| Reference | # Subjects | Trial design | EPA | DHA | Control | Duration | Serum | Asthma | Wheeze | Symptoms | ACQ | BD use | FEV1 | FVC | FEV1% | BR | Exacerbations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nagakura 2000 | 29 | Parallel | 17-27 mg/kg | 7-12 mg/kg | Olive oil | 10 mo | Y | X | X | Y | X | X | X | X | X | Y | X |
| Ebden 1989 | 12 | Parallel | 2.9 g linoleic | 0.36 g linolenic | Paraffin | 8 wk | Y | X | X | N | X | N | N | X | X | N | X |
| Lang 2019 | 98 | Parallel | 3.2 g | 822 mg | Soy oil | 24 wk | Y | X | X | X | N | N | X | X | X | X | N |
| Molsaeter 2025 | 70 | Parallel | 120 mg | 180 mg | MCTs | 20 wk | X | X | X | X | N | N | X | X | X | X | N |
| Brannan 2015 | 23 | Crossover | 4 g | 2 g | Omega 6 & 9 | 3 wk | Y | X | X | X | N | X | N | X | X | N | X |
| Mickleborough 2013 | 20 | Crossover | PCSO-525 | | Olive oil | 3 wk | X | X | X | Y | X | Y | N | X | X | Y | X |
| Covar 2010 | 43 | Parallel | 3 g | 1.6 g | regular formula | 12 wk | Y | N | X | X | X | X | N | N | N | Y | X |
| Mickleborough 2003 | 10 | Crossover | 3.2 g | 2.2 g | Olive oil | 3 wk | Y | X | X | X | X | X | N | N | N | Y | X |
| Mickleborough 2006 | 16 | Crossover | 3.2 g | 2 g | Olive oil | 3 wk | Y | X | X | X | X | Y | N | X | X | Y | N |
| Dressler 2020 | 99 | Parallel | 710 mg | 161 mg | Olive oil | 4 wk | Y | X | X | X | N | N | X | X | X | N | X |
| Lindemann 2009 | 22 | Parallel | 0.5 g | 0.35 g | Placebo | 4 wk | Y | X | X | X | N | Y | X | X | X | X | X |
| Moreira 2007 | 23 | Parallel | 0.45 g | 0.18 g | Unsat/monosat | 3 wk | X | X | X | X | N | X | N | X | X | X | X |
| Surette 2008 | 101 | Crossover | 0.5 g | 1.3 g | Olive oil | 4 wk | Y | X | Y | Y | Y | X | X | X | X | X | X |
| Schubert 2009 | 23 | Parallel | 455 mg | 325 mg | Unsat/monsat FA | 2 wk | Y | X | X | X | X | X | N | X | X | N | X |
| Arm 1989 | 22 | Parallel | 3.2 g | 2.2 g | Olive oil | 10 wk | Y | X | X | N | X | N | X | X | X | N | X |
| Emelyanov 2002 | 46 | Parallel | 200 mg | EHA & DHA | Olive oil | 8 wk | X | X | Y | X | X | N | N | X | X | X | X |
| Okamoto 2000 | 14 | Parallel | linolenic acid | - | Corn oil | 4 wk | X | X | X | X | X | X | Y | Y | X | X | X |
| Hodge 1998 | 39 | Crossover | 0.72 g | 0.48 g | safflower/palm/olive | 24 wk | Y | X | X | N | X | N | N | N | N | N | X |
| Broughton 1997 | 26 | Crossover | n-3/n-6 1:1 ratio | - | n-3/n-6 0.5 1:1 | 4 wk | Y | X | X | X | X | X | Y | Y | Y | Y | X |
| Thien 1993 | 37 | Parallel | 3.2 g | - | Placebo | 6 mo | Y | X | X | N | X | X | X | X | X | N | X |
| Dry 1991 | 12 | Parallel | 1 g EPA & DHA | - | Placebo | 1 yr | X | X | X | X | X | X | Y | X | X | X | X |
| Picado 1988 | 10 | Crossover | 3 g | - | Placebo | 6 wk | Y | X | X | N | X | N | X | X | X | X | X |
| Hederos 1996 | 22 | Parallel | 500 mg EPO | - | Placebo | 16 wk | Y | X | X | N | X | X | YPEFR | X | X | X | X |
| Kirsch 1988 | 12 | Parallel | EPA | - | 0.1 g EPA | 8 wk | Y | X | X | N | X | X | N | N | N | X | X |

**Infants**

| Reference | # Subjects | Trial design | EPA | DHA | Control | Duration | Serum | Asthma | Wheeze | Symptoms | ACQ | BD use | FEV1 | FVC | FEV1% | BR | Exacerbations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D'Vaz 2012 | 420 | Parallel | 110 mg | 280 mg | Olive oil | 6 mo | Y | N | N | X | X | X | X | X | X | X | X |
| Mihrshahi 2003 at age 18 mo | 616 | Parallel | 500 mg tuna oil | | Sunola oil | 1 yr | Y | N | N | X | X | X | X | X | X | X | X |
| Mihrshahi 2004 at age 3 | 616 | Parallel | 500 mg tuna oil | | Sunola oil | 2.5 yr | Y | N | N | X | X | X | X | X | X | X | X |
| Peat 2004 at age 3 | 616 | Parallel | 500 mg tuna oil | | Sunola oil | 2.5 yr | Y | N | N | X | X | X | X | X | X | X | X |
| Marks 2006 at age 5 | 616 | Parallel | 500 mg tuna oil | | Sunola oil | 4.5 yr | Y | N | N | X | X | X | N | X | N | X | X |
| Almqvist 2007 at age 5 | 616 | Parallel | 500 mg tuna oil | | Sunola oil | 4.5 yr | Y | N | N | X | X | X | X | X | X | X | X |
| Toelle 2008 at age 8 | 616 | Parallel | 500 mg tuna oil | | Sunola oil | 4.5 yr | N | N | N | X | N | X | X | X | X | X | X |
| Garden 2018 at age 11 | 616 | Parallel | 500 mg tuna oil | | Sunola oil | 4.5 yr | N | N | X | X | X | X | X | X | X | X | X |
| Manley 2011 preterm infants | 657 | Parallel | Tuna oil | | Soy oil | 9.4 wk average | X | N | X | X | X | X | X | X | X | X | X |
| Birch 2010 at age 3 yr | 89 | Parallel | 0.32-0.36% of FA | | Enfamil | 12 mo | X | Y | X | X | X | X | X | X | X | X | X |

**Prenatal supplementation**

| Reference | # Subjects | Trial design | EPA | DHA | Control | Duration | Serum | Asthma | Wheeze | Symptoms | ACQ | BD use | FEV1 | FVC | FEV1% | BR | Exacerbations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bisgaard 2023 at age 6 yr | 736 | Parallel | 1.3 g | 0.9 g | Olive oil | 16 wk | Y in mother | Y | X | X | X | X | X | X | X | X | X |
| Bisgaard 2016 between 3 & 5 yr | 736 | Parallel | 1.3 g | 0.9 g | Olive oil | 16 wk | Y in mother | Y nonatopic | or persistent wheeze | X | X | X | X | X | X | X | X |
| Bisgaard 2016 between 3 & 5 yr | 736 | Parallel | 1.3 g | 0.9 g | Olive oil | 16 wk | Y in mother | N atopic | X | X | X | X | X | X | X | X | X |
| Hansen 2017 at 24 yr Follow up | 533 | Parallel | 1.3 g | 0.9 g | Olive oil | 10 wk | X | Y | X | X | X | X | N | N | N | X | X |
| Olsen 2008 at 16 yr follow up | 533 | Parallel | 1.3 g | 0.9g | Olive oil | 10 wk | X | Y | X | X | X | X | X | X | X | X | X |
| Komulainen 2023 at 12 & 24 mo | 439 | Parallel | 1.9 g | 0.22 g | MCT | >22wk | X | N atopic | N | X | X | X | X | X | X | X | X |
| Best 2016 at 6 yr | 706 | Parallel | 0.8 g | 0.1 g | Vegetable oil | <21 wk | Y in cord blood | X | N | X | X | X | X | X | X | X | X |
| Palmer 2013 at 3 yr | 706 | Parallel | 0.8 g | 0.1 g | Vegetable oil | <21 wk | Y in cord blood | N | X | X | X | X | X | X | X | X | X |
| Dunstan 2003 at 12 months | 98 | Parallel | 1.03 g | 2.1 g | Olive oil | 20 wk to delivery | Y | N | N | N | X | X | X | X | X | X | X |

**Table S1. Randomized, placebo-controlled trials of polyunsaturated omega-3 fatty acid supplementation in pregnant women and asthma outcomes in offspring and in individuals with asthma**

**Abbreviations and symbols:** Ref-reference number in manuscript, #-number of subjects; D-Study design, P-parallel study design, C-Crossover trial,, EPA- eicosapentaenoic acid, DHA-docosahexaenoic acid, control-supplement supplied to the control group, duration of supplementation to both intervention and control groups, Serum-whether there was a change in serum fatty acid content, asthma-whether treatment was associated with an increase in asthma, or wheeze -increase in number with wheeze, Symptoms-whether intervention increased symptoms, ACQ-asthma control questionnaire, QOL-quality of life, BD use-whether intervention reduced bronchodilator use, FEV1-forced expiratory volume in one second, FVC-forced vital capacity, FEV1%-ratio of FEV1 to FVC, BR-whether intervention reduced bronchial reactivity, exac-whether intervention reduced the risk of asthma exacerbations. g-gram, mg-milligram, mg/k-milligram per kilogram child's weight, Y-intervention improved a particular outcome, N-no change in outcome, X-outcome was not reported, MCT-medium chain triglyceride, reg-regular, wk-week, mo-month, yr-year, n-3/n-6-ratio of omega 3 to omega 6 fatty acid in formula, Regarding reference 94, placebo contained: C-carbohydrate, pr-protein. PCSO-524 marine lipid fraction of New Zealand green lipped mussel. Sans O3-supplement without omega-3 fatty acid.

| Normal vitamin D levels or not measured | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reference** | **# of subjects** | **Study design** | **Vitamin D dose/day** | **Control** | **Duration** | **Serum** | **Asthma** | **Wheeze** | **Symptoms** | **ACQ** | **QOL** | **BD use** | **FEV1** | **FVC** | **FEV1%** | **BR** | **Exacerbations** | |
| Watkins 2024 | 32 | Parallel | 125 mcg | Placebo | 12 wk | Y | X | X | X | N | X | X | N | N | Y | X | X | Adults |
| Thakur 2021 | 60 | Parallel | 2000 IU | Placebo | 12 wk | Y | X | X | X | N | X | X | N | X | X | X | N | Children age 6-11 |
| Camargo 2021 | 214 | Parallel | 100000 IU/mo | Placebo | 3.3 yr | Y | X | X | X | X | X | X | X | X | X | X | N | Older adults age 50-84 |
| Rueter 2020 | 195 | Parallel | 400 IU | Placebo | 6 mo | Y | X | N | X | X | X | X | X | X | X | X | X | Infants >6mo |
| Ali 2017 | 82 | Parallel | 1 µg | Open label | 4 mo | Y | X | X | X | X | X | X | Y | Y | Y | X | X | Adults |
| Kerley 2016 | 44 | Parallel | 2000 IU | Placebo | 15 wk | Y | X | X | X | N | X | X | N | N | N | X | X | Children age 6-16 |
| Tachimoto 2016 | 89 | Parallel | 800 IU | Placebo | 2 mo | Y | X | X | X | Y | X | X | YPEFR | X | X | X | X | Children age 6-15 |
| Arshi 2014 | 130 | Parallel | 100K IU IM + 50K/wk | not mentioned | 24 wk | Y | X | X | X | X | X | X | Y | X | X | X | X | Age 10-50 years |
| Bar Yoseph 2015 | 39 | Parallel | 14000/wk | Olive oil | 6 wk | Y | X | X | X | X | X | X | N | X | X | N | X | Age 6-18 years |
| Castro 2014 | 408 | Parallel | 100K + 4000/day | Placebo | 28 wk | Y | X | X | X | N | N | X | N | X | X | N | N | Age 18 years and older |
| Yadav 2014 | 100 | Parallel | 60000 IU/mo | Placebo | 6 mo | X | X | X | X | Y(control) | X | X | YPEFR | X | X | X | v | Childen age 3 to 14 years |
| Majak 2011 | 48 | Parallel | 500 IU | Placebo | 6 mo | X | X | X | X | X | X | X | N | X | X | X | N | Children age 5-18 years |
| de Groot 2015 | 44 | Parallel | 400K once | Placebo | 9 wk | Y | X | X | X | N | N | X | N | X | Y | X | X | Adults age 18 and older |
| Baris 2014 | 32 | Parallel | 650 IU + SCIT | SCIT | 1 yr | Y | X | X | Y | X | X | X | N | N | N | N | X | Children age 5-15, SCIT subcutaneous immunotherapy |
| Gold 2025 | 1654 | Parallel | 2000 IU | placebo | 5 yr | X | X | X | X | X | X | X | N | N | N | X | N | women 55 & older, men 50 & older |

| Low serum vitamin D levels | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reference** | **# of subjects** | **Study design** | **Vitamin D dose/day** | **Control** | **Duration** | **Serum** | **Asthma** | **Wheeze** | **Symptoms** | **ACQ** | **QOL** | **BD use** | **FEV1** | **FVC** | **FEV1%** | **BR** | **Exacerbations** | |
| O'Sullivan 2024 (Parts 1+2) | 112 | Parallel | 50K + 8K/day | 600 IU | 16 wk | Y | X | X | N | N | X | X | X | X | X | X | X | Age 6 to 18 years |
| Andujar-Espinosa 2021 | 112 | Parallel | 16K IU/wk | Placebo | 6 mo | Y | X | X | X | Y | Y | X | X | X | X | X | X | Age 18 and older |
| Martineau 2015 | 250 | Parallel | 1000 IU | Placebo | 9 mo | Y | X | X | X | N | X | X | N | N | N | X | N | Majority vitamin D deficient |
| Forno 2020 | 192 | Parallel | 4000 IU | Placebo | 8 wk | Y | X | X | X | X | X | X | X | X | X | X | N | Study terminated early due to futility |
| Shabana 2019 | 103 | Parallel | 300K IU IM | Placebo IM | 3 mo | Y | X | X | X | X | X | X | Y | X | N | X | X | Children age 3 to 18 years |
| Swangtrakul 2022 | 84 | Parallel | wt based | Placebo | 3 mo | Y | X | X | X | N | X | X | N FOT | X | X | X | X | <30 Kg 300K + 20 kgQ2wk, +/>30 kg 600K + 20K/wk |
| Jat 2021 | 250 | Parallel | 1000 IU | Placebo | 9 mo | Y | X | X | X | N | X | X | X | X | X | X | X | |

| Prenatal supplementation | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reference** | **# of subjects** | **Study design** | **Vitamin D dose/day** | **Control** | **Duration** | **Serum** | **Asthma** | **Wheeze** | **Symptoms** | **ACQ** | **QOL** | **BD use** | **FEV1** | **FVC** | **FEV1%** | **BR** | **Exacerbations** | |
| Shadid 2022 | 881 | Parallel | 4400 IU | 400 IU | 10-18 wk->term | Y | N | N | X | X | X | X | N | N | N | X | X | Vitamin D started between wk 10 & 18, children assessed at age 6 years |
| Litonjua 2020 | 881 | Parallel | 4400 IU | 400 IU | 10-18wk->term | Y | N | N | X | X | X | X | N | N | X | X | X | Children assessed at 6 years |
| Litonjua2016 | 881 | Parallel | 4400 Iu | 400 IU | 10-18 wk->term | Y | N | N | X | X | X | X | X | N | N | N | X | Children assessed at 3 years |
| Brustad 2019 | 545 | Parallel | 2800 IU | 400 IU | 24 wk->term | Y | N | N | X | X | X | X | N | N | N | N | X | Children assessed at 6 years |
| Nasantogtokh 2023 | 360 | Parallel | 4000 or 2000 IU | 600 IU | 12-16 wk->term | cord blood Y | N | N | X | X | X | X | X | X | X | X | X | Children assessed at 2 years |
| Chawes 2016 | 623 | Parallel | 2800 IU | 400 IU | 24wk->term | Y | X | N | Y | X | X | X | X | X | X | X | X | Children assessed at 3 years |
| Grant 2016 | 260 | Parallel | 2K/800 IU, 1K/400 IU | Placebo | 24->term/6 mo | Y | N | X | X | X | X | X | X | X | X | X | X | 3 arm study: 24 wk->term, then infants X6 mo. Three arms: 2K/800 IU, 1K/400 IU, placebo/placebo. Children assessed at 18 months |

**Table S2. Randomized, placebo-controlled trials of vitamin D supplementation in pregnant women and asthma outcomes in offspring and in individuals with asthma**

**Abbreviations and symbols:** Ref-reference number in manuscript, #-number of subjects, D-study design, P-study was parallel-designed, C-Crossover trial. vitamin dose-vitamin D dose (loading dose plus daily dose, given to intervention group, Control-treatment received by control group, Duration-duration of vitamin D therapy, Serum- serum level on treatment, Asthma-whether prevalence of asthma was decreased with intervention, Wheeze-whether prevalence of wheeze decreased with intervention, Symptoms-whether symptoms improved, ACQ-asthma control questionnaire, QOL-quality of life, BDuse-whether bronchodilator use decreased with intervention, BR-whether rescue bronchial reactivity decreased, Exac-whether treatment resulted in a reduction in exacerbation frequency. Treatment resulted in an improvement (Y), treatment did not result in a change(N) or was not

measured. (X). a-same study cohort, b-same study cohort, K represents thousands of I.U. of vitamin D, e.g., 16K represents 16000 I.U., wk-week, mo-month. FOT forced oscillation technique, PEFR peak expiratory flow rate.