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### **Vitamin d deficiency causes deficits in lung function and alters lung structure.**

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#### **Abstract**

**Rationale:** The prevalence of vitamin D deficiency is increasing and has been linked to obstructive lung diseases including asthma and chronic obstructive pulmonary disease. Recent studies suggest that vitamin D deficiency is associated with reduced lung function. The relationship between vitamin D deficiency and lung function is confounded by the association between physical activity levels and vitamin D status. Thus, causal data confirming a relationship between vitamin D and lung function are lacking. **Objectives:** To determine if vitamin D deficiency alters lung structure and function. **Methods:** A physiologically relevant BALB/c mouse model of vitamin D deficiency was developed by dietary manipulation. Offspring from deficient and replete colonies of mice were studied for somatic growth, lung function, and lung structure at 2 weeks of age. **Measurements and Main Results:** Lung volume and function were measured by plethysmography and the forced oscillation technique, respectively. Lung structure was assessed histologically. Vitamin D deficiency did not alter somatic growth but decreased lung volume. There were corresponding deficits in lung function that could not be entirely explained by lung volume. The volume dependence of lung mechanics was altered by deficiency suggesting altered tissue structure. However, the primary histologic difference between groups was lung size rather than an alteration in architecture.

**Conclusions:** Vitamin D deficiency causes deficits in lung function that are primarily explained by differences in lung volume. This study is the first to provide direct mechanistic evidence linking vitamin D deficiency and lung development, which may explain the association between obstructive lung disease and vitamin D status.

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