



DOSSIER · SUBSTANCE

MSM (Methylsulfonylmethane)

MSM is an organic sulfur compound that has been studied in humans mainly for joint complaints, on the skin and in sports.

462

STUDIES IN
TOTAL

69

IN HUMANS

31

OF WHICH
CONTROLLED

53

IN ANIMALS

34

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

MSM (Methylsulfonylmethane) at a Glance

A meta-analysis found significantly less pain and better function for MSM in osteoarthritis than with placebo, but of unclear clinical significance ⁴.

In two randomized controlled trials, MSM alone relieved knee complaints more than placebo ⁹¹⁴.

Many joint studies tested MSM only in mixtures, for example with glucosamine and chondroitin sulfate ¹ or with hyaluronic acid and collagen ¹⁰. Their effect cannot be attributed to MSM alone.

For skin aging, oral MSM capsules in a placebo-controlled study reduced facial wrinkles and skin roughness more than placebo ³⁰.

We evaluated 45 human studies on MSM (Methylsulfonylmethane), including 20 randomised controlled trials and 8 meta-analyses or systematic reviews; the controlled studies include 1,056 participants in total. As of 4 October 2026.

1. What Is MSM (Methylsulfonylmethane)? Occurrence, Origin and Forms

MSM is an organic sulfur compound; chemically it is also called dimethyl sulfone. It occurs in small amounts in plants and foods. As a powder, capsule, tablet or cream it is mainly used in the context of joints, sport and skin, and that is where studies in humans examine it.

Naturally, MSM is found in small amounts in plants and foods. In use it appears as a dietary supplement and as a preparation applied to the skin.

For preparations, MSM is produced technically; chemically it differs from the solvent dimethyl sulfoxide (DMSO) only by one additional oxygen atom. Studies mainly examine orally taken forms as well as preparations applied to the skin.

Forms and Preparations Studied

- Powder for dissolving
- Capsules
- Tablets
- Liquid preparations
- Topical gels or creams
- Combination products with other substances

Not covered on this page:

- DMSO (dimethyl sulfoxide), a related but distinct substance
- Cartilage building blocks such as glucosamine and chondroitin, which are often part of combination products
- Sulfur baths and sulfur springs
- Sulfur-containing amino acids such as cysteine and methionine

2. What Does MSM (Methylsulfonylmethane) Do? Results by Area

AREA	RESULT IN CONTROLLED STUDIES	STRENGTH OF EVIDENCE	STUDIES	PARTICIPANTS
Joints and Musculoskeletal System	mostly improved	high	2 meta-analyses · 14 controlled · 12 other	948
Skin	mostly improved	moderate	0 meta-analyses · 4 controlled · 2 other	96
Sport and Physical Exercise	mostly improved	moderate	0 meta-analyses · 3 controlled · 0 other	52
Inflammation and Inflammatory Markers	mixed	low	0 meta-analyses · 4 controlled · 2 other	124
Other investigations	mostly no difference	low	0 meta-analyses · 8 controlled · 7 other	340

How to read the table: counted are human studies whose results concern the area. "High" means at least one meta-analysis and two controlled studies showing improvement, or at least three controlled studies of which three quarters show improvement, with at least 300 participants in total. "Moderate" means at least two controlled studies showing improvement, as a majority, or one meta-analysis alongside controlled studies. "Low" means one controlled study showing improvement. Where an area has no controlled study, the strength of evidence is at most "low" (result "reviews only" or "observational data only"). Everything else is "unclear". A study counts as showing improvement when at least half of its outcomes in this area improved. Reviews of combination products do not count as meta-analyses; results that only describe side effects or shares of users do not count as an effect. The same study is counted only once.

3. What the Studies Show in Detail

MSM (Methylsulfonylmethane), Joints and Musculoskeletal System: Human Studies

In knee osteoarthritis, MSM capsules alone in a randomized controlled study improved pain and swelling more than placebo ⁹. The combination with glucosamine had the strongest effect there, also lowering the Lequesne index ⁹. In mild knee pain, MSM tablets in a second randomized controlled study improved the JKOM score more than placebo ¹⁴. A meta-analysis found a significant pain relief of unclear clinical significance for MSM versus placebo ⁴. A network meta-analysis counted MSM among the most effective agents against knee stiffness ². Many other joint studies tested MSM only in mixtures, for example with glucosamine ¹¹¹, collagen ¹⁰¹²¹³ or boswellia and curcumin ¹⁵²⁶. Some of them relieved joint pain more than in the control group ¹¹¹²¹³, but not the two boswellia-curcumin mixtures ¹⁵²⁶. These results cannot be ascribed to MSM alone. Long-term data and independent replications are still pending.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
¹ Sumsuzzman et al. 2024	meta-analysis · 5,265 participants	Glucosamine + chondroitin sulfate + methylsulfonylmethane (combination product); vs. Placebo and other glucosamine c
² Du et al. 2025	meta-analysis · 2,777 participants	Dietary supplements incl. MSM, compared as combination; vs. Placebo
³ Brien et al. 2011	meta-analysis · 326 participants	MSM (one included MSM trial; two DMSO trials); vs. Placebo or control
⁴ Liu et al. 2018	meta-analysis	Oral dietary supplements, including methylsulfonylmethane; Short, medium and long term (not specified); vs. Placebo
⁵ Liu et al. 2018	systematic review	Oral supplements, including methylsulfonylmethane
⁶ Gallagher et al. 2015	systematic review	MSM as one of 12 chondroprotective agents; at least 12 months required; vs. Placebo
⁷ Stuber et al. 2011	systematic review	MSM combined with glucosamine and chondroitin sulfate; vs. Placebo or no intervention
⁸ Ameye et al. 2006	systematic review	Oral natural molecules, including methylsulfonylmethane; vs. Placebo or other oral interventions

Further studies in this area: ^{9 10 11 12 13 14 15 16 17 18 19 20 21 26 33 38 41 42 43 44}

MSM (Methylsulfonylmethane) and Skin: Human Studies

In a placebo-controlled study, oral MSM capsules reduced facial wrinkles and skin roughness more than placebo ³⁰. Firmness, elasticity and moisture improved in the subsequent dose comparison compared with baseline ³⁰. In women with photoaged skin, capsules of MSM, hyaluronic acid and L-carnosine improved skin moisture and elasticity, while they remained the same with placebo ¹⁸. Wrinkle depth around the eyes decreased slightly with the mixture ¹⁸. A nail polish of hydroxypropyl chitosan, horsetail and MSM healed nail psoriasis more often than placebo in a randomized study ²⁸. In a placebo-controlled study, redness, papules, itching and moisture in rosacea improved with silymarin and MSM on the skin ²⁹. The studies are small and short; three of the four controlled studies tested mixtures ¹⁸²⁸²⁹. Long-term effects remain open; larger placebo-controlled studies with pure MSM are still pending.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
¹⁸ Guaitolini et al. 2019	randomised controlled · 50 participants	Nutraceutical with hyaluronic acid, L-carnosine and MSM; daily 400 mg MSM (plus 200 mg hyaluronic acid, 500 mg L
²⁸ Cantoresi et al. 2014	randomised controlled	Water-soluble nail lacquer with HPCH, Equisetum arvense and MSM; 24 weeks, once daily; vs. Placebo nail lacquer
²⁹ Berardesca et al. 2008	controlled · 46 participants	Topical preparation with silymarin and methylsulfonylmethane (S-MSM); 1 month; vs. Placebo, double-blind
³⁰ Muizzuddin et al. 2022	controlled	Oral MSM capsules; Part I: 3 g/day; Part II: 1 g or 3 g/day; 16 weeks; vs. Placebo (Part I); 1 g vs. 3 g MSM (Part II)
³⁷ Fleck et al. 2006	case report · 1 participants	moisturizer containing amino acids, vitamins, antioxidants, and MSM; 4 weeks; vs. no comparison (case report)
³⁹ Fernández-Campos et al. 2020	study	Regenail nail lacquer with MSM, biotin, dimethylsilanediol salicylate; vs. Betalfatrus reference product

MSM (Methylsulfonylmethane), Sport and Physical Exercise: Human Studies

A small pilot study compared two MSM doses without a placebo group ²⁵. Muscle soreness and fatigue after strength training decreased only as a statistical trend, while strength performance remained the same ²⁵. With glucosamine, chondroitin sulfate and MSM, aerobic capacity in training women with knee osteoarthritis increased somewhat more than with placebo ²⁰. In runners, a mixture of curcumin, pomegranate ellagitannins and MSM increased mRNA markers of innate immunity ²⁴. From these combination products, no effect of the individual substance MSM can be derived. The studies are small, short and partly open-label; a larger placebo-controlled study on MSM alone in sports is still pending.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
²⁰ Magrans-Courtney et al. 2011	randomised controlled · 30 participants	Capsules with glucosamine, chondroitin and MSM (GCM) or placebo; 900 mg/d MSM plus 1,500 mg/d glucosamine and
²⁴ McFarlin et al. 2021	randomised controlled · 14 participants	R + MSM: curcumin, pomegranate ellagitannins and MSM; 31 days; vs. control group without supplement
²⁵ Kalman et al. 2012	randomised controlled · 8 participants	MSM ingested; 1.5 g/day or 3.0 g/day; 30 days (28 days before and 2 days after exercise); vs. 3.0 g/day versus 1.5 g/day

MSM (Methylsulfonylmethane), Inflammation and Inflammatory Markers: Human Studies

For inflammatory markers, four smaller randomized studies are available, three of them with mixtures; their findings are inconsistent ¹⁶¹⁹²⁴²⁵. In runners, a mixture of curcumin, pomegranate ellagitannins and MSM dampened inflammation-related mRNA signals in an open randomized study ²⁴. In knee osteoarthritis, a mixture of collagen, boswellic acids, MSM and vitamins reduced the synovitis area more than glucosamine with chondroitin ¹⁶. In a pilot study without a placebo group, antioxidant capacity in the blood increased after training with MSM, and homocysteine decreased ²⁵. A mixture of glucosamine, chondroitin sulfate, MSM, guava leaf extract and vitamin D did not significantly change serum hyaluronan compared with placebo ¹⁹. The favorable results come from mixtures or from a pilot study without a placebo group, and the participant numbers are small. The effect of MSM alone, the transferability to longer-term courses and the influence of the forms studied (powder, capsules, topical preparation) remain open.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
¹⁶ Mazurov et al. 2023	randomised controlled · 70 participants	Artno (AN): MSM plus collagen, boswellic acids, vitamins C/D3; 1 capsule per day; 6 months; vs. glucosamine hydrochloride
¹⁹ Nakasone et al. 2011	randomised controlled · 32 participants	Glucosamine-based combination supplement with chondroitin sulfate, MSM, guava leaf extract, vitamin D; MSM dose 900 mg/day
²⁴ McFarlin et al. 2021	randomised controlled · 14 participants	R + MSM: curcumin, pomegranate ellagitannins and MSM; 31 days; vs. control group without supplement
²⁵ Kalman et al. 2012	randomised controlled · 8 participants	MSM ingested; 1.5 g/day or 3.0 g/day; 30 days (28 days before and 2 days after exercise); vs. 3.0 g/day versus 1.5 g/day
³² Kantor et al. 2012	cross-sectional study · 9,947 participants	Specialty dietary supplement containing methylsulfonylmethane; vs. regular users vs. non-users (cross-sectional comparison)
³⁹ Fernández-Campos et al. 2020	study	Regenail nail lacquer with MSM, biotin, dimethylsilanediol salicylate; vs. Betalfatrus reference product

MSM (Methylsulfonylmethane): Further Outcomes in Studies

In women with knee osteoarthritis in a weight-loss training program, glucosamine, chondroitin and MSM did not change body composition, strength and metabolic values more than placebo ²⁰. A chewing gum with EDTA, xylitol and MSM did not differ from a chlorhexidine mouth rinse in plaque and gum values ²². In contrast, an MSM-containing mixture improved the body pain index more than placebo ¹². Another raised physical quality of life more than glucosamine with chondroitin ¹⁶. In chronic bacterial prostatitis, a mixture of saw palmetto, selenium, lycopene, bromelain and MSM in addition to levofloxacin reduced symptoms and relapses ²⁷. Because of the mixtures, these results cannot be attributed to MSM alone. The overall evidence is low; the studies are small and short, and the forms tested range from capsules to chewing gum. It remains open whether MSM alone - as a powder, capsule, tablet or topically applied preparation - has a benefit for joint, skin or other complaints.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
¹¹ Nieman et al. 2013	randomised controlled · 100 participants	Instaflex™ Joint Support, combination product containing MSM; 3 capsules per day; 8 weeks; vs. Placebo
¹² Xie et al. 2008	randomised controlled · 100 participants	AR7 Joint Complex, supplement with sternum collagen II and MSM; 1 capsule daily orally; 12 weeks; vs. Placebo capsu
¹⁵ Yuan et al. 2026	randomised controlled · 84 participants	Oral combination with MSM 1500 mg/day plus Boswellia, pine bark, curcumin, piperine; MSM 1500 mg/day (total comb
¹⁶ Mazurov et al. 2023	randomised controlled · 70 participants	Arteo (AN): MSM plus collagen, boswellic acids, vitamins C/D3; 1 capsule per day; 6 months; vs. glucosamine hydroc
²⁰ Magrans-Courtney et al. 2011	randomised controlled · 30 participants	Capsules with glucosamine, chondroitin and MSM (GCM) or placebo; 900 mg/d MSM plus 1,500 mg/d glucosamine an
²² Shakhshi et al. 2024	randomised controlled · 24 participants	Chewing gum with EDTA, MSM and xylitol vs. chlorhexidine mouthrinse; Gum 15 min twice daily; chlorhexidine twice d.
²³ Liu et al. 2020	randomised controlled · 16 participants	MSM with Boswellia, curcumin, pine bark extract; single dose, 1-week washout; vs. combination versus constituents al
²⁷ Cai et al. 2016	randomised controlled	Serenoa repens, selenium, lycopene + bromelain and MSM extract plus levofloxacin; Levofloxacin 500 mg once daily;

Further studies in this area: [31](#) [34](#) [35](#) [36](#) [40](#) [43](#) [45](#)

4. How Is MSM (Methylsulfonylmethane) Dosed? Preparation, Dose and Duration in Studies

The studies used MSM as a powder for dissolving, as capsules, as tablets and as topically applied preparations such as nail polish or cream. Some of the investigations tested MSM alone, but many as a combination product with other substances such as glucosamine, chondroitin sulfate, curcumin or collagen. The exact amounts and treatment durations are shown in the table.

PREPARATION OR FORM	DOSE	DURATION	STUDY
MSM 500 mg capsules, alone or with glucosamine 500 mg	500 mg three times daily	12 weeks	⁹
oral combination product (IA) with MSM, HA, CS, collagen, manganese, milk glycoprotein	—	3 months	¹⁰
Instaflex™ Joint Support, combination product containing MSM	3 capsules per day	8 weeks	¹¹
AR7 Joint Complex, supplement with sternum collagen II and MSM	1 capsule daily orally	12 weeks	¹²
Oral supplement Tenosan (arginine L-alpha-ketoglutarate, MSM, hydrolyzed type I collagen, bromelain)	—	3 months after repair	¹³
10 tablets daily, each with 200 mg MSM or lactose	10 tablets each containing 200 mg MSM per day	12 weeks	¹⁴
Oral combination with MSM 1500 mg/day plus Boswellia, pine bark, curcumin, piperine	MSM 1500 mg/day (total combination daily)	12 weeks	¹⁵
Arteo (AN): MSM plus collagen, boswellic acids, vitamins C/D3	1 capsule per day	6 months	¹⁶

PREPARATION OR FORM	DOSE	DURATION	STUDY
CS/GL/MSM/HA with or without collagen	—	8 weeks	17
Nutraceutical with hyaluronic acid, L-carnosine and MSM	daily 400 mg MSM (plus 200 mg hyaluronic acid, 500 mg L-carnosine)	60 days	18
Glucosamine-based combination supplement with chondroitin sulfate, MSM, guava leaf extract, vitamin D	MSM dose not reported; glucosamine 1,200 mg/day	16 weeks	19
Capsules with glucosamine, chondroitin and MSM (GCM) or placebo	900 mg/d MSM plus 1,500 mg/d glucosamine and 1,200 mg/d chondroitin	14 weeks	20
GCM supplement (glucosamine, chondroitin sulfate, MSM)	—	3 months supplementation, 12-month follow-up	21
Chewing gum with EDTA, MSM and xylitol vs. chlorhexidine mouthrinse	Gum 15 min twice daily; chlorhexidine twice daily	14 days per period, 14-day wash-out	22
MSM with Boswellia, curcumin, pine bark extract	—	single dose, 1-week washout	23

5. Is MSM (Methylsulfonylmethane) Safe? Side Effects in Studies

With a mixture of MSM, boswellia, pine bark, curcumin and piperine, side effects occurred about as often as with placebo ¹⁵. With a similar mixture, slightly more participants discontinued because of side effects than with placebo ²⁶.

STUDY	REPORTED SIDE EFFECTS
¹ Sumsuzzman et al. 2024	Glucosamine + omega-3 ranked most favorable for adverse events
⁴ Liu et al. 2018	No differences vs placebo for safety outcomes, except diacerein
⁵ Liu et al. 2018	Possible adverse effects poorly reported; products generally recognized as safe
⁹ Usha et al. 2004	All treatments were well tolerated
¹⁰ Panuccio et al. 2015	well tolerated
¹² Xie et al. 2008	No significant toxicity in either group
¹⁴ Toguchi et al. 2023	Safety assessed by physical exam, urinalysis, blood test, interview
¹⁵ Yuan et al. 2026	Similar AE rates; mostly mild/moderate; 4 serious AEs unrelated to treatment
¹⁶ Mazurov et al. 2023	no clinically significant adverse reactions in both groups
¹⁸ Guaitolini et al. 2019	none reported; product called safe
²⁶ Liu et al. 2021	Discontinuation due to AE: 10% supplement vs 7% placebo
²⁷ Cai et al. 2016	No side effects reported in the combination group

6. What Remains Open: Limits of the Evidence

- Many studies tested MSM only in combination products, so the effect of the individual substance remains open.
- The participant numbers of most studies are small and the observation periods short.
- For MSM alone in athletes, only one very small investigation is available.
- Long-term effects and the transferability to pure MSM preparations are not clarified.

7. Bottom Line: What Is Established About MSM (Methylsulfonylmethane)

MSM is used as a powder, capsule, tablet or topically applied preparation, especially in the context of joints, sport and skin. For knee complaints, MSM alone in two randomized studies relieved the complaints more than placebo ⁹¹⁴. Many other joint studies tested only mixtures. For skin, inflammatory markers and sport, smaller studies found partly favorable but inconsistent results, mostly with mixtures ¹⁶¹⁸¹⁹²⁰²⁴²⁵²⁸²⁹³⁰.

Above all, the effect of MSM alone, the transferability to pure preparations and long-term courses remain open.

Frequently Asked Questions

How well has MSM (Methylsulfonylmethane) been studied in humans?

We evaluated 45 human studies on MSM (Methylsulfonylmethane), including 20 randomised controlled trials and 8 meta-analyses or systematic reviews; the controlled studies include 1,056 participants in total. As of 4 October 2026.

Does MSM (Methylsulfonylmethane) help with joints and Musculoskeletal System? What the studies show

We evaluated 2 meta-analyses or systematic reviews, 14 controlled studies and 12 further studies; the controlled studies include 948 participants in total. Result of the controlled studies: mostly improved. Strength of evidence under our published rules: high. Sources: ¹²³⁴

Does MSM (Methylsulfonylmethane) help with skin? What the studies show

We evaluated 4 controlled studies and 2 further studies; the controlled studies include 96 participants in total. Result of the controlled studies: mostly improved. Strength of evidence under our published rules: moderate. Sources: ¹⁸²⁸²⁹³⁰

Does MSM (Methylsulfonylmethane) help with sport and Physical Exercise? What the studies show

We evaluated 3 controlled studies; the controlled studies include 52 participants in total. Result of the controlled studies: mostly improved. Strength of evidence under our published rules: moderate. Sources: ²⁰²⁴²⁵

Does MSM (Methylsulfonylmethane) help with inflammation and Inflammatory Markers? What the studies show

We evaluated 4 controlled studies and 2 further studies; the controlled studies include 124 participants in total. Result of the controlled studies: mixed. Strength of evidence under our published rules: low. Sources: ¹⁶¹⁹²⁴²⁵

What is MSM and how is it used?

MSM is an organic sulfur compound, chemically dimethyl sulfone. In human studies it was used as a powder, capsule, tablet or topically applied preparation. The amounts and durations tested are shown in the table.

Do human studies show an effect on joint complaints?

MSM alone relieved knee complaints in two randomized studies more than placebo ⁹¹⁴. A meta-analysis found a statistically significant but clinically unclear pain relief for MSM ⁴. Many other joint studies tested MSM only in mixtures whose effect cannot be attributed to the individual substance ¹¹⁰¹¹¹²¹³¹⁵.

Are there studies on skin and skin aging?

Oral MSM capsules in a placebo-controlled study reduced facial wrinkles and skin roughness more than placebo ³⁰. With capsules of MSM, hyaluronic acid and L-carnosine, skin moisture and elasticity improved, but not with placebo ¹⁸. A nail polish of hydroxypropyl chitosan, horsetail and MSM healed nail psoriasis more often than placebo ²⁸. The studies are small and mostly last only weeks to a few months.

How well tolerated is MSM?

MSM alone was well tolerated in a randomized study ⁹, as were MSM-containing mixtures in further studies ¹⁰¹²¹⁶. In a study with a mixture of boswellia, pine bark, curcumin, piperine and MSM, side effects were similarly frequent under the preparation and placebo ¹⁵.

What should be considered with combination products?

Many preparations studied contained MSM together with other substances such as glucosamine, chondroitin sulfate, curcumin or collagen ¹¹⁰¹¹¹²¹³¹⁵. From such mixtures, no effect of the individual substance MSM can be derived. Statements about MSM alone therefore rely only on the studies that tested it without further active substances.

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