2.0

MODULE 1 OF 5 · UU LIFE PEPTIDES 2.0

FOUNDATIONS

How peptides work and how to read the science. Receptors and signaling, half-life and pharmacokinetics, routes, units, the anatomy of a study, evidence grades, safety architecture, reconstitution and storage done right.

Module 1 · UU LIFE PEPTIDES 2.0 · Verified references · Reported doses with provenance

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Educational and informational reference for adults. Not medical advice, not a prescription and not a recommendation to use any substance. Many compounds described are not approved for human use and several are prohibited in sport. Decisions about any compound belong to you and a licensed clinician.

The evidence scale used in every card

GRADE	MEANING
A	Approved drug or multiple human randomized trials
B	Human trials that are small, short or single-arm, or consistent case series
C	Animal data only, or human data too weak to support the claim
D	In vitro, mechanistic or anecdotal; no reliable human or animal outcome data

Doses in this book are reported, not recommended: each one names its source, a drug label, a study with its PMID, or the explicit tag that it is commonly cited in non-clinical use and not validated in trials.

Contents

How peptides work: receptors, signals and pharmacokinetics

A peptide's effects depend on three linked questions: what it interacts with, what that interaction changes, and how much intact compound reaches relevant tissues. Receptor pharmacology explains the signal. Pharmacokinetics explains exposure over time. Neither, by itself, establishes a useful clinical outcome. This distinction separates an interesting laboratory finding from evidence that a treatment benefits people. (PMID: 35165272)

Peptide, protein and small molecule

Peptides consist of amino acids joined by peptide bonds. Their sequence, folding, charge and chemical modifications determine their interactions. Proteins use the same basic chemistry but generally form larger, more elaborate structures. There is no universal length boundary that reliably predicts biological behavior. A short peptide can be inactive, while a larger protein can bind a receptor with high specificity. (PMID: 35165272)

Small-molecule drugs generally have lower molecular mass and can use chemical structures unrelated to amino-acid chains. Some cross membranes readily and reach intracellular targets. Many therapeutic peptides instead act at cell-surface receptors because their size, charge and polarity limit passive membrane passage. These are tendencies, not absolute rules. NAD+, included in this catalog, is a nucleotide coenzyme rather than a peptide. Catalog membership does not define molecular chemistry. (PMIDs: 35165272, 33028824)

Agonist, analog and fragment describe different properties

- An agonist binds a receptor and activates signaling. An antagonist blocks agonist-mediated activation without producing the same activating response. (PMID: 21208601)
- An analog is structurally related to another molecule, with changes that can alter affinity, selectivity, stability or duration. (PMID: 35165272)
- A fragment contains part of a larger sequence. Its effects cannot be assumed to reproduce those of the parent molecule. (PMIDs: 35165272, 37171185)

The categories overlap. Semaglutide is both a GLP-1 analog and a GLP-1 receptor agonist. Its amino-acid substitutions and attached fatty-acid group help protect it from degradation and increase albumin binding. AOD-9604 is a modified growth-hormone fragment; that structural relationship does not establish equivalence to full-length GH. (PMIDs: 26308095, 25208511)

Selected catalog compounds grouped by mechanism family

This table illustrates mechanism families using a subset of the supplied catalog. It is not the complete 41-compound inventory. A shared goal, such as recovery, does not imply a shared receptor. Where targets or preparation identities remain uncertain, the table preserves that uncertainty. Findings for a parent molecule do not automatically establish effects of its fragments or modified analogs.

MECHANISM FAMILY	CATALOG COMPOUNDS	MECHANISM AND EVIDENCE BOUNDARY
Incretin receptor agonists	Semaglutide; tirzepatide	GLP-1 receptor activation; tirzepatide also activates GIP receptors. Grade A evidence supports clinical weight outcomes in studied populations. PMIDs: 32730231, 33567185, 35658024.

MECHANISM FAMILY	CATALOG COMPOUNDS	MECHANISM AND EVIDENCE BOUNDARY
GHRH receptor agonists	CJC-1295	Stimulates pituitary GH release. Short human studies support grade B hormonal effects, without establishing athletic benefits. PMID: 16352683.
IGF-related experimental constructs	PEG-MGF	Related to research on the IGF-1 splice system and MGF peptides. Endogenous MGF findings do not validate a PEG-modified preparation. PMID: 37171185.
Modified GH fragments	AOD-9604	GH-derived sequence. The cited laboratory study characterizes identity and metabolism, not clinical fat-loss efficacy or equivalence to full GH receptor pharmacology. PMID: 25208511.
Experimental tissue-response modulation	BPC-157	Multiple proposed growth and angiogenesis pathways. Grade C musculoskeletal efficacy evidence: predominantly preclinical findings and inadequate human confirmation. PMID: 40756949.
Thymosin-related tissue biology	TB-500	Associated with thymosin beta-4 research. A preparation's identity must be established before applying findings from full-length thymosin beta-4. PMID: 36709593.
Neuroactive peptides	Semax; Selank	Grade B evidence for short human functional-connectivity observations. These findings do not establish a single receptor mechanism or durable cognitive benefit. PMID: 32342318.
Melanocortin receptor agonists	PT-141, bremelanotide	Melanocortin signaling with grade A clinical evidence for a defined sexual-desire disorder population. PMIDs: 21208601, 31599840.
Mitochondrial-derived signaling	MOTS-c	Cellular effects involving folate metabolism and AMPK. Foundational intervention findings come from cells and mice, supporting grades D and C respectively. PMID: 25738459.
Coenzyme metabolism	NAD+	Redox cofactor and substrate for multiple enzymes. Neither a peptide nor a conventional peptide-receptor agonist; biochemical roles do not establish supplementation benefits. PMID: 33028824.

Under the 2026 WADA Prohibited List, AOD-9604, CJC-1295, BPC-157, TB-500 and MOTS-c are prohibited at all times. IGF-1 analogs and mechano growth factors are also prohibited at all times. These restrictions concern both competition and periods outside competition.

Worked example 1: the GLP-1 receptor

A receptor is a protein that converts molecular binding into a cellular response. GLP-1 receptors belong to the G protein-coupled receptor family. Agonist binding changes receptor conformation, engaging intracellular signaling that includes cyclic AMP, or cAMP. In pancreatic beta cells, this supports glucose-dependent insulin secretion. Other pathways influence glucagon, gastric emptying and appetite. One receptor can therefore produce different effects across tissues. (PMID: 29617641)

Affinity describes binding strength; potency describes the concentration needed for a defined response. Neither guarantees superior clinical results. Tirzepatide illustrates why: its activity spans GIP and GLP-1 receptors. Laboratory studies show a preference for cAMP signaling over beta-arrestin recruitment at GLP-1 receptors. This is biased agonism, meaning that receptor activation can favor some downstream pathways over others under the tested conditions. (PMID: 32730231)

Clinical outcomes require separate evidence. STEP 1 studied a target semaglutide dose of 2.4 mg subcutaneously once weekly, following escalation, alongside lifestyle intervention (PMID: 33567185). Participants had obesity or overweight with a weight-related condition, without diabetes. This documented trial regimen is not a recommendation for the reader. Its weight outcomes cannot be inferred from receptor binding alone.

US semaglutide labeling contraindicates treatment with personal or family medullary thyroid carcinoma, multiple endocrine neoplasia type 2, or prior serious semaglutide hypersensitivity. Weight-loss treatment is

inappropriate during pregnancy. These boundaries remain relevant even when the receptor mechanism is well established.

Worked example 2: ghrelin and GHRH reach GH through different receptors

Ghrelin activates the growth hormone secretagogue receptor, GHS-R1a. Important signaling involves Gq proteins, phospholipase C and intracellular calcium. GHRH activates a different receptor, with prominent Gs and cAMP signaling. Both systems influence pituitary GH secretion, but they are not interchangeable. Ghrelin also participates in appetite and gastrointestinal regulation, so stimulating its receptor is not an isolated muscle-building signal. (PMIDs: 24381790, 32257855)

CJC-1295 acts through the GHRH system. A simplified sequence is receptor activation, pituitary GH release, then changes in downstream IGF-1 production. The human trials measured GH, IGF-1 and pharmacokinetics. They did not establish that the same exposure improves strength, tendon healing or longevity. A biomarker response establishes biological activity within the measured endpoint. These short trials also cannot establish long-term safety or a complete contraindication profile. (PMID: 16352683)

Worked example 3: melanocortin receptors

Melanocortin receptors form a receptor family with overlapping ligand recognition but different tissue functions. Their signaling commonly involves cAMP. Receptor subtype and tissue location therefore matter: pigment-related activity and central behavioral effects cannot be treated as the same endpoint. Designing selective melanocortin agonists is difficult because related receptors recognize overlapping structural features. (PMID: 21208601)

PT-141, or bremelanotide, demonstrates the gap between mechanism and indication. Two phase 3 trials studied bremelanotide 1.75 mg subcutaneously as needed in premenopausal women with hypoactive sexual desire disorder (PMID: 31599840). Improvements in desire and related distress apply to that studied population; they do not establish universal libido enhancement. Nausea, flushing and headache were more frequent with treatment. (PMID: 31599840)

US bremelanotide labeling contraindicates treatment in uncontrolled hypertension or known cardiovascular disease because blood pressure can increase transiently.

Half-life shapes frequency but does not determine it alone

Plasma half-life describes how long concentration takes to fall by half during a defined elimination phase. Peptides may disappear through enzymatic breakdown and clearance, while chemical modification, albumin binding and formulation can prolong exposure. Absorption can also shape the measured terminal phase. Consequently, a half-life belongs to a particular molecule, formulation, route and study population. (PMIDs: 35165272, 33969456)

Illustrative first-order elimination after absorption and distribution are complete: the remaining fraction equals one-half raised to elapsed time divided by half-life. After 1 half-life: 50%. After 2: 25%. After 4: 6.25%. After 5: 3.125%. This simplified model describes concentration decline, not effect size or a dosing instruction.

Repeated administration before complete elimination can produce accumulation. Under a simple linear model, concentrations approach steady state over roughly four to five half-lives, assuming a constant administration schedule. Plasma persistence and biological persistence differ: receptor occupancy, intracellular signaling and downstream hormone production may follow different time courses. Oral semaglutide modeling illustrates how repeated administration and prolonged persistence smooth substantial day-to-day absorption variability. (PMID: 33969456)

The albumin-binding CJC-1295 studied subcutaneously in humans had an estimated half-life of 5.8 to 8.1 days, with prolonged hormonal responses (PMID: 16352683). Those measurements cannot automatically be assigned to a different construct carrying a similar name. Dosing frequency depends on the tested exposure-response relationship, accumulation, tolerability and clinical objective. It does not follow a general rule to administer every half-life.

Bioavailability and why route changes the answer

Bioavailability is the fraction of an administered dose that reaches systemic circulation intact. Intravenous administration defines complete systemic availability. Subcutaneous and intramuscular administration bypass digestion but still require absorption and can involve local degradation. Neither guarantees identical exposure. Intranasal and transdermal delivery face their own barriers. Reaching blood does not prove that a useful concentration reaches the brain. (PMIDs: 15984901, 35165272)

Most unmodified oral peptides face two major obstacles: digestive enzymes break peptide bonds, and intact molecules often cross intestinal membranes poorly. Protecting a peptide from stomach conditions solves only part of the problem. An enteric coating can change where material is released without ensuring absorption through the intestinal wall. (PMID: 15984901)

Exceptions depend on molecular design and formulation. The studied oral semaglutide formulation uses an absorption enhancer and achieves useful exposure despite low absolute bioavailability. A population analysis estimated approximately 0.8% bioavailability under its reference conditions (PMID: 33969456). Food, fasting duration and sufficiently large water volumes affected exposure. Differences between the smaller water volumes tested separately were not significant. These findings do not validate generic oral formulations of other peptides. (PMIDs: 33969456, 34080123)

Other oral peptide medicines act locally in the gastrointestinal tract, where high systemic absorption is unnecessary. This is a different pharmacological objective. Oral failure should therefore mean failure to deliver the required exposure to the intended site, rather than simply failure to enter blood. (PMID: 35165272)

Pulsatility: concentration patterns carry information

GH secretion normally occurs in pulses shaped by stimulatory signals, somatostatin inhibition and feedback. Pulse size, frequency and the concentration between pulses are separate measurements. A GH secretagogue can change one without changing all three. In a human CJC-1295 study, GH pulses persisted during prolonged stimulation, but trough concentrations increased markedly. Preserved pulsatility therefore did not mean unchanged physiology. (PMIDs: 24381790, 17018654)

This also limits conclusions from isolated blood samples. A single GH concentration cannot characterize an overnight secretion pattern. The CJC-1295 pulsatility study used repeated overnight sampling. Its findings concern hormone dynamics rather than proven recovery or performance benefits. Under this guide's scale, these short human physiological studies warrant grade B for the measured hormonal effects. (PMID: 17018654)

Tolerance, desensitization and downregulation

Desensitization means reduced signaling responsiveness. Receptor phosphorylation and beta-arrestin recruitment can reduce coupling to G proteins and promote internalization. Internalized receptors may recycle; internalization is not automatically permanent receptor loss. Downregulation refers to a reduction in receptor availability or abundance. Tolerance describes a reduced observed response and can involve mechanisms beyond the receptor itself. (PMID: 30616820)

Adaptation can be endpoint-specific. In nine healthy volunteers, continuous intravenous GLP-1 exposure produced a smaller gastric-emptying delay after a second meal than after the first. This demonstrated rapid tachyphylaxis of that response, associated with altered vagal activation. It did not show that every GLP-1 effect disappears or establish a universal cycling schedule. (PMID: 21430088)

> The rule that matters: match the claim to the exact molecule, formulation, route, population and measured outcome. Receptor activity, a longer half-life or a higher biomarker does not by itself establish clinical benefit or justify a personal regimen.

Apply evidence grades to the claim being evaluated. Grade A clinical evidence does not transfer to a different indication. Short human studies support grade B within their endpoints. MOTS-c intervention findings in mice

support grade C; mechanistic pathways alone support grade D. The BPC-157 review found predominantly preclinical evidence and insufficient human evidence for confident musculoskeletal efficacy claims, consistent with grade C. A mechanism is a reason to investigate, not a guarantee. (PMIDs: 33567185, 35658024, 32342318, 25738459, 40756949)

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How to read a study and grade the evidence

A five-minute abstract review should answer a narrow question: what does this study actually support? Identify who or what was studied, the comparison, the measured outcome and the uncertainty. Save the authors' conclusion for last. This chapter provides a screening method, with deeper reading required when essential details are missing. Greenhalgh's guide explains why identifying the research question and study design comes before judging a paper's findings (PMID 9253275).

> Keep every claim within the population, intervention, outcome and follow-up actually studied. Label any extrapolation. An abstract review produces a provisional assessment.

The five-minute abstract checklist

Use this sequence to create a provisional evidence note. It draws on Greenhalgh's appraisal approach and CONSORT 2010 reporting questions (PMIDs 9253275 and 20332511).

1. Minute 1: record the PMID, population or species, study type, comparison group and whether treatment assignment was randomized.
2. Minute 2: record sample size, group sizes, treatment duration and follow-up. Distinguish enrollment from completion when reported.
3. Minute 3: identify the stated primary endpoint. Classify it as a clinical outcome, biomarker or laboratory mechanism; confirm prespecification in the protocol.
4. Minute 4: extract the between-group effect, its units, confidence interval and reported harms, then inspect the P value.
5. Minute 5: check funding and disclosures. Assign a provisional A to D grade to the claim and list details requiring the full paper.

Start with study design

For treatment effectiveness, the following designs provide a useful starting point. Design determines which alternative explanations can be addressed, but execution still matters. A poorly conducted randomized trial can mislead. Observational studies remain useful for questions that trials cannot readily answer. Match the design to the question before treating a hierarchy as a verdict (PMID 9253275).

DESIGN	WHAT IT CONTRIBUTES	MAIN LIMITATION
Randomized controlled trial, RCT	Random assignment balances prognostic factors on average, although individual trials can have imbalances.	Bias can remain through poor concealment, missing outcomes or selective reporting.
Cohort study	Follows exposed and unexposed people to compare subsequent outcomes.	Differences in health, behavior or treatment selection can confound associations.
Case series	Describes outcomes in several treated people.	Without a suitable comparison, improvement cannot reliably be attributed to treatment.
Animal experiment	Tests biological effects and outcomes in a controlled organism.	Species and disease-model differences limit conclusions about people.
In vitro experiment	Tests cells, tissues or molecules under laboratory conditions.	An isolated response does not establish an effective treatment in humans.

A review assembles evidence; it does not automatically upgrade it. Check which designs it includes, how studies were selected and whether conclusions reflect their limitations. The industry-sponsorship review below reports different certainty levels for different outcomes, illustrating why confidence should remain outcome-specific (PMID 28207928).

Count participants, time and missing outcomes

There is no universal sample-size threshold for credibility. Precision depends on variability, event frequency, design and the size of the effect being estimated. Small studies often leave wide uncertainty, while large studies can detect differences too small to matter practically. Read the confidence interval instead of judging the sample count alone (PMID 27209009).

Distinguish people enrolled, randomized, followed and analyzed. If participants leave because treatment is ineffective or poorly tolerated, analyzing only completers may distort the result. Duration also limits the question answered: an early response does not establish persistence after treatment or long-term safety. CONSORT asks authors to report participant flow, losses, analysis populations and harms so readers can examine these issues (PMID 20332511).

Find the endpoint, then separate mechanism from outcome

The primary endpoint is the prespecified outcome around which the trial's main question is organized. Some trials specify more than one. Check its definition and measurement time, then compare the paper with its protocol or registration when available. Secondary outcomes add information, but selecting impressive results from many analyses can exaggerate the apparent evidence (PMIDs 20332511 and 27209009).

A mechanism describes a possible causal pathway. A biomarker measures a biological response. A clinical outcome concerns health, symptoms or function. These questions require separate evidence. Teichman and colleagues studied CJC-1295 in two randomized trials lasting 28 and 49 days, measuring growth hormone and IGF-I responses. Those findings demonstrate endocrine activity within the experiment. They do not establish improved strength, muscle gain or longevity (PMID 16352683).

Likewise, GHK-Cu stimulated collagen synthesis in fibroblast cultures. The measured outcome was cellular collagen production, not fewer wrinkles or faster recovery in people. A plausible explanation for a benefit is a reason to test that benefit, not evidence that it has already occurred (PMID 3169264).

Read effect size before statistical significance

Effect size describes how much the groups differ. A P value measures incompatibility between the data and a specified hypothesis under the analysis assumptions. Statistical significance applies a chosen threshold to that value. Neither establishes the probability that treatment works, the probability that the null hypothesis is true, or clinical importance (PMID 27209009).

Inspect the units and comparison. Kilograms, percentage change in weight and percentage points between groups are different quantities. For binary outcomes, ask for both absolute and relative effects. A large relative change can correspond to a small absolute difference when the baseline event rate is low. CONSORT recommends reporting both for binary trial outcomes (PMID 20332511).

A confidence interval displays uncertainty under the statistical model. Ask whether its range includes effects too small to matter, substantial benefit or harm. A nonsignificant result with a wide interval may be inconclusive rather than evidence of equivalence. Conversely, a very small P value cannot repair biased measurement or an inappropriate comparison (PMID 27209009).

Check conflicts without using them as a shortcut

Check funding, employment, consulting relationships, patents and the sponsor's role in analysis and publication. An industry-funded trial can provide useful evidence, but funding deserves scrutiny. A Cochrane

review found that industry-sponsored drug and device studies more often reported favorable efficacy results and conclusions. That association does not prove that any particular paper is wrong (PMID 28207928).

If the abstract omits disclosures, mark them as unchecked. Continue to the full paper and protocol, especially when conclusions emphasize secondary results or omit important harms (PMIDs 20332511 and 28207928).

Apply the book's A to D scale

This is the book's practical classification, not a formal GRADE assessment. Apply it to a defined claim and evidence base. The examples classify the cited findings, not every possible use of each compound. A letter alone does not establish clinical relevance or treatment suitability.

GRADE	BOOK DEFINITION	EXAMPLE AND BOUNDARY
A	Approved drug or multiple human randomized trials.	Semaglutide for weight reduction in studied populations: STEP 1 and STEP 3 provide randomized human evidence (PMIDs 33567185 and 33625476).
B	Human trials that are small, short or single-arm, or consistent case series.	CJC-1295 for short-term GH and IGF-I elevation: two early randomized trials measured endocrine responses. B reflects their short duration and limited scope (PMID 16352683).
C	Animal data only or human data too weak to support the claim.	BPC-157 for muscle-crush recovery: the cited experiment reports healing and functional findings in rats, without establishing human efficacy (PMID 18668315).
D	In vitro, mechanistic or anecdotal.	GHK-Cu for collagen stimulation in the cited fibroblast experiment: cell-culture evidence cannot establish a clinical skin benefit (PMID 3169264).

The A and B definitions overlap. This chapter applies B when the available trials are small or short, even if more than one is randomized. Human biomarker trials are classified by their design and limitations; they do not become D solely because the endpoint is mechanistic. Approval for one indication does not upgrade unrelated claims. Record the population, outcome and principal limitation beside every letter.

Sport eligibility is separate. The 2026 WADA Prohibited List prohibits BPC-157 under S0 and CJC-1295 under S2 at all times, including outside competition. Source: 2026 WADA Prohibited List, https://www.wada-ama.org/sites/default/files/2025-09/2026list_en_final_clean_september_2025.pdf.

Worked example: reading STEP 1

STEP 1 randomized 1,961 adults without diabetes in a double-blind, placebo-controlled trial lasting 68 weeks. Eligibility required obesity, or overweight with at least one weight-related condition. The study reports a target semaglutide dose of 2.4 mg subcutaneously once weekly, with lifestyle intervention in both groups (PMID 33567185). Coprimary endpoints were percentage weight change and achieving at least 5% weight loss. The primary analysis targeted effects regardless of treatment discontinuation or rescue interventions.

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STEP 1, PMID 33567185
Mean weight change: −14.9% with semaglutide versus −2.4% with placebo
Reported estimated difference: −12.4 percentage points
95% confidence interval for the difference: −13.4 to −11.5 percentage points
P < 0.001
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Use the reported estimate, not subtraction of rounded means. Gastrointestinal events caused treatment discontinuation in 4.5% with semaglutide versus 0.8% with placebo; the abstract identifies manufacturer funding. The result supports weight reduction in the studied setting, without establishing muscle gain or lifelong safety (PMID 33567185).

> The US semaglutide prescribing information contraindicates use with personal or family medullary thyroid carcinoma, multiple endocrine neoplasia type 2, or prior serious hypersensitivity to semaglutide or

formulation excipients. Source: DailyMed prescribing information, Contraindications, https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=ee06186f-2aa3-4990-a760-757579d8f77b.

Why animal doses do not translate linearly

Matching mg/kg across species assumes that body weight alone captures relevant biological differences. Metabolism and physiological functions do not scale proportionally with mass. Allometric scaling uses relationships between body size and biological properties; one common approximation converts an animal dose using body surface area. Nair and Jacob describe its use in estimating human-equivalent doses during planning for initial human trials (PMID 27057123).

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Body-surface-area method, PMID 27057123
Human-equivalent dose in mg/kg = animal dose in mg/kg multiplied by animal Km divided by human Km
Km = body weight in kg divided by body surface area in square meters
The formula estimates a dose, not measured human exposure.
It does not establish a human route, frequency or treatment regimen.
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This conversion is an approximation, not proof of equivalent blood concentrations or biological effects. Route, absorption, metabolism and species-specific pharmacology still matter. Estimating a first human trial dose also requires toxicology and safety considerations. A calculated human-equivalent dose is not a validated personal dose (PMID 27057123).

Find the record and preserve the evidence

Search PubMed using the title, or combine the compound with an author and year. Open the result and match its title, authors, journal and publication year. The PMID identifies the PubMed record; the DOI is a separate article identifier. For STEP 1, these are PMID 33567185 and DOI 10.1056/NEJMoa2032183. Save the identifiers with the claim and check whether the record links to corrections or retractions.

```
Evidence note template
Claim:
PMID and DOI:
Population, design and comparator:
Sample size and follow-up:
Primary endpoint and prespecification checked:
Effect size and confidence interval:
Harms, missing data and funding:
Provisional grade and reason:
What this paper does not establish:
```

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Units and math: mg, mcg, IU, mL and the syringe

A peptide calculation connects active compound mass, solution concentration, and the volume represented by a measuring device. Confusing these quantities can produce large errors. A semaglutide case series documented tenfold administration errors and confusion involving milligrams, milliliters, and syringe units. Evidence grade B applies to this descriptive human safety signal, not its frequency or proof of causation. Reference: Lambson et al., 2023, PMID 37392810.

> A syringe number cannot identify peptide mass without the syringe calibration and solution concentration. An unclear instruction requires clarification from the prescribing clinician or pharmacist before use.

Mass, biological activity, and volume

Milligrams, written mg, and micrograms, written mcg, measure mass. One mg equals 1000 mcg. Conversion changes the numerical expression, not the amount of material. A milliliter, written mL, measures volume. A volume alone cannot identify how much peptide it contains. These metric relationships are definitions. Mass conversions and hypothetical vial contents below are arithmetic inputs, not administered doses.

International units, written IU, express biological activity relative to a substance-specific standard. There is no universal IU-to-mg conversion across peptides. A valid conversion requires the particular substance and its established standard. Biological unitage does not guarantee a particular clinical response. Reference: Miles and Perry, 1953, PMID 13082386, a methodological discussion rather than clinical efficacy evidence.

An insulin syringe is calibrated for insulin at a specified concentration. With matching insulin, its numbers represent insulin units. With another solution, those marks provide only a volume mapping. Calling them peptide IU is incorrect: the syringe cannot measure that peptide's biological potency. A published human case documents an insulin concentration and syringe mismatch. Reference: Barrera and Murvelashvili, 2019, PMID 31316841.

QUANTITY	EQUIVALENT	MEANING
1 mg	1000 mcg	Mass conversion, not a dose
0.1 mg	100 mcg	Mass conversion, not a dose
0.01 mg	10 mcg	Mass conversion, not a dose
1 mL	100 U-100 scale units	Volume mapping
0.1 mL	10 U-100 scale units	Volume mapping
0.01 mL	1 U-100 scale unit	Volume mapping
1 mL	40 U-40 scale units	Different calibration
IU to mg	No universal conversion	Requires a substance-specific standard

Concentration after reconstitution

Concentration is active compound mass divided by final solution volume. As a hypothetical arithmetic example, 5 mg in a final volume of 2 mL gives 2.5 mg/mL. The same hypothetical mass in 1 mL gives 5 mg/mL. Doubling concentration halves the volume representing any fixed mass. Neither example specifies an administered dose.

Final volume and added diluent are different inputs. The formulation's documented final concentration or final volume takes precedence over an assumption based on liquid added. These examples assume complete dissolution, uniform distribution, and the stated active mass. Arithmetic cannot establish identity, potency, stability, sterility, or a suitable diluent.

The four UU Life Calculator formulas

```
Concentration in mg/mL = active mass in mg / final volume in mL

Documented dose in mg = documented dose in mcg / 1000

Volume in mL = documented dose in mg / concentration in mg/mL

U-100 scale reading = volume in mL × 100
```

The second formula applies only to an input in mcg. An input already expressed in mg requires no further conversion. The final formula applies only to U-100 calibration. Units cancel through the calculation: mg divided by mg/mL leaves mL. A reverse check multiplies calculated volume by concentration to recover the original mass. Zero, negative, missing, or ambiguous inputs require an error flag.

U-100 versus U-40

U-100 means 100 insulin units per mL; U-40 means 40 insulin units per mL. One U-100 scale unit represents 0.01 mL, while one U-40 scale unit represents 0.025 mL. The same numbered mark represents 2.5 times as much volume on U-40. A case report describes recurrent hypoglycemia with U-40 syringes used for U-100 insulin. Reference: PMID 31316841. This single case illustrates the mismatch without estimating its prevalence.

SCALE READING	U-100 VOLUME	U-40 VOLUME
5	0.05 mL	0.125 mL
10	0.1 mL	0.25 mL
20	0.2 mL	0.5 mL
40	0.4 mL	1 mL

Calibration, capacity, and graduation spacing are separate properties. U-100 does not mean every syringe holds 1 mL or has one-unit graduations. Relevant device information includes calibration, maximum volume, and smallest marked interval. A calculated volume can be mathematically correct while exceeding capacity or falling between measurable marks.

Five worked examples

These exercises use semaglutide, tesamorelin, and tirzepatide. Every vial mass and final volume is a hypothetical teaching input, not a verified presentation or reconstitution instruction. Repeated compounds demonstrate how concentration changes the answer. Each example's study citation, route, and frequency apply to its complete calculation. Studied regimens are not reader recommendations or starting doses.

Semaglutide and tirzepatide contraindications include personal or family history of medullary thyroid carcinoma, MEN 2, and prior serious hypersensitivity to the respective drug or excipients. Sources: U.S. prescribing information for semaglutide and tirzepatide injections. These arithmetic examples do not establish clinical eligibility.

Example 1: semaglutide, hypothetical 5 mg vial content

```
Dose provenance for this calculation: SURPASS-2 studied semaglutide 1 mg subcutaneously once
weekly, PMID 34170647.
Hypothetical vial mass = 5 mg
Hypothetical final volume = 2 mL
Concentration = 5 / 2 = 2.5 mg/mL
Equivalent study dose = 1000 mcg subcutaneously once weekly, PMID 34170647
Dose conversion = 1000 / 1000 = 1 mg
Volume = 1 / 2.5 = 0.4 mL
U-100 scale reading = 0.4 × 100 = 40
Reverse check = 0.4 × 2.5 = 1 mg
```

Example 2: semaglutide, hypothetical 10 mg vial content

```
Dose provenance for this calculation: SURPASS-2 studied semaglutide 1 mg subcutaneously once
weekly, PMID 34170647.
Hypothetical vial mass = 10 mg
Hypothetical final volume = 2 mL
Concentration = 10 / 2 = 5 mg/mL
Volume = 1 / 5 = 0.2 mL
U-100 scale reading = 0.2 × 100 = 20
Reverse check = 0.2 × 5 = 1 mg
```

The concentration doubled between these examples, so the calculated volume and scale reading halved. Copying the earlier syringe number would double the mass represented. A saved syringe number cannot substitute for the concentration.

Example 3: tesamorelin, hypothetical 2 mg vial content

```
Dose provenance for this calculation: a randomized trial studied tesamorelin 2 mg subcutaneously
once daily in participants with HIV and abdominal fat accumulation, PMID 25038357.
Hypothetical vial mass = 2 mg
Hypothetical final volume = 1 mL
Concentration = 2 / 1 = 2 mg/mL
Volume = 2 / 2 = 1 mL
U-100 scale reading = 1 × 100 = 100
Reverse check = 1 × 2 = 2 mg
```

This theoretical result uses the entire assumed solution volume, making recoverable volume relevant. The study does not establish a regimen for healthy trainees or interchangeability with current formulations. Tesamorelin contraindications include disrupted hypothalamic-pituitary function, active malignancy, pregnancy, and known hypersensitivity to tesamorelin or excipients. Source: U.S. tesamorelin prescribing information. Tesamorelin is prohibited at all times under S2.2.4 of the 2026 WADA Prohibited List.

Example 4: tirzepatide, hypothetical 15 mg vial content

```
Dose provenance for this calculation: SURPASS-2 included tirzepatide 5 mg subcutaneously once
weekly as a maintenance-dose arm, PMID 34170647.
Hypothetical vial mass = 15 mg
Hypothetical final volume = 1 mL
Concentration = 15 / 1 = 15 mg/mL
Volume = 5 / 15 = 0.333333... mL
U-100 scale reading = 0.333333... × 100 = 33.333333...
Reverse check using unrounded volume = 5 mg
```

A repeating decimal is an arithmetic result, not an instruction to estimate a fractional graduation. The calculator should retain precision and flag the mismatch with the selected device.

Example 5: tirzepatide, hypothetical 10 mg vial content

```
Dose provenance for this calculation: SURPASS-2 included tirzepatide 5 mg subcutaneously once
weekly as a maintenance-dose arm, PMID 34170647.
Hypothetical vial mass = 10 mg
Hypothetical final volume = 2 mL
Concentration = 10 / 2 = 5 mg/mL
Volume = 5 / 5 = 1 mL
U-100 scale reading = 1 × 100 = 100
Reverse check = 1 × 5 = 5 mg
```

Compared with Example 4, one-third the concentration requires three times the volume. A device with 0.3 mL or 0.5 mL capacity cannot contain this calculated volume. Capacity requires a separate check after conversion.

Dead space and recoverable volume

Dead space is liquid retained in the syringe tip, needle hub, or needle after expulsion. Bench measurements show that retained volume varies with device design and components. It can reduce the number of recoverable portions from a vial. Reference: Smith et al., 2021, PMID 34812330. This device study used water and provides no peptide-specific efficacy evidence.

Nominal vial mass divided by dose gives a theoretical count, not guaranteed availability. Dead space does not change solution concentration. It does not justify automatically adding extra volume: delivered-volume behavior depends on the device and its instructions. No universal dead-space correction belongs in the calculator.

Rounding and the final check

Small-volume measurements can have substantial relative error. Experimental testing of insulin devices found greater percentage error at smaller settings, particularly with syringes. These findings concern measurement precision, not a universal minimum volume for every modern device. Reference: Gnanalingham et al., 1998, PMID 9771255. This was a dispensing experiment, not a clinical outcomes trial.

1. Retain full precision through intermediate calculations; distinguish the displayed result from a measurable device setting.
2. Display a leading zero below one, such as 0.1 mL, and avoid unnecessary trailing zeros.
3. Record the actual graduation interval instead of assuming every visible line represents one scale unit.
4. Flag results between graduations or beyond capacity without silently changing the documented amount.
5. For any evaluated rounding option, display its percentage difference; clinical acceptability requires the prescriber or pharmacist.
6. Reverse-check volume against concentration and retain the compound, dose source, route, frequency, and syringe calibration with the calculation.

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Reconstitution and storage depend on the formulation

Reconstitution changes a dried formulation into a solution with a different stability profile. Preserving that solution requires two separate controls: maintaining chemical and physical integrity, and preventing microbial contamination. Success with one does not establish success with the other. Formulation research addresses molecular stability. Medication-handling guidance addresses contamination prevention. Neither supports a universal storage rule for every peptide. PMID: 36986796; PMID: 27184207.

> The exact formulation determines the validated diluent, preparation method, storage conditions and discard deadline. Clear appearance and refrigeration cannot establish an unknown preparation's stability or sterility.

Diluent compatibility depends on formulation

A diluent does more than dissolve powder. Its pH, preservatives and interaction with existing excipients can change solubility and degradation. A peptide's name alone does not identify a compatible diluent. Different formulations of the same molecule may require different handling because their buffers, stabilizers and concentrations differ. PMID: 36986796.

DILUENT	WHAT IT CONTAINS	DOCUMENTED CONTEXT	MAIN LIMITATION
Bacteriostatic Water for Injection	Sterile water with an antimicrobial preservative. The reviewed Bacteriostatic Water for Injection label specifies benzyl alcohol.	Drug dilution or dissolution when the exact formulation permits this preserved diluent.	Compatibility requires validation. Benzyl alcohol promoted aggregation in an experimental protein formulation. PMID: 25100180.
Sterile Water for Injection	Sterile water without an antimicrobial preservative or added buffer, according to the Sterile Water for Injection label.	Preparation of medications whose instructions specify this diluent.	The reviewed label specifies single-dose containers and disposal of unused contents. The diluent provides no preservative protection.
Acetic acid solution or acetate buffer	An acidic solvent or a defined buffering system. These are not interchangeable.	Formulation development or a validated preparation requiring controlled acidic conditions.	Dissolution does not establish suitability for administration. Acetate buffer concentration affected multimer formation in a freeze-dried peptide formulation. PMID: 10845681.

The water descriptions follow the official Sterile Water for Injection and Bacteriostatic Water for Injection labels on DailyMed. These are pharmaceutical diluents with specific labeling, not interchangeable categories of water. Both labels warn that intravenous administration without sufficient solute can cause hemolysis. The bacteriostatic label contraindicates benzyl alcohol-containing preparations in neonates and excludes their use for epidural or spinal anesthesia.

Bacteriostatic does not mean sterilizing. Preservatives do not replace aseptic preparation or justify retaining a vial after suspected contamination. They can also affect the active molecule. Benzyl alcohol increased aggregation of interferon α-2a in laboratory experiments. That finding demonstrates a compatibility concern, not instability in every preserved peptide solution. PMID: 27184207; PMID: 25100180.

Acetic acid is not a general rescue solvent for undissolved powder. Changing pH can alter both solubility and degradation. An acetate salt named on a peptide label does not establish a need for additional acetic acid.

Compatibility depends on the complete formulation, including final pH and buffer composition. Experimental acetate-buffer findings cannot validate an improvised acidic preparation. PMID: 36986796; PMID: 10845681.

The documented preparation sequence

The sequence below describes professional preparation principles and a labeled example. It is not a universal mixing protocol. Aseptic technique addresses contamination, while controlled transfer and movement address formulation handling. The exact product instructions remain decisive. Careful handling alone cannot establish that an unidentified powder is suitable for human administration. PMID: 27184207; PMID: 36986796.

1. Verification covers formulation identity, expiration, container integrity, specified diluent, required volume and instructions after reconstitution.
2. Professional preparation follows hand hygiene and uses a clean designated area, sterile equipment and protected connection points. PMID: 27184207.
3. Aseptic vial access includes alcohol disinfection of medication and diluent stoppers, with drying before access. PMID: 27184207.
4. The EGRIFTA SV instructions describe slow solvent transfer along the inside vial wall to limit foaming. This method belongs to that formulation.
5. The EGRIFTA SV instructions specify gentle rolling and prohibit shaking. Other formulations require their own validated mixing instructions.
6. Completion checks cover the labeled dissolution conditions and expected appearance, followed by documentation of concentration and the applicable discard deadline.

The tesamorelin EGRIFTA SV prescribing information specifies gentle rolling for 30 seconds without shaking. Its instructions describe slow solvent transfer down the vial wall. The same label requires immediate use after reconstitution and disposal if the solution is not used immediately. Refrigeration and freezing of the reconstituted solution are prohibited. These instructions cannot be transferred to a different tesamorelin formulation.

This label example addresses handling, not treatment selection. The EGRIFTA SV label lists pregnancy, active malignancy, hypothalamic-pituitary axis disruption and hypersensitivity to tesamorelin or its excipients as contraindications.

No cited study establishes a universal waiting time after diluent addition. Research on concentrated lyophilized proteins found that formulation viscosity and composition strongly influenced reconstitution time. Those results explain variability, but cannot establish timing for unrelated peptides. Persistent material outside the labeled expectation requires assessment. Stronger shaking, heating or a solvent change would introduce conditions that the instructions may not validate. PMID: 32534031.

Dry powder and dissolved peptide have different limits

Lyophilization removes water through controlled freezing and drying and can improve storage stability. It does not eliminate degradation. Freezing conditions, residual moisture and changes in the dried material can affect stability and dissolution. A manufactured lyophilized cake is therefore a formulation whose processing and physical state matter. Its handling requirements cannot be inferred from the peptide name alone. PMID: 21426937.

Direct peptide evidence illustrates the limitation. A study of a freeze-dried atrial natriuretic peptide preparation identified multimer formation that depended on processing and formulation. A separate secretin study found that storage conditions and excipients affected peptide content, particles and reconstitution time. Neither result supports assigning all dry peptide vials the same expiration date or freezer requirement. PMID: 10845681; PMID: 25636302.

After dissolution, aqueous degradation pathways and physical changes become relevant. Temperature, pH and formulation influence their rates. The unopened expiration date does not automatically define the allowable period after mixing. The applicable deadline comes from exact product instructions or, for

compounded preparations, a qualified pharmacy assessment under applicable sterile-compounding standards. PMID: 36986796; PMID: 27184207.

Refrigeration windows require evidence

The insulin storage study describes refrigerated conditions of 2 to 8 °C. That range is not a universal requirement for every dry or dissolved peptide. Cold storage cannot supply missing compatibility data or override instructions requiring immediate use. The applicable temperature range and allowable duration belong to the specific preparation. PMID: 33534816; EGRIFTA SV prescribing information.

CDC medication-vial guidance specifies disposal within 28 days after opening a multidose vial unless the manufacturer provides another interval. That deadline cannot exceed the original expiration date. This rule does not demonstrate chemical stability for an arbitrary reconstituted peptide. Adding bacteriostatic water does not establish a validated multidose preparation. Formulation stability and contamination control impose separate limits. Source: CDC, Preventing Unsafe Injection Practices; PMID: 27184207.

In a laboratory study, selected insulin formulations retained measured quality and biological activity during four weeks of temperature cycling between 25 and 37 °C. PMID: 33534816. These results apply to the tested formulations and conditions. They do not establish the same window for unrelated peptides. A defensible storage claim identifies the formulation, exposure conditions and measured outcomes.

What can damage the molecule

- Heat can accelerate degradation and aggregation. Sensitivity depends on the molecule and formulation. PMID: 36986796; PMID: 14567625.
- Light contributed to instability in the experimental insulin formulations studied. This does not establish identical light sensitivity across all peptides. PMID: 35779744.
- Agitation and exposure to interfaces can contribute to physical instability. Ordinary movement does not automatically destroy every peptide. PMID: 36986796.
- Freezing changes the local environment as ice forms. Manufacturing freeze-drying evidence does not validate repeated freezing and thawing of a reconstituted solution. PMID: 21426937.
- Moisture exposure and changes in excipient structure can undermine a lyophilized formulation during storage. PMID: 25636302.

Labeling and travel

A handling record identifies the formulation, concentration, preparation time and applicable discard deadline while preserving lot information. A clinical audit evaluated date-and-time labeling and compliance with multidose-vial policies. It did not validate a universal peptide labeling template. The record below is an organizational aid assembled from those handling principles. PMID: 36875329; PMID: 27184207.

Concentration means mass per final solution volume. Diluent volume added and final solution volume are not automatically interchangeable. The labeled formulation determines the concentration calculation. The EGRIFTA SV prescribing information provides a formulation-specific example; its relationship between diluent volume and concentration cannot be assumed for an unidentified powder.

```
Formulation and strength:
Lot and original expiration:
Diluent identity and lot:
Reconstitution date and time:
First puncture date and time, if different:
Final concentration in mg/mL or mcg/mL:
Required storage conditions:
Discard date and time, or immediate-use requirement:
Source of concentration and discard deadline:
Temperature excursion details:
```

During travel, the handling objective is to maintain the labeled conditions throughout the journey. Insulation alone does not document temperature. Monitoring records exposure, while separation from frozen packs limits direct contact with a freezing source. These are practical implications of temperature and freezing research. They do not validate a particular travel container or an untested formulation. PMID: 33534816; PMID: 21426937.

Assessment after a temperature excursion requires the observed range, duration, formulation and preparation date. Returning a vial to refrigeration does not establish that the exposure was acceptable. The secretin study demonstrates that environmental conditions can affect formulation quality. It cannot supply an excursion allowance for other peptides. Without applicable stability data, the remaining stability is uncertain. PMID: 25636302.

Clarity cannot certify quality

Unexpected cloudiness, particles or discoloration can identify a problem. Their absence cannot certify potency or sterility. Published stability experiments used chromatography, mass spectrometry, particle measurements or biological assays to detect changes beyond visible appearance. Those stability measurements do not replace microbiological controls. PMID: 35779744; PMID: 25636302; PMID: 33534816; PMID: 27184207.

The experimental stability findings cited here are laboratory evidence, grade D under this product's scale. They establish neither clinical efficacy nor human safety for an untested preparation. Regulatory handling instructions and infection-control guidance are separate evidence categories. The hospital audit evaluates clinical practice, not peptide treatment outcomes. Approval of an example drug does not upgrade an extrapolated storage claim to grade A.

Handling and storage checklist

- The exact formulation has documented diluent and preparation instructions.
- Container integrity, expiration and lot information have been checked.
- Aseptic preparation includes stopper disinfection and sterile equipment.
- Mixing method and dissolution conditions match the product instructions.
- The record identifies concentration, preparation time and the applicable discard deadline.
- Storage and travel conditions match the validated requirements.
- Temperature excursions and unexpected appearance changes trigger product-specific assessment.
- Clear appearance is never treated as proof of potency or sterility.

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Routes and technique: subcutaneous, intramuscular, intranasal, oral, topical

A route determines which barriers a peptide encounters before reaching its target. Systemic bioavailability describes the fraction of an administered dose that reaches systemic circulation intact. Local activity in the intestine or skin is a separate outcome. Neither gastric stability nor penetration into superficial skin establishes effective bloodstream exposure. Formulation, molecular properties and the delivery device all matter. There is no reliable bioavailability percentage for peptides as a class. These distinctions are supported by the absorption and delivery literature, PMIDs 25122564, 30429357 and 34936316.

> Technique cannot establish the quality, efficacy or safety of an unapproved preparation. A dose documented for one formulation or route cannot be transferred to another without supporting pharmacokinetic data. Injection training belongs with a qualified clinician. PMIDs 27594187 and 42198317.

What each route changes

ROUTE	DELIVERY PRINCIPLE	MAIN LIMITATION
Subcutaneous	Absorption from tissue beneath the skin into blood and lymph.	Absorption rate and losses vary by molecule and formulation, PMID 25122564.
Intramuscular	Deposition in muscle, with exposure dependent on preparation and placement.	A needle that does not reach muscle changes the intended route, PMID 36669836.
Intranasal	Delivery onto nasal mucosa, bypassing gastrointestinal degradation for the nasally absorbed fraction.	Deposition, clearance and device performance influence exposure, PMID 23316447.
Oral	Delivery through the gastrointestinal tract.	Enzymatic degradation and poor epithelial permeability limit most peptides, PMID 30429357.
Topical	Application to skin for a potential local effect.	The stratum corneum restricts penetration; systemic delivery requires separate evidence, PMID 34936316.

Subcutaneous: site selection and rotation

Subcutaneous administration bypasses gastrointestinal digestion but does not guarantee complete absorption. Transport through interstitial tissue, uptake into blood or lymph, and degradation before systemic entry depend on the molecule. Findings from insulin or larger therapeutic proteins cannot establish the pharmacokinetics of an unrelated experimental peptide. PMID 25122564.

Insulin guidance provides a documented clinical framework for site care. Documented sites include abdominal subcutaneous tissue, thighs, buttocks and upper arms. Selection considers tissue depth, accessibility and the medicine's approved instructions. Inspection identifies inflammation, wounds and lipohypertrophy, which is thickened or lumpy tissue associated with repeated insulin administration. Such tissue can produce delayed and unpredictable insulin absorption. PMIDs 27594187 and 28670547.

A documented insulin rotation scheme divides the abdomen into quadrants or other regions into halves. It uses one section for a week before moving systematically to another, with individual puncture sites separated by 1 to 2 cm, PMID 28670547. This scheme distributes puncture sites across a defined area. The evidence

concerns insulin technique. It does not demonstrate that administration near an injured tendon directs an experimental peptide to that tendon.

Needle dimensions: diameter and depth are separate

Gauge describes needle diameter, with higher numbers indicating narrower needles. Length influences potential tissue reach, together with anatomy and placement. A pen needle and a syringe needle are different device components, so dimensions alone do not establish compatibility. Insulin guidance supports short needles to reduce accidental intramuscular delivery. That conclusion concerns the intended tissue layer and does not establish suitability for an experimental peptide preparation. PMIDs 27594187 and 28670547.

DOCUMENTED CONTEXT	GAUGE AND LENGTH	INTERPRETATION
Subcutaneous insulin pens	32 G, 4 mm; comparators included 31 G, 5 or 8 mm, PMID 20429832.	A short randomized crossover trial found comparable glycemic control across the tested needles in adults with diabetes.
Subcutaneous insulin syringes	28 to 31 G, with 6 or 8 mm lengths described, PMID 28670547.	Guidance favors shorter options when appropriate to reduce unintended muscle entry, PMIDs 28670547 and 27594187.
Adult deltoid vaccination	22 to 25 G; lengths include approximately 25 or 38 mm, PMID 36189092.	These are vaccination dimensions, not a universal specification for injectable peptides.

Hygiene and sharps handling

Documented injection practice includes clean hands, a clean preparation area, site inspection, and a new sterile needle and syringe for each administration. Pens and other injection devices are not shared. Where alcohol is used to clean skin, it is allowed to dry completely. Home insulin guidance sometimes accepts visibly clean skin without routine alcohol preparation. That context does not establish the sterility of an unapproved injectable preparation. PMIDs 27594187 and 28670547.

Documented sharps handling includes prompt placement in an appropriate puncture-resistant container, with final disposal through the applicable local collection system. Loose needles in household rubbish expose other people to injury. Recapping and manual needle handling add opportunities for needlestick injury. Device-specific removal procedures and sharps disposal therefore form part of training. PMID 28670547.

Intramuscular: placement determines the tissue reached

Intramuscular delivery depends on anatomical landmarks and sufficient needle reach without penetration into unintended structures. A systematic review found that some participants outside the underweight category required needles longer than 25 mm for adequate deltoid muscle penetration, PMID 36669836. Body mass index alone could not supply a dependable universal cutoff. These findings address anatomical placement, not dose selection or therapeutic superiority.

The deltoid is a documented vaccination site, but its needle specifications cannot simply be applied to every peptide formulation. Accidental deposition in adjacent shoulder structures can cause injury, PMID 36189092. Intramuscular administration also does not establish superior bioavailability. BPC-157 has species-dependent preclinical intramuscular absorption data, without a validated human conversion from subcutaneous or oral administration, PMID 42198317.

Intranasal: volume, deposition and device performance

Nasal absorption bypasses gastrointestinal digestion, but the nasal valve, mucus clearance and deposition pattern constrain exposure. Some deposited material can be cleared toward the throat and swallowed.

Reaching nasal tissue does not establish delivery to a particular brain region. Pump characteristics, formulation and administration technique require evaluation together. PMID 23316447.

The device review reports typical intranasal pump output of 0.1 mL per actuation, ranging from 0.025 to 0.2 mL across devices, PMID 23316447. These are device volumes, not peptide doses or administration frequencies. Nominal output describes liquid emitted by the pump, not the volume retained at a target site. Bilateral administration cannot be inferred from pump output alone.

Priming, head position and breathing instructions are device-specific. More liquid does not necessarily increase absorbed drug because retention and clearance remain limiting. Reproducible pump output also does not prove reproducible bloodstream exposure. Interpretable regimen documentation includes concentration, volume per actuation, actuations per nostril and frequency. The phrase one spray alone does not identify a peptide dose. PMID 23316447.

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Nominal amount per actuation = concentration in mcg/mL x measured mL per actuation
Nominal amount per administration = amount per actuation x total actuations
These calculations describe emitted drug, not the amount deposited or absorbed.
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Oral: stability, permeability and local action

Most peptides face two independent oral barriers: enzymatic breakdown and limited movement across gastrointestinal epithelium. Surviving digestion solves only the first. Oral semaglutide illustrates a formulation-specific exception. Coformulation with the absorption enhancer SNAC supports local protection from degradation and transcellular stomach absorption. Its success cannot be generalized to an ordinary capsule containing another peptide. PMID 30429357.

PIONEER 1 studied oral semaglutide target doses of 3 mg, 7 mg or 14 mg once daily versus placebo, PMID 31186300. The trial enrolled adults with type 2 diabetes and lasted 26 weeks. These are trial regimens, not reader recommendations or conversion factors for other formulations. Oral semaglutide qualifies as evidence A because it is an approved medicine. That grade does not transfer to other oral peptides or establish benefit for every training goal.

The Rybelsus US prescribing information contraindicates semaglutide with personal or family history of medullary thyroid carcinoma, or multiple endocrine neoplasia syndrome type 2. Prior serious hypersensitivity to semaglutide or formulation ingredients is also a contraindication. The label additionally warns about pancreatitis, severe gastrointestinal reactions and gallbladder disease.

BPC-157 is reported to remain stable in gastric juice, but human pharmacokinetics, formulation characterization and validated dosing remain insufficiently established, PMID 42198317. Gastric stability is grade D laboratory evidence. Proposed oral therapeutic effects remain predominantly preclinical, grade C. Chemical persistence does not demonstrate human benefit. BPC-157 is prohibited at all times under WADA category S0. Sport Integrity Canada's April 27, 2026 advisory confirms its inclusion on the 2026 Prohibited List.

KPV offers a different hypothesis: local intestinal activity involving the dipeptide and tripeptide transporter PepT1. Researchers demonstrated cellular uptake and anti-inflammatory effects, then reduced inflammation in mouse colitis models using KPV in drinking water, PMID 18061177. This supports grade C animal efficacy and grade D cellular mechanisms. It does not establish human oral bioavailability, clinical efficacy or a validated human dosing regimen.

Topical: reaching skin is not reaching every target

Topical delivery aims at local skin effects; transdermal delivery implies passage through skin toward systemic circulation. The stratum corneum restricts many peptides because molecular size, charge and hydrophilicity impede passive transport. Results obtained with penetration enhancers or barrier-disrupting devices describe those specific systems. They cannot establish the performance of every cream containing the ingredient. PMID 34936316.

For GHK-Cu, a laboratory study found almost no peptide or copper passage through intact excised human skin under its test conditions. Microneedle pretreatment increased passage, PMID 25690343. This is grade D laboratory delivery evidence, not proof of clinical rejuvenation or a validated home procedure. It also does not establish that all topical GHK-Cu formulations are inactive. Deposition within skin and complete passage through skin are different measurements.

Argireline, acetyl hexapeptide-8, shows poor passive permeation associated with its molecular properties. Chemical modification improved transport for certain analogues in laboratory experiments, PMID 29371611. Separately, a randomized study involving 60 participants reported cosmetic improvement with topical application twice daily for four weeks, PMID 23417317. That small, short human trial supports grade B cosmetic evidence, while the penetration experiments remain grade D. Neither establishes systemic exposure or reliable delivery to deep muscular targets.

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Safety architecture: contraindications, interactions, red flags and drug testing

Safety assessment begins before protocol selection: identify the compound, establish its regulatory status, review medical history and medications, and define discontinuation criteria. Evidence belongs to a particular molecule, formulation, population and indication. Findings from prescribed growth hormone replacement do not establish the safety of experimental secretagogues in healthy adults. Limited human observations cannot establish the long-term safety of a research peptide. References: PMID 21602453; PMID 35319491; PMID 40756949.

> A serious new symptom overrides the protocol and the next planned administration. Stop the suspected compound and seek care at the urgency described below.

Contraindications: distinguish formal exclusions from precautions

An absolute contraindication means a specific medicine should not be used in that setting. A precaution requires assessment of competing risks and alternatives. Neither term should be applied indiscriminately to an entire family. This book also uses editorial exclusions for elective physique, recovery and longevity protocols. These are broader than some prescribing labels and are identified explicitly below. The table presents selected concerns, not every contraindication.

FAMILY OR SETTING	EXCLUSION OR CONCERN	INTERPRETATION
GH axis: growth hormone and GH-stimulating compounds	Active malignancy	Active malignancy contraindicates prescribed GH replacement. Extending this exclusion to experimental GH stimulation is this book's precautionary policy, not an approved label for every secretagogue. PMID 21602453; PMID 35319491.
IGF-1 and analogues	Active malignancy or malignancy history	The Increlex US prescribing information contraindicates mecasermin in pediatric patients with malignancy or a history of malignancy. This does not establish eligibility for experimental adult IGF-1 analogues. PMID 19707272.
All elective protocols in this book	Pregnancy and breastfeeding	Excluded from this book's elective protocols because adequate safety evidence is unavailable. This is not a universal contraindication to medically necessary peptide medicines. Incretin pregnancy and lactation evidence remains limited. PMID 41885132.
Incretins with applicable thyroid warnings	Personal or family history of medullary thyroid carcinoma, or MEN2	Formal contraindications appear in the Wegovy and Zepbound US prescribing information. Ordinary hypothyroidism is different. These warnings do not establish that semaglutide or tirzepatide causes human thyroid cancer.
Bremelanotide	Known cardiovascular disease or uncontrolled hypertension	Formal contraindications in the Vyleesi US prescribing information. Bremelanotide transiently raises blood pressure. Its labeling cannot automatically be assigned to every melanocortin compound. PMID 31429064.
Incretin therapies	Previous pancreatitis	A history requiring clinical assessment, not a universal absolute contraindication. Suspected acute pancreatitis requires discontinuation and evaluation. PMID 34305810.

FAMILY OR SETTING	EXCLUSION OR CONCERN	INTERPRETATION
Semaglutide and tirzepatide	Severe gastroparesis	The Wegovy and Zepbound US prescribing information state that treatment is not recommended in severe gastroparesis. This is distinct from a formal contraindication.
Any specific medicine	Previous serious hypersensitivity to that medicine or an ingredient	Check the exact label for formal contraindications. A different formulation or repeat exposure cannot be assumed tolerable without specialist assessment. PMID 33204386.

A remote cancer history is not equivalent to active cancer. A consensus supports considering GH replacement in selected GH-deficient cancer survivors in remission after individualized assessment. This does not establish suitability for bodybuilding exposure or IGF-1 analogues. Limited observational reassurance after inadvertent early incretin exposure does not establish safety throughout pregnancy or breastfeeding. References: PMID 35319491; PMID 41885132.

Formal exclusions depend on the exact medicine and jurisdiction. The label statements above were checked against the [Wegovy US prescribing information](https://dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm?setid=ee06186f-2aa3-4990-a760-757579d8f77b), [Zepbound US prescribing information](https://www.dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm?setid=487cd7e7-434c-4925-99fa-aa80b1cc776b), [Increlex US prescribing information](https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=a8b27a1b-a611-4f91-ad22-76d4b390c3ae), and [Vyleesi US prescribing information](https://dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm?setid=f1d0c1b5-2f39-4bad-a6a4-0066e3ad5dcf).

Interactions: review the complete medication list

Record prescriptions, nonprescription medicines, supplements and intermittent treatments. Include the actual formulation and route. Interaction evidence for an approved molecule does not automatically cover an experimental analogue. An empty interaction database entry means insufficient information rather than demonstrated compatibility. This distinction matters especially when clinical safety evidence is inadequate, as illustrated by the BPC-157 review. Reference: PMID 40756949.

EXPOSURE	COMMON MEDICATION INVOLVED	DOCUMENTED ISSUE
GLP-1 receptor agonists	Insulin or sulfonylureas	Hypoglycemia risk increases with these background medicines. The prescriber may need to reassess treatment and glucose monitoring. PMID 34305810.
GH replacement	Diabetes medicines	GH can reduce insulin sensitivity and change glucose-lowering treatment requirements. PMID 21602453.
GH replacement	Levothyroxine or glucocorticoid replacement	GH can change thyroid and cortisol physiology, revealing inadequate replacement or previously masked pituitary deficits. PMID 21602453.
Injectable GLP-1 receptor agonists studied in the review	Oral drugs, including warfarin and digoxin	Delayed gastric emptying can change absorption timing. Reviewed studies generally found no clinically important overall exposure change. Narrow therapeutic index medicines and kidney dysfunction warrant individualized review. PMID 38273155.
Bremelanotide	Oral naltrexone	Reduced naltrexone exposure can compromise treatment. The Vyleesi US prescribing information advises avoiding this combination when oral naltrexone treats alcohol or opioid addiction.

Tirzepatide has a specific oral hormonal contraception warning. Its US label calls for nonoral contraception or an added barrier method for four weeks after initiation and four weeks after each dose escalation. This is not a blanket rule for every incretin. Reference: [Zepbound US prescribing information, sections 7.2 and 8.3]

(https://www.dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm?setid=487cd7e7-434c-4925-99fa-aa80b1cc776b).

For bremelanotide, reduced oral naltrexone exposure creates a risk of treatment failure. This is a potential clinical consequence, not an inevitable outcome. Reference: [Vyleesi US prescribing information, section 7.2](https://dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm?setid=f1d0c1b5-2f39-4bad-a6a4-0066e3ad5dcf).

Planned anesthesia or deep sedation also belongs in the medication review. GLP-1 therapies delay gastric emptying, and pulmonary aspiration has been reported during procedures. The anesthesia team needs the exact exposure history; this chapter provides no universal interruption schedule. Reference: [Wegovy US prescribing information, section 5.10](https://dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm?setid=ee06186f-2aa3-4990-a760-757579d8f77b).

Red flags: symptoms determine urgency

The following are triage signals, not diagnoses. Suspend further exposure to the suspected compound while arranging assessment. Emergency symptoms require emergency services rather than waiting for routine laboratory results.

SYMPTOM	POSSIBLE CONCERN	REQUIRED RESPONSE
Tongue or throat swelling, wheezing, breathing difficulty or collapse	Anaphylaxis, which can occur without a rash	Emergency services immediately; follow an existing prescribed allergy emergency plan. PMID 33204386.
Chest pain, collapse, or severe headache with neurological symptoms	Possible cardiovascular or neurological emergency	Emergency assessment immediately. These symptoms warrant assessment regardless of the suspected cause; bremelanotide additionally has a documented blood pressure warning. Vyleesi US prescribing information.
Confusion, seizure or loss of consciousness, especially with sweating or tremor	Severe hypoglycemia or another emergency	Emergency assistance; do not give food or drink to someone unable to swallow safely. Mecasermin-associated hypoglycemia is discussed in PMID 19707272.
Persistent severe upper abdominal pain, sometimes extending to the back	Possible acute pancreatitis	Urgent hospital assessment, especially with repeated vomiting. PMID 34305810.
Right upper abdominal pain with fever or jaundice	Possible gallbladder or biliary complication	Urgent same-day assessment; severe illness warrants emergency care. PMID 34305810.
Repeated vomiting, inability to retain fluids, faintness or markedly reduced urination	Dehydration and possible acute kidney injury	Urgent same-day assessment; collapse or confusion warrants emergency services. PMID 34305810.
Severe new headache with visual changes or vomiting during GH or IGF-1 exposure	Possible intracranial hypertension	Urgent assessment rather than treating this as an expected adjustment effect. PMID 19707272; PMID 21602453.
Expanding redness, severe localized pain, pus or fever after skin penetration	Possible skin or deeper tissue infection	Same-day assessment; rapidly progressive pain, confusion or systemic illness warrants emergency care. PMID 24947530.

Provide the treating team with the compound name, packaging details, route, exposure timing, other medicines and symptom chronology. These details help distinguish an adverse drug effect from infection, an interaction or an unrelated illness. Keep the record factual; a presumed explanation should not delay assessment.

When laboratory testing is warranted

Testing should answer a clinical question. In medically indicated GH treatment, assessment includes IGF-1, glucose status and relevant thyroid and adrenal function. Results are interpreted alongside symptoms and the

underlying pituitary diagnosis. Monitoring during prescribed replacement cannot establish a validated safety schedule for experimental secretagogues. Reference: PMID 21602453.

For incretin treatment, glucose monitoring is particularly relevant with insulin or sulfonylureas. Significant vomiting or diarrhea can warrant renal function and electrolyte assessment. Compatible abdominal symptoms can warrant pancreatic enzymes and imaging selected by the clinician. Isolated enzyme elevations do not establish pancreatitis. Repeated testing in an asymptomatic person does not provide clearance for continued exposure. Reference: PMID 34305810.

Routine calcitonin testing or thyroid ultrasound has uncertain value for screening asymptomatic semaglutide users. A thyroid nodule or relevant history requires its own assessment. Reference: [Wegovy US prescribing information, section 5.1](https://dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm?setid=ee06186f-2aa3-4990-a760-757579d8f77b).

Normal bloodwork cannot validate an unstudied exposure. Grade A denotes an approved drug or multiple human randomized trials, not established safety for every use. Grade B covers small, short or single-arm human trials, or consistent case series. Grade C covers animal evidence or human data too weak for the claim. Grade D covers in vitro, mechanistic or anecdotal evidence. The BPC-157 review found predominantly preclinical evidence, one weak human study and no clinical safety data within its search through June 3, 2024. Its musculoskeletal application evidence remains grade C on this scale. Reference: PMID 40756949.

Drug testing and athlete responsibility

These examples follow the WADA 2026 Prohibited List, effective January 1, 2026. The listed S0, S2 and S4 substances are prohibited in and out of competition. Reference: [WADA 2026 Prohibited List](https://www.wada-ama.org/sites/default/files/2025-09/2026list_en_final_clean_september_2025.pdf).

CATEGORY	RELEVANT EXAMPLES	INTERPRETATION
S0: Non-approved substances	BPC-157	Covers pharmacological substances without governmental approval for human therapeutic use when not addressed elsewhere on the List.
S2: Peptide hormones, growth factors, related substances and mimetics	GH, AOD-9604, CJC-1295, tesamorelin, ipamorelin, GHRPs, IGF-1 and TB-500	Medicinal approval does not remove the sporting prohibition.
S4: Hormone and metabolic modulators	MOTS-c, insulins, insulin mimetics and follistatin	Follistatin appears among myostatin-binding proteins; MOTS-c appears among AMPK activators.

A prescription is not itself a Therapeutic Use Exemption. TUE requirements and recognition depend on the athlete's status and responsible organization. Strict liability means intent is not required to establish a prohibited-substance presence violation; fault can still affect consequences. Reference: [World Anti-Doping Code, articles 2.1 and 4.4](https://www.wada-ama.org/sites/default/files/resources/files/2021_wada_code.pdf).

Verify the exact substance against the current List and applicable sport rules. Absence from this example table does not establish eligibility. Analytical methods continue to develop, and a previous negative test does not establish permission. The cited review discusses analytical research and the 2025 List; it does not establish the 2026 classifications. Reference: PMID 41702393.

Legal status: separate three different questions

An approved drug has authorization for a defined product and use. That authorization does not transfer automatically to another formulation or research analogue. A research compound may have published biological findings without approval for human treatment. The BPC-157 review describes this distinction and reports the compound's lack of FDA approval. Reference: PMID 40756949.

A cosmetic ingredient belongs to a different regulatory context. In the United States, intended use and claims help determine whether a product is a cosmetic, a drug or both. Cosmetic marketing does not establish

authorization for systemic treatment. Reference: [FDA explanation of cosmetics and drugs] (https://www.fda.gov/cosmetics/cosmetics-laws-regulations/it-cosmetic-drug-or-both-or-it-soap).

Jurisdiction matters: prescribing, compounding, importation, possession and supply can be governed differently. Regulatory authorization, clinical suitability and sporting eligibility are separate checks. Current local requirements must be confirmed for the exact product and intended activity with the relevant regulator or qualified professional. This chapter provides no universal legal clearance.

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The hierarchy of systems: why protocols can fail before the first dose

A protocol can fail before exposure begins because its target does not match the problem. The Protocol Room uses five assessment steps: inflammation and immunity, mitochondrial energy, nervous system and sleep, metabolism and insulin sensitivity, then tissue and anabolic stimulus. This is an editorial planning framework, not a clinically validated treatment sequence. The systems interact, and several problems may require attention together.

The rationale for this order is to examine constraints before considering additional biological stimulation. Low energy availability can compromise health and performance across multiple systems. Experimental sleep restriction reduced muscle protein synthesis in the group without added exercise (PMIDs: 37752011, 32078168). A hypertrophy assessment therefore includes food and sleep before attributing a plateau to growth signaling. These findings support checking foundations, but do not validate five sequential treatment stages.

> Planning principle: identify unresolved constraints relevant to the goal before considering escalation. Their priority depends on clinical importance, not their position in this framework.

Evidence belongs to a specific claim. A means an approved drug or multiple human randomized trials. B means small, short or single-arm human trials, or consistent case series. C means animal evidence or human findings too weak to support the claim. D means in vitro, mechanistic or anecdotal evidence. Approval for one indication does not validate another goal, route or combination. Study quality and whether results support efficacy remain separate questions.

Step 1: inflammation and immunity

The intake questions concern persistent gastrointestinal symptoms, repeated illness, unresolved injury and deteriorating recovery. These observations belong in the assessment record; they are not diagnoses of systemic inflammation. The IOC consensus describes immune, gastrointestinal and performance consequences associated with problematic low energy availability. Food intake and training demand are therefore relevant assessment factors (PMID: 37752011).

BPC-157 is a catalog cross-reference for proposed inflammatory and repair pathways. Its musculoskeletal review included 35 preclinical studies and one small retrospective clinical study (PMID: 40756949). This supports Grade C for human tendon or ligament repair. Reported knee-pain relief does not establish restored tissue strength, and the review found no clinical safety data. KPV reduced inflammation in mouse colitis models, also Grade C for clinical gut-repair claims (PMID: 18061177).

Assessment first establishes the problem, nutritional adequacy and compatibility of training with injury and recovery capacity. Symptoms alone do not identify a nutritional deficiency or justify an immune intervention. Tendon & Ligament Repair, Post-Injury Recovery Accelerator and Gut Repair map here, with tissue function reassessed at step 5. Persistent or worsening unexplained symptoms warrant clinical assessment (PMIDs: 37752011, 40756949).

Step 2: mitochondrial energy

The record captures falling exercise tolerance, fatigue between sessions and difficulty sustaining previously manageable work. These are assessment prompts, not evidence of mitochondrial disease. Initial review concerns fueling, carbohydrate availability, recovery time and potentially relevant deficiencies. Low energy availability can impair performance, so fatigue alone does not establish a mitochondrial peptide target (PMID: 37752011).

MOTS-c connects this step with step 4. Its foundational study reported metabolic signaling effects and improved insulin sensitivity in mice, Grade C for therapeutic metabolic improvement in humans (PMID: 25738459). Elamipretide, cataloged as SS-31, illustrates the limits of target-based reasoning. MMPOWER-3 studied 40 mg subcutaneously once daily for 24 weeks in primary mitochondrial myopathy (PMID: 37268435). It did not improve the primary walking-distance or fatigue outcomes. This documented dose is not a reader recommendation or a regimen for unexplained fatigue.

Metabolic and Mitochondrial Reset and Longevity Maintenance therefore require a defined baseline and measurable outcome. Reset is a protocol title, not a demonstrated physiological event.

Step 3: nervous system and sleep

The screening record captures sleep opportunity, prolonged sleep onset, repeated awakenings, daytime fatigue and inconsistent concentration. Sleep assessment precedes attributing these observations to a need for cognitive enhancement. Cognitive behavioral therapy for insomnia has randomized-trial support (PMID: 26054060). A controlled study found reduced muscle protein synthesis during restricted sleep without added exercise (PMID: 32078168). Sleep therefore matters to both cognitive and tissue goals.

Catalog cross-references include Semax and Selank. The cited Semax study concerns protective signaling in rat cerebral ischemia; the Selank study concerns brain monoamines in mice (PMIDs: 34201112, 19093364). These provide Grade C support for proposed human applications, without demonstrating cognitive enhancement or neuro-regeneration in healthy trainees. DSIP has Grade B study-level evidence from a small insomnia trial. Its weak findings did not establish meaningful therapeutic benefit (PMID: 1299794).

Deep Sleep, Cognitive Focus and Neuro-Regeneration map here, but require different endpoints. Libido and Sexual Response also intersects this step. PT-141, or bremelanotide, has Grade A evidence from two randomized trials in premenopausal women with hypoactive sexual desire disorder. Those trials studied 1.75 mg subcutaneously as needed (PMID: 31599840). Desire and related distress improved, while nausea, flushing and headache were more frequent. These findings do not establish universal sexual enhancement. Uncontrolled hypertension and known cardiovascular disease are contraindications because bremelanotide can transiently raise blood pressure. Source: [U.S. bremelanotide prescribing information, contraindications and warnings](https://dailymed.nlm.nih.gov/dailymed/lookup.cfm?setid=f1d0c1b5-2f39-4bad-a6a4-0066e3ad5dcf).

Step 4: metabolism and insulin sensitivity

The record includes weight and waist trends, eating patterns, training performance and clinically indicated glucose measurements. Subjective energy and appetite do not establish insulin sensitivity. Nutrition planning considers the goal, protein adequacy and the risk of problematic underfueling (PMIDs: 37752011, 28698222).

Semaglutide is the catalog example with established clinical weight-management evidence. STEP 1 studied a target dose of 2.4 mg subcutaneously once weekly, after escalation, alongside lifestyle intervention (PMID: 33567185). Participants had overweight or obesity without diabetes; gastrointestinal adverse effects were common. Grade A weight-management evidence does not establish muscle preservation. Contraindications include personal or family medullary thyroid carcinoma, multiple endocrine neoplasia type 2, and prior serious hypersensitivity to semaglutide or formulation ingredients. Source: [U.S. semaglutide weight-management prescribing information, contraindications](https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=ee06186f-2aa3-4990-a760-757579d8f77b). MOTS-c remains Grade C for the human metabolic treatment claim based on the cited mouse experiment (PMID: 25738459).

Fat Loss with Muscle Preservation, Non-Incretin Recomposition and Metabolic and Mitochondrial Reset meet here. Non-incretin describes a category, not an equivalent evidence base. Clean Bulk and Advanced Hypertrophy also revisit this checkpoint. In an older-adult trial, the nonpeptide ghrelin mimetic MK-677 increased fat-free mass and reduced insulin sensitivity. Strength and function did not demonstrably improve; statistical power for functional endpoints was limited (PMID: 18981485).

Step 5: tissue and anabolic stimulus

Assessment now concerns training progression, tissue tolerance and nutritional support for adaptation. A plateau alone does not establish insufficient anabolic signaling. A meta-analysis found that protein supplementation augmented resistance-training gains (PMID: 28698222). Its modeled plateau was approximately 1.6 g/kg/day of total dietary protein consumed orally each day, with no further average fat-free-mass benefit above that level (PMID: 28698222). This is a population estimate, not an individual prescription or evidence for a specific meal schedule.

CJC-1295 is the catalog cross-reference for growth-hormone signaling. Short randomized studies of the long-acting form documented increased GH and IGF-I, Grade B for those hormonal endpoints (PMID: 16352683). They did not establish athletic hypertrophy, tendon recovery or long-term safety. BPC-157 remains Grade C for human musculoskeletal repair (PMID: 40756949). GHK-Cu literature includes mechanistic and preclinical tissue-remodeling findings. Extrapolation to a systemic Skin Hair and Connective Tissue regimen or human longevity benefit remains Grade D, without clinical validation (PMID: 29986520).

Mapping the 14 Protocol Room entries

This table assigns assessment priorities, not treatment sequences. Every entry still receives the full five-step review. The names describe intended goals; the cited studies do not validate these complete protocols or their combinations.

PROTOCOL	PRIMARY STEPS	FIRST PLANNING CHECKPOINT	OUTCOME TO DOCUMENT
Tendon & Ligament Repair	1 and 5	Injury assessment and workload	Function and load tolerance
Post-Injury Recovery Accelerator	1, 2 and 5	Diagnosis and rehabilitation plan	Rehabilitation milestones
Gut Repair	1	Cause of persistent symptoms	Symptoms and nutritional adequacy
Clean Bulk	4 and 5	Energy intake and progressive training	Strength, weight and waist
Advanced Hypertrophy	3, 4 and 5	Sleep, protein and recoverable workload	Strength and muscle measurements
Fat Loss with Muscle Preservation	4 and 5	Energy deficit and protein adequacy	Weight trend and strength
Non-Incretin Recomposition	2, 4 and 5	Evidence for the exact intervention	Waist and performance
Metabolic and Mitochondrial Reset	2 and 4	Fatigue assessment and metabolic baseline	Function and relevant laboratory results
Deep Sleep	3	Sleep opportunity and insomnia assessment	Sleep continuity and daytime function
Cognitive Focus	3	Sleep and baseline cognitive complaint	Repeatable task performance
Neuro-Regeneration	1 and 3	Neurological diagnosis and rehabilitation	Condition-specific function
Longevity Maintenance	1 through 5	Established risks and functional baseline	Function and risk-factor trends
Libido and Sexual Response	3 and 4	Nature and context of sexual symptoms	Desire, distress and response
Skin Hair and Connective Tissue	1 and 5	Diagnosis and nutritional assessment	Standardized photographs and function

Turning the hierarchy into a decision record

The decision record starts with the goal, unresolved constraint and evidence gap before any dose field. For example, a hypertrophy plateau with shortened sleep and inconsistent food intake generates a recovery and nutrition review. It does not establish growth-hormone deficiency. Reassessment distinguishes changes in symptoms, biomarkers and actual function.

```
Goal:
Primary hierarchy step:
Unresolved constraint:
Baseline measure:
Nonpeptide factors to address:
Compound evidence grade for this exact outcome:
Study population, route and frequency:
Documented dose source, if applicable:
Relevant contraindications and evidence gaps:
Review date and reassessment criteria:
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Under the WADA 2026 Prohibited List, BPC-157, MOTS-c, CJC-1295, MK-677, IGF-1 and thymosin-beta-4 derivatives including TB-500 are prohibited at all times. BPC-157 appears in S0, MOTS-c in S4, and the other listed substances in S2. Sporting eligibility is a separate constraint from biological plausibility or evidence grade. Source: [WADA 2026 Prohibited List](https://www.wada-ama.org/sites/default/files/2025-09/2026list_en_final_clean_september_2025.pdf).

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Your first 30 days: from reading to a documented plan

Your first month has a concrete deliverable: one defined goal, an evidence file, completed pre-checks, and a record another person can understand. Understand. Plan. Apply with judgment. This calendar organizes your work with UU LIFE PEPTIDES 2.0. It is an educational schedule, not a clinically validated treatment timeline. A documented decision to defer treatment is a completed outcome.

> The calendar never authorizes treatment. Any treatment start requires a clinician-reviewed plan documenting the indication, contraindications, interactions, source, monitoring schedule, and stopping criteria.

Week 1: understand the system and define the question

Read Foundations before opening the Protocol Room. Use the glossary whenever a term changes your interpretation, especially mechanism, route, half-life, and evidence grade. Create one folder for references, calculator checks, clinical questions, sourcing documentation, and tracker exports. Keep unanswered questions visible.

DAY	ACTION	SAVED OUTPUT
1	Read Foundations and note unfamiliar terms in the glossary.	A short glossary and a list of unresolved questions.
2	Use the Master Map to identify one goal and its relevant module.	One goal sentence and one primary outcome to track.
3	Read the two or three cards most relevant to that goal.	A comparison of evidence, study population, outcomes, and uncertainties.
4	Open the cards' references and compare the studies with their claims.	A source file with PMIDs and notes on applicability.
5	Run the calculator as a documented arithmetic rehearsal using a sourced card example.	Inputs, units, source, result, and questions requiring verification.
6	Collect your health history, medication list, and existing measurements for clinical review.	A pre-check packet with missing information clearly marked.
7	Review the packet and open the progress tracker.	A baseline record and a decision to investigate, defer, or seek clinical review.

Choose a goal you can describe without naming a peptide. For example: document waist measurements under consistent conditions while maintaining the planned training schedule. Define the measurement method, timing, and what change would matter before collecting results. Keep secondary observations separate from the primary outcome.

Apply the system's evidence scale to each relevant claim. A means an approved drug or multiple human randomized trials. B means small, short, or single-arm human trials, or consistent case series. C means animal data only or human evidence too weak to support the claim. D means in vitro, mechanistic, or anecdotal evidence. Record the indication beside the grade. Approval or evidence for one purpose does not establish benefit for another.

Week 2: verify the plan and complete pre-checks

On days 8 through 10, take the shortlisted cards and questions to a qualified clinician. Include medicines and supplements, allergies, relevant diagnoses, previous adverse reactions, and pregnancy or breastfeeding status where applicable. Document the intervention-specific contraindication and interaction review. Ask which examination, measurements, or laboratory tests are relevant. Record the answer; this chapter does not assign a universal peptide laboratory panel.

On days 11 through 14, use the Smart Buyer scorecard as a documentation audit. Record supplier identity and authorization, product classification, traceability, and the connection between the product lot and its certificate of analysis. Record the laboratory, report date, methods, and results. Keep identity, purity, and any required sterility or endotoxin documentation as separate fields. Mark absent evidence as missing.

The scorecard documents sourcing questions; it does not establish suitability for human use or provide medical clearance. For prescribed treatment, record dispensing details reviewed with the clinician or pharmacist. If competitive sport applies, record current WADA status from the official list, including applicable restrictions, the date checked, and any required review.

Revisit the calculator after the source review. Every dose figure needs route, frequency, and provenance in the same field. Use a study PMID, a named regulatory label, or the exact tag: commonly cited in non-clinical use; not validated in trials. That tag describes reported use, not a validated regimen. Use mcg, mg, IU, and mL consistently. Leave unsupported inputs blank.

```
Calculator verification record
Card and version:
Source PMID, named regulatory label, or non-clinical provenance tag:
Reported amount, unit, route, frequency, and provenance together:
Other required inputs and their sources:
Calculator output and unit, with provenance if a dose:
Independent arithmetic check:
Clinician or pharmacist questions:
Status: arithmetic verified, unresolved, or not applicable
Arithmetic verification does not establish clinical suitability.
```

Week 3: open the protocol record and log consistently

On day 15, identify the relevant Protocol Room entry and compare it with the reviewed plan. Record discrepancies for resolution. If treatment has been prescribed and pre-checks are complete, document the clinician-set start date and instructions. Otherwise, open a baseline-only record. The onboarding schedule continues without forcing a treatment start.

Written monitoring has evidence as a general behavior-change tool. A meta-analysis found that interventions promoting progress monitoring improved goal attainment, with larger effects when progress was physically recorded. This supports the logging habit, not peptide effectiveness or this calendar. Harkin B, 2016, Psychological bulletin, PMID 26479070.

- Log the date, primary outcome, measurement conditions, and whether the scheduled entry was completed.
- Record training, nutrition, sleep, illness, and medication changes as context.
- For prescribed treatment, record actual administration details and deviations. Each dose entry includes units, route, frequency, provenance, and the associated clinical instructions.
- Record new symptoms with onset, duration, severity, and the action taken. Symptoms requiring prompt assessment should not wait for day 30.
- Mark missing observations as missing instead of reconstructing them from memory.

Week 4: check completeness and prepare the review

On days 22 through 29, check the tracker for missing entries, inconsistent measurements, unrecorded changes, and unresolved symptoms. Summarize baseline and follow-up observations using the method

chosen in week one. Separate treatment exposure from adherence to logging. An empty tracker cannot establish that either treatment or monitoring occurred as planned.

CENT guidance addresses reporting formal N-of-1 trials, which use clinical-trial methods to evaluate individual treatment effects. This chapter adapts its emphasis on explicit methods and transparent reporting as an educational workflow. An ordinary before-and-after tracker does not establish causation or become a trial. Vohra S, 2016, Journal of clinical epidemiology, PMID 26272792. Interpret observed improvement alongside other changes.

Day 30: answer the review questions

1. What was the original goal, and did I measure the outcome I selected?
2. How complete is the baseline, and how many scheduled observations are missing?
3. Were measurement methods and conditions consistent enough to compare?
4. What changed, and did it meet the meaningful-change criterion recorded beforehand?
5. What training, nutrition, sleep, illness, or medication changes complicate interpretation?
6. What symptoms or adverse events occurred, and were the planned responses followed?
7. Do unresolved evidence, calculator, clinical, or sourcing questions remain?
8. What does the clinician recommend next, and when will the next review occur?

Finish with a dated record: continued observation, further assessment requested, or the clinician's documented treatment decision. Save the reasoning beside the tracker export and source file. Day 30 closes the onboarding review. It does not automatically end treatment, justify escalation, or establish long-term safety.

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Understand first.

Every card in the next three modules assumes these eight chapters.

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