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PATIENT GUIDE

TB 500 *for tissue repair*

TB 500 is a short fragment of thymosin beta 4, a protein involved in tissue repair. Human trials have used the full protein, and the fragment itself has not been tested in people.

COMPOUND	CLASS	ROUTES	RESEARCH	SOURCES
TB 500 / Tβ4	Repair peptide	Injection, topical	Early, mostly Tβ4	35 · PMID linked

§ 01

Overview

TB 500 is one of the peptides patients ask us about most, usually in connection with a tendon, muscle or joint injury that is slow to settle. The interest comes from thymosin beta 4, a repair protein your own body makes and releases at the site of an injury, and from a large body of laboratory and animal research showing how that protein helps tissue heal.[1]

The human trials were done with the whole thymosin beta 4 protein, while the product sold as TB 500 is usually a short synthetic piece of it. This guide explains the difference, what each has and has not been tested for, the ways they are given, and what your first visit would involve. The research is listed at the end with links so you can read it yourself.

43 **Amino acids in thymosin beta 4.** The natural protein is small, found in almost every cell, and is the main molecule cells use to hold actin, the building block of their internal scaffolding, in reserve.[2]

7 **Amino acids in the TB 500 fragment.** Analysis of TB 500 identified Ac LKKTETQ, a copy of positions 17 to 23 of thymosin beta 4 with a small chemical cap added to one end.[3]

40 **Healthy volunteers in the first safety trial.** Intravenous thymosin beta 4, given daily for 14 days at doses up to 1,260 mg, caused no dose limiting side effects and no serious adverse events.[4]

6 of 10 **Eyes fully healed at four weeks.** In a small trial of thymosin beta 4 eye drops for a hard to heal corneal condition, 6 of 10 treated patients healed completely, compared with 1 of 8 on placebo.[5]

§ 02

What TB 500 is

Thymosin beta 4, often written Tβ4, is a naturally occurring protein of 43 amino acids. It is present in nearly all cells and body fluids, and its best understood job is to bind actin, the protein that lets cells change shape and move.[2] After an injury it is released by platelets, by immune cells called macrophages and by many other cell types, which is one reason researchers began to study it as a repair signal.[1]

Researchers found that different short stretches of the protein carry different activities. A stretch of seven amino acids in the middle, positions 17 to 23 and spelled LKKTETQ, is the part that binds actin, and in laboratory work it promotes cell migration, new blood vessel growth and wound healing.[2] TB 500 emerged as a veterinary preparation, and when analytical chemists examined it, its main ingredient was a synthetic copy of that stretch with an acetyl group added to the front, written Ac LKKTETQ.[3 6]

When you read that "TB 500 was studied in patients", the study almost always used the full protein. A 2024 laboratory study of the fragment itself noted that its biological effects had not been documented, and found that it is broken into smaller pieces in human serum and in rats, one of which showed the wound healing activity in cell culture.[7]

TWO RELATED MOLECULES They are often given the same name in marketing, though they are different molecules.

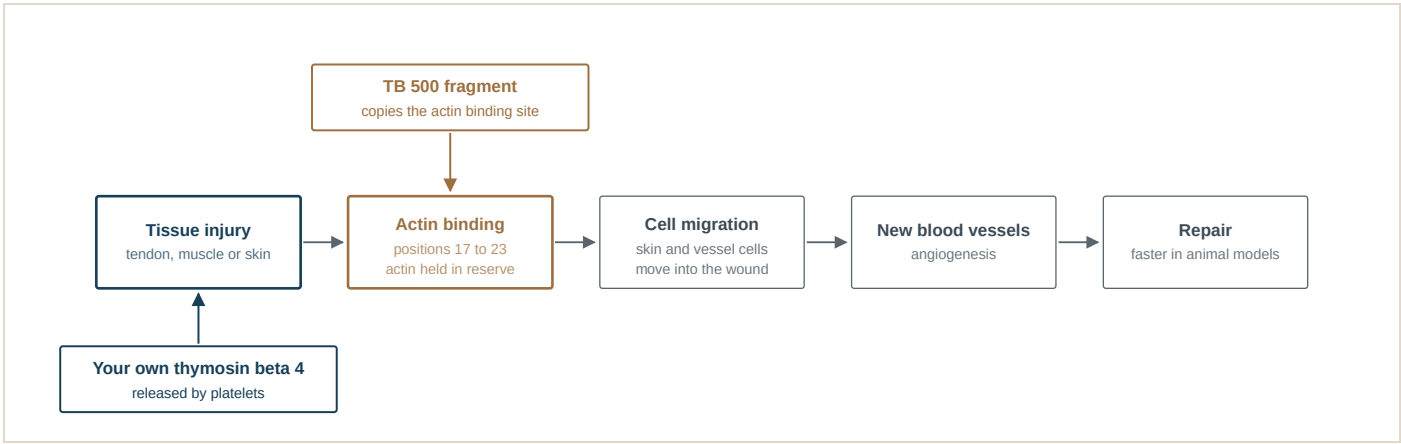
	THYMOSIN BETA 4	TB 500 (AS USUALLY SOLD)
Also called	Tβ4; timbetasin (in eye drop trials, as RGN 259)[5]	Thymosin beta 4 fragment; Ac LKKTETQ[3]
Structure	43 amino acids[2]	7 amino acids, positions 17 to 23, acetylated[3]
Origin	Made naturally by the body; synthetic and recombinant versions used in trials[4 8]	Synthetic only
Class	Actin binding regenerative protein[1]	Peptide fragment of that protein
Studied in people	Yes: intravenous, topical gel and eye drop trials[4 5 9]	No published human trials[7 10]
How it is given	Intravenous, on the skin, in the eye (research settings)	Injection under the skin, prepared on prescription

§ 03

How TB 500 works

To move, a cell has to take its internal scaffolding apart at the back and build it again at the front. Thymosin beta 4 holds single actin units in reserve so the cell can draw on them,[2] and in laboratory and animal studies this translates into faster movement of the cells that close a wound: skin cells, the cells that line blood vessels, and the cells that lay down collagen.[1] Thymosin beta 4 made endothelial cells migrate toward it four to six times more than control medium, and it promoted new blood vessel growth.[11]

This actin binding stretch is what links the research to TB 500. In laboratory tests of blood vessel sprouting and cell migration, the seven amino acid actin binding motif performed almost identically to the full protein, while pieces lacking that motif were inactive.[12]



TB 500 copies the part of thymosin beta 4 that binds actin. In laboratory tests this seven amino acid region matched the full protein for cell migration and blood vessel sprouting.[12] Whether an injected fragment does the same in people has not yet been studied.[10]

Thymosin beta 4 also calms inflammation. In human corneal cells exposed to an inflammatory signal, it reduced activation of NFκB, a central switch for inflammatory genes.[13] Of the regions identified so far, the one most clearly tied to calming inflammation is a four amino acid piece at the front end called Ac SDKP, which the TB 500 fragment does not contain.[2]

In animals, these effects add up to faster healing. In rats with full thickness skin wounds, thymosin beta 4 increased the rate at which new skin covered the wound by 42 percent at four days and by as much as 61 percent at seven days, compared with saline.[14] In aged mice, the synthetic seven amino acid fragment promoted wound repair to a degree comparable with the full protein.[15] In a 2026 rat study of repaired Achilles tendons, TB 500 was associated with stronger tendons at four weeks and better organized tissue under the microscope.[16]

KEY POINT

The fragment carries the actin binding part of the protein, which is the part most closely tied to cell movement and new blood vessel growth in the laboratory.[12] It does not carry Ac SDKP, the region most clearly tied to calming inflammation.[2] So we do not assume every result reported for thymosin beta 4 applies equally to TB 500, and we describe the two separately.

§ 04

What the research shows

Thymosin beta 4 has a longer research history than most peptides patients ask about, including controlled trials in people. Every one of those trials used the full protein.

What the evidence supports

Full length thymosin beta 4 has been given to healthy people intravenously and was well tolerated. In the first randomized trial, 40 volunteers received placebo or doses from 42 to 1,260 mg, first as a single dose and then daily for 14 days. Side effects were infrequent and mild or moderate, with no dose limiting toxicity and no serious adverse events.[4] A separate trial of a recombinant version in 84 healthy volunteers reached the same conclusion, with no build up in the blood after 10 daily doses.[8]

Thymosin beta 4 applied to the skin has been tested in chronic wounds. In two phase 2 trials, in venous stasis ulcers and in pressure ulcers, patients whose wounds healed did so almost a month sooner with thymosin beta 4.[9] Phase 2 work in epidermolysis bullosa, a rare inherited blistering condition, also pointed to faster repair.[17]

Thymosin beta 4 eye drops (RGN 259) have been studied in several randomized trials. In 9 patients with severe dry eye, the drops reduced discomfort by 35.1 percent and corneal staining by 59.1 percent at day 56, compared with the inactive drops.[18] In a trial of 72 people with dry eye, the two main measures did not differ from placebo, although some secondary measures improved, including a 27 percent reduction in discomfort during a controlled dry air challenge.[19] In the phase 3 SEER 1 trial in neurotrophic keratopathy, 6 of 10 treated patients healed completely at four weeks, compared with 1 of 8 on placebo.[5]

Heart research in animals drew wide attention. In mice, thymosin beta 4 improved cell survival and heart function after a heart attack, and in adult mouse heart tissue it activated dormant repair cells in the heart's outer layer.[20][21] In pigs, a single dose delivered into a heart vein reduced the size of the damaged area.[22] These are animal findings, and a later mouse study found that hearts developed and worked normally even without the gene for thymosin beta 4, so its role in the heart is still unsettled.[23]

What is not yet known

There are no published trials of the TB 500 fragment in people, and reviews written for orthopaedic and sports physicians in 2026 describe human data for musculoskeletal injuries as lacking, with the right dose, frequency and duration unknown.[10][24] The encouraging tendon and wound results for the fragment come from rats and mice.[15][16]

The evidence for the full protein is also incomplete. The eye trials have given mixed results. The 72 person dry eye trial missed its main measures,[19] and an independent Cochrane review rated the evidence from SEER 1, a trial of 18 people, as low certainty.[25] The developer's ARISE 3 dry eye trial enrolled 700 patients, and its public summary highlighted secondary and pooled measures such as ocular grittiness; to our knowledge those phase 3 results have not been published in full in a peer reviewed journal.[27] No thymosin beta 4 product has yet been approved in the United States.

MAIN HUMAN STUDIES All used the full thymosin beta 4 protein, not the TB 500 fragment.

STUDY	N	DESIGN	FINDING
Ruff 2010[4]	40	Phase 1, randomized, intravenous, healthy volunteers	Well tolerated up to 1,260 mg daily for 14 days; no serious adverse events
Wang 2021[8]	84	Phase 1, randomized, intravenous recombinant protein	No dose limiting toxicity; no accumulation after 10 days
Treadwell 2012[9]	2 trials	Phase 2, topical, venous and pressure ulcers	Ulcers that healed did so almost a month sooner
Sosne 2015[18]	9	Phase 2, randomized, eye drops, severe dry eye	35.1 percent less discomfort, 59.1 percent less staining at day 56
Sosne 2015[19]	72	Phase 2, randomized, eye drops, dry eye	Main measures unchanged; some secondary measures improved; no adverse events
SEER 1, 2022[5]	18	Phase 3, randomized, eye drops, neurotrophic keratopathy	Complete healing in 6 of 10 versus 1 of 8; no significant adverse effects
TB 500 fragment[10]	0	No published human trials	Evidence limited to laboratory and animal studies

SUMMARY

Thymosin beta 4 is a well characterized repair protein with a reassuring early safety record in people and encouraging results in wound and eye trials. TB 500 carries the part of that protein most closely tied to cell movement and blood vessel growth, and it looks promising in animals, but it has not yet been tested in people. If we recommend it, we will tell you that we are reasoning from the protein and from animal work.

§ 05

How TB 500 is given

Thymosin beta 4 and its fragment have been given in several ways. The routes studied in people are different from the route usually used in clinics.

Injection under the skin

TB 500 is usually prescribed as a small injection into the fatty tissue of the abdomen or thigh, using a fine needle similar to the ones used for insulin. It is also the route with the least published human research. No clinical trial has tested TB 500 or thymosin beta 4 given under the skin, and no regulator has set a dose, so the dose and schedule are set by your physician.[10] What is known about the fragment in the body comes from laboratory and animal work, which shows that it is cut into smaller pieces, and one of those pieces could still be found in rat urine 72 hours later.[7] As with any injection, some redness or tenderness where the needle went in is possible.

Intramuscular injection

Some people ask about injecting close to an injured muscle or tendon. There are no published human studies of thymosin beta 4 or TB 500 given into muscle, and the animal tendon study used injections into the abdominal cavity rather than into the tendon itself.[16] We therefore have no evidence that injecting near an injury works better than injecting under the skin.

Intravenous infusion

The full thymosin beta 4 protein has been given by vein in healthy volunteers at 42 to 1,260 mg daily for 14 days, in research developing it for heart attack treatment.[4] A recombinant version was given by vein at 0.05 to 25 micrograms per kilogram.[8] These were safety studies in a research setting. They did not test a benefit, and they did not use the TB 500 fragment.

On the skin and in the eye

Thymosin beta 4 has been applied directly to chronic wounds as a topical preparation in phase 2 ulcer trials.[9] As an eye drop, a 0.1 percent solution was used six times a day for 28 days in severe dry eye, and five times a day in neurotrophic keratopathy.[5] [18] These preparations were made for trials and are not available as approved products.

By mouth or nasal spray

There are no published human studies of TB 500 or thymosin beta 4 taken by mouth or as a nasal spray. Because the fragment is broken down even in blood serum,[7] we would not expect it to survive digestion well, and we do not recommend these forms.

COMPARING THE OPTIONS

	UNDER THE SKIN	INTO MUSCLE	INTRAVENOUS	SKIN OR EYE	ORAL OR NASAL
Molecule used	TB 500 fragment, on prescription	TB 500 fragment	Full thymosin beta 4[4]	Full thymosin beta 4[5 9]	Various
Human research	NONE PUBLISHED	NONE PUBLISHED	PHASE 1 SAFETY [4 8]	PHASE 2 AND 3 [5 18]	NONE PUBLISHED
Dose	Set by your physician	Set by your physician	42 to 1,260 mg daily in trials[4]	0.1 percent drops, five or six times a day[5 18]	Not established
Common experience	Possible tenderness at the site	Possible soreness at the site	Infrequent, mild or moderate effects[4]	No significant adverse effects reported[5]	Likely broken down before absorption[7]

§ 06

What to expect

Because TB 500 has not been studied in people, we cannot give you a timeline drawn from trials of the fragment. The human studies of the full protein give some sense of scale. In the ulcer trials, wounds that healed did so almost a month sooner,[9] and in the corneal trial, healing was measured at four weeks.[5] Those are different conditions and a different molecule, so they show how repair was measured and cannot predict what will happen in a tendon or muscle.

In practical terms, a visit usually involves learning to give the injection under the skin, or having it given in the clinic, and agreeing in advance what improvement you will be watching for, such as pain with a specific activity, range of movement, or return to a particular exercise. Healing tissue follows its own pace. Rest, loading and rehabilitation as advised by your physician or physical therapist remain the foundation, and any peptide is added to that plan.

BETWEEN VISITS

- Keep a short note of how the injured area feels during the activities you agreed to track.
- Tell us straight away about redness, warmth or swelling that spreads from an injection site, or any symptom that concerns you.

§ 07

Safety

What is known about safety in people comes from the full protein, and it is reassuring. In the intravenous trial of 40 healthy volunteers, side effects were infrequent and mild or moderate at every dose up to 1,260 mg daily for 14 days, with no serious adverse events.[4] In the trial of a recombinant version in 84 volunteers, side effects were likewise mild to moderate, with no dose limiting toxicity.[8] In the eye trials, no adverse events were observed in 72 participants with dry eye, and no significant adverse effects were seen in neurotrophic keratopathy.[5 19] Reviewers describe thymosin beta 4 in the wound trials as safe and well tolerated.[17]

For the TB 500 fragment, rigorous human safety data are scarce, according to a 2026 review of peptides in sports medicine.[24]

Because thymosin beta 4 encourages cell movement and new blood vessel growth, researchers have asked whether it could help an existing tumor grow or spread. In a mouse study, melanoma cells engineered to make extra thymosin beta 4 formed larger tumors (21.7 mm against 13.3 mm) and more lung metastases (46.7 nodules against 10.9) than unaltered cells.[26] That concern is theoretical, because the experiment was done in mice and altered the tumor cells themselves instead of giving the peptide as a treatment. We still ask about cancer history before starting.

TELL YOUR PHYSICIAN BEFORE STARTING IF ANY OF THESE APPLY

- You have a current or past cancer diagnosis, or you are under active surveillance.
- You are pregnant, trying to conceive, or breastfeeding.
- You compete in a sport that tests for banned substances.
- You have significant heart, kidney or liver disease, or an eye condition you are being treated for.
- You take any prescription medication, over the counter product or supplement. Please bring the full list.

Long term data do not yet exist. The human studies of the full protein followed people for weeks, not years, and there are no published human studies of repeated TB 500 injections at all.[4] [8] [24] For that reason we review how you are doing at set points.

§ 08

Is this right for you

TB 500 suits some patients and is not the right first step for others. The purpose of your consultation is to work out which group you are in.

Before we begin

- [ ] A review of your medical history, current medications and supplements
- [ ] Relevant vital signs, and an examination of the area that is troubling you
- [ ] Baseline bloodwork where your physician feels it is useful, so later results have a starting point
- [ ] A clear written note of what you are hoping to improve, so we can tell together whether it worked

If an injury has not been properly diagnosed, that comes first. Imaging, a specific rehabilitation program, or referral to a specialist may be the right answer, and a clear diagnosis also tells us what improvement to look for if you do go on to use a peptide.

Reviewing your progress

We will reassess against your documented starting point after a set period. If you are improving, we will plan how long to continue. If you are not, we will say so and look at other options. You are welcome to stop at any time.

QUESTIONS TO ASK YOUR PHYSICIAN

Is the evidence you are relying on from the full protein or from the fragment? What would you expect me to notice, and by when? How will we measure whether this is working? What would make you recommend stopping?

§ 09

Regulatory status

Neither TB 500 nor thymosin beta 4 is approved by the U.S. Food and Drug Administration for any indication, and there is no FDA approved product containing either one.

Since 30 October 2026, a federal enforcement discretion policy from the U.S. Department of Health and Human Services has allowed licensed pharmacies to compound TB 500 under strict conditions.[28] The preparation must be made on a prescription for you personally and contain TB 500 acetate as its only active ingredient, and it may be given only under the skin or into the muscle.[28 29] The ingredient must come from an FDA registered manufacturer that meets federal quality standards and supplies a certificate of analysis, and serious side effects must be reported to the FDA.[28] The policy is temporary. It applies until the FDA addresses TB 500 in a final rule, and HHS may revisit it. It is also not FDA approval. The policy itself states that compounded drugs are not FDA approved and that the FDA does not review their safety, effectiveness or quality before they are sold.[28] The full thymosin beta 4 protein used in the clinical trials is not among the peptides the policy covers, so a pharmacy has no federal pathway to compound it at present.[29]

In April 2026 the FDA's list of bulk substances that may present significant safety risks in compounding, known as Category 2, no longer included the thymosin beta 4 fragment.[30] In July 2026 the FDA's Pharmacy Compounding Advisory Committee voted to recommend TB 500 for the list of substances pharmacies may compound, after FDA staff had recommended against it. That vote was advisory, and the FDA has not yet issued its final rule.[31] Prescribing a compounded preparation is lawful and common in American medicine, and it is a decision your physician makes with you. It does mean no regulator has reviewed this preparation for your condition, and you should know that before you consent.

If you compete in sport, please tell us. The World Anti Doping Agency lists “Thymosin β4 and its derivatives e.g. TB 500” among prohibited growth factors, banned at all times, in and out of competition.[32] Laboratory methods to detect the fragment in blood and urine were published in 2012.[3 6]

If you would like details about the preparation used in your treatment, please ask.

§ 10

Common questions

Has TB 500 been tested in people?

There are no published trials of the TB 500 fragment in people.[10 24] The human trials used the full thymosin beta 4 protein, given by vein, on the skin or as eye drops, while the encouraging tendon and wound results for the fragment come from rats and mice.[4 9 5 15 16]

Is it safe, and what side effects should I expect?

The safety record in people comes from the full protein. In an intravenous trial of 40 healthy volunteers, side effects were infrequent and mild or moderate, with no serious adverse events.[4] For the TB 500 fragment itself, rigorous human safety data are scarce.[24] Some redness or tenderness where the needle went in is possible; please tell us straight away if redness, warmth or swelling spreads from the site.

How soon will I notice a difference?

No study has measured that for TB 500, because the fragment has not been tested in people. In trials of the full protein, ulcers that healed did so almost a month sooner and corneal healing was measured at four weeks, though those were different conditions and a different molecule.[9 5] Healing tissue follows its own pace, so we agree in advance on what to watch for.

How is it given, and for how long?

TB 500 is usually prescribed as a small injection under the skin, and the federal compounding policy covers it only by injection under the skin or into the muscle.[29] No clinical trial has tested TB 500 given under the skin, and no regulator has set a dose, so your physician sets the dose and schedule. [10] We reassess against your starting point after a defined period.

Can I combine TB 500 with BPC 157 or other peptides?

The federal policy allows only single ingredient products, so a blend that puts TB 500 together with BPC 157 or any other peptide falls outside it.[28] Because TB 500 has not been tested in people, its use alongside other peptides has not been studied either. [10] Our BPC 157 guide (OCW WP 016) covers that peptide in the same way.

Who should not use TB 500?

Please tell your physician before starting if you have a current or past cancer diagnosis, or if you are pregnant, trying to conceive or breastfeeding. The cancer question comes from a mouse study in which tumor cells engineered to make extra thymosin beta 4 formed larger tumors and more lung metastases.[26] That concern is theoretical, but it is why we ask.

What happens if I stop, and how will we know if it is working?

You are welcome to stop at any time, and long term data on stopping or continuing do not yet exist.[4] [8] [24] Before you begin, we write down what you are hoping to improve, such as pain with a specific activity or return to a particular exercise. After a defined period we compare against that starting point, and if you are not improving, we will say so and look at other options.

Where is a compounded medicine made, and who oversees it?

Federal law sets out two kinds of compounding. Under section 503A, a state licensed pharmacy or physician prepares a medicine for one patient against that patient's own prescription, and the state board of pharmacy carries the day to day oversight while the FDA inspects for cause and on surveillance.[33] Under section 503B, an outsourcing facility registers with the FDA, works to federal manufacturing quality standards, reports adverse events and the products it makes to the agency, and is inspected by the FDA on a risk based schedule; it may also supply a clinic directly rather than for one named patient. [34] We use both kinds, and which one prepares your medicine depends on the preparation. For TB 500 the October 2026 federal policy applies to section 503A compounding only. [28]

Is a compounded medicine the same as an FDA approved one?

No, and the difference matters. A compounded preparation is not FDA approved, and the agency does not check its safety, effectiveness or quality before it is sold, which is why an approved product is the first choice whenever one fits your situation.[33] What a prescription from a licensed pharmacy or a registered outsourcing facility does give you is a named prescriber, a facility answerable to a state board or to the FDA, ingredients that meet federal requirements, and a route for reporting a problem. A vial bought online and labelled for research use only has none of that: the FDA treats those products as unapproved new drugs when they are meant for people, and has written to the companies selling them. [35] Please do not use one.

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NEWPORT BEACH

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PATIENT SIGNATURE	DATE	REVIEWING PHYSICIAN

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