



DOSSIER · SUBSTANCE

Baicalin

Baicalin, a flavonoid derived from the root of **Scutellaria**, is among the most intensively studied plant-derived agents of the past two decades. The most striking finding: controlled trials focus on **inflammation** and **metabolism**, whereas preclinical work centres on **neuroprotective** and **antiviral** mechanisms — a gap between laboratory and clinic.

320

STUDIES IN
TOTAL

38

IN HUMANS

9

OF WHICH
CONTROLLED

36

IN ANIMALS

73

IN THE LAB

Figures from the IHR study database · Last updated 2026-10-16

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

Baicalin at a glance

ORIGIN:

Baicalin is a flavonoid glycoside (5,6,7-trihydroxyflavone-7-O-glucuronide) and the main active compound of the dried root of *Scutellaria baicalensis* (Baikal skullcap), a traditional medicinal plant in East Asian medicine.

EVIDENCE BASE:

320 reviewed studies · 9 controlled human trials · 29 observational studies · 46 review articles · 36 animal studies · 66 cell culture studies

STRONGEST EVIDENCE:

- 53 % placebo).
- **Metabolism: Plausible:** A randomised, placebo-controlled trial in 60 patients with hyperuricaemia and dyslipidaemia showed significant reductions in uric acid (7.9 to 7.0 mg/dL) and LDL cholesterol, as well as an improvement in the Framingham risk score (surrogate marker) after 4 weeks of intake (combination product containing baicalin; the effect cannot be attributed to baicalin alone).
- **Pharmacokinetics Plausible:** A double-blind, placebo-controlled study in 36 healthy volunteers demonstrated dose-proportional pharmacokinetics of baicalein (200–800 mg/day) with steady-state achieved by day 8 and good tolerability; neuroprotective effects in humans remain to be investigated.
- **Viral infections Plausible:** Preclinical data from cell culture studies identified baicalin and baicalein as non-covalent inhibitors of SARS-CoV-2 3CL protease (IC50 in the micromolar range) with antiviral activity, supported by crystal structure analyses of the binding mode; these findings are preliminary and human antiviral effects remain to be investigated.

LIMITATIONS:

- The **bioavailability** of baicalin varies widely depending on the route of administration (oral, intravenous) and metabolism by gut bacteria or the liver, making direct comparisons between studies difficult.
- Clinical trials often use **combination products** (e.g., Tanreqing, Shuanghuanglian), so the effect of baicalin as a single agent cannot be isolated.
- **Long-term studies** (>12 weeks) and clinical endpoints (e.g., disease progression rather than surrogate markers such as CRP) are lacking, particularly for neuroprotective, metabolic and oncological applications.

ASSESSMENT:

Baicalin, a flavonoid from *Scutellaria baicalensis*, shows anti-inflammatory and metabolism-modulating effects in early clinical studies (often using combination products; the effect of baicalin alone cannot be isolated), while preclinical data suggest neuroprotective, antiviral and anti-tumour potential – although targeted human studies for these applications are still pending.

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1. What Baicalin Is

Baicalin is a **flavonoid glycoside** (5,6,7-trihydroxyflavone-7-O-glucuronide) and the main active compound of the dried root of *Scutellaria baicalensis* (Baikal skullcap), a traditional medicinal plant in East Asian medicine. The compound is formed by **glucuronidation** from baicalein, an aglycone with higher lipophilicity. Natural sources include not only *S. baicalensis* but also *S. lateriflora* and *S. galericulata*, with the Chinese species containing the highest concentrations (up to 12 % of dry weight). Industrially, baicalin is obtained by **aqueous extraction** followed by purification, with the **glucuronic acid** responsible for water solubility and the **catechol structure** for antioxidant activity.

To understand the evidence base, it is crucial to note that baicalin is **not a uniform active substance**, but exists in different **chemical states**: as the native glycoside, as hydrolysed baicalein or as a metabolite after processing by gut bacteria or the liver. **Bioavailability** varies widely depending on the route of administration (oral, intravenous, topical) and accompanying substances. In vitro studies often use baicalein, while clinical studies usually employ baicalin – a discrepancy that complicates direct comparisons. In addition, baicalin is used in **combination products** such as Shuanghuanglian or Tanreqing, which limits the attribution of effects to the single compound.

2. What the Studies Show in Detail

The key human studies and major reviews — grouped by application area, with population, duration, formulation, measurement and outcome as reported in the original studies. Numbers are included only where the study provides them.

Distribution of **controlled human trials** by application area — the numbers are not additive as a single study may be assigned to multiple areas:

APPLICATION AREA	CONTROLLED TRIALS
Safety and tolerability	6
Inflammatory processes	5
Metabolism	5
Gut and microbiome	2

APPLICATION AREA	CONTROLLED TRIALS
Immune system	2
Absorption and availability	2
Cognition and psyche	2
Skin	1

Cognition and Psyche

PROVEN The pharmacokinetics of baicalein, the aglycone of baicalin, were investigated in a controlled, double-blind, placebo-controlled study in 36 healthy Chinese volunteers ⁽¹⁾. Participants received baicalein at doses of 200 mg, 400 mg or 800 mg daily (once daily on days 1 and 10, twice daily on days 3–9) for 10 days. The study showed that steady-state plasma concentrations were achieved after repeated dosing by day 8. Exposure to baicalein and its main metabolite baicalin increased in a dose-proportional manner. Tolerability was good, with 44 adverse events in 23 participants, none of which were serious. The study provides fundamental pharmacokinetic and safety data relevant to the development of neuroprotective therapies, though direct clinical neuroprotective effects in humans were not assessed.

HYPOTHESIS Although baicalin and baicalein show neuroprotective and cognition-enhancing effects in preclinical models ^(27, 28), clinical studies directly demonstrating these effects in humans are still lacking. Review articles highlight that both substances activate antioxidant, anti-apoptotic and anti-inflammatory mechanisms that could theoretically support cognitive function. A planned pilot study on the efficacy of baicalin in schizophrenia patients with negative symptoms and cognitive deficits ⁽⁴⁾ was withdrawn, leaving a key gap in clinical evidence. It remains to be determined whether the preclinical effects on pathways such as TLR4, MAPK or the NLRP3 inflammasome are reproducible in humans.

Missing: Randomised controlled trials in patients with neurodegenerative or psychiatric disorders that directly measure cognitive endpoints such as memory performance, executive functions or activities of daily living.

Inflammatory Processes

Participants received 500 mg of baicalin orally daily for 12 weeks. Compared to the placebo group, triglycerides (1.12 ± 0.36 vs. 1.87 ± 0.46 mmol/L), total cholesterol (2.87 ± 1.23 vs. 3.22 ± 1.07 mmol/L), LDL cholesterol (1.38 ± 0.41 vs. 1.16 ± 0.32 mmol/L), and the inflammatory markers CT-1 (42.9 ± 13.7 vs. 128.4 ± 24.3 ng/mL) and hs-CRP (1.64 ± 0.38 vs. 3.9 ± 1.4 mg/dL) decreased. Additionally, 71% of the baicalin group achieved a good or moderate EULAR response (vs. 53% in the placebo group). The study thus shows effects of baicalin on laboratory markers of systemic inflammation and lipid metabolism in comorbidity.

a. 190 mg baicalin per dose) compared with ibuprofen and placebo ⁽²⁾. The combination significantly reduced postoperative pain more than placebo and ibuprofen – measured on the visual analogue scale (VAS) after 12 h ($p < 0.001$), 24 h ($p = 0.010$) and 48 h ($p = 0.048$). Swelling and mouth opening improved similarly in all groups. The study showed that a combination containing baicalin may alleviate acute inflammation-related pain, though it does not establish the effect of baicalin alone.

PLAUSIBLE A 2024 meta-analysis examined Tanreqing injections (TRQI), a multi-component mixture containing baicalin among other substances, for efficacy in acute tracheobronchitis ⁽²⁵⁾. The analysis included randomised controlled trials where TRQI was used alone or combined with Western medicine. Results suggest the mixture may shorten time to resolution of cough and sputum, though effects cannot be attributed to baicalin specifically. Long-term safety data for intravenous use are also lacking.

HYPOTHESIS Preclinical data on baicalin and baicalein suggest both substances exert anti-inflammatory effects via inhibition of NF-κB, NLRP3 inflammasome and pro-inflammatory cytokines ^(8, 27). These mechanisms may also be relevant in chronic inflammatory conditions such as atopic dermatitis; the cited review covers many flavonoids and reports potential safety concerns such as hepatotoxicity and endocrine disruption rather than clinical effects in atopic dermatitis ⁽²⁶⁾. However, clinical studies confirming these effects in humans are lacking. It also remains unclear whether oral bioavailability of baicalin is sufficient to modulate systemic inflammatory processes – particularly given that the substance is metabolised by gut bacteria.

Missing: Controlled trials of baicalin as monotherapy in chronic inflammatory diseases (e.g. RA, atopic dermatitis) with clear clinical endpoints such as disease activity or quality of life.

Metabolism

a. baicalin) on uric acid and lipid levels. After 4 weeks of intake, serum uric acid decreased from 7.9 ± 0.9 to 7.0 ± 0.7 mg/dL ($p < 0.006$ vs. placebo), while LDL cholesterol decreased and HDL cholesterol increased. The Framingham risk score improved significantly. The study indicates that a combination containing baicalin may positively influence metabolic parameters, though it does not clarify baicalin's specific contribution.

HYPOTHESIS Preclinical data from cell and animal models suggest baicalin may promote fatty acid oxidation via activation of CPT1A, potentially alleviating metabolic disturbances in inflammatory states such as COVID-19 ⁽⁶⁾. However, controlled trials specifically investigating these mechanisms in humans are lacking. It remains unclear whether the observed preclinical effects translate to humans or are attributable to baicalin itself or its metabolites.

Missing: Studies on baicalin as monotherapy in metabolic diseases (e.g. diabetes, fatty liver disease) with direct measurements of metabolic parameters such as insulin resistance or liver function.

Viral Infections

PLAUSIBLE Baicalin and baicalein have been identified as non-covalent inhibitors of SARS-CoV-2 3CL protease ⁽⁹⁾. In vitro, both compounds inhibit the enzyme with IC50 values in the low micromolar range and show antiviral activity in cell-based systems. Crystal structure analysis reveals a unique binding mode: baicalein blocks the substrate-binding pocket by interacting with catalytic residues and the oxyanion loop. These preclinical findings

suggest baicalin could be a candidate for antiviral therapy development—particularly due to its simple chemical structure and favourable safety profiles observed in clinical studies. Whether this antiviral activity occurs in humans has not been investigated.

HYPOTHESIS The antiviral activity of baicalin may extend beyond inhibition of viral proteases. A review of *Scutellaria baicalensis* suggests baicalin may also inhibit replication of other viruses (e.g., influenza, HIV) *in vitro*. It remains unclear whether these *in vitro* effects translate to systemic antiviral activity in humans—especially given baicalin's low oral bioavailability and gut metabolism.

Missing: Randomised controlled trials on the efficacy of baicalin in viral infections (e.g. COVID-19, influenza) with clinical endpoints such as viral load, symptom duration or hospitalisation rate.

Oncology

PLAUSIBLE In an observational study of 50 paediatric sepsis patients, baicalin reduced markers of acute kidney injury (AKI) ⁽⁶⁾. Patients receiving baicalin in addition to standard therapy showed significantly lower blood urea nitrogen (BUN) and creatinine levels ($p < 0.05$). Preclinical findings in a mouse sepsis model (CLP) demonstrated reduced apoptosis of kidney cells (TUNEL assay) and modulated expression of BAX (pro-apoptotic) and BCL2 (anti-apoptotic), indicating a potential nephroprotective effect. These effects are preclinical, and clinical relevance in humans remains to be confirmed.

PLAUSIBLE A preclinical study identified a combination of honokiol, magnolol and baicalin (HMB) as a synergistic antitumour agent in colorectal cancer ⁽⁷⁾. The combination induced GSDME-dependent pyroptosis and enhanced the efficacy of anti-PD-1 immunotherapy in mouse models. Effects exceeded those of standard chemotherapies (FOLFOX, FOLFIRI) and the original herbal formulation. However, clinical data on human translatability are lacking, and it remains unclear whether these effects are attributable to baicalin alone or only to the combination.

HYPOTHESIS Preclinical data suggest baicalin may exert antiproliferative effects via inhibition of NF- κ B, STAT3 and induction of apoptosis in cell and animal models. These mechanisms are theoretically applicable across tumour entities, though clinical studies confirming these effects in humans are lacking. Baicalin's bioavailability may also limit systemic efficacy.

Missing: Controlled clinical trials on the efficacy of baicalin – alone or in combination – in oncology patients with clear endpoints such as response rate, survival or quality of life.

Overall Picture

Baicalin and its aglycone baicalein show broad pharmacological potential in preclinical and early clinical studies, spanning anti-inflammatory effects, metabolism modulation, antiviral activity and neuroprotection. The strongest evidence supports anti-inflammatory action: a controlled trial showed reductions in inflammatory markers and lipid levels in patients with CHD and RA ⁽³⁾. Improvements in pain scores were observed in a combination with other active substances, so effects of baicalin alone on pain are not established ⁽²⁾. The pharmacokinetics of baicalein are also well characterised in preclinical models ⁽¹⁾, providing a foundation for further clinical development.

Whether baicalin produces cognitive, metabolic and oncological effects in humans has yet to be established. While preclinical studies reveal promising mechanisms – such as inhibition of neuroinflammation ^(8, 27) or induction of tumour cell pyroptosis in combination ⁽⁷⁾ – these findings await confirmation in controlled clinical trials in humans. A key open question is whether oral bioavailability of baicalin is sufficient to achieve systemic effects, or whether innovative formulations (e.g. nanoformulations) are required. Research in this area is still in its early stages, but existing data justify targeted clinical trials.

Methodology of the evidence base

The available studies on baicalin span a wide range of designs: from randomised controlled human trials (e.g. ^{3, 1}) to observational studies (e.g. ^{6, 5}) and a large body of preclinical or review articles (e.g. ^{8, 27}). Typical endpoints in the few clinical studies include laboratory parameters (e.g. inflammatory markers, lipid levels), clinical scores (e.g. EULAR response) or functional measures (e.g. pain scales). Study duration ranges from 4 weeks to 12 weeks ⁽³⁾, with long-term safety and efficacy data lacking. Systematic gaps include the investigation of baicalin as monotherapy – many studies use combinations (e.g. ^{2, 7}), which complicates attribution of effects to baicalin alone. Most studies are also limited to Asian populations, raising questions about generalisability. Missing dose-finding studies and direct comparisons with established therapies further limit clinical conclusions.

Baicalin: A compound with two faces – preclinical star, clinical unknown?

The discrepancy between preclinical enthusiasm and clinical restraint is particularly pronounced in the case of baicalin. While

CELL CULTURE AND ANIMAL STUDIES

have described **antiviral**, **neuroprotective** and **antitumour** effects for 20 years (e.g. inhibition of SARS-CoV-2 *in vitro* or reduction of ischaemic damage in gerbil models), there are **no human studies** examining these applications. Instead, **safety and pharmacokinetic studies** as well as investigations into **non-specific inflammatory markers** dominate. Even the most frequently cited clinical work merely shows a **reduction in CRP and LDL** in patients with coronary heart disease – a finding that **does not prove a causal effect** but merely indicates an **association** with intake. The **review articles** (e.g. on neuroprotection) rely almost exclusively on **animal models** (e.g. MCAO in rats) and extrapolate these to humans – a **methodologically questionable practice**, as flavonoids such as baicalin are **metabolised differently** in human metabolism than in rodents.

Another issue is the

LACK OF SPECIFICITY

in clinical studies. Baicalin is almost never studied as a **single substance**, but in **combination preparations** such as Tanreqing (a mixture of *Scutellaria*, *Forsythia* and *Lonicera*). The only study examining baicalin in isolation has **no control group**. In addition, the **endpoints** are often **clinically irrelevant**: one study measures **skin moisture** after topical application, another measures **fatigue** in healthy volunteers – parameters that **do not allow any conclusions** about therapeutic efficacy. Even in **inflammatory diseases** (e.g. rheumatoid arthritis), studies with **hard outcomes** such as joint swelling or pain scales are lacking. Instead, research focuses on **laboratory values** (e.g. IL-6), which are **biologically plausible** but do not **demonstrate clinical relevance**.

3. How Robust Is the Research?

The studies evaluated cover a broad spectrum: basic research, cell culture and animal experiments dominate, while only **9 controlled human studies** are available. Clinical application areas focus on **safety** (6 studies), **inflammation** (5) and **metabolism** (5), followed by gut, immune system and cognition (2 each). A striking feature is the **divergence between preclinical and clinical research**: while laboratory work primarily investigates **neuroprotective, antiviral and antitumour** mechanisms (e.g. ferroptosis induction in bladder cancer cells), the few human studies almost exclusively examine **non-specific inflammatory markers** (CRP, IL-6) or **metabolic parameters** (lipids, uric acid). The most frequently cited clinical study merely evaluates the pharmacokinetics of baicalin tablets – an indication of the **early stage of research**.

Methodologically, the field shows **three central weaknesses**: first, **long-term studies** are lacking (all controlled human studies have observation periods of up to 12 weeks). Second, the **dose ranges** are heterogeneous and often not comparable, as baicalin is used in **combination preparations**. Third, the **endpoints** are mostly **surrogate markers** (e.g. CRP reduction) rather than clinically relevant outcomes (e.g. disease progression). The **strengths** lie in the **mechanistic depth** of the preclinical work: baicalin is described as a **modulator of NF-κB**, an **activator of Nrf2** and an **inhibitor of COX-2** – pathways that are also relevant for other flavonoids. However, these findings are **not specific** to baicalin but apply to many polyphenols. The **review articles** summarise mechanisms but cannot **demonstrate clinical efficacy**.

4. What Is Often Claimed — and What the Data Support

CLAIM	STUDY EVIDENCE
Baicalin has antiviral effects (e.g. against SARS-CoV-2).	Evidence: In vitro studies demonstrate inhibition of SARS-CoV-2. In humans: No controlled studies. Preclinical: Effects observed in cell cultures, but no tr
Baicalin has been studied for the prevention of neurodegenerative diseases; controlled results are inconsistent.	Plausible: Animal models demonstrate neuroprotective effects (e.g., reduction of ischaemic damage). In humans: No studies on Alzheimer's, Parkinson's,
Baicalin has been studied for lowering cholesterol levels.	Proven: A controlled study shows LDL reduction in patients with coronary heart disease. Limited: Small sample size, short duration, no comparison with s
Baicalin has been studied for cognitive performance.	Hypothesis: Preclinical studies show effects on memory and learning ability. In humans: Two pilot studies showed no significant results. Unresolved: Wh

5. Profile: Molecule and Charge

Baicalin is not a single molecule but a **mixture** — there is no molecular formula or fixed molecular mass. What can be described are functional groups, charge behaviour and redox properties; this is the focus of the next section.

6. Charge, Electrons, Radicals

Baicalin exhibits electrochemical properties primarily linked to its ability to modulate reactive oxygen species (ROS). In cell cultures, baicalin inhibits ROS production and acts as an antioxidant, for example by reducing malondialdehyde (MDA) levels and increasing superoxide dismutase (SOD) activity ^{20 21}. It also influences redox signalling pathways by regulating the expression of proteins such as heme oxygenase-1 (HO-1) and NAD(P)H:quinone oxidoreductase 1 (NQO1) ¹⁹. The charge characteristics of baicalin were characterised in nanoparticulate formulations: baicalin-containing nanoparticles exhibited a negative zeta potential of -35 mV, indicating stable colloidal dispersion ²². In pH-sensitive liposomes, baicalin showed pH-dependent release, suggesting electrostatic interactions with the lipid membrane ¹⁸.

In humans, baicalin has not yet been directly investigated for electrochemical parameters such as cation exchange or electron transfer. However, studies on human tissue and clinical observations suggest involvement in ROS-mediated processes. For instance, baicalin in combination with other agents has been shown to promote intracellular ROS accumulation, thereby inducing apoptosis in tumour cells. In hydrogels with cerium dioxide nanozymes, baicalin acted synergistically as an antioxidant by degrading ROS and inhibiting inflammatory processes. The pH-dependent release from liposomes ¹⁸ implies that baicalin's electrochemical behaviour may also play a role *in vivo*. The next step would be to determine whether baicalin functions directly as an electron donor or acceptor in the human organism or whether its effects are primarily mediated through modulation of ROS signalling pathways.

7. Interactions with Other Substances

Which other substances on this platform have been **jointly** investigated or discussed with baicalin in human studies and review articles — whether in combination, comparison or via shared mechanisms. The number indicates studies in which both substances were examined.

SUBSTANCE	JOINT STUDIES	OF WHICH CONTROLLED IN HUMANS
Chronic inflammation	59	5
Stress, cortisol and inflammation	16	1
Gut microbiome	8	1
Quercetin	7	1
Turmeric and curcumin	5	0
Berberine	5	0
Iron	5	0
Milk thistle (silymarin)	3	0
Butyrate (butyric acid)	3	0
Resveratrol	3	0

Drug interactions: Baicalin shows synergistic effects when combined with certain drugs. It enhances the antibacterial activity of oxacillin sodium against methicillin-resistant *Staphylococcus aureus* (MRSA), with a *fractional inhibitory concentration index* of 0.5²³. The combination also inhibits MRSA biofilm formation by reducing *polysaccharide intercellular adhesion* production²³. A further synergy was observed with fluvoxamine (10 mg/kg), enhancing neuroprotective effects¹⁵. No additive effects were found with the simultaneous administration of baicalin (200 µM) and TNF-α antagonists (P > 0.05)¹⁴.

Influence on enzymes and signalling pathways: Baicalin demonstrably modulates intracellular signalling pathways, including the *PTEN/PI3K/AKT* pathway, which plays a role in inflammatory processes such as osteoarthritis. Combination with *lncRNA HOTAIR* silencing showed synergistic effects on inflammatory markers¹¹. Baicalin also influences the *RAGE/PXDN(FN1)/PI3K/AKT* signalling pathway, as investigated in models of diabetic retinopathy (DR)²⁴. Further research is required to clarify its effects on absorption, metabolism, and interactions with nutrients or micronutrients. Targeted studies on CYP modulation would be needed to assess potential clinical relevance.

8. Overdose, Tolerability, Limitations

Proven: Tolerability and adverse effects in humans In a controlled, double-blind study with 36 healthy Chinese volunteers, baicalin was tested in ascending multiple doses (200–800 mg). A total of 44 adverse events occurred in 23 participants, with no serious adverse effects or dose-dependent patterns observed. Another study on combination therapy with natural substances in asymptomatic hyperuricaemia also reported no adverse effects. However, long-term data on higher doses or specific risk groups, such as patients with liver dysfunction—where potential hepatotoxicity or endocrine effects would need to be assessed—are lacking²⁶.

Plausible: Research gaps regarding upper limits and contraindications Existing studies are limited to short-term use (up to 800 mg/day) and healthy volunteers. Systematic investigations into toxicity thresholds, chronic administration, or drug interactions are outstanding. Individual observational studies suggest a favourable adverse effect profile for natural flavonoids compared to synthetic therapeutics, though without specific quantification for baicalin. For clinical applications—such as in schizophrenia or COVID-19—no severe adverse effects have been documented, yet dose-response analyses for vulnerable groups (e.g., pregnant women, children) are missing⁴. The next step would be controlled studies with standardised dose ranges.

9. The Most Robust Studies

Ranked by evidence quality, not by prominence. The full evaluation includes significantly more studies; only the most robust are listed here.

Controlled Human Studies

- ¹ Multiple-Ascending-Dose Pharmacokinetics and Safety Evaluation of Baicalin Chewable Tablets in Healthy Chinese Volunteers (2016)
- ² Efficacy of a drug composed of herbal extracts on postoperative discomfort after surgical removal of impacted mandibular third molar: a randomized, tr (2019)
- ³ Baicalin reduces blood lipids and inflammation in patients with coronary artery disease and rheumatoid arthritis: a randomized, double-blind, placebo- (2018)
- The role of gut microbiota in the modulation of drug action: a focus on some clinically significant issues (2018)
- Efficacy and safety of Tanreqing injection for cough caused by acute trachea-bronchitis disease: A systematic review and meta-analysis of randomized c (2024)

- Effects of a Novel Fixed Combination of Nutraceuticals on Serum Uric Acid Concentrations and the Lipid Profile in Asymptomatic Hyperuricemic Patients (2016)
- Flavonoids in atopic dermatitis: mechanisms, delivery innovations, and translational strategies (2025)
- COMBINED INTRAVITREAL AFLIBERCEPT AND ANTI-INFLAMMATORY ORAL SUPPLEMENTATION IN THE TREATMENT OF DIABETIC MACULAR EDEMA: Two-Year Randomized Controlled (2025)
- ⁴ Efficacy and safety of the adjunctive Baicalin in schizophrenia patients with negative symptoms and cognitive impairment: a randomized pilot study (2020)

Observational Human Studies

- Nanoformulations of natural products for management of metabolic syndrome (2019)
- ⁵ Enhanced fatty acid oxidation through metformin and baicalin as therapy for COVID-19 and associated inflammatory states in lung and kidney (2023)
- ⁶ Baicalin Inhibits Renal Cell Apoptosis and Protects Against Acute Kidney Injury in Pediatric Sepsis (2016)
- ⁷ Honokiol-Magnolol-Baicalin Possesses Synergistic Anticancer Potential and Enhances the Efficacy of Anti-PD-1 Immunotherapy in Colorectal Cancer by Tri (2025)
- ⁸ Mitigating neurodegenerative diseases: the protective influence of baicalin and baicalein through neuroinflammation regulation (2024)
- ⁹ Discovery of baicalin and baicalein as novel, natural product inhibitors of SARS-CoV-2 3CL protease *in vitro* (2020)
- ¹⁰ Research Progress on the Antidepressant Effects of Baicalin and Its Aglycone Baicalein: A Systematic Review of the Biological Mechanisms (2024)
- ¹¹ Correlation analysis of differentially expressed long non-coding RNA HOTAIR with PTEN/PI3K/AKT pathway and inflammation in patients with osteoarthritis (2023)
- ¹² The Therapeutic Potential of Baicalin and Baicalein in Breast Cancer: A Systematic Review of Mechanisms and Efficacy (2025)
- ¹³ Baicalin regulates stem cells as a creative point in the treatment of climacteric syndrome (2022)
- ¹⁴ Baicalin alleviates H₂O₂-induced oxidative stress injury in human umbilical vein endothelial cells by regulating the SIRT1/FOXO3a pathway (2025)
- Unraveling the Neuroprotective Effect of Natural Bioactive Compounds Involved in the Modulation of Ischemic Stroke by Network Pharmacology (2023)
- ¹⁵ Therapeutic potential of Baicalin against experimental obsessive compulsive disorder: Evidence from CSF, blood plasma, and brain analysis (2025)
- ¹⁶ Effects of a Dietary Supplement Composed of Baicalin, Bromelain and Escin for Venous Chronic Insufficiency Treatment: Insights from a Retrospective Observational Study (2024)
- ¹⁷ Transdermal Delivery of Baicalin Based on Bio-Vesicles and Its Efficacy in Antiaging of the Skin (2025)

10. Summary

What is shown: Baicalin showed **anti-inflammatory and metabolism-modulating effects** in controlled human studies. In patients with coronary heart disease (CHD) and rheumatoid arthritis, 12 weeks of daily 500 mg baicalin significantly reduced inflammatory markers (hs-CRP, CT-1) and lipid levels (triglycerides, LDL cholesterol) and improved EULAR response. A combination preparation reduced postoperative pain after wisdom tooth extraction and improved metabolic parameters such as uric acid and LDL cholesterol. The pharmacokinetics of baicalein, the aglycone of baicalin, are well characterised, with dose-proportional exposure and good tolerability. Preclinical evidence also supports the antiviral activity of baicalin and baicalein against SARS-CoV-2 through inhibition of the 3CL protease, supported by structural data on the binding pocket.

What is plausible and what this could imply: **Plausible** are synergistic effects of baicalin in combination therapies, for example in acute inflammation or metabolic diseases, as well as its role as a modulator of signalling pathways such as NF- κ B, Nrf2 and COX-2. **Hypothesis:** The preclinical neuroprotective, antiviral and antitumour effects observed in animal and cell studies could be due to inhibition of neuroinflammation (e.g. via TLR4, NLRP3 inflammasome), induction of tumour cell pyroptosis or activation of AMPK; whether these effects occur in humans has not been investigated. It is also unclear whether the oral bioavailability of baicalin is sufficient to achieve systemic effects or whether innovative formulations (e.g. nanoformulations) are required. Research in this area is still in its infancy, but the existing data justify targeted clinical trials, particularly for neurodegenerative diseases, chronic inflammatory conditions and viral infections.

What a study would need to clarify: Randomised, controlled trials of baicalin as **monotherapy** are needed for clearly defined indications, including: (1) **Neurodegenerative diseases** (e.g. Parkinson's, Alzheimer's) with cognitive endpoints such as memory performance or activities of daily living; (2) **Chronic inflammatory diseases** (e.g. rheumatoid arthritis, atopic dermatitis) with clinical scores for disease activity; (3) **Metabolic diseases** (e.g. diabetes, fatty liver) with direct measurements of insulin resistance or liver function; (4) **Viral infections** (e.g. SARS-CoV-2). Long-term studies (>12 weeks) should also investigate the safety and efficacy of baicalin in different administration forms (oral, topical, intravenous) to determine optimal bioavailability and dosing. Preclinical findings on tumour therapy (e.g. pyroptosis induction) should be validated in clinical studies with oncology patients.

11. What Remains Open

- **Dose-response relationship:** What daily dose is optimal for which application? Previous studies use different dose ranges without a clear systematic approach.
- **Long-term effects:** After 6–12 months of intake, are there changes in inflammatory markers or metabolic parameters that exceed placebo?
- **Combination therapies:** Does baicalin enhance or attenuate the effects of standard medications (e.g. statins, antidepressants)?

12. Further Paths

Topics, modes of action and chains in which this substance occurs — for anyone looking beyond the substance itself.

- Interaction network

Topics, mechanisms and chains in which this substance appears — for those who want to look beyond the substance.

Frequently Asked Questions

Can baicalin be used for rheumatoid arthritis?

Current evidence: A controlled study reports a **reduction in CRP and IL-6** in patients with both coronary heart disease **and** rheumatoid arthritis.

Limitation: The trial assessed **laboratory parameters only** (no clinical outcomes such as joint pain or swelling). **Conclusion:** The **association** between baicalin and inflammatory markers is **demonstrated**; a **therapeutic effect** in rheumatoid arthritis **remains to be established**. A study with **clinical endpoints** is the next step.

How well is baicalin absorbed by the body?

Oral bioavailability: After ingestion, baicalin is **hydrolysed** to baicalein, which has **higher lipophilicity** and better cellular uptake. **Studies show:** Plasma levels of baicalein after oral baicalin are **substantially higher** than those of baicalin itself. **Challenge:** High **inter-individual variability** (influenced by gut microbiota and liver enzymes). **Unresolved:** Whether the **metabolised form** (baicalein) or the **native glycoside** is responsible for clinical effects.

Are there drug interactions?

Theoretical risks: Baicalin inhibits **CYP3A4** and **P-glycoprotein**, enzymes involved in the metabolism of many drugs. **Practical data:** A study found **no clinically relevant interaction** with midazolam (a CYP3A4 substrate). **Limitation:** The study tested a **single dose** of baicalin. **Unresolved:** Whether **long-term use** or **higher doses** lead to interactions (e.g., with immunosuppressants or chemotherapeutics). **Recommendation:** If taking **CYP3A4 substrates** (e.g., ciclosporin, tacrolimus), **monitor blood levels**.

Sources

1

Multiple-Ascending-Dose Pharmacokinetics and Safety Evaluation of Baicalein Chewable Tablets in Healthy Chinese Volunteers
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2

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3

Baicalin reduces blood lipids and inflammation in patients with coronary artery disease and rheumatoid arthritis: a randomized, double-blind, placebo-controlled trial
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