



DOSSIER · SUBSTANCE

Purple Coneflower (Echinacea Purpurea)

The page classifies the research on purple coneflower (Echinacea purpurea). The immune system and safety are most frequently investigated, yet the studies work with very different preparations — from root, fresh plant or as fluid extract. Precisely this variety makes comparing the results difficult.

195

STUDIES IN
TOTAL

69

IN HUMANS

41

OF WHICH
CONTROLLED

13

IN ANIMALS

20

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

Purple Coneflower (Echinacea purpurea) at a Glance

ORIGIN:
Purple coneflower is Echinacea purpurea. Root extracts, preparations from the fresh plant, fluid extracts and standardised preparations are investigated. "Echinacea purpurea" therefore does not refer to a uniform preparation, but to extracts from different plant parts.

EVIDENCE BASE:
195 evaluated studies · 41 controlled human studies · 28 observational studies · 18 review articles · 13 animal studies · 17 cell-culture studies

- STRONGEST EVIDENCE:**
- **Prevention:** The 2019 systematic review evaluated randomised, placebo-controlled studies; for the prevention of upper-respiratory-tract infections the risk ratio was 0.78 (95 % CI 0.68–0.88) ⁴.
 - **Safety:** The 2012 randomised, double-blind, placebo-controlled study in 755 healthy participants over 4 months reported 293 adverse events with Echinacea and 306 with placebo ²⁸.
 - **Viral infections:** In the same study the alcohol extract from freshly harvested Echinacea purpurea reduced the number of cold episodes and inhibited virally confirmed infections with enveloped viruses (P < 0.05) ²⁸.
 - **Cold severity:** The 2010 randomised controlled study in 719 patients with a newly occurring cold reported mean global severity scores of 264 under placebo and 236 and 258 in the Echinacea groups ⁵.
 - **Prevention and treatment:** The 2000 review found 16 studies with a total of 3396 participants; some Echinacea preparations may be superior to placebo, but a quantitative meta-analysis was not possible ⁶.

- LIMITATIONS:**
- The studies differ in species, plant part, preparation and endpoint, from disease incidence through duration to immune markers; this complicates comparison of results.
 - The 2002 randomised, placebo-controlled study in 148 students with an incipient cold found no significant differences between Echinacea and placebo for any endpoint ¹⁹.
 - The 2015 review reports contradictory adverse effects, ranging from beneficial actions without serious events to abdominal pain, angio-oedema, dyspnoea and urticaria ³³.

CLASSIFICATION:
Purple coneflower preparations are not uniform but comprise extracts from different plant parts whose tested effects vary according to the preparation.

1. What Purple Coneflower Is

Purple coneflower is a plant genus of which three species appear most frequently in research: Echinacea angustifolia, Echinacea pallida and Echinacea purpurea. A 2005 review summarises the chemistry, pharmacology and clinical properties of these species. Even the study titles show that "Echinacea" does not denote a uniform substance but a group of preparations from different species and plant parts. Anyone reading a study must therefore first clarify which material was tested.

One point is decisive for understanding all studies: the studies use different preparations, different plant parts and different outcome measures. Some of the controlled studies examine whether a cold can be prevented, others whether it runs a shorter or milder course, and a third group tests laboratory parameters of the immune system. Studies on safety and absorption are also included: one study compares the influence of several substances, including Echinacea, on blood levels of digoxin. Anyone wishing to compare results must therefore first ask which preparation, which plant part and which endpoint are meant.

2. What the Studies Show in Detail

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

Distribution of **controlled human studies** by indication — the numbers are not additive because one study may be assigned to several indications:

INDICATION	CONTROLLED STUDIES
Immune system	32
Safety and tolerability	23
Viral infections	10
Inflammatory processes	8
Fatigue and stress	4
Musculoskeletal system	2
Absorption and bioavailability	2

INDICATION	CONTROLLED STUDIES
Oncology	1

Immune System

The 2019 systematic review evaluated randomised, double-blind, placebo-controlled studies of Echinacea preparations. For the prevention of upper-respiratory-tract infections the risk ratio was 0.78 (95 % CI 0.68–0.88); for treatment duration a mean difference of –0.45 days (95 % CI 1.85–0.94); for safety a risk ratio of 1.09 (95 % CI 0.95–1.25) ⁴. The authors note clinical heterogeneity as a limitation. The 2000 review found 16 studies with a total of 3396 participants, but could not perform a quantitative meta-analysis because of differing preparations and methodological quality; the results suggested that some Echinacea preparations might be superior to placebo ⁶.

The 1999 controlled study examined 109 patients with more than three colds in the previous year. They received 4 ml liquid extract from Echinacea purpurea or placebo juice twice daily for 8 weeks. In the Echinacea group 35 of 54 (65 %) had at least one cold, in the placebo group 40 of 54 (74 %) (RR = 0.88; 95 % CI 0.60–1.22). The average number of colds was 0.78 in the Echinacea group and 0.93 in the placebo group (difference = 0.15; 95 % CI –0.12–0.41; P = 0.33) ¹⁰. Infections occurred in 29.3 % of the E. purpurea group (RR 0.80; 95 % CI 0.53–1.31) versus 36.7 % under placebo ²⁰.

The randomised, double-blind, placebo-controlled study from 2002 in 148 students with an incipient cold tested a capsule mixture of unprocessed Echinacea purpurea herb (25 %) and root (25 %) as well as E. angustifolia root (50 %). Intake was in 1-g doses six times on the first day and three times on each subsequent day, for a maximum of 10 days. There were no statistically significant differences between this mixture and placebo in all measured endpoints. The mean cold duration was 6.01 days in both groups overall, 5.75 days in the placebo group and 6.27 days in the mixture group (difference –0.52 days; 95 % CI –1.09–0.22) ¹⁹.

The 2004 study in 282 persons aged 18–65 years with at least two colds in the previous year tested a standardised formulation from freshly harvested Echinacea purpurea plants with alkamides, cichoric acid and polysaccharides in concentrations of 0.25, 2.5 and 25 mg/ml. Intake began at the first symptom. The results are not fully reported in the abstract ¹¹. The systematic review from 1994 identified 26 controlled clinical trials (18 randomised, 11 double-blind); 6 examined three different mono-extracts, 20 examined three different preparations with additional ingredients. The authors of the primary studies claimed that 30 of 34 treatment strategies showed superior efficacy compared with the control groups ³.

The 2003 review summarises that Echinacea purpurea extracts showed significant immunomodulatory activities in a series of experiments, with macrophage activation demonstrated most convincingly. Phagocytosis indices and macrophage-derived cytokine concentrations responded to Echinacea in various assays. Activation of polymorphonuclear leukocytes and natural killer cells was also shown sufficiently. Changes in the number and activity of T- and B-cell leukocytes were reported but are less certain. The most robust data come from studies of Echinacea purpurea extracts in acute upper respiratory tract infections; however, these studies are limited in size and methodological quality ³⁶. The 2018 review analyses the immunomodulatory and anti-inflammatory activity of Echinacea spp. alongside another plant-derived compound and emphasises phytochemical research as well as new strategies for obtaining active substances; it therefore covers more than Echinacea ³⁷.

The 2008 study in human dendritic cells examined gene expression after treatment with a butanol fraction from stems and leaves of Echinacea purpurea ([BF/S+L/Ep]). DNA-microarray analyses showed significant upregulation of specific genes for cytokines (IL-8, IL-1β, IL-18) and chemokines (CXCL 2, CCL 5, CCL 2) within 4 hours after treatment. Bioinformatic analyses revealed a signal network with activation of adenylate cyclase 8. Proteome analyses showed increased expression of antioxidants and cytoskeletal proteins after treatment with [BF/S+L/Ep] and cichoric acid ³⁹. The 2008 study in 18 healthy volunteers examined the effect of Echinacea (267 mg three times daily) on digoxin pharmacokinetics. Echinacea did not significantly affect the digoxin parameters ¹⁸.

HYPOTHESIS The inconsistent results of the treatment studies could be due to different preparations, dosages and extraction methods. The 2004 study in 282 persons used a standardised formulation with defined contents of alkamides, cichoric acid and polysaccharides, yet the results are not fully reported in the present abstract ¹¹. What is missing are independent replications with standardised preparations and sufficient statistical power to measure clinically relevant effects reliably.

Safety and Tolerability

The randomised, double-blind, placebo-controlled study from 1999 in 559 recruited healthy adults examined different dosages and preparations of Echinacea purpurea for colds. 246 participants caught a cold and took three tablets twice daily of either Echinaforce (Echinacea purpurea preparation from 95 % herb and 5 % root), Echinacea purpurea concentrate (the same preparation in sevenfold higher concentration), a special Echinacea purpurea root preparation (completely different from Echinaforce) or placebo until they felt well, for a maximum of 7 days. The primary endpoint was the relative reduction of the symptom index from 12 symptoms according to medical recording. Echinaforce and its concentrate were significantly more effective than the special Echinacea extract or placebo. All treatments were well tolerated. In the Echinacea groups the frequency of adverse events was not significantly higher than in the placebo group ²¹.

The randomised, double-blind, placebo-controlled study from 2012 in 755 healthy persons examined the safety and efficacy of an alcohol extract from freshly harvested Echinacea purpurea (95 % herb and 5 % root) for the prevention of cold episodes over 4 months. A total of 293 adverse events occurred under Echinacea and 306 under placebo. Nine and 10 % of participants respectively experienced adverse events that were at least possibly related to the study medication (adverse drug reactions). The safety of Echinacea was therefore not inferior to placebo. Echinacea reduced the total number of cold episodes, the cumulative episode days within the group and the episodes treated with analgesics. Echinacea inhibited virally confirmed colds and in particular prevented infections with enveloped viruses (P < 0.05). The strongest effects were seen in recurrent infections, and the preventive effects increased with treatment adherence and protocol compliance ²⁸.

The 2015 review reports that clinical studies on adverse effects are contradictory. While some studies showed beneficial effects and no serious adverse effects, others reported serious adverse effects such as abdominal pain, angioedema, dyspnoea, nausea, pruritus, skin rash, erythema and urticaria ³³. The systematic review from 2019 found a risk ratio of 1.09 (95 % CI 0.95–1.25) for safety ⁴.

HYPOTHESIS The reported adverse effects come from different preparations and study populations, so the tolerability of individual preparations is not directly comparable. What is missing are systematic surveys of adverse events with uniform criteria and sufficient case numbers to capture rare or delayed reactions.

Inflammatory Processes

The randomised controlled study from 2010 in 719 patients aged 12 to 80 years with a newly occurring cold compared four groups: no pills, placebo pills (blinded), Echinacea pills (blinded) and Echinacea pills (unblinded, open). The Echinacea groups received the equivalent of 10.2 g dried Echinacea root during the first 24 hours and 5.1 g each on the following 4 days. The primary endpoint was the area under the curve for global severity, measured twice daily with the Wisconsin Upper Respiratory Symptom Survey (short version). Secondary endpoints included interleukin-8 levels and neutrophil counts from nasal lavages, determined at admission and 2 days later. Mean global severity was 236 and 258 for the blinded and unblinded Echinacea groups, 264 for the placebo group and 286 for the no-pill group ⁵.

The randomised crossover study from 2006 in 10 volunteers (8 test persons, 2 placebo) examined the bioavailability of alkalimides from liquid and tablet preparations of Echinacea purpurea (Echinaforce) and the effect on ex-vivo stimulated blood cells. Participants received either 4 ml of the standardised Echinacea purpurea tincture or 12 tablets or placebo. Both doses contained the same amount (0.07 mg) of the main alkalimides dodeca-2E,4E,8Z,10E/Z-tetraenoic acid isobutylamides. The mean C_{max} of the alkalimides after oral administration of the tincture occurred after 30 minutes (0.40 ng/ml serum), that of the tablets after 45 minutes with a C_{max} of 0.12 ng/ml. Ex-vivo stimulation of the blood with LPS showed that both Echinacea purpurea preparations had the same effect ²³.

The 2003 review, which considers Echinacea and its preparations as a whole, states that extracts showed significant immunomodulatory activities in a series of experiments, with macrophage activation demonstrated most convincingly. Despite these cellular indications of immune stimulation, pathways to increased resistance to infectious diseases were not sufficiently described ³⁶.

HYPOTHESIS The observed immunological changes are predominantly laboratory-based and cannot readily be transferred to clinical endpoints such as symptom duration or severity. What is missing are studies that bridge the gap between cellular and molecular effects and patient-relevant outcomes.

Viral Infections

The randomised, double-blind, placebo-controlled study from 2012 in 755 healthy persons examined the prevention of cold episodes over 4 months with an alcohol extract from freshly harvested Echinacea purpurea (95 % herb and 5 % root). Participants documented adverse events and rated cold-related complaints in a diary. Nasal secretions were collected during acute colds and examined for viruses.

The randomised, double-blind, placebo-controlled study from 2004 in 48 previously healthy adults examined the ability of Echinacea purpurea to prevent infection with rhinovirus type 39 (RV-39). Participants received either Echinacea or placebo, 2.5 ml three times daily, for 7 days before and 7 days after intranasal inoculation with RV-39. Symptoms were recorded to assess clinical illness; virus culture and serological examinations served to detect rhinovirus infection. 92 % of Echinacea recipients and 95 % of placebo recipients were infected. Administration of Echinacea before and after exposure did not reduce the infection rate; however, because of the small sample the statistical hypothesis test had relatively low power to detect statistically significant differences in frequency and severity of illness ³⁰.

The randomised, double-blind, double-dummy, multicentre non-inferiority study from 2015 compared a new Echinacea formulation with the neuraminidase inhibitor oseltamivir in 473 patients with early influenza symptoms (≤48 hours) in primary care in the Czech Republic. Patients received either 5 days of oseltamivir followed by 5 days of placebo or 10 days of an Echinacea purpurea-based formulation called Echinaforce Hotdrink. The proportion of recovered patients (influenza symptoms rated as absent or mild in the evening) was analysed for non-inferiority between the treatment groups. Recovery was comparable: 1.5 % versus 4.1 % after 1 day, 50.2 % versus 48.8 % after 5 days and 90.1 % versus 84.8 % after 10 days of treatment with Echinaforce Hotdrink versus oseltamivir. Non-inferiority was shown for each day and overall (95 % CI 0.487–0.5265 in the generalised Wilcoxon test) ¹².

The controlled study from 2005 in 437 volunteers examined three different extracts from Echinacea angustifolia roots, a different species from Echinacea purpurea (obtained with supercritical carbon dioxide, 60 % ethanol or 20 % ethanol), in rhinovirus infection. Participants received either prophylaxis (beginning 7 days before virus exposure) or treatment (beginning at the time of exposure) with one of the extracts or placebo. The results of 399 volunteers who were inoculated with rhinovirus type 39 and observed for 5 days in an isolated environment were included in the analysis. There were no statistically significant effects of the three extracts on infection rates or symptom severity. Likewise, no significant effects were shown on the volume of nasal secretions, on polymorphonuclear leukocytes or interleukin-8 concentrations in nasal lavage samples or on quantitative virus titre. These findings cannot establish effects of Echinacea purpurea ³².

The in-vitro study from 2020 examined the virucidal and antiviral effect of Echinaforce®, an Echinacea purpurea preparation, against human coronavirus 229E, MERS- and SARS-CoV as well as SARS-CoV-2. The authors found that HCoV-229E was irreversibly inactivated when exposed to Echinaforce® at an IC₅₀ of 3.2 µg/ml. However, pretreatment of cell lines did not inhibit infection with HCoV-229E, and treatment after infection also showed no effect. The study also examined the protection of reconstituted nasal epithelium ³⁴. These findings are preclinical; an effect in humans has not been investigated.

The laboratory markers included interleukin-8, nasal neutrophil count, mucus weight, virus titre and seroconversion. The questionnaires included the SF-8, the eight-item Jackson Cold Scale and the 44-item Wisconsin Upper Respiratory Symptom Survey (WURSS). Statistically significant associations were found between almost all variables. The correlations between the questionnaires were: WURSS-Jackson = 0.81; WURSS-SF-8 = 0.62; Jackson-SF-8 = 0.60. The correlations with laboratory values were: WURSS-mucus weight = 0.53; Jackson-mucus weight = 0.55; WURSS-virus titre = 0.37; Jackson-virus titre = 0.46; WURSS-IL-8 = 0.31; Jackson-IL-8 = 0.36; WURSS-PMN = 0.31; Jackson-PMN = 0.28. Neither WURSS nor Jackson provided satisfactory cut-off values for the diagnosis of infection ³⁵.

HYPOTHESIS The heterogeneous results of the viral studies reflect different viral pathogens, transmission routes and endpoints. What is missing are studies that systematically examine the transferability of in-vitro findings to the clinical situation in humans and test efficacy against specific viruses in controlled infection models with sufficient power.

Further Investigations

The randomised, double-blind, placebo-controlled study from 2001 in 80 adult patients with first signs of a cold examined *Echinacea purpurea* herba (Echinacin, EC31J0). The primary endpoint was the number of illness days with a complete cold picture (defined by a modified Jackson score of at least 5 points and rhinorrhoea and/or subjective cold feeling). In the verum group the median illness duration was 6.0 days versus 9.0 days in the placebo group, with time set to zero for patients without a complete picture (one-sided $p = 0.0112$). EC31J0 was well tolerated and showed faster symptom relief compared with placebo ²⁹.

The structured review article from 2005 identified 322 articles on Echinacea and colds, including 9 placebo-controlled clinical studies. Eleven characteristics of the experimental design were used for evaluation: validated case definition, quantifiable hypothesis, sample size calculation, randomised allocation, double-blinding, verification of blinding, measurement of compliance, measurement of drop-out rate, intention-to-treat analysis, description of analysis methods and measurement of probability. Of the 9 studies, 2 fulfilled all 11 criteria; both were judged negative by the authors. Of the remaining 7 studies, 6 were rated positive and 1 negative. The most frequently unfulfilled criterion was the verification of blinding ³¹.

The review article from 2015 addresses the clinical question of whether Echinacea products are associated with reduced incidence and shorter duration of colds compared with placebo. Individual prophylaxis studies show no association with prevention of colds, but an exploratory meta-analysis suggests that Echinacea products may be associated with a small reduction in cold incidence. In treatment studies, no association was found between Echinacea products and shorter cold duration ⁴⁰.

HYPOTHESIS The differing results of the review articles may be related to the selection of included studies and the assessment of methodological quality. What is missing are large, methodologically rigorous studies with uniform endpoints and standardised preparations that permit a robust statement on clinical efficacy.

Absorption and Bioavailability

Participants received lopinavir 400 mg-ritonavir 100 mg twice daily with meals for 29.5 days. On day 16 they received *Echinacea purpurea* 500 mg three times daily for 28 days: 14 days in combination with lopinavir-ritonavir and 14 days of *Echinacea purpurea* alone. To assess CYP3A and P-glycoprotein activity, participants received single doses of midazolam 8 mg and fexofenadine 120 mg before and after the 28 days of *Echinacea*. On days 15 and 30 of lopinavir-ritonavir administration, blood samples were collected over 12 hours. Neither lopinavir nor ritonavir pharmacokinetics were significantly altered by the 14-day *Echinacea* administration. The post- to pre-*Echinacea* ratio showed significant induction of CYP3A activity ²⁵.

HYPOTHESIS The small number of participants and the open design of the 2010 study limit the conclusiveness regarding the clinical relevance of CYP3A induction. What is missing are studies with larger samples and blinded design that systematically capture the interaction potential of *Echinacea* with other medicinal products.

Cognition and Psyche

The review article from 2001 examined the methodological quality of 207 randomised controlled trials from five earlier systematic reviews on homeopathy, herbal medicinal products (*Hypericum* in depression, *Echinacea* in colds) and acupuncture (in asthma and chronic headache). Quality was assessed using the validated Jadad scale and individual quality characteristics. Methodological quality was highly variable; the majority had important deficiencies in reporting and/or methodology. The main problems in most studies were the description of allocation concealment and the reporting of drop-outs and withdrawals. There were relevant differences in individual quality components between the therapy forms: acupuncture studies less frequently reported adequate allocation concealment (6 % versus 32 % for homeopathy and 26 % for herbal studies), and studies on herbal extracts had better overall scores (mean score 3.12 versus 2.33 for homeopathy and 2.19 for acupuncture). Larger studies published in shorter form in MEDLINE-listed and English-language journals achieved significantly higher values ³⁸. This review covers many agents and therapy forms, not only *Echinacea*.

HYPOTHESIS The methodological weaknesses affect the entire research landscape on the investigated therapy forms, including *Echinacea*, and complicate the interpretation of results. What is missing are studies with improved reporting, particularly regarding blinding and the handling of study withdrawals, to increase the reliability of the results.

Overall Picture

Across all areas, a mixed picture emerges. The systematic review article from 2019 with meta-analyses on prevention, duration and safety found a risk ratio of 0.78 (95 % CI 0.68–0.88) for prevention, a mean difference of -0.45 days (95 % CI 1.85–0.94) for treatment duration and a risk ratio of 1.09 (95 % CI 0.95–1.25) for safety ⁴. The review article from 2001 with 16 studies and 3396 participants was unable to perform a quantitative meta-analysis due to heterogeneity, but found indications of possible superiority of some preparations ⁶. The review article from 2015 concluded that individual prophylaxis studies show no association with prevention, yet an exploratory meta-analysis suggests a small reduction in incidence, while treatment studies found no shorter duration ⁴⁰.

The clinical studies on *Echinacea* in colds differ considerably in preparation, dosage, duration and endpoints. The 2010 study in 719 patients showed only minor differences in global severity ⁵. The transferability of in-vitro findings to the clinical situation is unclear, and the safety studies predominantly report good tolerability, but also isolated serious adverse effects ³³. What is missing are large, independent studies with standardised preparations and uniform, clinically relevant endpoints that could resolve the heterogeneity of previous results.

Methodology of the research situation

The studies on *Echinacea* include randomised, double-blind, placebo-controlled designs, open and crossover studies as well as systematic reviews and meta-analyses. Typical study durations range from 7 days in acute infections to 4 months in prevention studies. Endpoints vary widely: self-reported symptom duration and severity, physician-assessed complaint indices, virological confirmation, laboratory parameters such as interleukin-8, neutrophil counts and alkamide bioavailability. Participant numbers range from 10 in pharmacokinetic studies to 755 in large prevention studies. Frequent methodological limitations include inadequate description of allocation concealment, missing data on drop-outs and lack of verification of blinding; the review behind that

assessment covers homeopathy, herbal medicines and acupuncture, not Echinacea alone^{38 31}. What is systematically missing are studies with standardised preparations, uniform endpoints and sufficient statistical power to reliably measure clinically relevant effects, as well as independent replications of promising findings.

Not whether coneflower works, but which one

The most common question directed at the research situation is whether coneflower shortens colds. The studies only appear to answer it. One part examines the frequency of infections, one part the duration, one part the severity, one part experimentally induced rhinoviruses. Some investigate root extracts, others fresh-plant preparations, others standardised preparations. Anyone who lumps these results together averages across different substances. The review articles from 2000 and 2003 precisely reflect this difficulty.

HYPOTHESIS:

Part of the inconsistent findings arises from the diversity of preparations and not from coneflower as such.

A second point concerns transferability. Many studies work with experimentally induced rhinoviruses in healthy adults. This is a controlled model, but not the natural cold in everyday life. Other studies examine children or adults with an already existing illness.

PLAUSIBLE:

A model cannot be directly extrapolated to the other context. In addition, some of the studies examine not Echinacea purpurea but Echinacea angustifolia. The question of which preparation was tested in which situation must therefore be posed anew for every individual statement.

3. How Reliable the Research Is

The research is broadly distributed. The largest block consists of controlled human studies; observational studies, mechanistic reviews, cell-culture and animal studies are also present. Within the controlled studies, the immune system dominates, closely followed by safety. Antiviral questions, inflammation and exhaustion are represented far less frequently; the musculoskeletal system, bioavailability and oncology appear only marginally. **Plausible:** Safety is investigated almost as frequently as efficacy. The field therefore does not examine its tolerability incidentally, but as a separate focus.

Methodologically, the field is better positioned than many expect. There are randomised, double-blind and placebo-controlled studies, a systematic review of controlled studies already from 1994 and several critical review articles. The weakness does not lie in the number of studies, but in their comparability: different species, plant parts and preparations, different endpoints from disease frequency through duration to immune markers, and different populations from children to experimentally infected adults. A 2001 study explicitly addresses the methodological quality of randomised studies in this area. What is missing are studies that repeat the same preparation with the same endpoints.

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

STATEMENT	RESEARCH SITUATION
Coneflower shortens a cold	This was tested in several controlled studies, but with different preparations and endpoints. The titles list duration, severity and frequency separately; a uniform r
Coneflower prevents colds	Own studies are available on this, including on root extracts and on experimental rhinoviruses. They investigate prevention as a separate endpoint, not treatment
Coneflower can be combined arbitrarily	A study examines the influence of several critical substances on digoxin blood levels. It compares substances; a statement about Echinacea alone cannot be derived fr
Purple coneflower is well tolerated	Safety is a separate, frequently investigated focus. The studies examine tolerability as its own endpoint, not merely as a by-product of efficacy testing.

5. Profile: Molecule and Charge

Purple coneflower (Echinacea purpurea) is not a single molecule but a **mixture** — there is no molecular 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 covers.

6. Interactions with Other Substances

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

SUBSTANCE	SHARED WORKS	OF WHICH CONTROLLED IN HUMANS
Acceptance and Commitment Therapy (ACT)	37	12
Chronic Inflammation	23	8
Art Therapy	13	4
Vitamin C	12	5
Zinc	11	3
Saw Palmetto (Serenoa repens)	11	1
Adaptogens	9	3
High-Intensity Interval Training (HIIT)	9	6
Turmeric and Curcumin	7	1
Homeopathy	5	2

A randomised single-dose crossover study with ten volunteers compared the bioavailability of alkamides from liquid and tablet preparations of E. purpurea; another study examined bioavailability and pharmacokinetics ²³. Observations on concomitant administration: The pharmacokinetics of lopinavir and ritonavir remained unchanged after 14 days of co-administration of E. purpurea 500 mg three times daily ²⁵, ²⁵. For darunavir the geometric mean ratios with Echinacea versus alone were 0.84 (90 % CI 0.63-1.12) for the concentration at the end of the dosing interval, 0.90 (90 % CI 0.74-1.10) for the area under the curve from 0 to 12 hours and 0.98 (90 % CI 0.82-1.16) for the maximum concentration ²⁶.

For nutrients a controlled study showed: Echinacea purpurea together with zinc, selenium and vitamin C alleviated exacerbation symptoms after upper respiratory tract infections in COPD; the combination, not Echinacea alone, produced shorter and less severe episodes versus placebo, suggesting a synergistic effect ²⁴. No effect of the single substance can be inferred from combination data. For enzymes the literature describes E. purpurea as an inducer of CYP3A4 in vitro and in humans, investigated via the pharmacokinetics of docetaxel ²⁷. It remains to be clarified which CYP enzymes and transport proteins change measurably in humans under E. purpurea.

7. Overdose, Tolerability, Limits

All data on adverse effects come from controlled human studies. In one study in children aged 2 to 11 years rash occurred during 7.1 % of Echinacea-treated infections and 2.7 % of placebo-treated infections (P = .008); the overall rate of reported adverse events did not differ between the groups ⁹.

In children 76 events were reported under Echinacea and 105 under vitamin C (p = 0.016), only three of which were possibly related to Echinacea ¹³; the extract EC31J0 was considered well tolerated ²⁹. It remains to be clarified at which dose and over which duration of use adverse effects occur more frequently and for which population groups use is not appropriate.

8. The Most Robust Works

Ordered by strength of evidence, not by familiarity: systematic reviews and studies with many participants first. The complete evaluation comprises considerably more works; the most robust ones are listed here.

Controlled Human Studies

- ¹ Efficacy and safety of Echinacea purpurea in treating upper respiratory infections and complications of otitis media in children: Systematic review ... (2025) — Systematic review, 1,651 participants
- ² Efficacy and Safety of Echinacea purpurea in Treating Upper Respiratory Infections and Complications of Otitis Media in Children: Systematic Review ... (2025) — Systematic review, 1,651 participants
- ³ Immunomodulation with echinacea - a systematic review of controlled clinical trials (1994) — Systematic review
- ⁴ Echinacea for the prevention and treatment of upper respiratory tract infections: A systematic review and meta-analysis (2019) — Systematic review
- ⁵ Echinacea for treating the common cold: a randomized trial (2010) — 719 participants
- ⁶ Echinacea for preventing and treating the common cold (2000) — 3,396 participants
- ⁷ Rationale and methods for a trial assessing placebo, echinacea, and doctor-patient interaction in the common cold (2007) — 720 participants
- ⁸ Echinacea purpurea for prevention of upper respiratory tract infections in children (2005) — 524 participants
- ⁹ Efficacy and safety of echinacea in treating upper respiratory tract infections in children: a randomized controlled trial (2003) — 407 participants

- ¹⁰ A randomized controlled trial of the effect of fluid extract of Echinacea purpurea on the incidence and severity of colds and respiratory infections (1999) — 109 participants
- ¹¹ Efficacy of a standardised echinacea preparation (Echinilin) for the treatment of the common cold: a randomized, double-blind, placebo-controlled ... (2004) — 282 participants
- ¹² Effect of an Echinacea-Based Hot Drink Versus Oseltamivir in Influenza Treatment: A Randomized, Double-Blind, Double-Dummy, Multicentre ... (2015) — 473 participants
- ¹³ Echinacea reduces antibiotic usage in children through respiratory tract infection prevention: a randomized, blinded, controlled clinical trial (2021) — 103 participants
- Placebo effects and the common cold: a randomized controlled trial (2011) — 120 participants
- Efficacy and safety of a fixed combination phytochemistry in the treatment of the common cold (acute viral respiratory tract infection): results of a ... (1999) — 263 participants
- ¹⁴ Echinacea/sage or chlorhexidine/lidocaine for treating acute sore throats: a randomized double-blind trial (2009) — 154 participants
- ¹⁵ Randomised, double blind, placebo-controlled trial of echinacea supplementation in air travellers (2012) — 175 participants
- ¹⁶ Novel Echinacea formulations for the treatment of acute respiratory tract infections in adults-A randomized blinded controlled trial (2023) — 246 participants
- ¹⁷ Evaluating the Efficacy and Safety of EZC Pak, a 5-Day Combination Echinacea-Zinc-Vitamin C Dose Pack with or without Vitamin D, in the Management of ... (2023) — 360 participants
- ¹⁸ Gauging the clinical significance of P-glycoprotein-mediated herb-drug interactions: comparative effects of St. John's wort, Echinacea ... (2008)
- ¹⁹ Treatment of the common cold with unrefined echinacea. A randomized, double-blind, placebo-controlled trial (2002)
- ²⁰ Echinacea root extracts for the prevention of upper respiratory tract infections: a double-blind, placebo-controlled randomized trial (1998) — 18 participants
- ²¹ Echinaforce and other Echinacea fresh plant preparations in the treatment of the common cold. A randomized, placebo controlled, double-blind clinical ... (1999)
- ²² Echinacea purpurea therapy for the treatment of the common cold: a randomized, double-blind, placebo-controlled clinical trial (2004)

9. Summary

PLAUSIBLE Safety is investigated in this field almost as frequently as efficacy; the field examines its tolerability as a separate focus. The systematic review from 2019 evaluated randomised, double-blind, placebo-controlled studies on Echinacea preparations and found a risk ratio of 0,78 (95% CI 0,68–0,88) for the prevention of upper respiratory tract infections and a risk ratio of 1,09 (95% CI 0,95–1,25) for safety ⁴; the authors point to clinical heterogeneity as a limitation. The 2012 study on 755 healthy individuals over 4 months reports 293 adverse events under Echinacea versus 306 under placebo and does not show inferiority in safety ²⁸.

PLAUSIBLE Echinacea purpurea extracts showed immunomodulatory activities in a series of experiments; the most convincingly demonstrated is macrophage activation, activation of polymorphonuclear leukocytes and natural killer cells was also sufficiently shown, while changes in number and activity of T- and B-cell leukocytes are less certain ³⁶. These findings are predominantly laboratory-based and thus preclinical. It follows that a result remains initially tied to the tested preparation, the plant part and the endpoint.

A study that repeats the same preparation with the same endpoints would need to clarify whether the reduction in upper respiratory tract infections reported in the 2019 review is confirmed for a standardised preparation. The 2004 study on 282 persons used a standardised formulation from freshly harvested Echinacea purpurea plants with defined contents of alkamides, cichoric acid and polysaccharides ¹¹. Likewise, systematic surveys of adverse events with uniform criteria and sufficient case numbers are an open question to capture rare or delayed reactions. Also open is bridging the gap between cellular and molecular effects and patient-relevant outcomes such as symptom duration or severity.

10. What Remains Open

- **Preparation:** Which preparation from which plant part was tested in which study, and can the results be transferred to the same preparation?
- **Endpoint:** Which endpoint decides — frequency, duration or severity of the disease — and how are they measured uniformly?
- **Transfer:** How well can the model of experimental rhinovirus infection be transferred to natural colds in everyday life?

11. Further Paths

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

- Interaction network

Frequently Asked Questions

Which preparation of purple coneflower is tested in the studies?

Very different ones. The study titles mention root extracts, fluid extracts, preparations from the fresh plant and standardised preparations, as well as different species. A single preparation therefore cannot be described as the tested form. For the evaluation of a study, it is first necessary to clarify which material was used.

Are the studies in humans controlled?

A large part yes: randomised, double-blind and placebo-controlled. In addition, there are observational studies and a number of review articles. The controlled studies predominantly examine the immune system and safety, as well as antiviral and inflammatory questions.

What is known about children?

One controlled study examines the treatment of upper respiratory tract infections in children. Whether its results can be transferred to other age groups is an open question. Children do not form a separate focus in the research on purple coneflower.

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Research, put in context. Every statement leads to the original paper; the decision in the individual case rests with the treating professional.
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