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METHOD FOR ASSESSING THE CONTRIBUTION OF ENVIRONMENTAL TOBACCO SMOKE TO RESPIRABLE SUSPENDED PARTICLES IN INDOOR ENVIRONMENTS

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ABSTRACT

The development of a method providing an upper limit for the ETS contribution to indoor concentrations of RSP is reported. This upper limit is termed ultraviolet particulate matter (UVPM). Air is drawn at 2 L min^{-1} through an inertial impactor separating at 3.5 μm, the RSP is collected on a membrane filter, and analyzed gravimetrically. Filters and collected material are then extracted in methanol, and the absorbance of the extract is measured spectrophotometrically at 325 nm. UVPM mass is computed from a calibration curve based upon ETS particulate matter collected in an environmental chamber.

INTRODUCTION

Scientists throughout the world are working to quantify human exposure to environmental tobacco smoke (ETS). ETS is the diluted, aged mixture of sidestream smoke and exhaled mainstream smoke occurring in indoor spaces occupied by smokers. With the recent publication of reports by the U. S. Department of Health and Human Services (1) and the U. S. National Research Council (2), increased attention is now given to quantifying ETS exposure. Drawing primarily from epidemiological reviews, the two reports concluded that ETS exposure is associated with lung cancer in nonsmoking spouses of smokers. However, a major shortcoming of this epidemiology is the absence of an adequate data base quantifying exposure to ETS particles. Attempts to estimate ETS exposure are hampered by the lack of a specific ETS particulate phase indicator. In estimating ETS exposure, many investigators use respirable suspended particles (RSP); however, because RSP in indoor spaces includes particles from sources other than and in addition to ETS, the use of RSP as an indicator can overestimate ETS exposure to a significant extent.

Reported here is the development of a method which, unlike RSP, has selectivity for ETS and which provides an upper limit for ETS particle concentrations in indoor environments. The method is based on the spectrophotometric estimation of the RSP fraction attributable to ETS, namely, "tar." Because the method does not provide a direct quantification of the particulate phase of ETS, its measure is referred to as ultraviolet particulate matter (UVPM), rather than, for example, ETS particulate matter. The UVPM method has been used to survey ETS in passenger cabins of commercial aircraft (3), restaurants (4, 5, 6, 7), offices (4, 7, 8, 9), and betting houses (10).