Brief Rapid Communications

Passage of Inhaled Particles Into the Blood Circulation in Humans

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Background— Pollution by particulates has been consistently associated with increased cardiovascular morbidity and mortality. However, the mechanisms responsible for these effects are not well-elucidated.

Methods and Results— To assess to what extent and how rapidly inhaled pollutant particles pass into the systemic circulation, we measured, in 5 healthy volunteers, the distribution of radioactivity after the inhalation of "Technegas," an aerosol consisting mainly of ultrafine $^{99m}$Tc-labeled carbon particles (<100 nm). Radioactivity was detected in blood already at 1 minute, reached a maximum between 10 and 20 minutes, and remained at this level up to 60 minutes. Thin layer chromatography of blood showed that in addition to a species corresponding to oxidized $^{99m}$Tc, ie, pertechnetate, there was also a species corresponding to particle-bound $^{99m}$Tc. Gamma camera images showed substantial radioactivity over the liver and other areas of the body.

Conclusions— We conclude that inhaled $^{99m}$Tc-labeled ultrafine carbon particles pass rapidly into the systemic circulation, and this process could account for the well-established, but poorly understood, extrapulmonary effects of air pollution.

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