

DOSSIER · SUBSTANCE

D-Mannose

D-Mannose is a monosaccharide that is primarily investigated through its binding to the adhesin FimH of Escherichia coli. The majority of the studies originate from basic research; the most frequently cited human studies address recurrent urinary tract infections. Notably, a large proportion of the controlled studies examine combinations rather than D-Mannose alone.

151

STUDIES IN
TOTAL

43

IN HUMANS

20

OF WHICH
CONTROLLED

7

IN ANIMALS

21

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

D-Mannose at a Glance

ORIGIN:

D-Mannose is a monosaccharide from the group of hexoses, chemically an epimer of glucose. The main focus of research is its binding to the adhesin FimH of Escherichia coli. For research, its nutritional value is less important than its path through the body: the anti-adhesive approach presupposes that D-Mannose reaches the urine after ingestion and remains available there.

EVIDENCE BASE:

151 evaluated papers · 20 controlled human studies · 23 observational studies · 12 review articles · 7 animal studies · 18 cell-culture studies

STRONGEST EVIDENCE:

- Urinary tract infections: In 308 women with recurrent urinary tract infection, 103 women received 2 g D-Mannose daily; 14.6 % had a further episode versus 60.8 % without prophylaxis (p < 0.001).
- Urinary tract infections: A review with meta-analysis identified 4 randomised controlled trials with 890 participants and reported an overall reduction in UTI incidence versus placebo (RR 0.34; 95 % CI 0.21–0.56).
- Urinary tract infections: The placebo-controlled MERIT study assigned 2 g D-Mannose daily for 6 months in 99 general practices in the United Kingdom and showed no significant difference from placebo.
- Urinary tract infections: In a randomised study of 75 premenopausal women, D-Mannose (0.32 episodes per year) lay between antibiotic prophylaxis (0.2) and increased fluid intake (1.08).
- Urinary tract infections: Addition of a D-Mannose-containing supplement to fosfomycin reduced rUTI episodes more than fosfomycin alone — a combination that permits no conclusion about the single substance.

LIMITATIONS:

- Many controlled studies test combinations (e.g. proanthocyanidins, N-acetylcysteine, propolis, quercetin, Bacillus coagulans); the effect of the single substance cannot be inferred.
- Findings diverge: the large placebo-controlled MERIT study showed no difference from placebo, whereas a review reported a reduction (RR 0.34); heterogeneity is high.
- Several papers are small or single-arm and supply hints; they prompted larger follow-up studies.

CLASSIFICATION:

D-Mannose is a monosaccharide whose anti-adhesive mechanism at the adhesin FimH has been described; whether this translates into benefit in recurrent urinary tract infections remains open.

1. What D-Mannose Is

D-Mannose is a monosaccharide from the group of hexoses, chemically an epimer of glucose. **Plausible:** It is precisely there, in the bladder, that the idea of an anti-adhesive effect begins. The best-studied mechanism is bacterial attachment. Type-1 fimbriae on the surface of Escherichia coli carry the adhesin FimH, which binds to mannose residues on the host-cell surface. Papers on the structure of this adhesin and on anti-adhesive compounds belong to the most-cited foundational studies in the field. **Plausible:** Soluble D-Mannose occupies the same binding site and thereby weakens attachment to the urothelium; laboratory and cell-culture studies exist for this step.

DECISIVE FOR THE ASSESSMENT of all papers is what D-Mannose was tested in each case. The controlled studies include administrations of D-Mannose alone, but also fixed combinations with proanthocyanidins, with N-acetylcysteine and a fruit extract, with collagen, propolis, quercetin, hyaluronic acid and chondroitin sulphate, as well as with Bacillus coagulans. The effect of the single substance cannot be derived from such mixtures. In addition there are different formulations, for example sustained-release, different comparator groups such as placebo, proanthocyanidins alone or antibiotics, and different endpoints: relapse frequency, symptoms of acute infection, asymptomatic bacteriuria or safety. Anyone reading these papers side by side must keep them separate.

2. What the Studies Show in Detail

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

Distribution of **controlled human studies** by indication — the numbers are not additive, as one paper may be assigned to several areas:

INDICATION	CONTROLLED STUDIES
Immune system	20
Safety and tolerability	9
Gut and microbiome	4
Inflammatory processes	1

Immune System

The randomised controlled study by Kranjčec and colleagues examined 308 women with recurrent urinary tract infection (rUTI) and without relevant comorbidities. After initial antibiotic treatment of an acute cystitis they were randomised into three groups: 103 women received 2 g D-Mannose powder in 200 ml water daily for 6 months, 103 women received 50 mg nitrofurantoin daily, and 102 women received no prophylaxis. In total 98 patients (31.8 %) suffered a further UTI: 15 (14.6 %) in the D-Mannose group, 21 (20.4 %) in the nitrofurantoin group and 62 (60.8 %) in the no-prophylaxis group. The rate was significantly higher in the group without prophylaxis than in the active groups ($p < 0.001$). The relative risk for a further UTI episode under prophylaxis was 0.239 for D-Mannose and 0.335 for nitrofurantoin ($p < 0.0001$). In the active groups 17.9 % of the patients reported adverse effects that were mild and did not require discontinuation. D-Mannose was associated with a significantly lower risk of adverse effects than nitrofurantoin (RR 0.276; $p < 0.0001$), although the clinical relevance is low because nitrofurantoin was well tolerated. The study shows a clear advantage over no prophylaxis, yet the open question remains how D-Mannose performs in direct comparison with placebo.⁷

The MERIT study by Hay and colleagues is the largest placebo-controlled investigation to date. In 99 general practices in the United Kingdom, 7591 women were approached, 830 responded, 232 were ineligible or were not randomised. Included were women aged 18 years and older with at least two UTI consultations in the preceding 6 months or three in 12 months. 2 g D-Mannose powder daily or a matched placebo powder was given for 6 months. The primary endpoint was the proportion of women with at least one further episode of a clinically suspected UTI. Statistical analysis was reported in December 2022. The results show that D-Mannose produced no significant difference from placebo in this population. The study is methodologically robust and supplies important indications that the effects previously observed may not be transferable to the general population.³

An updated systematic review and meta-analysis from 2025 identified 4 randomised controlled trials with 890 participants (D-Mannose $n = 447$, 50.22 %). High heterogeneity points to differences between the studies. In the subgroup of postmenopausal women no advantage was seen. These reviews suggest that the evidence for D-Mannose for prophylaxis of recurrent UTI is overall inconsistent.^{1 2}

In a network meta-analysis of randomised controlled trials on nonantibiotic prophylaxis for urinary tract infections, D-Mannose showed a significant reduction in UTI incidence in the overall collective compared with placebo (RR 0.34; 95 % CI 0.21–0.56). Further interventions with significant effect were vaccines (RR 0.65; 95 % CI 0.52–0.82), probiotics (RR 0.69; 95 % CI 0.50–0.94), cranberry (RR 0.72; 95 % CI 0.60–0.87) and a triple therapy of cranberry, probiotics and vitamin A (RR 0.27; 95 % CI 0.09–0.87). In the subgroup of non-adults, probiotics were most effective (RR 0.50; 95 % CI 0.28–0.89); with long follow-up (≥ 1 year) vitamin D (RR 0.46; 95 % CI 0.27–0.81). The authors report no significant differences in adverse events. This review classifies D-Mannose as one of several effective options, although direct comparisons between the interventions are limited.³²

Inflammatory Processes

A prospective randomised study from 2017 compared, in 80 patients (42 men, 38 women) undergoing urodynamic examination, antibiotic prophylaxis with prulifloxacin (400 mg/day orally for 5 days) versus a combination of D-Mannose, N-acetylcysteine (NAC) and Morinda citrifolia fruit extract (two vials per day for 7 days). Urine examinations were performed ten days after the examination. The authors justify the combination by complementary mechanisms: D-Mannose is said to inhibit bacterial adhesion to the urothelium, NAC to destroy bacterial biofilm, and Morinda citrifolia to act anti-inflammatorily and analgesic. The results show that the combination was not inferior to antibiotic prophylaxis in preventing urinary tract infections after urodynamic examination. The study is small and limited to a specific clinical model; transferability to other situations remains open.¹⁰

A preclinical study from 2015 investigated heptylmannoside-based glycoconjugates as anti-adhesive substances against adherent-invasive *Escherichia coli* (AIEC) associated with Crohn's disease. In vitro, monovalent and multivalent derivatives of the nanomolar FimH antagonist n-heptyl- α -D-mannoside (HM) were tested on intestinal epithelial cells infected with the AIEC strain LF82. Multivalent derivatives were more potent than monovalent ones, with an efficiency gain beyond their valency, probably through the formation of bacterial aggregates. In vivo, after oral administration to CEACAM6-expressing mice infected with LF82, HM and the multi-HM glycoconjugates showed lower efficacy in reducing LF82 intestinal colonisation. However, two HM analogues with isopropylamide (1A-HM) or β -cyclodextrin pharmacophore (1CD-HM) at the end of the heptyl tail had beneficial effects: they markedly reduced the amount of LF82 bacteria in faeces and intestinal mucosa when administered orally at a dose of 10 mg/kg body weight after infection. These findings are preclinical and do not concern D-mannose itself, but related mannoside derivatives.²⁵

A 2022 study examined the effect of D-mannose on psoriasis in animal and cellular experiments. In a mouse model, $\gamma\delta$ T cells proliferated strongly in skin-draining lymph nodes and adopted an IL-17-producing phenotype. Transcriptomic profiles showed an increased glycolytic signature. Treatment with D-mannose suppressed the $\gamma\delta$ T-cell response and alleviated local and systemic inflammation triggered by imiquimod. A reduced AKT/mTOR/HIF-1 α signalling pathway and glycolytic activity are discussed as the mechanism. The authors suggest D-mannose as a potential clinical application for autoimmune diseases driven by $\gamma\delta$ T cells. This is preclinical research; clinical studies in humans on this question are still pending.³¹

Gut and Microbiome

A randomised controlled trial from 2023 investigated a D-mannose-based food supplement (DAPAD complex: D-mannose, citric acid, prebiotic fibres, Astragalus and dandelion) in acute uncomplicated *E. coli* urinary tract infection. In a single-centre, double-blind, placebo-controlled design, non-menopausal women with acute uncomplicated *E. coli* UTI were enrolled in Bangalore, India, from April to October 2021. The DAPAD complex was administered twice daily for 5 days together with phenazopyridine and alkalising substances as standard of care (SOC); the control group received placebo plus SOC. Subjective (clinical resolution/response) and objective (bacteriuria in midstream urine) endpoints were assessed at the end of therapy (day 6) and on day 35 of follow-up. Adverse events were recorded. The results show a significant improvement in clinical resolution and bacteriuria in the DAPAD group compared with placebo. As this is a combination complex, the effect cannot be attributed to D-mannose alone.¹²

A randomised controlled trial from 2025 compared the addition of a D-mannose food supplement (D-mannose, propolis-quercetin, *Bacillus coagulans*, hyaluronic acid and chondroitin sulphate) to fosfomycin with fosfomycin alone or the supplement alone in women with recurrent urinary tract infections. In a tertiary hospital in Italy, women aged 21–65 years with a history of rUTI were randomised into three groups. The primary endpoint was the frequency of rUTI episodes per month. Combination therapy showed the strongest reduction in rUTI episodes per month after 12 months compared with fosfomycin or supplement monotherapy (0.23 ± 0.37 vs. 0.58 ± 0.67 and 1.12 ± 0.96 ; $p < 0.05$) and compared with supplement monotherapy after 6 months (0.69 ± 1.03 vs. 1.43 ± 1.33 ; $p < 0.05$). In addition, the ICIQ-FLUTS domains improved significantly compared with the other groups after 12 months ($p < 0.05$).

Combination therapy had a lower proportion of women meeting the rUTI criteria (55.32 % vs. 76.47 % and 84 %; $p < 0.05$) and a higher symptom remission after 12 months (89.36 % vs. 56.86 % and 20 %; $p < 0.001$). The study is single-blind and the combination does not permit any statement about the individual substance.¹³

A prospective pilot study from 2026 (MANCOIT) investigated the combination of D-mannose and proanthocyanidins (PAC) for the prevention of postcoital urinary tract infections. Twenty-six women aged 18–45 years with recurrent postcoital UTIs received a sustained-release formulation containing 2000 mg D-mannose and 140 mg PAC daily for 6 months. The primary endpoint was the incidence of postcoital UTI episodes. After 6 months, 53.6 % of participants had no new UTI episode. A total of 24 episodes were documented in 12 women, with more than two thirds occurring in a small subgroup. UTI incidence decreased significantly ($p = 0.01$), and 76.2 % of participants remained infection-free at the final visit. Adherence was high. The study is small and single-arm; the combination does not permit any statement about D-mannose alone.¹⁷

A randomised controlled trial from 2026 compared three strategies over 12 months in 75 premenopausal women (18–49 years) with ≥ 3 UTIs per year: increased fluid intake, D-mannose or low-dose antibiotic prophylaxis. The antibiotic group showed the lowest rUTI incidence (mean 0.2 episodes/year, median 0), significantly lower than the increased fluid intake group (mean 1.08 episodes/year, median 1; $p < 0.05$). D-mannose showed intermediate efficacy (mean 0.32 episodes/year, median 0) with a trend in favour of D-mannose over increased fluid intake. The study is small, but the direct comparability with antibiotics and fluid intake is an important contribution.¹⁵

Further Investigations

An observational study from 2011 examined whether anti-adhesive components reach the urinary tract after oral intake of cranberry juice cocktail (CJC). One volunteer received 16 oz water or CJC. Urine samples were collected at 0, 2, 4, 6 and 8 hours after intake. The ability of the urine samples to influence bacterial adhesion was tested on six clinical uropathogenic *E. coli* strains, including four P-fimbriated strains (B37, CFT073, BF1023 and J96) and two strains without P-fimbriae but with mannose-resistant haemagglutination (B73 and B78). A non-fimbriated strain (HB101) served as control. Adhesion force was measured by atomic force microscopy (AFM). Within 2 hours after CJC consumption, bacteria of the clinical strains treated with the corresponding urine showed lower adhesion forces than after water consumption. Adhesion forces continued to decrease over the 8-hour measurement period. HB101 showed low adhesion forces under both conditions. This study examined cranberry components in urine and not D-mannose.

A narrative review from 2022 summarises the role of D-mannose in urinary tract infections. D-mannose, a monosaccharide naturally occurring in fruits, is marketed as a food supplement. The review describes that supplemented D-mannose could be a promising alternative or adjunct, particularly for the prophylaxis of recurrent UTIs. When D-mannose is excreted in urine, it potentially inhibits the attachment of *Escherichia coli*, the main cause of UTIs, to the urothelium. The work provides an overview of UTIs, *E. coli* pathogenesis and D-mannose and discusses possible mechanisms of action. It is not a systematic review and contains no original primary data.²⁰

A review from 2023 discusses D-mannose as a potential candidate in disease management. D-mannose is described as a nutraceutical in CDG, diabetes, obesity, lung diseases and autoimmune diseases as well as, based on newer findings, for antitumour activity and improvement of drug-delivery techniques. A special feature of the work is the collection of data from the ChEMBL database, which presents targetable proteins on pathogens and in humans. D-mannose has 50 targets, the majority in humans. The structure and conformation of certain monosaccharides play a decisive role in receptor–pathogen interaction. The work is a review and provides no clinical efficacy data.³⁰

Oncology

A review from 2023 addresses D-mannose as a potential candidate in disease management, including oncological aspects. The authors describe D-mannose as a great hope as a nutraceutical against CDG, diabetes, obesity, lung diseases and autoimmune diseases; newer findings on antitumour activity make it interesting, together with its role in drug-delivery techniques. D-mannose has 50 targets, the majority in humans.³⁰

Overall Picture

Across all areas, a mixed picture emerges. The largest placebo-controlled study (MERIT) with 7591 women approached and 232 randomised found no difference between D-mannose and placebo in preventing recurrent urinary tract infections.³² This discrepancy highlights the heterogeneity of study populations, dosages and endpoints. The older controlled study from 2014 with 308 women showed a more favourable adverse-event profile than nitrofurantoin, but no placebo comparison.⁷

For specific subgroups such as postmenopausal women receiving vaginal oestrogen therapy or kidney-transplant recipients, the data are limited. A randomised controlled trial in 57 postmenopausal women receiving vaginal oestrogen therapy was terminated early due to futility; cumulative UTI incidence was 41.1 % under D-mannose and 50.4 % in the control group (HR 0.76; 99.9 % CI 0.15–3.97).⁴ A pilot study in 60 kidney-transplant recipients found no significant differences between D-mannose plus proanthocyanidins and proanthocyanidins alone.¹⁴ The evidence for D-mannose as monotherapy in acute cystitis is also limited: a randomised controlled trial in 118 women showed non-inferiority to fosfomycin that could not be statistically demonstrated.⁸ Overall, the question remains open as to which patient groups might benefit from D-mannose and which dosage and formulation are most effective.

Methodology of the evidence base

The controlled human studies include randomised controlled trials (RCTs) with placebo-controlled, double-blind or open-label designs; systematic reviews and meta-analyses are a separate group. Typical study durations range from 3 to 12 months, with dosages of 2 g D-mannose daily in most prophylaxis studies. Endpoints vary: frequency of recurrent UTI episodes, time to first UTI, clinical resolution, bacteriuria, symptom scores (e.g. UTISA, ACSS, ICIQ-FLUTS) and adverse events. Study populations are heterogeneous: premenopausal and postmenopausal women, kidney-transplant recipients, women with acute cystitis or recurrent infections. Information on blinding, adherence and duration of follow-up is frequently missing. Combination preparations complicate attribution of the effect to D-mannose alone. Systematic recording of quality of life and costs is absent in many studies. Transferability of the results to men, children or immunosuppressed patients has hardly been investigated.

The mixture obscures the single substance

The most striking weakness of the field lies in the study design itself. A considerable proportion of the controlled studies do not test D-mannose alone, but in fixed mixtures: with proanthocyanidins, with N-acetylcysteine and a fruit extract, with collagen, propolis, quercetin, hyaluronic acid and chondroitin sulphate, or with Bacillus coagulans. If a difference from the control group appears in such studies, it is impossible to say which component is responsible. No conclusion about the single substance follows from mixture studies, even when the title names D-mannose first.

In addition, there is dispersion of target variables. Some studies record relapse frequency over months, others the symptoms of an acute infection, others asymptomatic bacteriuria or tolerability alone. These are different questions. The groups are equally heterogeneous: premenopausal women, postmenopausal women on vaginal oestrogen therapy, women with uncomplicated cystitis. The animal studies on the gut microbiome and metabolism also show that D-mannose is not considered only in the urinary tract; these findings are preclinical and cannot be readily transferred to the bladder.

3. How Robust the Research Is

Research on D-mannose is distributed unevenly. The largest block consists of **basic-science** studies, followed by **observational** and **controlled** human studies; cell-culture, animal and agricultural studies as well as reviews on the mechanistic level are also included. Among the controlled human studies, assignments to the immune system and safety predominate, followed by gut and inflammation. The most frequently cited controlled studies, however, deal throughout with **recurrent urinary tract infections** in women, from the randomised study of 2014 through a pilot study of 2016 to the randomised study of 2024. The database categories and the topics of the most cited studies therefore do not correspond one-to-one.

Methodologically, the field shows a clear gradient. On one side stand randomised, placebo-controlled trials and a systematic review with meta-analysis that compare D-mannose with other agents. On the other side stand pilot studies and observational studies with small groups; they provide indications and have repeatedly been the impetus for larger follow-up studies. **Shown:** the anti-adhesive mechanism at the adhesin FimH is described in basic-science and cell-culture studies. **Plausible:** that a benefit in recurrent urinary tract infections follows from this is examined in the controlled studies; however, several of them investigate mixtures, which complicates attribution. Participant numbers are stated in the titles only sporadically; one study reports 283 women.

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

STATEMENT	STUDY STATUS
D-Mannose was investigated for the prevention of recurrent urinary tract infections	Several randomised studies and a systematic review with meta-analysis are available on this, some of them on combinations. The studies address the question,
D-Mannose treats the acute infection	A pilot study is available on this, which describes D-mannose as a supportive measure in acute urinary tract infection, as well as a controlled study on a mixture.
D-Mannose acts via the intestine	Animal studies describe changes to the gut microbiome and metabolism. These are preclinical findings; this pathway is not an endpoint in the controlled human
D-Mannose is arbitrarily combinable and free of side effects	Safety is a separate endpoint in several controlled studies. The tolerability data refer in each case to the tested dose and formulation and cannot be transferred t

5. Profile: Molecule and Charge

D-Mannose 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 is about.

6. Charge, Electrons, Radicals

Redox-related effects appear in the cell model: In LPS-stimulated macrophages, poly-D-mannose reduced the secretion of nitric oxide and reactive oxygen species and downregulated the expression of TNF- α and IL-6 ²². Poly-D-mannose showed varying scavenging capacity towards free radicals ²². A protective potential against the UPEC-induced rise in reactive oxygen species and the expression of PD-L1 was also investigated; UTI89 caused a clear reduction in cell viability and monolayer integrity ²³. Cellular radical and cytokine levels were measured, not electron transfer at D-mannose itself.

On charge: In a synthesis study, D-mannose was first converted to D-mannose carboxylate and then esterified ²⁴. This describes a reaction, not a measured value on D-mannose. The radical findings come from cell culture ^{22 22}; measured values on these questions in humans are still outstanding. What remains to be clarified is which charge D-mannose carries in solution, whether it participates in cation exchange and whether it transfers electrons. It is also open whether the cellular radical effects can be reproduced in human samples.

7. Interactions with Other Substances

With which other substances on 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	JOINT WORKS	OF WHICH CONTROLLED IN HUMANS
Cranberry (Large-fruited Cranberry)	23	6
Acceptance and Commitment Therapy (ACT)	18	6
Gut Microbiome	14	2
Chronic Inflammation	10	1
Probiotics	10	3
Art Therapy	7	1
Anthocyanins (Berries)	6	5
Grape Seed Extract (OPC)	5	4
High-Intensity Interval Training (HIIT)	3	3
Adaptogens	2	0

Combinations with other substances are mainly described. In a controlled study in women with recurrent urinary tract infections, fosfomycin, a food supplement and the combination of both arms were compared ¹³. Another controlled study tested D-mannose together with PAC (proanthocyanidins) in a delayed-release formulation over six months in 26 women with postcoital recurrent infections; only one discontinuation occurred due to vaginal dryness ^{17 17}. An earlier controlled study examined D-mannose together with VET in postmenopausal women; a fertility analysis showed that the study had insufficient power to demonstrate the planned (25 %) or observed (9 %) difference statistically significantly, and it was terminated before completion ⁴. An observational study describes herbal extracts plus D-mannose in uncomplicated recurrent urinary tract infections ²¹.

At the molecular level, binding to FimH, the adhesin of type-1 pili, is described. One study examined various FimH antagonists for their ability to block the adhesion of AIEC to intestinal epithelial cells ²⁵; mono- and multivalent derivatives of n-heptyl- α -D-mannoside, a nanomolar FimH antagonist, were tested in vitro in infected epithelial cells and in vivo after oral administration to CEACAM6-expressing mice ²⁵. The aim was an anti-adhesive strategy with synthetic FimH antagonists against AIEC to reduce intestinal inflammation ²⁵. A review classifies α -D-mannose as a natural aldohexose sugar and C-2 epimer of glucose and discusses the interaction with E. coli in the context of regulatory classification as a medicinal product or medical device ²⁷. Another review describes that FimH antagonists in bacteria prevent the adhesion of Escherichia coli, while mannose-functionalised materials disrupt Pseudomonas and Burkholderia biofilms or improve the release of antitubercular drugs ²⁸. One observation reports that chronic mannose overload increases β -amyloid loads and exacerbates cognitive impairments that are reversed by a mannose-free diet or mannose transporter antagonists ²⁶. It would need to be examined whether these binding and transporter effects also occur with usual intake of the substance in humans.

8. Overdosage, Tolerability, Limits

Diarrhoea is reported most frequently: with 2 g D-mannose over at least 6 months it occurred in approximately 8 % of those treated ⁹, and in another controlled study diarrhoea was the most common adverse effect in both groups ²⁹. Compared with nitrofurantoin the risk of adverse effects was lower under D-mannose (RR 0.276, P < 0.0001), which the study itself classifies as clinically of little significance ⁷. In comparison with fosfomycin gastrointestinal adverse effects occurred less frequently (9.8 % vs. 24.6 %) ⁸.

Under antibiotics mild adverse effects such as mild gastrointestinal complaints were more frequent; no serious adverse effects occurred ¹⁵; one discontinuation took place because of vaginal dryness ¹⁷. Information on overdosage, toxicity, upper limits and contraindications is still outstanding; it is a testable question. They would need to be clarified in a study that systematically examines D-mannose for undesirable effects, for example in a three-arm design with 75 premenopausal women over 12 months ¹⁵.

9. The Most Robust Studies

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

Controlled Studies in Humans

- ¹ D-Mannose for prevention of recurrent urinary tract infection in adult women: An updated systematic review and meta-analysis of randomized controlled ... (2025) — systematic review, 890 participants
- ² Efficacy of D-mannose as prophylaxis of recurrent urinary tract infection: a systematic review and meta-analysis of randomized controlled trials (2025) — systematic review, 1,167 participants
- ³ d-Mannose for Prevention of Recurrent Urinary Tract Infection Among Women: A Randomized Clinical Trial (2024) — 7,591 participants
- ⁴ d-Mannose for Recurrent Urinary Tract Infection Prevention in Postmenopausal Women Using Vaginal Estrogen: A Randomized Controlled Trial (2023) — 545 participants
- ⁵ D-Mannose to prevent Recurrent urinary tract Infections (MERIT): protocol for a randomised controlled trial (2021) — 508 participants
- ⁶ Feasibility and Research Insights From a Randomized Controlled Trial for Recurrent Urinary Tract Infection Prevention in Postmenopausal Women Using ... (2022) — 545 participants
- ⁷ D-mannose powder for prophylaxis of recurrent urinary tract infections in women: a randomized clinical trial (2014) — 308 participants
- ⁸ Proof-of-Concept of Non-Inferiority in the First Randomized Controlled Trial Comparing D-Mannose to Fosfomycin in Acute Uncomplicated Lower Urinary ... (2025) — 118 participants
- ⁹ Role of D-Mannose in the Prevention of Recurrent Uncomplicated Cystitis: State of the Art and Future Perspectives (2021)
- ¹⁰ Prospective study to compare antibiosis versus the association of N-acetylcysteine, D-mannose and Morinda citrifolia fruit extract in preventing ... (2017) — 80 participants
- ¹¹ Recurrent urinary tract infections: from pathogenesis to prevention (2020)
- ¹² A Randomized Controlled Trial Comparing a New D-Mannose-based Dietary Supplement to Placebo for the Treatment of Uncomplicated Escherichia coli ... (2023)
- ¹³ Adding collagen, propolis plus quercetin, bacillus coagulans, hyaluronic acid and chondroitin sulphate to D-mannose avoids symptoms and prevents ... (2025)
- ¹⁴ Randomized clinical trial of non-antibiotic prophylaxis with d-Mannose plus Proanthocyanidins vs. Proanthocyanidins alone for urinary tract ... (2024)
- ¹⁵ Comparison of increased hydration, D-mannose, and antibiotic prophylaxis for recurrent urinary tract infection prevention in premenopausal women: a ... (2026)
- ¹⁶ A randomized, triple-blind, placebo-controlled, parallel study of the efficacy of D-mannose for urinary tract infection symptoms in women (2026)
- ¹⁷ MANCOIT study: Pilot study on the prevention of recurrent postcoital urinary tract infection in women with d-mannose plus proanthocyanidins (PAC) (2026) — 26 participants

Observational Studies in Humans

- ¹⁸ Systematic review of the effect of D-mannose with or without other drugs in the treatment of symptoms of urinary tract infections/cystitis (Review) (2022) — systematic review
- ¹⁹ D-mannose for preventing and treating urinary tract infections (2022) — 719 participants
- Development of Heptylmannoside-Based Glycoconjugate Antiadhesive Compounds against Adherent-Invasive Escherichia coli Bacteria Associated with ... (2015)
- ²⁰ Role of D-mannose in urinary tract infections - a narrative review (2022)
- Phenotypic Assays to Determine Virulence Factors of Uropathogenic Escherichia coli (UPEC) Isolates and their Correlation with Antibiotic Resistance ... (2015)
- ²¹ Effects of a new combination of plant extracts plus d-mannose for the management of uncomplicated recurrent urinary tract infections (2018)
- Oral consumption of cranberry juice cocktail inhibits molecular-scale adhesion of clinical uropathogenic Escherichia coli (2011)

10. Summary

In humans, the randomised study by Kranjčec and colleagues in 308 women with recurrent urinary tract infection showed an advantage of 2 g D-mannose daily compared with no prophylaxis: 14.6 % versus 60.8 % with a new episode ($p < 0.001$). A review article with meta-analysis reports in the overall collective a reduction in UTI incidence compared with placebo (RR 0.34; 95 % CI 0.21–0.56). The largest placebo-controlled investigation, the MERIT study, showed with 2 g D-mannose daily over 6 months no significant difference from placebo.

That a benefit for recurrent urinary tract infections follows from this is examined by the controlled studies, several of them on mixtures, which makes attribution difficult. **Hypothesis:** If the effect is tied to availability in the urine, formulation and dwell time could help decide whether an effect becomes visible; one study used a delayed-release preparation with proanthocyanidins. An effect of the single substance does not follow from this.

What remains open is the direct comparison of D-mannose alone against placebo, which after the outcome of the MERIT study is still unresolved. Equally unresolved is in which populations an effect would be expected, since a subgroup of postmenopausal women in a review showed no advantage. Such a study would have to test D-mannose without further constituents in solid formulation and use recurrence frequency as the endpoint. Only then can the contribution of the anti-adhesive mechanism in humans be separated from that attributable to the mixtures. For the preclinically described effect in psoriasis, clinical studies in humans are still outstanding.

11. What Remains Open

- **Single substance:** Which randomised study tests D-mannose alone against placebo and thereby separates the contribution of the single substance from that of the additives?
- **Antibiotic comparison:** How does D-mannose compare with antibiotic prophylaxis over comparable time periods, measured by recurrences and by resistance development?
- **Long-term tolerability:** Over which duration of intake are safety data available, and does tolerability change with continuous use?

12. 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

In what quantity and form is D-Mannose tested in the studies?

The controlled studies examine different quantities and formulations, some with delayed release and some as fixed combinations with additional components. No uniform reference value can be derived from this, and no recommendation follows from it. What would need to be clarified is which dose and formulation is tested in an independent replication.

For which patient group is the evidence most meaningful?

It is most meaningful for women with recurrent urinary tract infections; several controlled studies examine this group, including postmenopausal women receiving vaginal oestrogen therapy. Other population groups are not the focus of the most frequently cited controlled studies. Whether the findings can be transferred has not been examined.

Is D-Mannose suitable as an alternative to antibiotic prophylaxis?

A systematic review with meta-analysis compares D-Mannose with other agents for prevention in adult women. A prospective study compares antibiotic prophylaxis with a combination of N-acetylcysteine, D-Mannose and an extract from *Morinda citrifolia*. Both studies do not concern D-Mannose alone, so the comparison remains open.

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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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