

Supplementary material—Clinical practice box

Clinical Practice Points: Antioxidant & Environmental Strategies in Pediatric Asthma.

1. Oxidative stress is a key driver of poor asthma control.

Children with high oxidant exposure or low antioxidant status have worse symptoms, more exacerbations, and reduced responsiveness to inhaled corticosteroids.

2. Environmental control remains foundational.

Reducing exposure to air pollutants and tobacco smoke is essential and can meaningfully lower airway inflammation.

3. Dietary modification provides a measurable benefit.

Mediterranean-style patterns and increased fruit/vegetable intake improve FEV₁, reduce inflammation, and may buffer the effects of pollution.

Multi-food interventions show stronger effects than isolated nutrients.

4. Single-nutrient supplements help mainly in deficiency states.

Vitamin D, magnesium, zinc, and selenium supplementation show benefit primarily when baseline levels are low.

5. Multi-component nutraceuticals appear more promising than monotherapies.

Combinations that include polyphenols and micronutrients can reduce FeNO, improve vascular function, and enhance redox balance—suggesting synergistic action.

6. Consider adjunctive use, not replacement of standard therapy.

These strategies may reduce inflammation or improve steroid responsiveness, but do not replace inhaled corticosteroids or bronchodilators.

7. Biomarkers will guide future precision use.

Oxidative markers (e.g., GPx activity, isoprostanes, ferroptosis markers), micronutrient status, and mitochondrial indices may identify children most likely to benefit.