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The Dosimetry and Distribution of Whole Cigarette Smoke Particulates in Inbred Strains of Mice: Comparison of a Large Smoke-Exposure Machine (SEM) with a Small-Capacity Smoke-Exposure Machine (Walton)

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ABSTRACT

The disposition and the internal distribution of total particulate matter (TPM) of cigarette smoke were examined under conditions of high TPM deposition in the lungs of mice. Two different smoke-exposure systems were used. The smoke-exposure machine (SEM II) is a large-capacity (480 mice) dynamic system in which smoke is routed through the animal containment unit as a continuously flowing stream. Mice are restrained about the neck in stock-type holders for nose-only exposure. The Walton Horizontal Smoking Machine (Walton) is a small-capacity (12 to 20 mice) static system where the smoke is introduced into exposure chambers into which mice (restrained in either stock-type holders or whole-body tubes) expire directly. Both machines were operated under standardized conditions for puff duration (2 sec), average puff volume (35 ml), puff frequency (once per minute), and butt length of cigarette (23 mm).

A radioactive tracer (¹⁴C-labeled dotnacontane) was used to quantitate the deposition of TPM in tissues of the mouse after exposure to smoke. When the Walton machine was used, the deposition of TPM for 2A1 Kentucky reference cigarettes increased with increasing smoke concentration and smoke-exposure time but was independent of sex or strain of mouse. Detectable levels of TPM were found in the head, larynx, lungs, and stomach. The distribution of TPM among these tissues did not change as the total exposure time increased to 300 sec or as the smoke concentration was increased to 14.1% (vol./vol.). Regardless of total exposure time or smoke concentration, 73 to 77% of the TPM was found in the lungs and 88 to 91% of the TPM was contained in the entire respiratory tract. Thus the conditions of 10% (vol./vol.) smoke concentration for 300 sec of

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