

EFFECT OF VEGAN & PLANT-BASED DIETS ON ORAL HEALTH & DENTAL TREATMENTS



Plant-based diets have experienced exponential growth globally, driven by health consciousness, environmental concerns, and ethical considerations regarding animal welfare. The spectrum of plant-based eating encompasses various dietary patterns with distinct implications for oral health & dental treatments.

TYPES OF PLANT-BASED DIETS

Veganism: Complete exclusion of all animal products including meat, dairy, eggs, honey, and often animal-derived ingredients in processed foods. This represents the most restrictive form of plant-based eating.

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EFFECT OF KETOGENIC DIET ON ORAL HEALTH & DENTAL TREATMENT PLANS

The ketogenic diet has evolved from a specialized therapeutic intervention for pediatric epilepsy into one of the most popular dietary approaches worldwide. As millions adopt this high-fat, very low-carbohydrate eating pattern, dental professionals must understand its implications for oral health and treatment planning.

Mechanism of the Ketogenic Diet

The ketogenic diet operates by fundamentally shifting the body's metabolic fuel source from glucose to ketone bodies. The standard macronutrient distribution comprises 55-60% fats, 30-35% protein, and only 5-10% carbohydrates. When

carbohydrate intake falls below 20-50 grams daily, blood glucose levels decrease, prompting a cascade of metabolic adaptations.

As glycogen stores deplete within 24-48 hours, the liver initiates ketogenesis, converting fatty acids into three primary ketone bodies: beta-hydroxybutyrate (BHB), acetoacetate, and acetone. BHB becomes the predominant circulating ketone, crossing the blood-brain barrier to provide an alternative energy source for neural tissue. Nutritional ketosis occurs when blood ketone levels exceed 0.5 mmol/L, with optimal therapeutic ranges between 1.5-3.0 mmol/L.

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EFFECT OF SATVIK DIET AND LIFESTYLE ON ORAL HEALTH AND DENTAL TREATMENT

A satvik or pure diet and lifestyle—often centered on fresh, seasonal, minimally processed foods and a calm daily routine—can support many habits that dentists already recommend: steady hydration, better sleep, lower stress, and fewer refined sugars.

But “satvik” doesn’t automatically mean “caries-proof.” Some common satvik choices (like frequent fruit, sticky dried fruit, or sipping lemon water) can raise caries risk or worsen sensitivity if the timing and technique aren’t right. The goal is balance: **Contd... (Page 2)**



EFFECT OF STRENGTH TRAINING ON ORAL HEALTH AND DENTAL TREATMENTS

Walk into any clinic today and you’ll notice something interesting. More patients lift weights than ever before. From college students to middle-aged executives, strength training has become mainstream. And yet, we almost never ask about it during dental **Contd... (Page 3)**

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Effect Of Vegan And Plant-Based Diets On Oral Health & Dental Treatments

(Contd..) Lacto-Vegetarianism: Excludes meat, poultry, fish, and eggs but includes dairy products, providing natural sources of calcium and vitamin D.

Ovo-Vegetarianism: Excludes meat, poultry, fish, and dairy but includes eggs, offering vitamin B12 and protein sources.

Lacto-Ovo Vegetarianism: Excludes meat, poultry, and fish but includes both dairy and eggs, the most common vegetarian pattern.

Pescatarianism: Excludes meat and poultry but includes fish, seafood, dairy, and eggs, providing omega-3 fatty acids.

Raw Veganism: Consumes only uncooked plant foods not heated above 118°F (48°C), believing this preserves enzymes and nutrients.

IMPACT ON ORAL HEALTH

• Dental Erosion: A Primary Concern

The systematic review by Smits et al. (2020) confirmed a 2.4-fold increased risk of dental erosion among vegetarians (OR: 2.40; 95% CI: 1.24-4.66; p = 0.009). Multiple factors contribute to this elevated risk:

• **High Fruit Consumption:** Citrus fruits (oranges, lemons, grapefruits), berries, and tropical fruits contain citric, malic, and ascorbic acids with pH values ranging from 2.0-4.0, well below the

critical pH of 5.5 for enamel dissolution.

• **Fruit Juices:** Concentrated fruit juices lack the fiber that slows consumption and provides mechanical cleaning. Sipping acidic beverages prolongs acid contact time with enamel.

• **Vinegar-Based Foods:** Apple cider vinegar drinks, salad dressings, and pickled vegetables contribute to acid exposure. Some health trends promote vinegar consumption for purported benefits, increasing erosion risk.

• **Fermented Foods:** Kombucha, sauerkraut, and other fermented foods have low pH values. While offering probiotic benefits, frequent consumption erodes enamel.

• **Reduced Calcium Buffering:** Dairy products naturally buffer dietary acids through their calcium content. Absence of dairy removes this protective effect from the diet.

Caries Risk Profile

The relationship between plant-based diets and caries is complex. Meta-analysis showed a lower DMFT (Decayed, Missing, Filled Teeth) score in vegetarians compared to omnivores (mean difference: -0.15; 95% CI: -0.29, -0.02; p = 0.023), though this finding became insignificant

when only adult studies were included.

Protective factors include reduced sugar intake from processed foods, higher fiber consumption stimulating saliva, and generally healthier lifestyle behaviors. Risk factors include frequent fruit consumption (natural sugars), sticky dried fruits, and reliance on carbohydrate-heavy meat alternatives.

NUTRITIONAL DEFICIENCIES AFFECTING ORAL HEALTH

1. Vitamin B12 Deficiency

Vitamin B12 deficiency represents the most significant oral health concern for vegans. B12 is essential for red blood cell formation, neurological function, DNA synthesis, and cellular metabolism. Since B12 occurs naturally only in animal products (meat, fish, dairy, eggs), vegans have no dietary source without fortification or supplementation.

Oral Manifestations of B12 Deficiency:

• **Glossitis:** Swollen, inflamed, beefy-red tongue with loss of papillae ("bald tongue") causing burning sensation and taste alterations.

• **Angular Cheilitis:** Painful cracks and inflammation at the corners of the mouth, often with secondary candidal infection.

• **Burning Mouth Syndrome:** Chronic burning sensation of oral mucosa without visible lesions.

• **Recurrent Aphthous Ulcers:** Increased frequency and severity of canker sores.

• **Periodontal Attachment Loss:** Studies link low B12 levels with increased loss of adhesive dental tissue and periodontal deterioration.

Recommended intake: 2.4 mcg daily minimum.

Vegan sources: Fortified nutritional yeast, fortified plant milks, fortified cereals, and B12 supplements (cyanocobalamin or methylcobalamin forms).

2. Calcium Deficiency

Calcium forms the structural basis of tooth enamel (hydroxyapatite crystite) and alveolar bone supporting teeth. Inadequate calcium:

- Compromises enamel strength
- Reduces remineralization capacity and weakens the periodontal supporting structures.

Recommended Intake: 1000-1200 mg

daily for adults.

Vegan sources: Fortified plant milks (300mg per cup when fortified), tofu processed with calcium sulfate (250-750mg per serving depending on firmness), leafy greens (kale: 100mg per cup; bok choy: 74mg per cup; broccoli: 43mg per cup), almonds (75mg per ounce), white beans (63mg per half cup), figs (35mg per fig).

Bioavailability Note: Calcium absorption varies by source. Oxalates in spinach and Swiss chard reduce absorption significantly. Kale, bok choy, and broccoli have better bioavailability despite lower total calcium content.

3. Vitamin D Deficiency

Vitamin D facilitates intestinal calcium absorption and has independent anti-inflammatory effects on periodontal tissues. Multiple studies link vitamin D deficiency to increased periodontal disease severity. Without adequate vitamin D, dietary calcium cannot be effectively utilized for enamel and bone health.

Recommended Intake: 600-1000 IU daily; higher doses may be needed to achieve optimal serum levels (30-50 ng/mL).

Vegan sources: sun exposure (primary source; 10-30 minutes midday depending on skin tone and latitude), fortified plant milks, fortified orange juice, fortified cereals, mushrooms exposed to UV light, supplements (D2 is plant-derived; vegan D3 from lichen is available).

4. Omega-3 Fatty Acid Deficiency

Omega-3 fatty acids (EPA and DHA) demonstrate anti-inflammatory effects beneficial for periodontal health, modulating the immune response to bacterial challenge. Deficiency may increase susceptibility to inflammatory periodontal destruction.

Recommended: 250-500 mg combined EPA/DHA from algae supplements, plus ALA-rich foods daily.

Vegan sources: ALA (alpha-linolenic acid) from flaxseeds, chia seeds, walnuts, hemp seeds, and canola oil. However, conversion of ALA to active EPA and DHA is limited (approximately 5-10% efficiency). Algae-derived DHA and EPA supplements provide direct sources for plant-based individuals.

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EFFECT OF SATVIK DIET AND LIFESTYLE ON ORAL HEALTH AND DENTAL TREATMENT

(Contd...)

keep the benefits of a satvik lifestyle while making small, tooth-smart adjustments.

As dentists, we often help patients align their food preferences with preventive dental care and treatment planning—without asking them to abandon cultural or spiritual routines.

What is a Satvik Lifestyle?

While traditions differ, many satvik patterns overlap with these themes:

- Freshly prepared meals, whole grains, legumes, vegetables, fruits, nuts, and milk-based foods

• Less processed food, fewer stimulants, little spices and often no alcohol and tobacco exposure

• Emphasis on cleanliness, routine, mindfulness, yoga, and stress reduction

• Warm water, herbal infusions, and home-cooked foods

• More belief in Ayurvedic practices

Oral health is strongly shaped by daily exposures: how often teeth face sugars/acids, how well saliva can neutralize acids, and whether habits support gum health. Satvik routines can help those systems—especially if they reduce snacking, improve sleep, and lower stress.

How Satvik Eating Prevents Oral Diseases

Many satvik staples are naturally supportive of dental health

1) Lower ultra-processed & sugary foods

When a diet is lighter on packaged snacks and sweetened drinks, teeth experience fewer sugar “hits.” That can mean fewer acid attacks on enamel and less caries over time.

If your patient’s satvik approach reduces frequent sweets and keeps treats to mealtimes, that’s a big win for enamel.

2) More fiber-rich foods

Crunchy vegetables and other fibrous foods can increase chewing and help stimulate saliva. Saliva is the mouth’s built-in defense: it neutralizes acids and helps remineralize early enamel damage.

3) Better hydration and routine meals

Many people following a disciplined lifestyle drink more water and snack less. Fewer “all-day” eating events, generally two meals a day only, means fewer chances for plaque bacteria to produce acid.

4) Stress reduction can support gingival health

Chronic stress may contribute to inflammation, clenching/grinding, and neglect of self-care routines. A satvik lifestyle that includes meditation, yoga, and consistent sleep can indirectly protect gums and reduce jaw tension.

Hidden oral health risks in common satvik choices

Some habits are healthy overall but can be rough on teeth if they’re frequent or used the wrong way.

1) Frequent fruit and acidic foods

Fruits are nutritious, but many are naturally acidic or sugary. If your patient’s satvik approach is frequent grazing on fruit throughout the day, their mouth will stay in an acidic state longer—raising caries risk. Tooth-smart approach: Ask your patients to enjoy fruit with meals, not as constant snacks. Rinse with water after, and wait 30–60 minutes before brushing.

2) Sticky dried fruits & “natural sweeteners”

Dates, raisins, figs, jaggery-based snacks, and honey-coated foods can cling to teeth. “Natural” doesn’t mean “non-cariogenic.” Bacteria can still ferment these sugars and produce acid.

Tooth-smart approach: Ask your patients to keep sticky sweets occasional, have them with meals, then drink water. If they are allowed to, chew sugar-free xylitol gum afterward.

3) Lemon water and herbal teas sipped for hours

A common wellness habit is sipping warm lemon water or herbal drinks over long periods. Even mild acidity, repeated often, can soften enamel and trigger sensitivity.

Tooth-smart approach: Ask your patients to drink it in one sitting, use a straw when appropriate, and follow with plain water. Avoid brushing immediately after acidic drinks.

4) Home “scrubs” and abrasive powders

Some traditional routines involve brushing with abrasive powders or vigorous scrubbing. Over time, this can wear enamel near the gumline and worsen recession-related sensitivity.

Tooth-smart approach: Ask your patients to choose a soft-bristled brush and fluoride toothpaste. If they prefer herbal products, help them pick one with low abrasivity along with a green dot with clean ingredients.

How can a satvik diet affect common dental treatments?

Dental treatment success depends on healing, inflammation control, and keeping teeth, free from frequent acid and sugar exposure. A satvik lifestyle can support treatment—if nutrition and timing are handled well.

Preventive Dentistry:

- Most satvik followers would prefer toothpastes with a green dot signifying vegetarian, clean ingredients - which a dentist must remember during prescriptions. Some also use herbal toothpastes, but most non standardised herbal toothpastes are abrasive, and those must be avoided.
- It is essential to reinforce that even with a clean diet, professional scaling and polishing and meticulous oral hygiene with less abrasives (uncommon with herbal toothpastes) are essential.
- Most satvik followers believe more in ayurvedic practices such as oil pulling for oral hygiene. Reinforce to your patients that mixed literature is available on this ancient practice - it may be a good addition to oral hygiene routine as supplementary measure - not as a replacement.
- Overly abrasive brushing techniques coupled with abrasives in non-standardised herbal toothpastes can cause more gum recession and Class V defects.

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EFFECT OF STRENGTH TRAINING ON ORAL HEALTH AND DENTAL TREATMENTS

(contd...) while taking dental history.

We ask about diabetes.

We ask about smoking.

We ask about medications.

But resistance training? Never.

That’s a missed opportunity. Because strength training does influence oral health – sometimes positively, sometimes indirectly, and sometimes in ways that surprise you.

The Bone Story: Why This Actually Matters

If there’s one reason dentists should care about strength training, it’s bone.

Mechanical loading is one of the strongest stimuli for bone remodeling. When muscles contract under resistance, they generate strain signals that stimulate osteoblast activity. This isn’t controversial – it’s foundational bone physiology.

Animal studies show that resistance training improves alveolar bone quality and alters bone remodeling patterns. In experimental models, exercise enhanced bone density and even influenced orthodontic tooth movement dynamics (Pereira et al., Bone, 2020).

Now pause and think clinically.

Alveolar bone quality influences:

- Periodontal stability
- Implant prognosis
- Healing after extractions
- Orthodontic movement

We don’t yet have large randomized human trials proving that strength training improves implant survival or reduces periodontal breakdown. But biologically? The pathway makes sense.

And that matters.

Because when you’re treatment planning an implant in a physically active, resistance-trained patient with good metabolic health, you’re not looking at the same systemic profile as a sedentary patient with chronic inflammation.

The evidence isn’t definitive yet – but it’s pointing in a promising direction.

Inflammation: The Quiet Link Between Muscles and Gums

Periodontitis is an inflammatory disease. Not just bacterial – inflammatory.

Strength training, when done consistently and not excessively, reduces systemic inflammatory markers. Studies show improvements in CRP and metabolic parameters with structured resistance exercise. Lower systemic inflammation potentially means lower inflammatory burden at the periodontal level.

Observational data suggest physically active individuals tend to have better periodontal parameters compared to sedentary individuals (Chan et al., Frontiers in Oral Health, 2023).

Is exercise a substitute for scaling and root planing? Of course not.

But here’s the more interesting thought: If a patient improves insulin sensitivity and reduces chronic inflammation through resistance training, their host response to periodontal pathogens may shift. That’s host-modulation biology.

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Effect of Ketogenic Diet on Oral Health & Dental Treatment Plans



(Contd...) This metabolic shift triggers several systemic effects relevant to oral health: reduced circulating insulin levels, enhanced fat oxidation, decreased systemic inflammation, and improved mitochondrial function. The anti-inflammatory properties occur through activation of the Nrf2/ARE pathway and SIRT enzymes, while improved cellular energy metabolism supports tissue repair and regeneration throughout the body, including the periodontium.

Cycle of Physiological Changes in Ketosis

- Understanding the timeline of metabolic adaptation helps clinicians anticipate oral health changes in keto-following patients:
- **Phase 1 (Days 1-3):** Glycogen Depletion— The body exhausts liver and muscle glycogen stores. Blood glucose decreases, insulin levels drop significantly, and the body begins mobilizing fatty acids from adipose tissue. Patients may experience initial symptoms including fatigue, headache, and dry mouth as electrolyte shifts occur.
- **Phase 2 (Days 4-7):** Ketogenesis Initiation— Hepatic ketone production accelerates dramatically. Acetone release through respiratory and urinary pathways produces the characteristic 'keto breath' that patients commonly report. Salivary composition begins changing as the body adapts to new

- metabolic demands.
- **Phase 3 (Weeks 2-4):** Keto Adaptation— Tissues progressively increase ketone utilization efficiency. Inflammatory markers decrease as BHB activates anti-inflammatory pathways. The oral microbiome begins shifting due to reduced fermentable carbohydrate availability, potentially decreasing cariogenic bacterial populations.
 - **Phase 4 (Month 2+):** Metabolic Stability— Full keto-adaptation establishes stable ketone utilization. Systemic inflammation typically reaches its lowest point, and most transient symptoms resolve. Long-term effects on periodontal inflammation and oral bacterial populations become apparent during this phase.

Keto Products and Their Effects on Oral Health

- **High-Fat Foods:** Cheese, Nuts, & Oils
Cheese represents one of the most tooth-friendly keto staples. Its high calcium and phosphorus content actively supports enamel remineralization, while casein proteins form a protective film on tooth surfaces. Cheese consumption raises oral pH levels, creating an environment less hospitable to acid-producing bacteria. Hard cheeses like aged cheddar and parmesan provide the most benefit due to their concentrated mineral content and stimulation of salivary flow through chewing.
- Nuts and seeds, particularly almonds, walnuts, and chia seeds, deliver essential minerals for dental health. However, their hard texture requires cautious consumption to avoid enamel microfractures or damage to existing restorations. MCT oil and coconut oil, popular keto supplements, exhibit antimicrobial properties; coconut oil

pulling has demonstrated modest efficacy in reducing Streptococcus mutans counts and improving gingival health indices in some studies.

Protein Sources: Meats, Fish, & Eggs
Fatty meats, fish, and eggs form the protein foundation of ketogenic eating. These foods provide phosphorus essential for tooth structure and vitamin D crucial for calcium absorption. Fatty fish like salmon and mackerel deliver omega-3 fatty acids with documented anti-inflammatory effects that may benefit periodontal tissue health. However, meat fibres can lodge interdentally, necessitating thorough flossing. Bone-in meats present mechanical risks including tooth fractures if consumed carelessly.

Low-Carbohydrate Vegetables
Leafy greens including spinach, kale, and Swiss chard provide vitamin K essential for calcium metabolism and bone health. Cruciferous vegetables supply fibre that mechanically cleanses teeth and

stimulates salivary production. However, keto dieters often limit vegetable intake to maintain carbohydrate restrictions, potentially compromising vitamin C intake critical for collagen synthesis and gingival tissue integrity. Clinical observation suggests some keto followers develop signs of subclinical vitamin C deficiency manifesting as increased gingival bleeding.

Keto-Friendly Sweeteners and Beverages
Sugar alcohols like erythritol and xylitol, commonly used in keto products, offer dental benefits. Xylitol actively inhibits S. mutans growth and biofilm formation. However, some keto beverages contain acidic ingredients (apple cider vinegar, citrus) that erode enamel with frequent consumption. Coffee, a keto-permitted beverage, contributes to tooth staining and xerostomia when consumed excessively.

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Dental Reach

Across

- Patterns of midfacial fractures involving pterygoid plates of sphenoid bone
- Largest cusp of maxillary molar
- Appropriate radiographic view for zygomatic bone fracture
- Accessory cusp commonly found in mandibular molar

Down

- Condition for chronic ulcer on underside of the tongue of infants mostly due to natal / neonatal teeth
- Fibers that anchor teeth to bone by embedding both cementum and alveolar bone
- Othodontic movement where crown and root moves in opposite direction

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