

## Symptoms And Lung Function, Including Impulse Oscillometry, In A Diverse Population With World Trade Center Dust Exposure

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**Rationale:** The destruction of the World Trade Center (WTC) released a mixture of dust and fumes into the environment with the development of diverse respiratory complaints in some exposed individuals. The WTC Environmental Health Center evaluates and treats a symptomatic, exposed population of local workers, residents, and clean-up workers. We investigated the utility of impulse oscillometry (IOS), and specifically the resistance at 5Hz (R5), a measure of global airway resistance, as a tool to characterize pulmonary abnormalities.

**Methods:** Between 8/2005-3/2009 individuals (n=2461) underwent a standardized evaluation including spirometry and IOS. Spirometry values were analyzed according to National Health and Nutrition Education Survey III (NHANES) standards. IOS measurements included R5. Individuals with current or >5 p-y tobacco use, inability to perform maneuvers, prior lung disease or respiratory symptoms were excluded from analysis.

**Results:** There were 1366 individuals included for analysis. Mean spirometry values were normal ( $93 \pm 17$ , FVC% of predicted,  $92 \pm 17$ , FEV<sub>1</sub>% of predicted,  $79 \pm 7$ , FEV<sub>1</sub>/FVC, mean  $\pm$  SD). R5 was higher than published normal values (4.6 [2.3] cmH<sub>2</sub>O/l/s; median [interquartile range]). Measurements of FEV<sub>1</sub> and FVC were significantly lower in those with new onset persistent symptoms of wheeze and dyspnea on exertion (DOE) (p<0.004, all comparisons) although values remained in the normal range. R5 was elevated for the group, but was even higher in those with wheeze and DOE (p<0.0001). Spirometric patterns were grouped into normal or abnormal patterns (NHANES). In those with normal spirometry, median R5 was above normal values (4.4 [2.1]) and was higher in those with an obstructed pattern (5.2 [2.5]), a low FVC pattern (4.9 [2.3]), or an obstructed and low FVC pattern (7.1 [3.1]). Among those with normal spirometry (FEV<sub>1</sub> and FVC  $\geq$  80% predicted), R5 was significantly elevated in individuals with persistent wheeze (4.7 [2.4], p<0.05) or DOE (4.6 [2.4], p<0.0001) and was also associated with severity of wheeze (p<0.004).

**Conclusions:** R5, an IOS measurement of total airway resistance, was associated with new onset, persistent lower respiratory symptoms and abnormal spirometric patterns in our population. Among those with normal spirometry, R5 values were also abnormal and values were significantly higher in patients with persistent symptoms. The data suggest that IOS is a tool that can be used to characterize individuals after environmental exposures and may suggest airways dysfunction when traditional spirometry is normal.

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