



DOSSIER · SUBSTANCE

Selenium

Selenium is a trace element from food and supplements; human studies show mixed to favorable results depending on the field of application and form.

1,911

STUDIES IN
TOTAL

698

IN HUMANS

258

OF WHICH
CONTROLLED

215

IN ANIMALS

142

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

Selenium at a Glance

In Hashimoto's thyroiditis, selenium lowered TPO antibodies in several meta-analyses ¹²¹⁷²³; individual randomized trials found no difference ¹⁵⁷¹⁹¹²⁰⁸. Mortality and cardiovascular events showed no difference in large reviews ³⁶, while individual blood lipid levels improved ²⁴⁴⁶. Inflammatory markers such as C-reactive protein decreased in several randomized controlled trials ¹⁶⁷¹⁷⁵¹⁸¹. In gestational diabetes, fasting blood glucose decreased in two randomized controlled trials ¹⁶⁷²³⁵, but not in another ¹⁸⁴. For cancer prevention and cancer diseases, several controlled trials and meta-analyses found predominantly no benefit ⁴¹⁰².

For male fertility, the situation is unclear: one meta-analysis found better semen parameters with selenium ⁶⁷, while a mixed preparation with vitamin E and folic acid showed no benefit ¹⁶⁵.

We evaluated 314 human studies on Selenium, including 169 randomised controlled trials and 89 meta-analyses or systematic reviews; the controlled studies include 242,635 participants in total. As of 4 October 2026.

1. What Is Selenium? Occurrence, Origin and Forms

Selenium is a trace element that the human body takes up through food. It occurs in soils, plants and animal foods and is part of the body's own enzymes. In studies it is examined as a dietary supplement, mostly in people with low selenium intake or with particular conditions.

Selenium occurs in soils and in plants, and the content varies greatly from region to region. It reaches the body through plant and animal foods, and the amounts differ depending on the food and its origin.

Selenium is obtained mainly as a by-product of metal refining and then processed into salts such as sodium selenite and sodium selenate or into organic compounds such as selenomethionine. Studies examine mainly these forms as well as selenium-enriched yeast.

Forms and Preparations Studied

- Sodium selenite
- Sodium selenate
- Selenomethionine
- Selenium-enriched yeast
- Selenocysteine as it occurs in food proteins

Not covered on this page:

- Selenium disulfide in anti-dandruff products: a topically applied compound, not the dietary and supplemental selenium discussed here.
- Sulfur: a different element with a similar name that must not be equated with selenium.
- Combination products with several micronutrients: a separate question, because the share of the single substance in them cannot be separated out.

2. What Does Selenium Do? Results by Area

AREA	RESULT IN CONTROLLED STUDIES	STRENGTH OF EVIDENCE	STUDIES	PARTICIPANTS
Heart and circulation	mixed	high	17 meta-analyses · 41 controlled · 7 other	17,260
Thyroid and Hashimoto's thyroiditis	mostly no difference	high	10 meta-analyses · 26 controlled · 16 other	3,052
Immune function	mostly improved	high	8 meta-analyses · 23 controlled · 7 other	2,396
Cancer prevention and cancer	mostly no difference	high	3 meta-analyses · 24 controlled · 13 other	205,108
Pregnancy	mixed	high	3 meta-analyses · 14 controlled · 4 other	1,294
Male fertility	mostly no difference	moderate	2 meta-analyses · 1 controlled · 2 other	70
Other investigations	mixed	high	46 meta-analyses · 110 controlled · 41 other	110,307

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

Selenium, Heart and Circulation: Human Studies

Meta-analyses found improvements in individual blood lipid levels: triglycerides in metabolic diseases and PCOS ²⁴²⁸, HDL cholesterol ²⁶ and VLDL cholesterol ⁴⁶. Total and LDL cholesterol remained unchanged in these meta-analyses ²⁴²⁶⁴⁶. A randomized controlled trial with selenium-enriched yeast also showed more favorable total and non-HDL cholesterol levels in older adults ¹⁰⁴, and another randomized controlled trial with sodium selenite or selenium-enriched yeast reports increased GPx activity as well as altered gene expression in atherosclerosis ¹⁸². A meta-analysis, by contrast, found a slight increase in systolic blood pressure ⁵⁷. These findings stand in contrast to studies that found no difference in mortality, in coronary heart disease ³, in prevention ⁶ as well as after heart surgery ¹⁰¹⁰⁰¹²¹. Also for cardiovascular events, several studies showed no differences ¹⁶⁸⁰. The forms studied range from sodium selenite and selenomethionine to selenium-enriched yeast to selenium preparations not further specified, sometimes as an infusion, sometimes orally. Mixed preparations with vitamin C and vitamin E ⁹³ or with probiotics ³⁹ do not allow any conclusion about selenium alone. A meta-analysis found no association with cardiovascular and all-cause mortality for selenium alone, but lower mortality for antioxidant mixtures with selenium ⁶⁶. It remains open whether and for which population groups selenium supplementation actually benefits the heart and circulation.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
¹ An et al. 2022	meta-analysis · 883,627 participants	Selenium supplement (form not stated); vs. Control/placebo in randomized trials
³ Ju et al. 2017	meta-analysis · 43,998 participants	Selenium supplementation (chemical form not reported); vs. Placebo or control
⁶ Rees et al. 2013	systematic review · 19,715 participants	Selenium as sole supplementation; at least three months follow-up; vs. placebo or no intervention
¹⁰ Rehan et al. 2023	meta-analysis · 2,521 participants	Selenium (infusion), chemical form not reported; pre- and/or postoperatively; vs. Placebo, normal saline, or no seleni
¹⁴ Cheng et al. 2025	meta-analysis · 2,080 participants	Selenium supplementation (chemical form not stated in abstract); vs. Control group without selenium supplementation
²⁴ Qiu et al. 2026	meta-analysis · 656 participants	Selenium dietary supplement (form not reported); vs. Placebo
²⁶ Ouyang et al. 2022	meta-analysis · 526 participants	Selenium supplementation (form not reported); vs. Control group (placebo/no supplementation)
²⁸ Kazempour et al. 2023	systematic review · 413 participants	Selenium supplementation (chemical form not reported); vs. Placebo

Further studies in this area: ^{29 32 33 34 37 39 46 57 60 66 77 80 93 94 95 100 104 107 108 111 112 113 116 121 128 132 134 137 138 140 141 145 151 158 167 168 173 180 181 182 183 186 188 189 192 196 200 212 215 224 227 236 248 277 290 295 296}

Selenium, Thyroid and Hashimoto's Thyroiditis: Human Studies

In Hashimoto's thyroiditis and related autoimmune diseases of the thyroid, selenium showed a reduction in TPO antibodies in several controlled studies and meta-analyses ¹²¹⁵¹⁷²³²⁷⁵⁴. Several randomized controlled studies, by contrast, found no difference in TPO antibodies ¹²³¹⁵⁷¹⁹¹²⁰⁸²¹¹²¹⁵. Tg antibodies fell in several studies, sometimes only at individual time points ¹⁷²³⁵⁴¹⁶¹²⁰⁹²⁴⁰, but not in two meta-analyses ¹²¹⁵. Above all selenomethionine, sodium selenite and selenium-enriched yeast were studied ¹⁷²⁷²⁰⁹²⁴⁰. For TSH, two meta-analyses and one randomized study found a slight decrease ¹²¹⁷²⁴⁰, several other studies found no difference ¹⁵⁷⁶¹⁷⁶²¹¹²¹⁵. For fT4, several studies showed no difference ¹²¹⁷⁶. For thyroid volume and echogenicity, the studies found no difference ¹²⁸⁴²⁰⁹. In Graves' disease, thyroid values improved more with selenium than with placebo in a meta-analysis after three and six months, but no longer after nine months ²¹. A large randomized controlled study found no higher remission rate in Graves' disease ¹¹⁴. Quality of life did not improve more than with placebo in two large randomized controlled studies ¹¹⁴¹¹⁷.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
¹² Huwiler et al. 2024	meta-analysis · 2,358 participants	Selenium supplementation (chemical form not stated in abstract); vs. Placebo or control
¹⁵ Zuo et al. 2021	meta-analysis · 1,911 participants	Selenium-containing drugs (form not reported); vs. Placebo
¹⁷ Zhang et al. 2025	systematic review · 1,610 participants	Selenium supplementation (selenomethionine, sodium selenite, selenium yeast); 3 to 6 months; vs. Control/placebo

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
²³ Fan et al. 2014	meta-analysis · 787 participants	Selenium supplementation (form not reported); 6 or 12 months; vs. Placebo
²⁷ van et al. 2013	systematic review · 463 participants	Sodium selenite or selenomethionine, partly with levothyroxine; 200 µg selenium daily; mean 7.5 months (range 3 to 18 mon
⁴⁹ Kubiak et al. 2023	systematic review	Selenium dietary supplement (12 studies); vs. Control groups in controlled trials
⁵⁰ Zavros et al. 2023	systematic review	Selenium supplementation, partly combined with zinc; vs. Placebo or control (not further reported)
⁵⁴ Wang et al. 2023	systematic review	Selenium supplementation (form not reported); 3, 6 and 12 months; vs. Control group without selenium

Further studies in this area: ⁶⁵ ⁷⁶ ⁸⁴ ¹¹⁴ ¹¹⁶ ¹¹⁷ ¹¹⁹ ¹²³ ¹²⁶ ¹³⁶ ¹⁴⁶ ¹⁶¹ ¹⁶⁶ ¹⁷¹ ¹⁷⁶ ¹⁷⁷ ¹⁸⁷ ¹⁹³ ²⁰⁹ ²¹¹ ²¹³ ²¹⁵ ²¹⁶ ²¹⁸ ²²⁷ ²⁴⁰ ²⁴¹ ²⁴⁶ ²⁵⁰ ²⁶⁴ ²⁶⁶ ²⁷⁴ ²⁷⁸ ²⁷⁹ ²⁸⁴ ²⁸⁷ ²⁸⁸ ²⁹⁰ ²⁹¹ ²⁹² ²⁹³ ²⁹⁴ ²⁹⁸ ²⁹⁹

Selenium and Immune Function: Human Studies

In randomized controlled studies, interleukin-17 fell in ulcerative colitis ¹⁴³, and interleukin-6 rose less in hemodialysis patients than with placebo ¹⁵⁵. In sepsis, selenium nanoparticles increased lymphocyte counts ¹⁶⁴, and in HIV selenium slowed the decline of CD4 cells ¹²⁰. C-reactive protein fell in several controlled studies ¹⁶⁷¹⁷⁵¹⁸¹²²⁴. In premature infants with very low birth weight, late-onset sepsis occurred less frequently in a systematic review ⁷². Two systematic reviews found no difference in the risk of infection in critically ill patients ⁴⁸⁷⁹. Above all selenomethionine, selenium-enriched yeast and sodium selenite were studied; mixed preparations with coenzyme Q10 ¹¹¹¹¹², with zinc, lycopene and vitamin C ¹⁵² as well as with probiotics ³⁹ do not allow any statement about selenium alone. The results remain inconsistent depending on form, dose and population.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
¹² Huwiler et al. 2024	meta-analysis · 2,358 participants	Selenium supplementation (chemical form not stated in abstract); vs. Placebo or control
¹³ Allingstrup et al. 2015	systematic review · 2,084 participants	Intravenous sodium selenite or ebselen; vs. Placebo or standard care
¹⁴ Cheng et al. 2025	meta-analysis · 2,080 participants	Selenium supplementation (chemical form not stated in abstract); vs. Control group without selenium supplementation
²⁴ Qiu et al. 2026	meta-analysis · 656 participants	Selenium dietary supplement (form not reported); vs. Placebo
³⁹ Asl et al. 2026	systematic review	Selenium plus probiotics (form and dose not reported); vs. no uniform comparator, ten clinical studies
⁴³ Hariri et al. 2024	meta-analysis	Parenteral selenium (chemical form not reported); not reported; not reported; vs. Comparison groups of included RCTs
⁴⁷ Gholizadeh et al. 2023	meta-analysis	Oral or intravenous selenium supplementation; vs. Control group without selenium
⁴⁸ Jaff et al. 2023	systematic review	Selenium supplementation (form not reported); vs. Placebo or standard care

Further studies in this area: ⁷⁰ ⁷² ⁷⁹ ¹¹¹ ¹¹² ¹²⁰ ¹⁴³ ¹⁴⁴ ¹⁵² ¹⁵⁵ ¹⁵⁷ ¹⁵⁹ ¹⁶² ¹⁶⁴ ¹⁶⁷ ¹⁷⁵ ¹⁷⁸ ¹⁸¹ ¹⁸⁵ ¹⁸⁷ ¹⁹¹ ¹⁹⁹ ²²⁴ ²³⁷ ²⁴⁰ ²⁵² ²⁷⁴ ²⁸⁰ ²⁸³ ²⁸⁸

Selenium, Cancer Prevention and Cancer: Human Studies

For cancer prevention and in cancer diseases, selenium shows predominantly no advantage in several controlled studies and meta-analyses. In a large randomized controlled study with selenomethionine, the prostate cancer risk did not fall ⁸⁷, and in the Cochrane review, cancer incidence and cancer mortality did not differ from placebo ⁴. Also in men with increased prostate cancer risk ¹⁰² and after lung cancer surgery ⁹⁹, selenium-enriched yeast did not lower the risk of new tumors. The response to chemoradiotherapy in cervical cancer remained unchanged ¹⁴², while side effects of treatment occurred less

frequently in two randomized controlled studies ¹⁴²¹⁴⁹. An older meta-analysis found a lower cancer incidence at low baseline selenium levels or high cancer risk ². The Cochrane review did not confirm this and found in studies with low risk of bias an indication of a higher melanoma risk ⁴. Above all selenomethionine ⁸⁵⁸⁶⁸⁷ and selenium-enriched yeast ¹⁰²¹³⁵ were studied, sometimes in combination with vitamin E ⁸⁵⁸⁶⁸⁷. Mixed preparations with other micronutrients do not allow any statement about selenium alone ⁴¹⁶⁴. The large prevention studies were predominantly conducted in men.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
² Lee et al. 2011	meta-analysis · 152,538 participants	Selenium supplement alone (chemical form not reported); vs. Placebo
⁴ Vinceti et al. 2018	systematic review · 27,232 participants	Selenium supplements versus placebo; vs. Placebo
⁴¹ Li et al. 2025	meta-analysis	Selenium as part of a multivitamin mixture or dietary intake; vs. lower vs. higher selenium intake/levels or
⁴⁵ Barnhart et al. 2024	systematic review	Selenium, sometimes combined with vitamin C and/or vitamin E; vs. No control reported
⁶⁴ Grammatikopoulou et al. 2020	systematic review	Selenium, partly combined with other dietary factors/supplements; vs. randomized controlled trials of vari
⁸² Hou et al. 2013	systematic review	Selenium (form and dose not stated); vs. Comparison of evidence across dietary factors
⁸⁵ Dunn et al. 2009	randomised controlled · 35,534 participants	L-selenomethionine, alone or with vitamin E; 200 µg/day selenium; 400 IU/day vitamin E; minimum 7, maxi
⁸⁶ Dunn et al. 2010	randomised controlled · 35,533 participants	L-selenomethionine, alone or with vitamin E; 200 µg/day L-selenomethionine; 7 to 12 years; vs. Placebo or

Further studies in this area: ^{87 88 89 91 92 95 96 97 98 99 102 107 122 135 142 149 153 221 234 238 243 247 255 256 257 259 269 275 282 289 296 300}

Selenium and Pregnancy: Human Studies

In pregnant women with gestational diabetes, several controlled studies found improvements in glucose and insulin metabolism with selenium supplementation ¹⁶⁷²³⁵. A randomized controlled study with a selenium tablet found no difference here ¹⁸⁴. In a randomized controlled study with selenium-enriched yeast, neonatal jaundice and hospital admissions of the newborns occurred less frequently ²²³. In HIV-positive pregnant women, selenium lowered the risk of premature birth ¹²⁷, and a meta-analysis of randomized studies found preeclampsia less frequently ⁷⁸. In two randomized controlled studies in pregnant women with increased preeclampsia or growth risk, blood flow in the uterine artery improved ¹⁷⁹¹⁸⁶.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
⁵³ McDougall et al. 2023	systematic review	Selenium supplementation (form not reported); vs. Placebo or no treatment
⁷³ Plows et al. 2019	systematic review	Nutritional supplements, including selenium
⁷⁸ Xu et al. 2016	meta-analysis	Selenium (form not specified); vs. healthy pregnant women or placebo/control
¹²⁴ Mao et al. 2016	randomised controlled · 230 participants	selenium supplement (form not stated); 60 µg/day; from 12 weeks of gestation until delivery; vs. placebo
¹²⁷ Okunade et al. 2021	randomised controlled · 180 participants	Daily tablet of 200 µg elemental selenium; 200 µg elemental selenium daily; until delivery, some beyond 14 weeks; vs
¹²⁹ Boskabadi et al. 2012	randomised controlled · 166 participants	100 µg selenium as selenium-yeast tablet vs. placebo-yeast tablet; 100 µg selenium daily; vs. placebo-yeast tablet
¹³⁰ Tara et al. 2010	randomised controlled · 166 participants	selenium supplement, chemical form not stated; 100 µg selenium per day until delivery; until delivery; vs. placebo, do
¹³¹ Tara et al. 2010	randomised controlled · 166 participants	Selenium 100 µg daily versus placebo; 100 µg selenium per day; until delivery; vs. Placebo

Further studies in this area: ^{167 179 180 184 186 220 223 235 239 262 273 288 290}

Selenium and Male Fertility: Human Studies

A meta-analysis found better semen parameters under selenium alone in oligo- and asthenozoospermia ⁶⁷. In a network meta-analysis of eight antioxidants, by contrast, only coenzyme Q10 and carnitine showed confirmed advantages, selenium did not ¹⁶. A randomized controlled trial with selenium, vitamin E and folic acid found no difference from placebo ¹⁶⁵. The chemical form of the selenium is not named in these studies, and some of the preparations contained

additional micronutrients. The strength of evidence is overall unclear: Besides two meta-analyses, only one small controlled trial is available.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
¹⁶ Su et al. 2022	meta-analysis · 1,790 participants	Selenium as oral antioxidant supplement (form not reported); vs. Placebo and seven other antioxidants (folic acid, zinc, vitamin C, vitamin E, vitamin K, vitamin B12, and vitamin D)
⁶⁷ Buhling et al. 2019	meta-analysis	oral micronutrient supplementation, including selenium; selenium 200 µg/day and 100 µg/day; vs. placebo (randomized, controlled trial)
¹⁶⁵ Bahmyari et al. 2021	randomised controlled · 70 participants	Selenium tablet plus vitamin E capsule plus folic acid tablet (combination); Selenium 200 µg/day, vitamin E 400 IU/day, folic acid 5 mg/day; vs. placebo
²⁷² Ramgiri-Naidu et al. 2026	review	Selenium alongside other micronutrients and fatty acids
²⁹⁷ Yao et al. 2016	review	Selenium (form not specified); vs. Placebo/control in RCTs

Selenium: Further Outcomes in Studies

In this area, a very large number of controlled studies and meta-analyses on different questions were evaluated, with mixed results. Several controlled studies and meta-analyses found improvements in selenium status, for example with selenium-enriched yeast and oral sodium selenite ¹⁴¹⁰⁵¹⁰⁸¹⁰⁹¹³⁰¹³⁹. Glutathione peroxidase activity also increased in several controlled studies and meta-analyses, among others with selenomethionine and sodium selenite ³⁶⁹⁸³¹⁴¹¹⁸⁹¹⁹⁹. For mortality in critically ill patients, two meta-analyses found a benefit ⁸⁴⁸. Several meta-analyses on sepsis, heart surgery and intensive care patients, by contrast, found no difference ²⁵⁴⁴⁶⁸⁷⁹. Isolated studies reported adverse effects: a randomized controlled trial with selenium-enriched yeast in older people in Denmark found higher all-cause mortality at the highest dose ¹⁰⁷, a randomized controlled trial with selenium in type 2 diabetes found a worsening of blood glucose control ¹⁹², and a randomized controlled trial with selenium in PCOS patients found a worsening of insulin resistance ²⁰¹. Various forms were studied, such as sodium selenite, sodium selenate, selenomethionine and selenium-enriched yeast, sometimes orally, sometimes intravenously. In Kashin-Beck disease, in a network meta-analysis all selenium forms tested improved the radiographic findings of the bones compared with placebo ⁹. In PCOS, selenium lowered fasting insulin in a meta-analysis on trace elements ¹⁸.

STUDY	DESIGN · PARTICIPANTS	PREPARATION · DOSE · DURATION · COMPARISON
³ Ju et al. 2017	meta-analysis · 43,998 participants	Selenium supplementation (chemical form not reported); vs. Placebo or control
⁴ Vinceti et al. 2018	systematic review · 27,232 participants	Selenium supplements versus placebo; vs. Placebo
⁵ Mao et al. 2014	meta-analysis · 20,294 participants	Selenium supplementation (form not reported); vs. Selenium supplementation versus control groups
⁶ Rees et al. 2013	systematic review · 19,715 participants	Selenium as sole supplementation; at least three months follow-up; vs. placebo or no intervention
⁷ Pham et al. 2024	meta-analysis · 9,366 participants	Selenium, alone or combined, alongside melatonin, vitamin C, vitamin E, N-acetylcysteine; vs. direct and indirect comparisons
⁸ Zhao et al. 2019	meta-analysis · 3,341 participants	intravenous selenium supplementation as single therapy; vs. control/placebo
⁹ Xie et al. 2018	meta-analysis · 2,931 participants	Selenium salt, sodium selenite, selenium-enriched yeast, sodium selenite + vitamin E, sodium selenite + vitamin C; vs. Placebo
¹⁰ Rehan et al. 2023	meta-analysis · 2,521 participants	Selenium (infusion), chemical form not reported; pre- and/or postoperatively; vs. Placebo, normal saline, or no selenium

Further studies in this area: [11](#) [12](#) [13](#) [14](#) [18](#) [19](#) [20](#) [22](#) [23](#) [24](#) [25](#) [26](#) [27](#) [28](#) [29](#) [30](#) [31](#) [32](#) [33](#) [34](#) [35](#) [36](#) [38](#) [39](#) [40](#) [42](#) [44](#) [45](#) [48](#) [49](#) [50](#) [51](#) [52](#) [55](#) [56](#) [58](#) [59](#) [60](#) [61](#) [62](#) [63](#) [66](#) [68](#) [69](#) [70](#) [71](#) [72](#) [74](#) [75](#) [76](#) [77](#) [79](#) [81](#) [83](#) [84](#) [86](#) [87](#) [90](#) [91](#) [93](#) [95](#) [98](#) [101](#) [103](#) [105](#) [106](#) [107](#) [108](#) [109](#) [110](#) [111](#) [115](#) [116](#) [118](#) [119](#) [120](#) [121](#) [122](#) [125](#) [128](#) [130](#) [132](#) [133](#) [137](#) [139](#) [141](#) [142](#) [143](#) [147](#) [148](#) [149](#) [150](#) [154](#) [155](#) [156](#) [158](#) [160](#) [162](#) [163](#) [164](#) [167](#) [168](#) [169](#) [170](#) [172](#) [173](#) [174](#) [175](#) [176](#) [177](#) [178](#) [179](#) [180](#) [181](#) [183](#) [185](#) [186](#) [188](#) [189](#) [190](#) [191](#) [192](#) [194](#) [195](#) [196](#) [197](#) [198](#) [199](#) [200](#) [201](#) [202](#) [203](#) [204](#) [205](#) [206](#) [207](#) [209](#) [210](#) [214](#) [215](#) [216](#) [217](#) [218](#) [219](#) [222](#) [223](#) [224](#) [225](#) [226](#) [227](#) [228](#) [229](#) [230](#) [231](#) [232](#) [233](#) [234](#) [241](#) [242](#) [244](#) [245](#) [246](#) [249](#) [251](#) [253](#) [254](#) [255](#) [258](#) [260](#) [261](#) [263](#) [264](#) [265](#) [267](#) [268](#) [269](#) [270](#) [271](#) [276](#) [277](#) [281](#) [285](#) [286](#) [288](#) [289](#) [290](#) [296](#) [301](#) [302](#)

4. How Is Selenium Dosed? Preparation, Dose and Duration in Studies

The studies predominantly used oral forms: selenomethionine, selenium-enriched yeast, sodium selenite and sodium selenate. Individual studies gave selenium intravenously, such as sodium selenite in cardiac surgery patients ¹⁰⁰ or in critically ill patients ⁸²⁰²²⁸¹. Some of the investigations tested selenium only together with other substances, such as with coenzyme Q10, so that no independent effect of selenium can be derived ¹¹¹¹¹².

PREPARATION OR FORM	DOSE	DURATION
L-selenomethionine, alone or with vitamin E	200 µg/day selenium; 400 IU/day vitamin E	minimum 7, maximum 12 years
L-selenomethionine, alone or with vitamin E	200 µg/day L-selenomethionine	7 to 12 years
Oral L-selenomethionine, alone or combined with vitamin E	200 µg selenium daily; vitamin E 400 IU daily	Planned follow-up 7 years
Selenium and/or vitamin E supplementation	—	median follow-up 7.3 years
oral L-selenomethionine, with or without vitamin E or placebo	200 µg selenium per day	planned follow-up 7.3 years
L-selenomethionine as individual supplement (or vitamin E)	200 µg selenium per day	mean treatment and follow-up 7.3 years
L-selenomethionine, 2×2 factorial with alpha-tocopherol	200 µg L-selenomethionine daily	6-year supplementation
Vitamin C, vitamin E, and selenium (multinutrient supplement)	—	7.3 years
Micronutrient capsules with 37.5 mg selenium plus vitamin C and E (mixture)	2 capsules daily with 250 mg vitamin C, 100 IU vitamin E, 37.5 mg selenium	7.3 years
Vitamin supplement with C, E and selenium; garlic extract and oil; H. pylori treatment	—	Supplementation 7.3 years
Selenium plus vitamin C and vitamin E (vitamin treatment)	—	7.3 years supplementation

PREPARATION OR FORM	DOSE	DURATION
Vitamin C, vitamin E, and selenium (combined supplement)	—	7.3 years
Selenium as selenized yeast, 200 µg/day	200 µg selenium daily	median 33.0–33.6 m
Selenized yeast	200 µg daily	48 months
Intravenous high-dose sodium selenite versus placebo	2000 µg/L before cardiopulmonary bypass, 2000 µg/L immediately postoperatively, then 1000 µg/L daily in ICU, maximum 10 days	Perioperative up to

5. Is Selenium Safe? Side Effects in Studies

In several reviews and controlled trials, selenium preparations were well tolerated, and adverse events did not differ from placebo ⁸²⁵. In the largest prevention study, however, alopecia and dermatitis occurred more frequently with selenium ⁴, and in randomized trials the risk of type 2 diabetes increased slightly ⁴⁷⁴. A randomized controlled trial with selenium-enriched yeast in older people in Denmark found higher all-cause mortality at the highest dose ¹⁰⁷, and the Cochrane review reports an indication of a higher melanoma risk ⁴.

STUDY	REPORTED SIDE EFFECTS
⁴ Vinceti et al. 2018	Alopecia, dermatitis, type 2 diabetes, high-grade prostate cancer with high baseline status
⁶ Rees et al. 2013	alopecia RR 1.28, dermatitis grade 1-2 RR 1.17, type 2 diabetes RR 1.06 (not significant)
⁸ Zhao et al. 2019	no increase in drug-induced side effects (RR 1.04, 95% CI 0.83–1.30, P = .73)
¹² Huwiler et al. 2024	adverse effects comparable (OR 0.89 [CI 0.46 to 1.75])
¹⁹ Chen et al. 2025	adverse events comparable (RR 1.02, 95% CI 0.94–1.10)
²⁰ Huang et al. 2013	no evidence of adverse events
²² Alhazzani et al. 2013	Heterogeneity in adverse event reporting precluded pooling
²³ Fan et al. 2014	no significant adverse events
²⁵ Kong et al. 2013	No difference in adverse events (RR 0.97)
²⁷ van et al. 2013	One event each in two studies; no significant difference
³² Stróżyk et al. 2019	One adverse event (nausea) as reason for discontinuation; reporting inaccurate
³⁷ Urbano et al. 2026	adverse blood lipid changes at high dose/intake

6. What Remains Open: Limits of the Evidence

- The participants' baseline selenium supply differed and was often not reported, which limits the transferability of the results.
- Many measures are blood values such as the selenium concentration in serum and not clinical endpoints.
- Some of the studies tested selenium in mixed preparations; for these, no independent effect of selenium can be derived.
- The chemical form and the amount administered were not reported in all studies.
- For male fertility, besides one meta-analysis there is only one small controlled trial, and that with a mixed preparation.

7. Bottom Line: What Is Established About Selenium

Selenium is a trace element that the body takes in through food and needs as a component of selenoproteins. Human studies show different results depending on the field of application: In Hashimoto's thyroiditis, meta-analyses showed that above all the TPO antibodies fell, individual inflammation and immune markers improved, and in gestational diabetes some studies found more favorable blood sugar levels. For cancer prevention and cancer diseases, predominantly no advantage was found, and for male fertility the data situation is unclear.

The results depend strongly on the chemical form, the amount supplied and the baseline supply of the participants. Under selenium supplementation, alopecia and dermatitis were reported more frequently as well as a slightly increased risk for type 2 diabetes, and the highest dose tested was associated with higher mortality in one study.

Frequently Asked Questions

How well has Selenium been studied in humans?

We evaluated 314 human studies on Selenium, including 169 randomised controlled trials and 89 meta-analyses or systematic reviews; the controlled studies include 242,635 participants in total. As of 4 October 2026.

Does Selenium help with heart and circulation? What the studies show

We evaluated 17 meta-analyses or systematic reviews, 41 controlled studies and 7 further studies; the controlled studies include 17,260 participants in total. Result of the controlled studies: mixed. Strength of evidence under our published rules: high. Sources: ¹³⁶¹⁰

Does Selenium help with thyroid and Hashimoto's thyroiditis? What the studies show

We evaluated 10 meta-analyses or systematic reviews, 26 controlled studies and 16 further studies; the controlled studies include 3,052 participants in total. Result of the controlled studies: mostly no difference. Strength of evidence under our published rules: high. Sources: ¹²¹⁵¹⁷²³

Does Selenium help with immune function? What the studies show

We evaluated 8 meta-analyses or systematic reviews, 23 controlled studies and 7 further studies; the controlled studies include 2,396 participants in total. Result of the controlled studies: mostly improved. Strength of evidence under our published rules: high. Sources: ¹²¹³¹⁴²⁴

Does Selenium help with cancer prevention and cancer? What the studies show

We evaluated 3 meta-analyses or systematic reviews, 24 controlled studies and 13 further studies; the controlled studies include 205,108 participants in total. Result of the controlled studies: mostly no difference. Strength of evidence under our published rules: high. Sources: ²⁴⁴¹⁴⁵

Does Selenium help with pregnancy? What the studies show

We evaluated 3 meta-analyses or systematic reviews, 14 controlled studies and 4 further studies; the controlled studies include 1,294 participants in total. Result of the controlled studies: mixed. Strength of evidence under our published rules: high. Sources: ⁵³⁷³⁷⁸¹²⁴

Does Selenium help with male fertility? What the studies show

We evaluated 2 meta-analyses or systematic reviews, one controlled study and 2 further studies; the controlled studies include 70 participants in total. Result of the controlled studies: mostly no difference. Strength of evidence under our published rules: moderate. Sources: ¹⁶⁶⁷¹⁶⁵²⁷²

What is selenium and what does the body need it for?

Selenium is a trace element that humans take in through food and that occurs in soils, plants and animal foods. It is a component of the body's own enzymes, the selenoproteins. In studies, it is mostly tested as a dietary supplement in people with low selenium intake or with certain diseases.

Which forms of selenium were used in the studies?

Mainly selenomethionine, selenium-enriched yeast, sodium selenite and sodium selenate were investigated. Individual studies gave selenium intravenously, such as sodium selenite in cardiac surgery patients ¹⁰⁰. The forms differ in absorption and residence time in the body, which is why the results cannot be readily transferred.

Does selenium show a benefit in Hashimoto's thyroiditis?

In meta-analyses, selenium lowered above all the TPO antibodies ¹²¹⁷²³, whereas several randomized controlled trials found no difference ¹⁵⁷¹⁹¹²⁰⁸. In two large randomized controlled trials, selenium did not improve quality of life, neither in Hashimoto's thyroiditis nor in Graves' disease ¹¹⁴¹¹⁷.

Does selenium help against cancer?

For cancer prevention and in cancer diseases, selenium shows predominantly no advantage in several controlled studies and meta-analyses. Cancer frequency did not fall in large randomized controlled studies or in the Cochrane review ⁴⁸⁷¹⁰², nor did cancer mortality ⁴. An advantage at low baseline selenium levels, which an older meta-analysis found ², was not confirmed there ⁴.

Which side effects are known with selenium supplementation?

In several reviews and controlled studies, selenium preparations were well tolerated, and adverse events did not differ from placebo ⁸²⁵. In the largest prevention study, hair loss (alopecia) and skin inflammation occurred more frequently with selenium, and the risk for type-2 diabetes rose slightly ⁴⁷⁴. A randomized controlled study with selenium-enriched yeast in older people in Denmark found higher overall mortality with the highest dose ¹⁰⁷.

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