Oxidant Air Pollution and Athletic Performance

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The effect of Los Angeles' oxidizing type of air pollution on athletic performance was studied in 21 competitive meets of high school cross-country track runners from 1959 to 1964. Since running times tend to improve throughout the season, team performance at a meet was evaluated by determining the percent of boys who failed to improve when their running time was compared to that run at the previous meet on the same course. The highest correlation to team performance is that of the oxidant level in the hour before the race. Neither carbon monoxide, temperature, nor humidity shows any relationship to performance. The specificity of the effect to a biologically meaningful time and the very high correlation are convincing evidence of a cause and effect relationship. The mechanism by which oxidants affect performance may be directly physiological or may be decreased motivation due to discomfort.

Air pollution in the Los Angeles area, in contrast to most other cities, is composed predominately of oxidizing compounds that arise from photochemical reactions among various combustion products of motor vehicle fuel. Effects of this smog on human health, other than eye irritation and chest discomfort, have never been clearly demonstrated. If other effects occur, they might well be more readily detected in the presence of other stresses such as illness, or fatigue due to exertion. To our knowledge, no type of air pollution has been studied in relation to athletic performance. Long-distance races would seem to be most likely to reveal such effects since they involve a maximal effort with considerable pulmonary air exchange.

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Methods

Because of the meticulous records of running times kept by the coach, the performance of the cross-country track team at San Marino (California) High School was studied. All competitive meets on the team's home course during the six-year period from 1959 to 1964 were included in the analysis.

To minimize the effect of differences in training and experience between the boys, only boys who ran in *all* the home meets during a year were studied. The running time of each athlete on a specific day was compared with his performance at the previous home meet. The group performance for each meet (after the first meet of the year) was expressed as the percent of the group members who failed to improve when their running time was compared to that of the previous meet.

Air pollution data were supplied by the Los Angeles County Air Pollution Control District. All measurements are from station 64, which is located approximately 2 miles north of the track. The hourly levels used for this report are the arithmetic averages of the readings taken during the hours.

All meets began at approximately 3 PM except the second meet of 1963, which was held at 6 PM. The air pollution data are only available for clock hours. Thus, the average pollutant concentration between 2 PM and 3 PM is considered to be the level for the hour preceding the race, even if the race actually began at 3:15 PM. In this case, the hour during which the race occurred would be from 3 PM to 4 PM; however, since the races only last about 12 minutes, most of the measured pollution for the hour of the race actually was present after the race was completed.