



DOSSIER · SUBSTANCE

Astragalus Membranaceus (Milk Vetch)

Research on Astragalus membranaceus is predominantly preclinical: at the citation peak stand a structural and inflammation paper on polysaccharides as well as animal studies on colitis and diabetes. In humans only a small portion of the works are controlled, and there safety testing dominates.

Proven: Several meta-analyses are available; they predominantly pool smaller primary studies.

646

STUDIES IN
TOTAL

79

IN HUMANS

23

OF WHICH
CONTROLLED

86

IN ANIMALS

133

IN THE LAB

Figures from the IHR study database · Last updated 2026-10-15

How to Read This Dossier

ESTABLISHED

measured in humans, with a comparison group

PLAUSIBLE

supported by mechanism, animal studies or observation

HYPOTHESIS

a likely connection that still needs to be tested

Astragalus membranaceus (Milk Vetch) at a Glance

ORIGIN:

Astragalus membranaceus is a plant of traditional Chinese medicine whose root is used as Astragali Radix and under the name Huangqi. Leading constituents are polysaccharides and astragaloside IV; the polysaccharides are mixtures of differing molecular weights and differing structures, astragaloside IV a defined single substance. The root is prepared as an extract, as a polysaccharide-containing preparation, as an injection solution and in finished formulations.

EVIDENCE BASE:

646 evaluated papers · 23 controlled human studies · 56 observational studies · 74 review articles · 86 animal studies · 120 cell-culture studies

STRONGEST EVIDENCE:

- Oncology: A meta-analysis of eight randomised controlled trials on astragalus as sole intervention showed reduced fatigue (SMD = -1.63) and improved quality of life (SMD = 0.86).
- Musculoskeletal system: A randomised, double-blind, placebo-controlled study in 90 adults reported a 30 % reduction in knee pain after 28 days of 480 mg root extract (p < 0.0001).
- Oncology: Astragalus polysaccharides outperformed control in response rate (RR = 1.30) and T-cell measures (CD3+ MD = 8.79, CD4+ MD = 7.94); no difference was seen for CD8+.
- Cardiology: A meta-analysis of astragalus injections in heart failure pooled ten randomised controlled trials with 995 patients and reported improved ejection fraction (LVEF, MD = 4.56).
- Ageing: A meta-analysis of a telomerase-activating astragalus compound (eight studies, 750 participants) found moderate telomere lengthening (SMD = 0.47), but no improvement in frailty or CRP/IL-6.

LIMITATIONS:

- The controlled clinical base is at an early stage: observational studies predominate in humans.
- Meta-analyses predominantly pool smaller primary studies and evaluate either single herbs or combinations; no effect of astragalus alone can be inferred from combination studies.
- Variation in preparations and choice of endpoints remain open questions: laboratory values and questionnaires are not disease courses; preparations range from extract to finished formulation.

CLASSIFICATION:

Astragalus membranaceus is a medicinal plant of traditional Chinese medicine whose preclinical base is broad and whose controlled clinical testing is at an early stage.

1. What Astragalus Membranaceus Is

Astragalus membranaceus is a plant of traditional Chinese medicine whose root is used as **Astragali Radix** and under the name **Huangqi**. The review articles cover botany, phytochemistry, pharmacology and clinical application; the leading constituents appearing in the titles are **polysaccharides** and **astragaloside IV**. Preparations are diverse: extracts, polysaccharide-containing preparations, injection solutions and finished formulations in which astragalus is one of several components (e.g. Yupingfeng powder, combinations with Panax notoginseng). Some of the papers examine defined single substances, others examine mixtures.

For the evaluation of all papers it is decisive that **astragalus polysaccharides** are not a uniform substance but mixtures of differing molecular weights and differing structures; one paper describes the structure–activity relationship of low-molecular-weight polysaccharides generated by Bacteroides. A review on the **oral pharmacokinetics** of polysaccharides from traditional Chinese medicine classifies which pharmacological effects are to be expected after oral administration, and several animal studies trace the observed effects back to the **intestinal microbiota**. Anyone transferring laboratory and animal findings to human application must therefore distinguish between extract, measured value and presumed mechanism of action. **Astragaloside IV**, by contrast, is a defined single substance.

2. What the Studies Show in Detail

The key human studies and the most important reviews — by therapeutic area, with population, duration, preparation, measure and result as reported in the original papers. Numbers appear only where the paper states them.

Distribution of **controlled human studies** by therapeutic area — the numbers are not additive because one paper may be assigned to several areas:

Therapeutic Area	Controlled Studies
Safety and tolerability	18
Inflammatory processes	8
Oncology	7
Immune system	7

Therapeutic Area	Controlled Studies
Fatigue and stress	5
Musculoskeletal system	5
Metabolism	3
Gut and microbiome	3

Oncology

The most robust work on cancer-related fatigue is a meta-analysis of randomised controlled trials [1]. Nine electronic databases were searched up to 1 July 2022; eight studies in which Astragalus membranaceus was tested as sole intervention were included. Addition of Astragalus membranaceus to the control group reduced fatigue (SMD = -1.63, 95% CI [-1.90, -1.36], P < .00001; RR = 1.55, 95% CI [1.19, 2.02], P = 0.001) and improved quality of life (SMD = 0.86, 95% CI [0.17, 1.55], P = 0.01). Evidence level was assessed with GRADE. An effect on fatigue and quality of life is therefore proven across eight studies.

The search covered eight databases from January 2010 to August 2024; risk of bias was assessed with ROB2. Treatment with astragalus polysaccharides outperformed control in response rate (RR = 1.30, 95% CI (1.21, 1.39), P < 0.01), CD3+ T-cell count (MD = 8.79, 95% CI (6.15, 11.43), P < 0.01), CD4+ T-cell count (MD = 7.94, 95% CI (5.27, 10.61), P < 0.01) and CD4+/CD8+ ratio (MD = 0.40, 95% CI (0.28, 0.52), P < 0.01). No difference was seen for CD8+ T-cell count (MD = -1.74, 95% CI (-4.66, 1.17), P = 0.242).

For cervical carcinoma, a meta-analysis examined Astragalus polysaccharide injections in combination with radiochemotherapy; searches were conducted up to 1 August 2025 in nine databases, with quality assessed using ROB2 [45]. For hepatocellular carcinoma, a systematic review screened 172 studies and included 16 describing molecular mechanisms of astragaloside IV: inhibition of proliferation, migration and invasion, induction of apoptosis, modulation of the immune response as well as reduction of resistance with simultaneous increase in chemosensitivity [2]. These findings originate predominantly from preclinical models. In ovarian cancer stem cells, it was shown preclinically that Astragalus polysaccharides increase sensitivity to PARP inhibitors by inhibiting mitophagy via the PINK1/Parkin signalling pathway [46].

Regarding peritoneal metastasis, a review summarises that more than 200 compounds have been isolated from Astragalus membranaceus and the plant is attributed with antitumour effects, immune regulation, prevention of postoperative recurrence and metastasis as well as prolongation of life [24]. It remains open which of these endpoints prospective studies in humans with hard outcome data examine.

Metabolism

For diabetic nephropathy, a meta-analysis of the combination of Astragalus membranaceus and Panax notoginseng (ARPN) is available [52]. Compared with control, ARPN improved the clinical efficacy rate (OR 5.12, 95% CI 3.42 to 7.66, P < 0.00001), reduced the urinary albumin excretion rate (MD -26.67, 95% CI -31.30 to -22.04, P < 0.00001) and 24-hour urinary protein (SMD -0.58, 95% CI -0.75 to -0.41, P < 0.00001) and lowered serum creatinine (Scr: MD -13.78). As this is a combination, the effect cannot be attributed to the individual substance.

An intervention other than Astragalus membranaceus was administered for three months, followed by a one-month washout phase. In the intention-to-treat analysis, plasma neurofilament light chain protein (NfL) decreased during treatment (27.6 ± 10.7 vs. 25.6 ± 9.8 pg/mL, P = 0.040) and insulin increased (12.5 ± 15.2 vs. 21.1 ± 15.5 µIU/mL, P = 0.004). However, the adjusted regression model showed no significant difference between treatments for NfL (P = 0.127), and NfL changes did not correlate with insulin. IGF1 and IGF-binding proteins did not change significantly. Exploratory subgroup analyses suggested larger biomarker changes in patients at later stages. These results do not describe an effect of Astragalus membranaceus.

Preclinically, Astragalus polysaccharide in a rat model of diabetic nephropathy showed a reduction in apoptosis and an increase in autophagy via the Sirt1/FoxO1 signalling pathway; 100 mg/kg APS after induction with 30 mg/kg streptozotocin as well as 0-200 µg/mL APS on podocytes were examined [67]. A review of astragaloside IV in diabetic kidney disease summarises antioxidant, anti-inflammatory and epithelial-mesenchymal transition-related mechanisms [72]. It remains open which of these mechanisms prove clinically relevant in controlled studies in humans.

Bone and Joints

A randomised, double-blind, placebo-controlled study examined a standardised Astragalus membranaceus root extract (AME) in functional knee pain [55]. Ninety adults aged 18 to 60 years received either 480 mg AME (n = 45) or placebo (n = 45) for 28 days. The primary endpoint was pain reduction, measured with a visual analogue scale after a 6-minute walk test. The AME group showed a 30% reduction in knee pain (p < 0.0001), with mean VAS values falling from 6.7 ± 0.5 to 1.2 ± 0.6. WOMAC, stair-climb test and mobility also improved (p < 0.0001).

A further randomised, double-blind, placebo-controlled study examined Astragalus membranaceus saponins (AMS) in healthy individuals with knee complaints without diagnosed knee osteoarthritis [16]. Participants aged 20 to 70 years received one capsule of AMS or placebo daily for 12 weeks. Primary endpoints were step count in the Single Leg Step Down (SLSD) and knee mobility; the KOOS total score was a secondary endpoint, and serum biomarkers were exploratory. In the AMS group, SLSD step count increased by 16.83% (Δ = +12.78 steps; p < 0.05) and recovery time decreased.

For rheumatoid arthritis, a study examined the dosage of Astragalus membranaceus in the Huangqi Guizhi Wuwu decoction [43]. In addition to bioinformatics and a collagen-induced arthritis model in animals in which the JAK/STAT signalling pathway was examined, a multicentre, randomised, double-blind, placebo-controlled study was conducted. The animal experimental findings are preclinical. It remains open which dose proves superior in the clinical trial.

Inflammatory Processes

A meta-analysis examined TA-65, a telomerase-activating compound from Astragalus membranaceus, in eight randomised controlled trials with 750 participants (mean age 63.3 years) [59]. Leukocyte telomere length was measured by Southern blot, qPCR or Flow-FISH. TA-65 showed moderate telomere elongation (SMD = 0.47, 95% CI 0.31-0.62, p < 0.00001), with a stronger effect in adults over 60 years (SMD = 0.63 vs. 0.36, p = 0.03). Industry-funded

studies reported higher efficacy (SMD = 0.63 vs. 0.40, $p = 0.03$). However, telomere elongation did not translate into functional improvements in frailty (SMD = 0.09, $p = 0.15$) or inflammation (CRP/IL-6 SMD = -0.11, $p = 0.07$).

For heart failure with reduced ejection fraction, a meta-analysis examined the influence of *Astragalus membranaceus* on left ventricular remodelling [60]. The combination of *Astragalus membranaceus* and conventional therapy showed an improvement in ejection fraction (LVEF, MD = 5.82, 95% CI 4.61 to 7.03, $p < 0.00001$), a reduction in left ventricular end-diastolic diameter (LVEDD, MD = -4.05, 95% CI -6.09 to -2.01, $p = 0.0001$) and end-systolic diameter (LVESD, MD = -12.24, 95% CI -15.24 to -9.24, $p < 0.00001$).

A systematic review of skin ageing screened PubMed from 2015 to 2025 [15]. Bioactive compounds such as astragaloside IV, cycloastragenol, flavonoids and polysaccharides showed photoprotective effects in preclinical investigations, including reduction of reactive oxygen species, inhibition of inflammatory signalling pathways, preservation of mitochondria and promotion of collagen synthesis. Telomere elongation under oxidative stress was shown for astragaloside IV in preclinical models. Clinical studies showed improvements in skin hydration, skin tone and wrinkle reduction.

Preclinically, a study in mice and AML-12 cells examined whether astragaloside IV alleviates cisplatin-induced liver damage via ferroptosis-dependent signalling pathways; 40 mg/kg and 80 mg/kg were tested [66]. It remains open whether these mechanisms are confirmed in controlled studies in humans.

Musculoskeletal System

A randomised, placebo-controlled, double-blind study examined a herbal mixture of *Cervus elaphus* Linnaeus, *Angelica gigas* Nakai and *Astragalus membranaceus* Bunge (CAA) over eight weeks in 80 patients with chronic fatigue symptoms [6]. The CAA group had a mean age of 43.5 ± 1.2 years, the placebo group 41.8 ± 1.3 years. Fatigue and cardiorespiratory endurance were measured at baseline, interim and after the intervention, as well as fatigue-related blood biomarkers before and at the end. The CAA group improved on the Fatigue Severity Scale ($p = 0.038$), the Multidimensional Fatigue Inventory ($p = 0.037$) and the 24-hour Visual Analogue Scale ($p = 0.002$) compared with placebo; maximum time to exhaustion also increased. As this is a mixture, the effect cannot be attributed to *Astragalus membranaceus* alone.

Safety and Tolerability

For heart failure with mildly reduced ejection fraction, a meta-analysis examined *Astragalus* injections [62]. Ten randomised controlled trials with 995 patients (562 men, 433 women) were included; searches were conducted up to 30 November 2023. Compared with conventional therapy, *Astragalus* injection improved ejection fraction (LVEF, MD = 4.56, 95% CI 3.68-5.44, $p < 0.00001$) and reduced left ventricular end-diastolic volume (LVEDV, MD = -7.89, 95% CI -11.13 to -4.64, $p < 0.00001$), end-diastolic diameter (LVEDD, MD = -4.18, 95% CI -5.79 to -2.56, $p < 0.00001$), end-systolic volume (LVESV, MD = -8.11, 95% CI -11.79 to -4.43, $p < 0.00001$) and end-systolic diameter (LVESD, MD = -3.42, 95% CI -4.90 to -1.93, $p < 0.00001$). These are echocardiographic parameters rather than clinical outcomes.

A Phase I study examined the safety of SH003, a mixture of *Astragalus membranaceus*, *Angelica gigas* and *Trichosanthes kirilowii*, in combination with docetaxel [64]. Twelve patients with advanced lung or breast cancer were enrolled in the multicentre, open-label dose-escalation study. SH003 was administered orally at 2400, 3600 or 4800 mg daily together with intravenous docetaxel (75 mg/m²) every 21 days; the design followed a 3+3 dose escalation. SH003 was well tolerated up to 4800 mg/day, without dose-limiting toxicities attributed to SH003. The most common adverse events were neutropenia, predominantly associated with docetaxel, and mild dermatological reactions such as eczema, acneiform rash and pruritus. Preliminary disease stabilisation was observed in several participants.

Skin

In the Phase I study of SH003 in combination with docetaxel in twelve patients with advanced lung or breast cancer, the most common adverse events were neutropenia, predominantly associated with docetaxel, as well as mild dermatological reactions such as eczema, acneiform rash and pruritus [64]. It remains open how the dermatological reactions are distributed among the *Astragalus membranaceus* component.

Intestine and Microbiome

A systematic review and meta-analysis examined Yupingfeng Powder (YPF), a classical Chinese herbal formula of *Astragalus membranaceus*, *Atractylodes macrocephala* and *Saposhnikovia divaricata*, in combination with conventional biomedical therapy in adult bronchial asthma [12]. The search was conducted in seven databases up to 20 October 2025; the protocol was registered with PROSPERO (CRD420251172600). Randomised controlled trials comparing YPF plus conventional therapy with conventional therapy alone were included; risk of bias was assessed with the Cochrane ROB-2.0 tool.

Heart and Circulation

A network meta-analysis examined oral Chinese medicines containing *Astragalus* in heart failure [13]. Six databases were searched. According to the Surface Under the Cumulative Ranking Curve, *Astragalus* Granule plus western medicine performed best in the overall rate of clinical efficacy; Qiangxin Capsule plus western medicine was best for another endpoint.

Immune System

A review summarises the mechanisms of action, pharmacokinetics and drug optimisation of astragaloside IV in atopic diseases [65]. Astragaloside IV is one of the main active substances of *Astragalus membranaceus* and is regarded as an important index component for quality assessment. It is attributed antiallergic and immunomodulatory effects. The underlying findings are predominantly preclinical. It remains open which of these effects are confirmed in controlled human studies.

Viral Infections

A review summarises the pharmacological effects of *Astragalus* polysaccharides in neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease and multiple sclerosis [71]. Described effects include antioxidant, immunomodulatory, anti-inflammatory, antitumour, antidiabetic, antiviral, hepatoprotective, anti-atherosclerotic, haematopoietic and neuroprotective actions. In preclinical models of Parkinson's disease, *Astragalus* polysaccharides

protect neurons and stabilise mitochondrial function by inhibiting ROS production and promoting autophagy via the PI3K/AKT/mTOR signalling pathway. The findings derive predominantly from preclinical models. It remains open which of the listed effects have been tested in humans.

Overall Picture

Across the fields, meta-analyses provide the most robust statements: on cancer-related fatigue [1], on immune function in malignant tumours [51], on diabetic nephropathy in combination with *Panax notoginseng* [52], on left-ventricular remodelling in heart failure [60][62] and on telomere lengthening by TA-65 [59]. It is striking that several of these works examine combinations or mixtures, so that the effect cannot be attributed to the single substance. In single-substance tests in humans the results are more mixed: in the crossover study on SCA3 the difference between treatments disappeared in the adjusted model [14].

Preclinical findings on astragaloside IV and *Astragalus* polysaccharides describe a broad diversity of mechanisms [2][46][66][67][71]. These mechanisms have not yet been tested in humans. The state of research is at an early stage for several endpoints: for skin moisture, skin tone and wrinkle reduction the review relies on clinical studies without stating their size [15]. It remains open which of the described mechanisms are confirmed in controlled studies with clinical endpoints.

Methodology of the Research Situation

The works comprise systematic reviews and meta-analyses of randomised controlled trials, individual randomised double-blind placebo-controlled studies as well as preclinical animal and cell investigations. Treatment duration ranges from 28 days for knee pain [55] through 12 weeks for knee complaints [16] to three months for SCA3 [14]. Endpoints include questionnaires such as the Fatigue Severity Scale [6], the visual analogue scale [55], the WOMAC [55], the KOOS [16], laboratory values such as T-cell counts [51], telomere length [59] and plasma neurofilament light-chain protein [14] as well as echocardiographic measures [60][62]. In several works the data on effect sizes are incomplete; several abstracts break off in the middle of the results presentation. Preclinical findings are identified as such.

The Burden of Proof Lies in the Laboratory, Not in the Clinic

A look at the citation peak reveals the imbalance: the most-cited work overall is a structural and inflammatory study on polysaccharides, followed by animal studies on colitis and type-2 diabetes as well as a basic study on diabetic nephropathy. These works supply

MECHANISMS

— gut microbiota, mucosal barrier, macrophage polarisation, ROS/NF- κ B — and must be labelled as preclinical. **Plausible:** such pathways can explain why effects are conceivable. They do not prove an effect in humans, and the controlled works predominantly examine other endpoints than those at which the mechanistic findings are directed.

The second finding is unusual: among the controlled human studies,

SAFETY

constitutes the largest single field, larger than inflammation, oncology or the immune system. This does not diminish the value of these works — tolerability studies are the prerequisite for every further question. It does mean, however, that the **efficacy question** for defined preparations and endpoints remains open. Some of the safety studies concern combinations, for example a finished product together with docetaxel in breast and lung cancer; such works carry statements about the mixture, not about *Astragalus* alone. What must be clarified is whether a single, well-characterised preparation alters the fatigue and inflammation endpoints in a controlled trial.

3. How Robust the Research Is

The works are distributed unevenly: basic research, cell-culture and animal studies form the largest block, together with mechanistic reviews. In humans observational studies predominate; controlled trials form a minority. Thematically the focus of the controlled works lies on **safety**, followed by **inflammation**, **oncology** and **immune system**; thereafter come **fatigue** and **musculoskeletal system**, while metabolism, gut, cardiovascular system and skin are represented by individual works. For the musculoskeletal system there is one randomised double-blind placebo-controlled study that reports a reduction in functional knee pain by an *Astragalus* extract. The most-cited works overall are preclinical; at the top stands a structural and inflammatory study on polysaccharides.

Methodologically, the **dispersion of preparations** is noticeable: meta-analyses evaluate partly single plants, partly combinations of several medicinal drugs, partly Chinese finished products. No effect of *Astragalus* alone can be derived from mixture studies. A second point is **endpoint choice**: some of the controlled works examine safety and tolerability, others clinical scales such as fatigue or joint pain, and laboratory values or questionnaires are not disease courses. The most robust statements come from **meta-analyses** — on tumour-related fatigue, on polysaccharides in malignant tumours, on left-ventricular remodelling in heart failure — yet they predominantly pool smaller primary studies. The preclinical base is broad, the controlled clinical base narrow. What must be clarified is which preparation and which endpoint would support its own controlled trial.

4. What Is Frequently Claimed — and What the Data Provide

STATEMENT	STATE OF RESEARCH
Astragalus acts against fatigue	Meta-analyses investigate tumour-related fatigue, one controlled study a combination of three medicinal drugs in chronic exhaustion. The statements are derived from
Astragalus protects the heart in heart failure	Two meta-analyses on left ventricular remodelling separate HFrEF and HFmrEF, another compares astragalus-containing finished preparations in the network co
Astragalus lowers blood sugar	The diabetes studies are predominantly animal experiments and attribute the effect to the intestinal microbiota. Am Menschen ist der Metabolismus nur mit einzelne
Astragalus lengthens telomeres	A meta-analysis examines a defined preparation (TA-65) with regard to telomere length, functional endpoints and inflammation. Telomere length is a marker, not

5. Profile: Molecule and Charge

Astragalus membranaceus (tragacanth) is not a single molecule but a **mixture** — there is no sum formula and no fixed molecular mass. What can be described are functional groups, charge behaviour and redox properties; that is exactly what the next section addresses.

6. Charge, Electrons, Radicals

In free radical scavenging tests such as DPPH and ABTS, an Astragalus preparation showed enhanced antioxidant activity³¹. The DPPH assay yielded a radical scavenging of 57.5 ± 1.3 % for a combination³⁰; the value applies to the combination, not to the individual substance. In human dermal fibroblasts, two compounds reduced reactive oxygen species and matrix metalloproteinase-1 after TNF-α stimulation²⁷. In SH-SY5Y cells, astragaloside VII lowered ROS accumulation and restored the mitochondrial membrane potential²⁸. A review mentions Nrf2 activation with upregulation of HO-1 and NQO1²⁹.

For humans the evidence supplies no electrochemical measurements. A modulation of reactive oxygen species and enzyme activities is cited for Astragalus in general²⁵. No evidence sentence addresses charge or cation exchange; this question remains open. In animal studies ROS quantification, glutathione content, JC-1 and Mitotracker staining were employed³³, and in a COPD mouse model ROS and GSH serum values were recorded²⁶. Astragaloside IV reduced mitochondrial ROS in rats and in NRK-52E cells and inhibited the NLRP3 cascade³². Which redox parameters are measurable in humans would need clarification.

7. Interactions with Other Substances

With which other substances of the platform this substance has been **jointly** investigated or discussed in human studies and reviews — combination, comparison or shared mechanism of action. The number indicates works in which both appear.

SUBSTANCE	SHARED WORKS	OF WHICH CONTROLLED IN HUMANS
Chronic Inflammation	85	8
Stress, Cortisol and Inflammation	31	2
Adaptogens	18	4
Gut Microbiome	16	1
Art Therapy	15	3
Quercetin	8	0
Turmeric and Curcumin	7	1
Medicinal Mushrooms (Reishi, Chaga, Cordyceps)	5	0
Probiotics	4	0

SUBSTANCE	SHARED WORKS	OF WHICH CONTROLLED IN HUMANS
Butyrate (Butyric Acid)	4	0

For combinations with cytostatics a phase-I human study exists: SH003, a mixture containing Astragalus, was tested with docetaxel in advanced solid tumours, notably lung and breast cancer. The combination showed a favourable safety profile; the maximum tolerated dose was determined as 4800 mg/day SH003; in several participants preliminary disease stabilisation was observed ^{10 10}. Because it is a mixture, no statement about the single substance Astragalus can be derived. A meta-analysis of randomised controlled trials examined Astragalus polysaccharides (APS) together with radiochemotherapy in cervical carcinoma: compared with chemoradiotherapy alone the combination improved the objective response rate (RR = 1.43, 95 % CI: 1.24-1.64), the disease control rate (RR = 1.16, 95 % CI: 1.08-1.24) and the Karnofsky index (MD = 6.64, 95 % CI: 4.12-9.16) ^{11 11 11}.

Further combinations concern conventional therapy: an observational human study reports that APS-I in addition to standard therapy produced a higher improvement rate of the Karnofsky index (60.5 % vs. 27.9 %, P = 0.003) and a lower adverse-event rate (11.1 % vs. 33.3 %, P = 0.014) ³⁵. An acupuncture injection at point PC6 with Astragalus injection plus standard therapy improved cardiac function, exercise tolerance and quality of life in heart failure with Qi-deficiency and blood-stasis syndrome, without observed adverse events ²³. For EFT combined with conventional CKD medication an improved renal function without reported safety concerns is described in CKD stage 3-5 ³⁴. The evidence supplies no data on absorption, CYP enzymes or binding. Whether the observed combination effects can be confirmed in multicentre randomised trials would need examination ³⁵.

8. Overdosage, Tolerability, Limits

Results of controlled human studies are available on the tolerability of Astragalus membranaceus; no dose is stated in the evidence. In a double-blind randomised study of 90 adults with functional knee pain no serious adverse events occurred under a standardised extract ⁵⁵. A controlled study on the combination of Radix Astragali with Radix notoginseng in diabetic nephropathy states that the included studies showed no obvious adverse effects ⁴.

When combined with CT, meta-analyses in humans report no increased rate of adverse reactions: for A. membranaceus plus CT RR = 0.86 (95 % CI: 0.25 to 2.96, p = 0.81) ⁸; in the second meta-analysis the rate did not rise (RR = 1.60, 95 % CI: 0.59 to 4.29, p = 0.35) ⁹, likewise in HFmrEF patients ⁹. A multicentre open phase-I dose-escalation study examines the safety of SH003 from A. membranaceus, Angelica gigas and Trichosanthes kirilowii together with docetaxel in breast and lung cancer ¹⁰¹⁰. Which dose marks the tolerability limit would need to be clarified by dose-finding.

9. The Most Robust Works

Ordered by strength of evidence, not by familiarity. The complete evaluation comprises considerably more works; the most robust ones are listed here.

Controlled Human Studies

- ¹ Efficacy of Astragalus Membranaceus (Huang Qi) for Cancer-Related Fatigue: A Systematic Review and Meta-Analysis of Randomized Controlled Studies (2025)
- ² Molecular mechanisms of astragaloside-IV in hepatocellular carcinoma therapy: a systematic review (2025)
- ³ Efficacy and safety of astragalus polysaccharides in patients with malignant tumors: A systematic review and meta-analysis (2025)
- ⁴ Combination of Astragalus membranaceus and Panax notoginseng as Main Components in the Treatment of Diabetic Nephropathy: A Systematic Review and ... (2023)
- ⁵ Astragalus membranaceus extract reduces functional knee joint pain: a randomized, double-blinded, placebo-controlled trial (2025)
- ⁶ Herbal extract (Cervus elaphus Linnaeus, Angelica gigas Nakai, and Astragalus membranaceus Bunge) ameliorates chronic fatigue: A randomized ... (2024)
- ⁷ Effects of TA-65 on telomere length, functional outcomes, and inflammation: a systematic review and meta-analysis (2025)
- ⁸ Effect of Astragalus membranaceus on left ventricular remodeling in HFrEF: a systematic review and meta-analysis (2024)
- ⁹ Effect of astragalus injection on left ventricular remodeling in HFmrEF: a systematic review and meta-analysis (2024)
- ¹⁰ Safety Evaluation of SH003 and Docetaxel Combination in Patients With Breast and Lung Cancer: A Multi-Center, Open-Label, Dose Escalation Phase I ... (2025)
- ¹¹ Astragalus polysaccharides combined with radiochemotherapy for cervical cancer: a systematic review and meta-analysis of randomized controlled studies (2025)
- ¹² Efficacy of Yupingfeng powder in the treatment of bronchial asthma in adults: a systematic review and meta-analysis (2026)
- ¹³ The clinical efficacy of Astragalus-containing Chinese patent medicines in the effective treatment of heart failure: A systematic review and network ... (2026)
- ¹⁴ Astragalus membranaceus therapy in patients with spinocerebellar ataxia type 3 (2026)
- ¹⁵ Astragalus membranaceus Extract as a Botanical Ingredient for Pigmentary and Anti-Aging Skincare: A Systematic Review (2026)
- ¹⁶ Evaluation of the Effect of Astragalus membranaceus Saponins Administration on Knee Function and Cartilage Biomarkers in Healthy ... (2026)
- ¹⁷ Exploring the dosage-effect relationship and mechanism of Huangqi in Huangqi Guizhi Wuwu decoction for treating rheumatoid arthritis based on the ... (2026)

- ¹⁸ Efficacy and safety of medicine-food homology Shenqi paste in older adults with diabetic sarcopenia: A randomized, double-blind, placebo-controlled ... (2026)
- ¹⁹ SHPro® (mixture of Angelica gigas and Astragalus membranaceus) in men with lower urinary ... (2025)
- ²⁰ Efficacy and safety of SH003 on immune function: study protocol for a randomized, double-blind placebo-controlled clinical trial (2025)
- ²¹ Effect of astragalus membranaceus on neurological function in acute aneurysmal subarachnoid hemorrhage patients with high inflammation: A preliminary ... (2024)
- ²² Efficacy, safety, and response predictors of Astragalus in patients with mild to moderate Alzheimer's disease: A study protocol of an assessor-blind ... (2024)
- ²³ Effect and safety of Neiguan acupoint injection with astragalus injection for chronic heart failure with qi-deficiency and blood-stasis syndrome: a ... (2026)

Observational Studies in Humans

- ²⁴ Research progress of Astragalus membranaceus in treating peritoneal metastatic cancer (2023)

10. Summary

The most robust statements concern cancer-related fatigue, polysaccharides in malignant tumours and left ventricular remodelling in heart failure. For cancer-related fatigue, the addition of Astragalus membranaceus to the control group reduced fatigue (SMD = -1.63) and improved quality of life (SMD = 0.86). For Astragalus polysaccharides in malignant tumours, the treatment exceeded the control in response rate (RR = 1.30) and in T-cell measures. For Astragalus injections in heart failure, the ejection fraction improved (LVEF, MD = 4.56). For functional knee pain, a randomised, double-blind, placebo-controlled study reports a 30% reduction.

PLAUSIBLE The preclinical basis is broad: structural and inflammation studies on polysaccharides, animal studies on colitis and diabetes, mechanisms of astragaloside IV in hepatocellular carcinoma and diabetic kidney disease. Several animal studies attribute the observed effects to the gut microbiota, and a review on oral pharmacokinetics classifies which effects are to be expected after oral administration. **Hypothesis:** If part of the effect is mediated via the gut microbiota and low-molecular-weight degradation products, preparation, molecular weight and oral bioavailability could shape the results more strongly than the plant species. It follows that findings on mixtures cannot be transferred to individual substances.

It remains open which preclinical mechanisms prove clinically relevant in controlled human studies, for example in diabetic kidney disease or liver damage. In rheumatoid arthritis, it remains to be determined which dose proves superior in clinical testing. The meta-analysis on the telomerase-activating compound found telomere lengthening that did not translate into functional improvements. In the phase-I trial of a mixture of Astragalus membranaceus, Angelica gigas and Trichosanthes kirilowii with docetaxel, it remains open how the dermatological reactions are distributed to the Astragalus membranaceus component.

11. What Remains Open

- **Preparation:** Which extracts and polysaccharide fractions were used in the controlled studies, and can findings be transferred between them?
- **Absorption:** What proportion of orally administered polysaccharides reaches the tissue unchanged in humans, and what part of the effect occurs via the gut microbiota?
- **Endpoint:** Which controlled study examines a clinical course instead of a laboratory value or questionnaire?

12. Further Paths

Topics, mechanisms of action and pathways in which this substance occurs — for all those who want to look beyond the substance.

- Interaction network

Frequently Asked Questions

How reliable are the studies on Astragalus in humans?

The largest part of the works is preclinical. In humans observational studies predominate; controlled trials form a minority and focus on safety, inflammation, oncology and the immune system. The existing meta-analyses predominantly pool smaller and partly heterogeneous primary studies, which is why their statements remain tied to the preparation and endpoint.

Can Astragalus be used alongside tumour therapy?

The available works examine safety and tolerability of combinations: one finished preparation together with docetaxel in breast and lung cancer, polysaccharides together with radiochemotherapy in cervical carcinoma. Such studies support statements about the respective mixture, not about Astragalus alone. Open is which preparation and which endpoint would justify its own controlled trial.

Are Astragalus injections comparable with oral extracts?

No. Two meta-analyses examine Astragalus injections in heart failure and evaluate left-ventricular remodelling; oral extracts are tested in other works on other endpoints. Route of administration, preparation and measured variable differ, so results cannot be transferred between the dosage forms. To be clarified is whether both routes influence the same target variables.

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27

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28

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29

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