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## A critical review of assays for hazardous components of air pollution

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**Abstract:** Increased mortality and diverse morbidities are globally associated with exposure to ambient air pollution (AAP), cigarette smoke (CS), and household air pollution (HAP). The AAP-CS-HAP aerosols present heterogeneous particulate matter (PM) of diverse chemical and physical characteristics. Some epidemiological models have assumed the same health hazards by PM weight for AAP, CS, and HAP regardless of the composition. While others have recognized that biological activities and toxicity will vary with components, we focus particularly on oxidation because of its major role in assay outcomes. Our review of PM assays considers misinterpretations of some chemical measures used for oxidative activity. Overall, there is low consistency across chemical and cell-based assays for oxidative and inflammatory activity. We also note gaps in understanding how much airborne PM of various sizes enter cells and organs. For CS, the body burden per cigarette may be much below current assumptions. Synergies shown for health hazards of AAP and CS suggest crosstalk in detoxification pathways mediated by AHR, NF- $\kappa$ B, and Nrf2. These complex genomic and biochemical interactions frustrate resolution of the toxicity of specific AAP components. We propose further strategies based on targeted gene expression based on cell-type differences.

**Keywords:** oxidants; nanoparticles; iron; signaling; air pollution; tobacco smoke

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