PUBLIC HEALTH

Pollution and cardiovascular risk

Exposure to low levels of fine particulate matter from cigarette smoke or air pollution increases health risks and cardiovascular mortality, a study by Arden Pope and colleagues at Brigham Young University and the American Cancer Society have found. "Our results demonstrate that it doesn't require extreme exposure to have significant cardiovascular effects," says Pope.

> "...very light smoking, secondhand cigarette smoke and ambient air pollution significantly increase health risks"

Studies have established that active cigarette smoking is a major contributor to cardiovascular disease, through inhalation of large amounts of fine particulate matter. Pope and colleagues have spent many years studying the effects of air pollution on health and have found an association between cardiovascular mortality and long-term exposure to fine particulate air pollution and secondhand cigarette smoke (SHS). "Critics of the SHS and air pollution literature have asserted that the significant effects of SHS or air pollution are implausible," says Pope, "because the estimated cardiovascular effects are much higher than would be expected on the basis of extrapolations of the effects of active cigarette smoking that assume a linear dose–response relationship that goes through the origin." This assumption suggests that health effects of SHS or air pollution would be negligible, as the inhaled dose is extremely small, compared with that from active cigarette smoking. The current study was undertaken to establish whether the exposure–response function is indeed linear through the origin, and whether low-dose exposures from SHS or air pollution could adversely affect cardiovascular health. The researchers were able to access data from the ACS CPS-II cohort, representing more than 1 million adults, to analyze the relationship between cardiovascular risks and fine particulate pollution.

The results showed that exposure–response relationship is nonlinear. Instead, the researchers found that the curve is steep at very low levels of exposure and flattens out at high exposure levels. Thus, the onset of adverse cardiovascular effects does not require extreme exposure—very light smoking, SHS and ambient air pollution significantly increase health risks. "Much of the excess cardiovascular risk from active smoking occurs even at very low levels of smoking," comments Pope. "Smoking is unhealthy even at small amounts. Reducing the amount one smokes does some good, but the biggest benefits come from not smoking at all," he adds. Public policy to reduce or prevent exposure to SHS and to improve air quality would provide substantial health benefits.

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Original article Pope, C. A. *et al.* Cardiovascular mortality and exposure to airborne fine particulate matter and cigarette smoke: shape of the exposure-response relationship. *Circulation* **120**, 941–948 (2009).