exercise/injury, improved sleep quality, increased bone density and anti-aging body composition changes.

Clinical studies show better tolerability then exogenous hGH and minimal side effects.

BPC-157

Mechanism: Promote angiogenesis (new blood vessels, collagen synthesis and tissue repair; strong anti-inflammatory and gut protective effects.

Benefits and evidence: Accelerated healing of the tendons, ligaments, muscle, and gastrointestinal lining; reduced inflammation and pain.

Supported by numerous animal models and pilot human studies showing rapid musculoskeletal and GI repair

TB-500 (thymosin beta-4 fragment

MECHANISM: PROMOTES CELL MIGRATION, ANGIOGENESIS, TISSUE REMODELING AND REDUCE SCAR FORMATION.

BENEFITS AND EVIDENCE: FULL BODY TISSUE REPAIR, IMPROVED FLEXIBILITY, FASTER INJURY RECOVERY, AND DECREASED INFLAMMATION.

ANIMAL STUDIES AND ATHLETE REPORTED OUTCOMES SHOW CONSISTENT REGENERATIVE EFFECTS WITH GOOD TOLERABILITY.

GHK-Cu (copper peptide)

Mechanism: Copper binding peptide that up regulates collagen/elastin production, modulates gene expression for repair and provides antioxidant anti-inflammatory effects.

Benefits and evidence: Skin rejuvenation, wound healing, hair growth, systemic antiaging.

Clinical trials and cosmetic studies demonstrate measurable improvements in skin elasticity, wrinkle reduction and tissue repair

Thymosin alpha-1

Mechanism: Immune modulator that matures T cells and enhances antiviral/antitumor immunity.

Benefits and evidence: Stronger immune response, or faster infection recovery, and support in chronic illness.

Used clinically in multiple countries; randomized trials show improved outcomes in viral infection and immune compromised states.

PT-141

Mechanism: Melanocortin receptor agonist that activates central sexual arousal pathways.

Benefits and evidence: Effective treatment of hypoactive sexual desire disorder in both men and women. FDA approved (Vyleesi)

Phase 3 trials confirm significant improvement in desire and satisfaction scores.

Melanotan 2

Mechanism: Synthetic a-MSH analog that activates melanocortin receptors for increased pigmentation, decreased appetite and increased libido

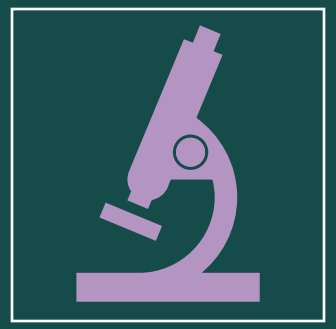
Benefits and evidence: Rapid tanning, appetite suppression, enhance libido/erectile function

Clinical studies and long-term user data show reliable skin darkening with UV exposure plus sexual function benefits similar to PT 141

LL-37

Mechanism: Human antimicrobial peptide; broad-spectrum antibacterial, antiviral and immunomodulatory with wound healing properties.

Benefits and evidence: Potent infection control, accelerated wound healing, and anti-inflammatory effects.



In vitro, animal and early human studies demonstrate efficacy against resistant bacteria and improved tissue repair

Semax and Selank

Mechanism: Semax enhances BDNF (brain derived neurotropic factor) and neuro protection; Selank modulates GABA and immune response for anxiolytic effects.

Benefits and evidence: Improved focus, memory, learning, stressed resilience, and anxiety reduction without sedation

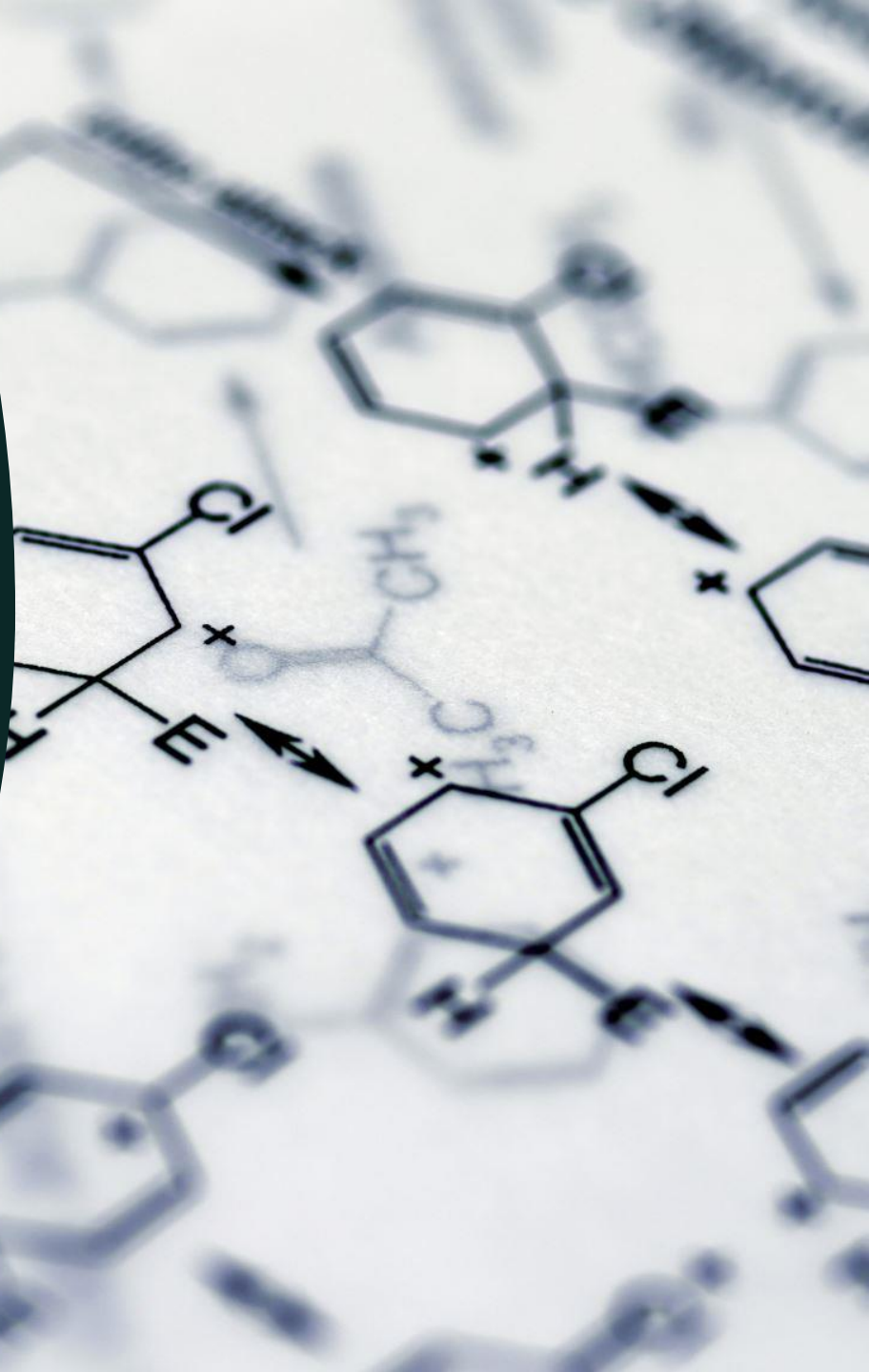
Russian clinical trials and cognitive studies show measurable enhancement in cognitive performance and neuroprotection

Pinealon

Mechanism: Brain specific bio regulator peptide the crosses the blood brain barrier; interacts with DNA/chromatin to regulate chain expression, reduces reactive oxygen species, modulates MAPK/ERK pathways and supports neuronal survival/proliferation

Benefits and evidence: Neuro protection against oxidative stress and hypoxia, improved cognitive function/memory, better sleep/circadian regulation, and reduced neuronal apoptosis

Cell culture and animal studies show decreased ROS, enhanced cell viability and cognitive improvements



MOTS-C

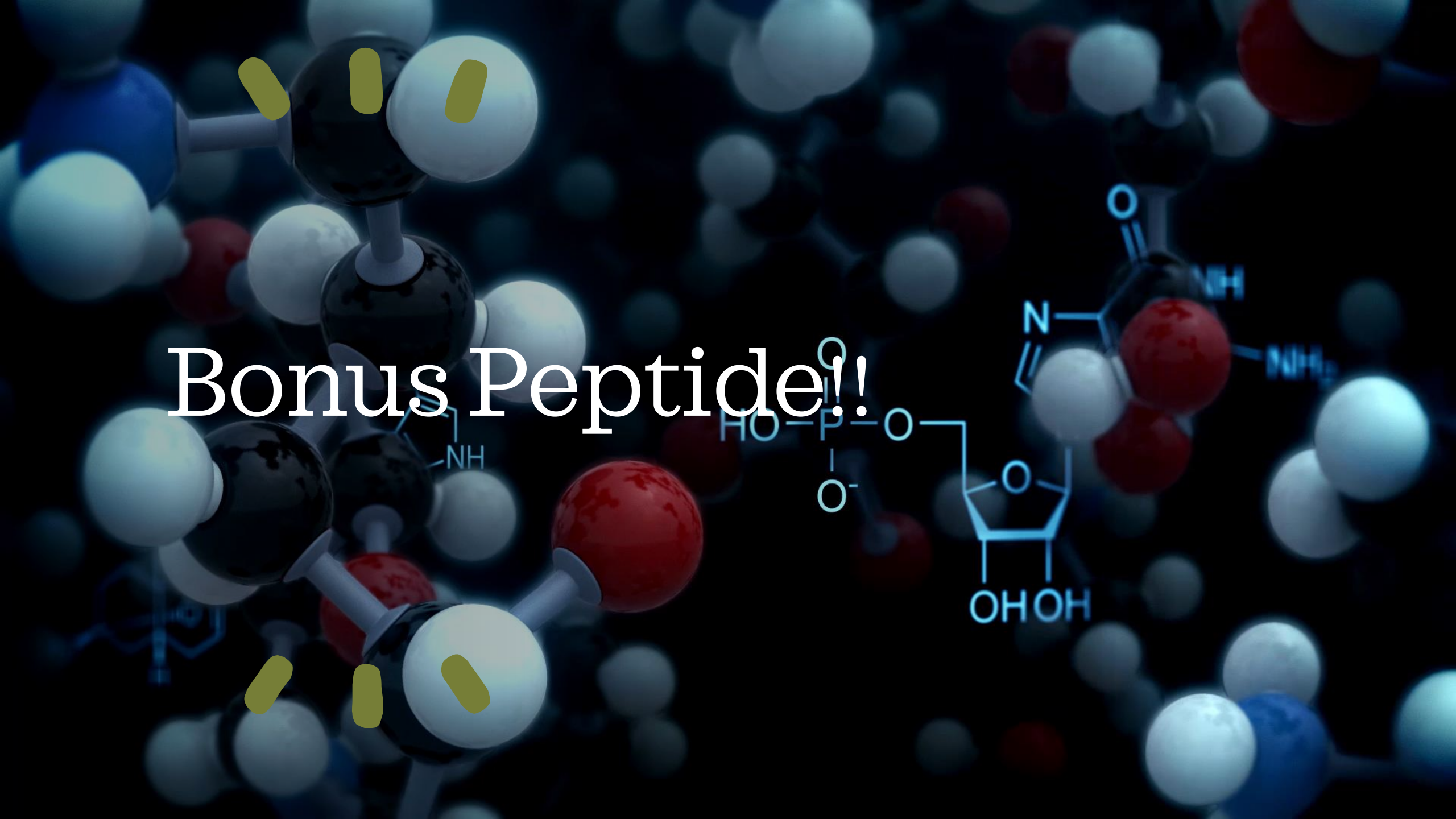
Mechanism: Activates AMPK pathway in skeletal muscle and other tissues; regulates metabolic gene expression, improves mitochondrial function, and enhances cellular energy balance under stress.

Benefits and evidence: Enhanced insulin sensitivity, prevention/reversal of diet induced obesity and insulin resistance, improved glucose uptake, increased exercise performance/endurance, and metabolic adaptation.

Strong preclinical rodent studies demonstrate AMPK activation,, better glucose homeostasis fat loss and physical performance gains

Early 2026 clinical trial showing promis for metabolic and longevity applications

Bonus Peptide!!



Epitalon

Mechanism: Pineal gland derived peptide that stimulates telomerase activity Boosts melatonin production, provides antioxidant effects, and modulates neuroendocrine immune function.

Human cohort studies with related epithalanin show decreased mortality up to 28 to 50% in older adults over 6 to 12 years, normalized melatonin and better/immune markers

Benefits and evidence: Telomere lengthening, improved sleep quality and circadian rhythm, reduced oxidative stress, potential mortality reduction and antiaging effects.

Animal/in vitro data confirmed telemorase activation, antioxidant activity and lifespan extension.

Conclusion:

- Global peptide therapeutic market is exploding valued at $50-$230 billion
- **Exciting developments ahead**: Longer acting peptides, oral delivery technologies, combination therapies, personalized regimens for metabolic health, tissue repair, cognitive function and healthy aging
- **Caution and responsibility**: While many peptides show excellent tolerability and excellent safety profiles, risk still exists it is always recommended to prioritize evidence-based use under medical supervision
- Peptides represent one of the most promising and rapidly evolving areas in medicine and wellness.
  - Stay informed
  - consult a physician with knowledge and experience using peptides
  - Individualize based on your goals and health status.