

RESEARCH MONOGRAPH · COMPOUND PROFILE

Selank

A 7-residue peptide developed at the Russian Academy of Sciences as a stable analog of tuftsin, characterized for anxiolytic, immunomodulatory, and cognitive endpoints in a substantial Russian-language literature.

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ABSTRACT

Selank (sequence Thr-Lys-Pro-Arg-Pro-Gly-Pro; CAS 129954-34-3; molecular formula C₃₃H₅₇N₁₁O₉; molecular weight 751.85) is a synthetic heptapeptide developed in the early 1990s at the Institute of Molecular Genetics of the Russian Academy of Sciences in collaboration with the Zakusov Research Institute of Pharmacology. The peptide is a stabilized analog of tuftsin, a naturally occurring tetrapeptide (Thr-Lys-Pro-Arg) derived from immunoglobulin G that has documented immunomodulatory effects but a very short half-life. Selank extends the tuftsin sequence with the C-terminal tripeptide Pro-Gly-Pro to confer protection against rapid peptidase degradation. The compound has been studied principally in the Russian clinical and preclinical literature, with the largest body of work on anxiolytic effects in generalized anxiety disorder, immunomodulatory effects in viral and bacterial infection models, and cognitive effects in attention and memory tasks. Selank is registered as a prescription medicine in the Russian Federation for the treatment of generalized anxiety disorder under the trade name Selank Bioregulator. The compound is not approved by any regulatory authority outside the Russian Federation; clinical use in the United States, the European Union, and Japan is off-label and outside the scope of regulatory oversight. The principal limitations on the strength of the evidence are the dominance of the Russian-language literature, limited Western independent replication of the most-cited findings, and the relatively small clinical sample sizes in the published trials.

Compound identification

Nomenclature and synonyms

The compound is referred to as Selank or Selankum. The original developmental designations include TP-7 and tuftsin analog 7. The CAS number is 129954-34-3. The PubChem CID is 11765683. The compound is registered in the Russian Federation under the trade name Selank Bioregulator.

A point of confusion is the relationship between Selank and the related anxiolytic peptide Semax. The two compounds were developed by overlapping research groups at the Institute of Molecular Genetics in Moscow but have distinct sequences (Selank is Thr-Lys-Pro-Arg-Pro-Gly-Pro, Semax is Met-Glu-His-Phe-Pro-Gly-Pro), distinct parent compounds (tuftsin for Selank, ACTH(4-10) for Semax), and distinct primary indications (anxiety for Selank, cognitive enhancement and stroke recovery for Semax). The shared C-terminal Pro-Gly-Pro tripeptide is a stability-conferring extension common to both.

Structural chemistry

The amino acid sequence is L-threonine - L-lysine - L-proline - L-arginine - L-proline - L-glycine - L-proline. The peptide is 7 residues, with three prolines providing significant constraint to the backbone conformation and resistance to peptidase degradation. The molecular formula is C₃₃H₅₇N₁₁O₉; the average molecular weight is 751.85 g/mol; the monoisotopic mass is 751.43 daltons.

The N-terminal threonine and the central arginine and lysine residues provide the principal ionizable side chains. The peptide carries a substantial net positive charge of +2 at physiological pH. The proline-rich C-terminal segment confers metabolic stability at the cost of conformational flexibility; the peptide is a constrained random coil rather than a fully flexible chain.

Physicochemical properties

Selank is supplied as a white powder. The lot of record (Kodiac biolabs lot 20260313) conforms to this description. Solubility in water and bacteriostatic water is high; concentrations up to 5 mg/mL are routinely prepared without precipitation. The peptide is also soluble in 0.9 percent saline, PBS, and standard biological buffers. Solubility in DMSO is poor.

The peptide is stable in the lyophilized state at minus 20 degrees Celsius for at least 24 months under standard light protection. Reconstituted solutions in bacteriostatic water are stable at 2 to 8 degrees Celsius for at least 30 days. Freeze-thaw cycles should be avoided.

Discovery and developmental history

Origin in the Russian Academy of Sciences

Selank emerged from a research program at the Institute of Molecular Genetics of the Russian Academy of Sciences and the Zakusov Research Institute of Pharmacology in the late 1980s and early 1990s. The starting point was the natural tetrapeptide tuftsin, originally identified in 1970 by Najjar and Nishioka as a phagocytosis-stimulating fragment of the immunoglobulin G heavy chain. Tuftsin had documented immunomodulatory effects but a very short biological half-life (under 5 minutes in serum) due to rapid peptidase cleavage. The Russian research group sought to develop a stable analog that retained the immunomodulatory activity and to extend the pharmacology to other CNS endpoints.

Selank was disclosed in Russian-language pharmacology literature in the early 1990s and progressed through clinical evaluation in the Russian Federation through the late 1990s and 2000s, culminating in registration as a prescription anxiolytic. The developmental work was led by Andrey Myasoedov, Lyudmila Andreeva, Lubov Smolskaya, and colleagues at the Institute of Molecular Genetics, with clinical work coordinated through the Zakusov Institute and several Moscow neuropsychiatric clinics.

Clinical translation

Selank is registered in the Russian Federation as a prescription medicine for the treatment of generalized anxiety disorder. The clinical record includes several Phase 2 and Phase 3 trials in anxiety, with reported efficacy comparable to benzodiazepine comparators (medazepam in particular) but without the sedation, dependence, or withdrawal effects that complicate benzodiazepine therapy. Additional clinical work has explored Selank in attention-deficit conditions and in the treatment of opiate withdrawal symptoms.

There is no FDA-approved IND for Selank in any indication. The compound is not a regulated drug substance in the United States, the European Union, or Japan. The Russian regulatory record does not directly translate to Western regulatory frame-

works because of differences in trial design conventions, sample sizes, and post-marketing surveillance.

Mechanism of action

GABA-A receptor modulation

The most-cited mechanism is enhancement of GABA-A receptor activity, the same receptor system that mediates the anxiolytic effects of benzodiazepines. The mechanism by which Selank modulates GABA-A is not direct receptor binding (the peptide does not occupy the benzodiazepine site or the GABA site) but rather indirect modulation, possibly through effects on neurosteroid synthesis or through allosteric effects mediated by an upstream peptide-sensitive receptor. The functional consequence in animal anxiety models is similar to benzodiazepine anxiolysis but without the sedation that characterizes benzodiazepines at therapeutic doses.

Enkephalinase inhibition

A more specific mechanistic claim is that Selank inhibits enkephalinase (the enzyme that degrades endogenous opioid peptides), producing accumulation of enkephalins at synaptic sites. This mechanism is consistent with the reported effects on opiate withdrawal symptoms and with some of the cognitive and mood effects. The supporting evidence is limited but reproducible across the Russian laboratory groups that have studied it.

Tufts-like immunomodulation

The parent compound tuftsins is a phagocytosis-stimulating peptide; Selank retains some of this immunomodulatory activity in cell culture and animal models. Reported effects include increased phagocytic activity of macrophages and neutrophils, enhanced antibody response to vaccination, and accelerated recovery from viral and bacterial infection in animal models. The functional consequences in human clinical use are less well characterized.

Cognitive effects

Reported cognitive effects in animal models include enhanced attention, improved memory consolidation, and reduced effects of stress on cognitive performance. The mechanism is not fully characterized; proposed pathways include direct effects on hippocampal BDNF expression and indirect effects through normalization of stress-axis activity.

Limits of the mechanistic model

The mechanistic literature is dominated by a small number of Russian research groups with limited independent replication outside the originating consortium. The reported effects (anxiolysis, immunomodulation, cognitive enhancement) are individually plausible but the receptor-level mechanism is incompletely characterized. Investigators should treat Selank as a peptide with documented short-term anxiolytic effects in the Russian clinical literature and with mechanistic claims that exceed the strength of independent replication.

Pharmacokinetics

Routes of administration

Intranasal administration is the route used in Russian clinical practice and in the majority of preclinical work. The intranasal route bypasses gastric and first-pass hepatic degradation, achieves rapid systemic absorption, and provides direct access to the central nervous system through the olfactory and trigeminal nerve pathways. Subcutaneous, intramuscular, and intravenous administration have also been characterized in preclinical work; oral bioavailability is poor due to gastric peptidase degradation.

Plasma half-life and tissue distribution

Plasma half-life following intranasal administration is approximately 30 to 60 minutes. The pharmacological effect duration extends substantially beyond the plasma half-life, reflecting persistence of downstream signaling. The peptide is detectable in brain tissue following intranasal administration at concentrations sufficient for the proposed central nervous system effects.

Metabolism and excretion

Selank is hydrolyzed by serum and tissue peptidases, with the C-terminal Pro-Gly-Pro tripeptide conferring substantial protection against the rapid degradation that limits the parent tuftsin tetrapeptide. Major metabolites include the central tetrapeptide (the tuftsin-like core) and shorter fragments. Renal excretion of intact peptide and shorter fragments is the primary clearance route.

Reported research dose ranges

Russian clinical practice for anxiety uses intranasal Selank at 0.15 percent solution, 0.3 milliliters total per dose (approximately 450 micrograms), three times daily, for treatment courses of 10 to 14 days. Allometric scaling of the rodent literature places the equivalent human exposure in the range of 50 to 500 micrograms per dose, broadly consistent with the clinical practice.

The dose range commonly cited in research-grade vendor literature (250 to 1000 micrograms per research subject, intranasally, two to three times per day, in 10 to 14 day cycles) is consistent with the clinical practice. Investigators should treat the cycle-based dosing as central to the published pharmacology; sustained or chronic dosing is not the standard regimen and the effects may differ.

Sourcing and quality verification

Synthesis route

Selank is produced by solid-phase peptide synthesis using Fmoc chemistry. The 7-residue length is well within routine SPPS capacity. The principal synthetic concerns are coupling efficiency at the proline-rich C-terminal segment (which is prone to chain aggregation on the resin), correct stereochemistry of all L-amino acids, and adequate desalting to remove TFA counterions.

The lot of record (Kodiak biolabs lot 20260313) was synthesized by the supplier of record and shipped in lyophilized acetate salt form. The vendor analytical report records 99.45 percent purity by HPLC.

Common adulterants and impurities

The research-grade Selank supply chain has documented patterns of substandard product. Reported issues include:

1. Substitution of Selank with the parent tuftsin tetrapeptide (Thr-Lys-Pro-Arg) or the related peptide Semax. Mass spectrometry distinguishes these readily.
2. Deletion sequences from incomplete coupling at one of the prolines, producing 6-mer impurities that are inactive.
3. Racemization at the central arginine or threonine during prolonged synthesis. Chiral HPLC is required to detect this.
4. Excess acetate or trifluoroacetate counterions inflating apparent mass by 8 to 12 percent.
5. Endotoxin contamination from non-pyrogen-controlled synthesis.

Independent verification by HPLC and mass spectrometry on every batch is essential. The vendor COA is necessary but not sufficient. Kodiak biolabs is in the process of establishing third-party verification through Janoshik Analytical.

Analytical standards

Reverse-phase HPLC on a C18 column with gradient elution from aqueous TFA (0.1 percent) to acetonitrile, monitoring at 215 nm, is the standard purity assay. The peptide does not absorb significantly above 220 nm due to the absence of aromatic residues. Identity confirmation by LC-MS yields a protonated molecular ion at 752.4 m/z.

Reconstitution and handling

Solvent system

Selank dissolves readily in water, bacteriostatic water, and 0.9 percent saline. For intranasal use (the standard route in Russian clinical practice), the peptide is typically dissolved in 0.9 percent saline at 0.15 percent (1.5 milligrams per milliliter) and administered with a calibrated nasal spray. For other routes, the standard reconstitution protocol uses bacteriostatic water for any solution intended for storage beyond a single use. DMSO is not the appropriate vehicle.

Reconstitution protocol

A 5 mg vial reconstituted in 2 mL produces a 2.5 mg/mL solution; in 3.3 mL produces the 0.15 percent (1.5 mg/mL) concentration commonly used for intranasal administration. Allow the vial to rest at room temperature for 30 to 60 seconds, then gently swirl until the powder fully dissolves. The peptide is highly soluble; full dissolution is typically complete within 60 seconds.

Storage stability

Lyophilized Selank in the unopened vial: stable at minus 20 degrees Celsius for at least 24 months. Reconstituted solutions: stable at 2 to 8 degrees Celsius for at least 30 days. Aliquot working solutions to avoid freeze-thaw cycles. Reconstituted nasal spray solutions should not be stored at room temperature beyond 24 hours.

Stack interaction considerations

Selank is occasionally combined with Semax in research-grade protocols on the rationale that the two peptides target overlapping but distinct CNS pathways (anxiety and cognitive enhancement). The combination is documented in some Russian clinical practice but the formal synergy data are limited.

Combination with conventional anxiolytics (benzodiazepines, SSRIs, buspirone) is not specifically studied. The mechanism of Selank may involve GABA-A modulation through an indirect pathway, but co-administration with benzodiazepines does not produce the synergistic sedation that one might expect; investigators should treat the combination as additive at best and should not assume that Selank reduces the effective dose of benzodiazepine cofactors without specific experimental data.

Pharmacokinetic interactions with CYP-substrate compounds are not expected. Selank has no documented receptor-level interactions with conventional small-molecule pharmacotherapy.

References

1. Kozlovskii II, Danchev ND. The optimizing action of the synthetic peptide selank on a conditioned active avoidance reflex in rats. *Neuroscience and Behavioral Physiology* 33:639-643 (2003). Active avoidance behavior model.
2. Volkova A, Shadrina M, Kolomin T, et al. Selank administration affects the expression of some genes involved in GABAergic neurotransmission. *Frontiers in Pharmacology* 7:31 (2016). GABAergic gene expression mechanism.
3. Inozemtseva LS, Karpenko EA, Dolotov OV, et al. Intranasal administration of the peptide Selank regulates BDNF expression in the rat hippocampus in vivo. *Doklady Biological Sciences* 421:241-243 (2008). BDNF mechanism.
4. Zozulya AA, Neznamov GG, Siuniakov TS, et al. Efficacy and possible mechanisms of action of a new peptide anxiolytic drug Selank in the therapy of generalized anxiety disorders and neurasthenia. *Bulletin of Experimental Biology and Medicine* 146:38-45 (2008). Phase 2 anxiety clinical trial.
5. Medvedev VE, Tereshchenko OYe, Israelyan AYu, et al. Optimization of therapy of patients with anxiety disorders using selank. *Zhurnal Nevrologii i Psikhiiatrii Imeni S.S. Korsakova* 115:33-40 (2015). Russian clinical experience.
6. Vyunova TV, Andreeva LA, Shevchenko KV, Myasoedov NF. Peptide-based anxiolytics: the molecular aspects of heptapeptide Selank biological activity. *Protein and Peptide Letters* 25:914-923 (2018). Mechanism review.
7. Semenova TP, Kozlovskaya MM, Zuikov AV, et al. Selank: improving the cognitive abilities of rats. *Doklady Biological Sciences* 437:108-110 (2011). Cognitive enhancement rodent study.
8. Najjar VA, Nishioka K. "Tuftsin", a natural phagocytosis stimulating peptide. *Nature* 228:672-673 (1970). Parent peptide disclosure.
9. PubChem. Compound CID 11765683 (Selank). National Library of Medicine. Accessed 2026-04.
10. Vendor Certificate of Analysis, Kodiak biolabs lot 20260313. kodiak.org/pages/lab-results.

This monograph is a research reference document. It does not constitute medical advice. The compound discussed is not approved by regulatory authorities outside the Russian Federation for any indication. Investigators are responsible for compliance with applicable laws and institutional review requirements in their jurisdiction.