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Air Pollution and Family Illness: II. Two Acute Air Pollution Episodes in New York City

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Between Nov 28 and Dec 5, 1962, the New York area was under the predominant influence of an elongated high pressure system extending from Maine to the Gulf of Mexico. The system moved slowly into the area on Nov 23 and began to stagnate on Nov 25. Strong daytime insolation and brisk northeast winds maintained moderate instability below the level of the subsidence inversion associated with the system, the base of which was still about 3,000 feet on Nov 25.

The air pollution episode of Oct 10-27, 1963, occurred under meteorological conditions similar to those of the episode of Nov 28-Dec 4, 1962.*

The second episode occurred at the peak of a period of extended drought accompanied by many forest fires in the New York-New Jersey area which contributed to pollution levels during this period. The second episode occurred in mid-October, 1963, when daily temperature averages were still above 60 F, while the 1962 episode was marked by daily temperature averages of 50 F or less. Space heating was of some importance in the 1962 episode but was not important in 1963.

Wind direction remained within 15° of the azimuth during the greater part of the 1962 episode with a mean flow from 055°, assuring that transport of pollutants was from the same set of sources at all times. The wind speed was highly variable with extremely low winds of less than 2 mph occurring in the early mornings or late evenings when strong ground inversions were present.

During the 1963 episode nocturnal inversions were less fully developed, and there were few periods when hourly winds averaged less than 2 mph. Rather, there were periods of consecutive days when the wind speed remained between 2-5 mph as, for example, on Friday, Oct 18, 1963, from 0000 EST through Oct 21, 1963, at 1000 EST, and during Oct 24 and 25, 1963.

The general level of pollution before and after the onset of the 1963 episode compares with the levels before the 1962 episode. However, there were a number of isolated days in October, 1963, and prior to the episode when, with low wind speeds, elevated pollution levels were experienced. The level of concentration was higher in the 1962 episode with maxima of more than 1.0 ppm SO_2 on Nov

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* A complete report of the 1962 episode is available. If needed for research purposes, requests may be directed to Mr. William Ingram or Dr. James R. McCarroll. Similar data on the 1963 episode will become available.

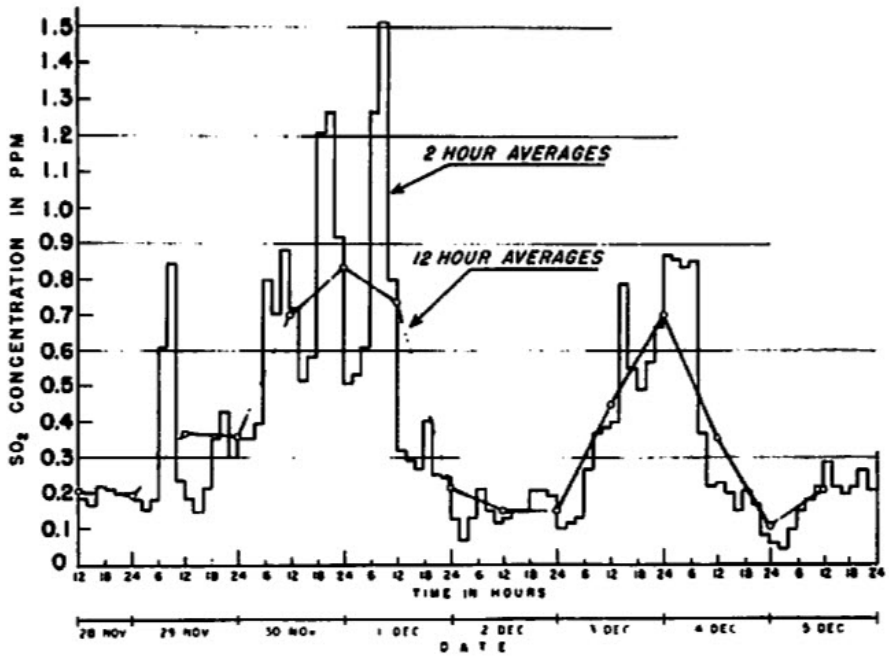

Fig 1

30 and Dec 1, 1962. There was a period on Nov 30, at 1900-2300 EST, when concentrations at all levels above ground were greater than 1.0 ppm. Again on Dec 1, at 0600-1000 EST, concentrations at three levels remained above 1.0 ppm (for one-hour averages).

Such high concentrations were not observed in the 1963 episode. There were sustained periods when concentrations averaged above 0.30 ppm, as for example:

Oct 18, 1963, at 0700-Oct 19, 1963, 2400—41 hours

Oct 23, 1963, at 2300-Oct 25, 1963, 1200—37 hours

On 11 days of the 18-day episode, levels of SO_2 remained at or above 0.30 ppm for at least eight consecutive hours. On four of the remaining days of the episode the SO_2 level held at 0.20 or above for at least eight consecutive hours. On each of the six days following Oct 13, the levels held at 0.30 ppm or greater for not less than eight consecutive hours.

The maximum one-hour average was 1.30 ppm during a period when all elevations above ground experienced concentrations of more than 1.0 ppm for three consecutive hours.

It is significant that the late evening (1800-2200 EST) secondary maxima which marked the 1962 episode were hardly discernible in the 1963 episode. Furthermore, in November, 1962, the third-floor elevation showed concentrations consistently less than 70% of the other elevations. In October, 1963, it was the tenth-floor elevation which showed temporal lows, but these occurred only during the first six hours of the day.

Levels of more than 10.0 ppm CO were monitored on Nov 30 and Dec 1, 1962, of the first episode with a maximum one-hour av-

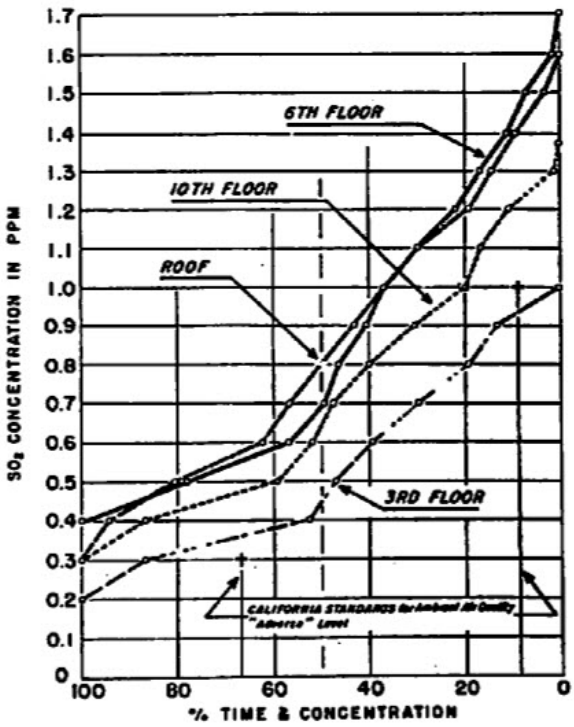

Fig 2

erage of 22.4 ppm. In the second episode there were similar periods on Oct 15 through 20, 1963, and again on the 24th. The highest one-hour average, taken at the 30-foot level above ground, was 27.5 ppm, occurring at 0800-0900, Oct 21, 1963.

Total hydrocarbons (asmethane) monitored on Oct 14, 15, 23, 24, and 25, 1963, showed that the general level was about 3.0 ppm, or three times that normally experienced, with several one-hour averages of greater than 9.0 ppm occurring at mid-afternoon. The maximum one-hour concentration of 11.1 ppm (methane) occurred on Oct 27, two days after SO_2 and CO concentrations had returned to near normal.

Two figures are presented to demonstrate certain characteristics of the 1962 episode. The first of these shows the course of pollution levels for sulfur dioxide from Nov 29 through Dec 4, 1962. It is obvious that information on peak concentrations continuing for two, four, and six hours are lost when data are reduced to 12-hour averages.

The second figure shows the percentage of time of various sulfur dioxide concentrations measured during a 12-hour period at the height of the episode. It is clear that at elevations above the third floor concentration levels consistently exceeded the California "adverse" level standards for ambient air quality. (The standards are 0.3 ppm for eight-hour average or 1.0 for one hour.)

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