

Vitamin D and Loss of Smell (Anosmia, Hyposmia, Olfactory Dysfunction): An Evidence Review

Yes. Low serum 25(OH)D is consistently linked to poorer smell function in observational studies. Animal work makes a causal role biologically credible. No placebo-controlled human trial has yet shown that vitamin D restores smell, so the honest summary is “consistent association, plausible mechanism, unproven treatment.”

TL;DR

- **Association: consistent but modest.** NHANES data on 2,216 US adults aged 40+ showed 39% higher odds of smell impairment when 25(OH)D was below 20 ng/mL versus above 30 ng/mL (OR 1.39, 95% CI 1.02-1.89) [Bigman 2020]. Smaller clinical studies in adults, children (n=518), and Parkinson’s disease (n=39) point the same way, and a 2026 study of 161 adults found a stepwise dose-response.
- **Intervention: weak.** The best data come from an uncontrolled before/after study: 91 Turkish adults with mean 25(OH)D of 12.9 ng/mL had low smell scores, which normalized after repletion to 43 ng/mL [Baki 2021]. Beyond that there are case reports and a registered Egyptian trial of vitamin D nasal drops for post-COVID parosmia that has never reported results.
- **Mechanism: now strong in animals.** A 2025 mouse study showed that vitamin D deficiency impairs odor discrimination, that supplementation sharpens sensitivity, and that knocking down VDR in the olfactory bulb reproduces the deficit [Ren 2025]. Correcting deficiency is reasonable for anyone with smell loss. It should be paired with olfactory training, not used instead of it.

Key Findings

1. **General adult and aging populations.** The association appears in a large US national survey, a dose-response clinical study, an older-adult medication study, and MRI studies of olfactory structures. Effect sizes are modest (OR $\approx$ 1.4). The strongest signal is at severe deficiency (<10-20 ng/mL).
2. **Children and allergic rhinitis.** In 518 Korean children, low 25(OH)D was linked to worse smell thresholds. The association held after adjusting for allergen sensitization, nasal obstruction, and allergic rhinitis, which argues against the link simply reflecting blocked noses. 
3. **Parkinson’s disease.** One small Korean study (Kim et al., J Clin Neurosci 2018;57:131-135) of 39 de novo patients found lower 25(OH)D independently associated with poorer odor identification. It has not been replicated in a larger cohort.

4. **COVID-19 and long COVID.** The evidence is thin and mostly from conference abstracts or secondary outcomes. A post-acute COVID clinic found vitamin D insufficiency in 60% of anosmic patients, compared with roughly 35% of those with hyposmia or normal smell, but only in patients under 65. ersnet
5. **Chronic rhinosinusitis with nasal polyps (CRSwNP).** Low vitamin D and impaired local vitamin D activation (CYP27B1) are well documented in CRSwNP. nih Smell-specific outcomes from vitamin D trials in this group are scarce.
6. **Trials.** No adequately powered, placebo-controlled RCT of vitamin D for smell loss exists. The one dedicated RCT registration (vitamin D3 nasal drops for post-COVID parosmia, NCT05269017) has posted no results. veeva
7. **Reviews.** The only dedicated systematic review found just 7 eligible articles and called for large blinded trials [[Ang 2023](#)]. nih No meta-analysis exists.

Summary Table of Key Studies

Study	Population	n	Vitamin D finding	Smell outcome	Reference
Bigman 2020 (NHANES 2013-14)	US adults 40-80 y	2,216 (smell)	<20 vs >30 ng/mL	Smell impairment OR 1.39 (1.02-1.89), Pocket Smell Test	Bigman 2020 mdpi
Baran 2026	Turkish adults	161 (98 deficient, 63 sufficient)	Graded <10, 10-20, 20-30, ≥30 ng/mL	Threshold r=0.302, identification r=0.432; stepwise rise; cutoff ≈10 ng/mL, AUC 0.636	Baran 2026 springer
Shin 2021	Korean children 10-12 y	518	<20 vs ≥20 ng/mL	Threshold 6.56 vs 7.28 (p=.036), independent of allergic rhinitis	Shin 2021
Kim 2018	De novo Parkinson's	39	Continuous 25(OH)D3	Independently associated with odor identification (β reported 0.38)	Kim 2018 via review mdpi
Baki 2021	Turkish adults, insufficient vs controls	91 + 91	12.88 → 42.99 ng/mL after repletion	CCCRS scores low before, matched controls after (p=0.4)	Baki 2021
Şencan 2021 (MRI)	Adults	29 deficient vs 34 controls	Deficient vs normal	Smaller olfactory bulb volume and sulcus depth	Şencan 2021
Şencan 2024 (MRI)	Adolescents	23 vs 18	<20 vs ≥20 ng/mL	No olfactory bulb volume difference	Şencan 2024
Older adults, Navarra	Geriatric, mean age 86	107	Vitamin D intake (not serum)	Identification +1.09 (95% CI 0.03-2.15)	Frontiers 2025
ERS 2022 abstract	Post-acute COVID clinic	143	Insufficiency prevalence	60% of anosmic insufficient vs ~35%	ERS 2022

Study	Population	n	Vitamin D finding	Smell outcome	Reference
				others; only <65 y	
Turkish pediatric COVID	Children with COVID	75	Low vs normal	Low D had more anosmia and taste loss	Epidemiol Infect
Stewart 2011 case reports	Adults	2	8.4 → 29 ng/mL; up to 96 ng/mL on 10,000 IU/d	Subjective smell returned	JCM case reports nih
Ren 2025 (mouse)	Mice, diet-controlled	Not reported	Deficient vs supplemented; VDR knockdown	Deficiency impaired discrimination; rapamycin rescued	Ren 2025

Details

1. Observational evidence

General population and aging. The largest dataset is Bigman’s NHANES 2013–2014 analysis [[Bigman 2020](#)]. Of 2,216 adults aged 40–80, 12.2% had smell impairment (failing 6 or more of 8 odors on the Pocket Smell Test) and 20% had 25(OH)D below 20 ng/mL. [nih](#) [mdpi](#) After adjustment for age, sex, race/ethnicity, and cancer history, deficiency was associated with OR 1.39 (95% CI 1.02–1.89) for smell impairment compared with levels above 30 ng/mL. [nih](#) The age-by-vitamin-D interaction was not significant (p=0.492). [nih](#) The lower confidence limit sits close to 1, so this is a real but modest signal.

The 2026 European Archives study of 161 adults is the most informative clinical study [[Baran 2026](#)]. [springer](#) Using HPLC-measured 25(OH)D and Sniffin’ Sticks, both threshold and identification scores rose stepwise across the <10, 10–20, 20–30 and ≥30 ng/mL groups (p<0.001). [vitamindwiki](#) 25(OH)D independently predicted identification (β=0.041). A cutoff near 10 ng/mL had 95% specificity for threshold-level impairment, but the AUC was only 0.636. In the authors’ words, vitamin D is “a specific risk indicator rather than a standalone diagnostic marker.” [springer](#) A letter to the editor on this paper appeared on 20 October 2026, and readers should check it for methodological critiques. [springer](#)

Baki et al. compared 91 vitamin D-insufficient adults (mean 12.88 ng/mL) with 91 controls (35.76 ng/mL) using the CCCRC test [[Baki 2021](#)]. [b-ent](#) Baseline scores were significantly lower in the insufficient group (p<0.001). [entandaudiologynews](#)

In a geriatric sample from Navarra, Spain (n=107, mean age 86.1), taking vitamin D was associated with better odor identification (+1.09 points, 95% CI 0.03–2.15, p=0.04) [Frontiers 2025]. [nih](#) This was a medication-use analysis, not serum-based, and the authors acknowledge it was underpowered. [frontiersin](#)

Structural MRI. Şencan et al. found significantly smaller olfactory bulb volume and shallower olfactory sulcus depth in 29 vitamin D-deficient adults than in 34 controls [Şencan 2021]. Central regions (insula, amygdala) were lower but not significantly so. [nih](#) [researchgate](#) The same group found no bulb-volume difference in adolescents (23 vs 18) [Şencan 2024]. [sciendo](#) One explanation is that structural effects need years of deficiency. A voxel-based morphometry study in elderly patients with cognitive decline linked low 25(OH)D to reduced grey matter in the right olfactory region [Food Sci Nutr 2021]. [nih](#)

Children and allergic rhinitis. In the Seongnam cohort of 518 children aged 10–12, those with 25(OH)D below 20 ng/mL had lower Sniffin' Sticks threshold scores (6.56 vs 7.28, p=.036) [Shin 2021]. [wiley](#) The association persisted after adjustment for aeroallergen sensitization, pre-decongestant nasal patency, and allergic rhinitis. This matters because smell loss in rhinitis is usually conductive, caused by Th2 mucosal swelling, and the finding suggests a non-obstructive pathway. [wiley](#) On the wider allergic rhinitis question, children with AR have lower vitamin D than controls, but Mendelian randomization studies do not support a causal link to AR itself [WJM review]. [doi](#)

Parkinson's and neurodegeneration. Smell loss often precedes motor symptoms in Parkinson's disease. In 39 drug-naïve de novo Korean patients, serum 25(OH)D3 was independently associated with Sniffin' Sticks odor identification and inversely with subjective olfactory dysfunction [Frontiers Neurol review]. [researchgate](#) [frontiersin](#) A later review reports a β of 0.38 and stronger associations in the akinetic-rigid subtype [MDPI 2025]. [mdpi](#) I was unable to check the exact coefficient against the primary abstract (J Clin Neurosci 2018;57:131–135). Reverse causation is a serious concern here: the Frontiers in Neurology 2020 review notes that “reduced mobility in advanced disease may result in limited sun exposure and lower vitamin D levels” [Frontiers Neurol review]. An updated meta-analysis (Gao et al., Neurosci Lett 2020) found the VDR FokI C allele raised PD risk (OR 1.497, 95% CI 1.098–2.042, p=0.011) only among Asian populations, but no study has tested VDR genotype against smell outcomes.

COVID-19 and long COVID. Direct evidence is surprisingly sparse given how much COVID-vitamin D research exists.

- At a post-acute COVID syndrome clinic (n=143), 60% of patients with anosmia had vitamin D insufficiency, compared with 36% of hyposmic and 34.7% of normosmic patients [ERS 2022]. The association held only under age 65, and among older anosmic patients none were deficient. This is a conference abstract, not peer-reviewed. [ersnet](#)

- In 75 Turkish children with COVID-19, those with low vitamin D had significantly higher rates of anosmia and taste loss, but lower rates of fever and cough [[Epidemiol Infect](#)]. nih
- Low vitamin D predicts long COVID overall (20.1 vs 23.2 ng/mL) [[JCEM 2023](#)], oup but that study did not report smell separately.
- Reduced olfactory bulb volume tracks persistent post-COVID smell loss [[Sci Rep](#)], which parallels the vitamin D MRI findings. nih Nobody has yet combined these measures in one study.

Chronic rhinosinusitis with nasal polyps. Systematic reviews consistently find lower serum vitamin D in CRS, especially CRSwNP [[Cureus SR 2023](#)] [[Cureus SR 2024](#)]. nih nih A 2025 narrative review notes reduced sinonasal 1 α -hydroxylase (CYP27B1) in CRSwNP, an inverse relation between 25(OH)D and symptom and mucosal severity, and that 1,25(OH)₂D regulates more than 2,000 genes in nasal epithelial cells [[Nutrients review](#)]. nih Smell loss affects 94% of CRSwNP patients (and 78% of all CRS patients), according to the Kohli 2017 Laryngoscope systematic review as cited by Hox ([Int J Mol Sci 2024;25\(8\):4460](#)), so vitamin D could act indirectly by damping Th2 inflammation and polyp burden. Studies reporting smell as a separate outcome, though, are rare.

2. Intervention evidence

Intervention	Design	Dose / duration	Outcome	Reference
Oral vitamin D repletion	Prospective before/after with untreated normal controls	Repletion to 42.99 ng/mL; retest ~12 weeks	CCCRC scores rose to match controls (p=0.4)	Baki 2021 ENT News
Oral D3	2 case reports	10,000 IU/d; level 8.4 → 29 ng/mL, other case to 96 ng/mL	Subjective return of smell; relapse when stopped	Case reports 2011 vitamindwiki nih
D3 nasal drops vs budesonide	Registered phase 2 RCT, post-COVID parosmia, n=60 estimated	5,000 IU/drop, 2 drops/nostril twice daily (~40,000 IU/day), 4 weeks	No results posted; status unknown	NCT05269017 clinicaltrials veeva
Aerosolized retinoic acid plus vitamin D	Registered RCT, post-COVID anosmia	Retinoic acid 3 weeks plus vitamin D	Status unknown; vitamin D effect not separable	NCT05002530 clinicaltrials
Vitamin D 400 IU in control arm	RCT, PEA-luteolin plus olfactory training vs multivitamin/vitamin D 400 IU plus olfactory training, n=130	90 days	Active arm beat the vitamin D-containing control	Curr Allergy Asthma Rep SR nih

Some interpretation of this table:

- The Baki study is the most cited “treatment” evidence, but it had no placebo arm. [entandaudiologynews](#) Spontaneous improvement, learning effects on retesting, and regression to the mean cannot be excluded.
- The Egyptian nasal-drop trial deserves particular caution. Its registry text contains copy-paste errors from a sister ivermectin trial, and no publication has followed. [veeva](#) A 2022 paper by the same team is about platelet-rich plasma, not vitamin D, and is sometimes confused with this trial. [nih](#)

- In the post-COVID RCT, vitamin D at 400 IU was part of the placebo arm, so that trial offers no test of vitamin D. [nih](#)
- I found no trials of vitamin D combined with zinc, omega-3, or corticosteroids that reported smell outcomes. The omega-3 pilot from the Dresden smell clinic tested omega-3 alone [[PubMed](#)]. [nih](#)
- Systematic reviews of COVID-related smell loss treatment put olfactory training first. Vitamins are grouped as low-certainty adjuncts [[Curr Allergy Asthma Rep SR](#)]. [springer](#)

3. Systematic reviews and meta-analyses

The only dedicated review, Ang et al. 2023 (J Laryngol Otol 137:971–976), screened four databases from 2000 to 2022 and included 7 articles [[Ang 2023](#)]. Four studied association, and three of those were significant. [nih](#) The three treatment studies (a case report, a case series, and a cohort) all reported improvement. [researchgate](#) The journal’s editorial stressed that “there were no robust, large-scale, blinded, placebo-controlled trials” [[JLO editorial](#)].

[cambridge](#) A 2026 narrative review on micronutrients and COVID-related smell loss cites vitamin D’s neuroprotective role but adds no new primary data [[ScienceDirect 2026](#)].

[sciencedirect](#) No pooled meta-analysis exists, and the studies are too heterogeneous to pool meaningfully.

4. Mechanisms

- **VDR in the olfactory bulb.** Ren et al. used mice with diet-controlled vitamin D from weaning [[Ren 2025](#)].
 - Single-nucleus and spatial transcriptomics showed VDR concentrated in olfactory bulb tufted cells, with 79.8% of VDR-positive bulb neurons in the external plexiform and glomerular layers. [biorxiv](#)
 - Deficiency impaired odor discrimination and supplementation increased sensitivity. Knocking down VDR in the olfactory bulb reproduced the deficit. [nih](#)
 - ChIP-seq showed VDR binding directly to synaptic and mTOR-pathway genes, and rapamycin restored function in deficient mice. [nih](#)
 - This is the strongest causal evidence available, but it is in rodents.
- **Local activation.** Sinonasal tissue expresses the vitamin D pathway enzymes, and CYP27B1 is dysregulated in CRS, so local conversion to calcitriol may be reduced in exactly the tissues where smell is lost [[Nutrients review](#)]. [nih](#) I found no direct human data on VDR or CYP27B1 in the olfactory neuroepithelium specifically.
- **Anti-inflammatory and anti-Th2 effects.** Vitamin D suppresses pro-inflammatory cytokines, strengthens the epithelial barrier, and modulates the Th2 inflammation that drives conductive loss in polyps and allergic rhinitis. [cambridge](#) [nih](#)

- **Neuroprotection and regeneration.** Vitamin D's neurosteroid effects plausibly support basal-cell-driven renewal of olfactory neurons after viral injury. This is inferred, not demonstrated, and the competing nutrient with direct evidence on olfactory stem cells is vitamin A.
- **Genetics.** I found no studies linking VDR polymorphisms to olfactory function.

5. Taste (dysgeusia/ageusia)

In NHANES, adults aged 70–80 with 25(OH)D of 20–30 ng/mL had higher odds of taste impairment than those above 30 ng/mL (reported OR 1.96) [Bigman 2020]. [vitamindwiki](#) [mdpi](#) The published 95% CI of 1.35–1.85 does not contain the point estimate, which indicates a typo, so cite this figure cautiously. [mdpi](#) Deficiency below 20 ng/mL was not significant for taste. The Turkish pediatric COVID cohort also linked low vitamin D to taste loss. [nih](#) Overall, taste evidence is weaker and less consistent than smell evidence.

6. Existing VitaminDWiki coverage

VitaminDWiki has a page titled “Loss of smell related to low Vitamin D or Zinc,” created March 2017 and updated June 2026 [VitaminDWiki]. [vitamindwiki](#) [vitamindwiki](#) It currently covers:

- Baran 2026, headlined as olfactory impairment below 10 ng/mL. [vitamindwiki](#) [vitamindwiki](#)
- Bigman 2020, headlined on the taste finding. [vitamindwiki](#) [vitamindwiki](#)
- The 2011 case reports. [vitamindwiki](#) [vitamindwiki](#)
- Links to Kim 2018 (Parkinson’s) and the “Nasal polyposis greatly decreased by 4,000 IU of vitamin D for 4 weeks – 2014” page. [vitamindwiki](#) [vitamindwiki](#)
- Observations linking smell loss to chemotherapy, obesity, PD/AD, and MS. [vitamindwiki](#) [vitamindwiki](#)
- A zinc section. [vitamindwiki](#) [vitamindwiki](#)

Related pages include “COVID and Zinc – many studies” [vitamindwiki](#) and a page on predictive COVID symptoms. **Gaps worth adding:**

- Shin 2021 (children, n=518)
- Baki 2021 (repletion study)
- Şencan 2021/2024 MRI studies
- Ang 2023 systematic review
- Ren 2025 mouse VDR mechanism study
- ERS 2022 post-COVID abstract
- NCT05269017 (registered, unreported)
- The NHANES smell OR of 1.39, since the page currently headlines only the taste result

Recommendations

1. **For VitaminDWiki framing:** use “associated with” and “plausibly contributes to,” not “causes” or “cures.” The Baran dose–response and the Ren VDR-knockdown data are the strongest items to headline.
2. **For people with smell loss:** check 25(OH)D. Deficiency below 20 ng/mL, and especially below 10 ng/mL, is worth correcting on general grounds and may help smell. Correction should go alongside evidence-based olfactory training (twice daily for 3 months or more) and ENT evaluation for polyps or other causes. Do not expect vitamin D alone to reverse established post-viral anosmia.
3. **For researchers:** the obvious missing study is a placebo-controlled RCT of vitamin D3 plus olfactory training in deficient patients with post-viral smell loss, using Sniffin’ Sticks TDI as the outcome. Contacting the Menoufia investigators about NCT05269017 could recover unpublished data.

Caveats

- **Confounding:** older age, obesity, smoking, chronic illness, frailty and limited time outdoors all lower vitamin D and impair smell. Most studies adjust for only a few of these.
- **Reverse causation:** sick or less mobile people (PD, long COVID) get less sun. Smell loss also changes diet.
- **Small and regional samples:** apart from NHANES, all samples are under 520 and come mostly from Turkey and Korea. Publication bias toward positive findings is likely.
- **Null and mixed findings:** in the Ang review, one of four association studies was null. ^{nih} The adolescent MRI study was null. ^{sciendo} The post-COVID association disappeared in patients over 65. ^{ersnet} NHANES found no significant age interaction.
- **Measurement:** NHANES used a brief 8-odor screen. ^{nih} Several COVID data points are self-reported or from abstracts. The Parkinson’s β could not be confirmed from the primary paper.