



# Training & Competing in Smoggy Conditions

Many of us live in areas which have high levels of air pollution—or must travel to such areas for competitions.

What's unfortunate for athletes is that heavy smog can impair their performance. As a result, it's important for coaches to know how to reduce the effects of pollution on our athletes.

The U.S. army has conducted some research into the problem. This article will discuss their findings and some methods for minimizing the effects of air pollution on athletic training and performance.

## Types of Pollution

Considering the extent of the problem, relatively little research has been conducted into the effects of pollution on athletic performance. However, the following types of air pollution have received attention:

### 1. Carbon Monoxide

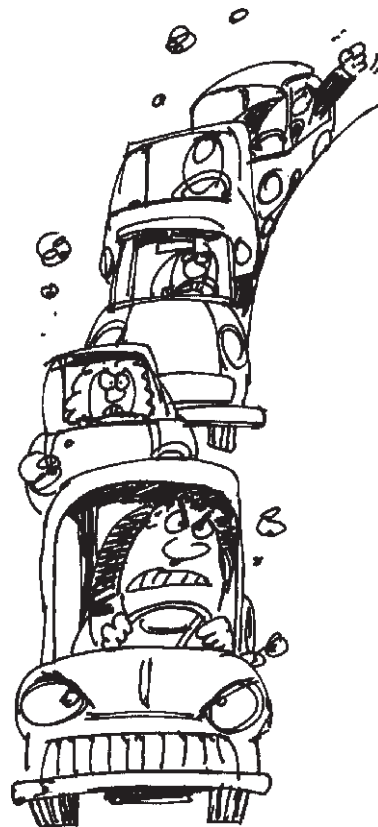
CO, a product of car exhaust, is 230 times more likely to bind with hemoglobin than is oxygen. As a result, high CO concentrations reduce the blood's ability to transport and release oxygen, reducing the volume and intensity of exercise an athlete can perform.

CO is the form of air pollution with the greatest negative effect on athletic performance.

### 2. Peroxyacetyl nitrate

This is another component of car exhaust. It's a nose and eye irritant and is responsible for the burning sensation in the eyes during smoggy conditions. Blurred vision, sore eyes and eye fatigue are symptoms of over-exposure. These problems can be a factor in visually-oriented sports.

*Some tips for training and competing when air pollution levels are high.*





### *3. Respiratory and Eye Irritants*

Other pollutants such as sulfur dioxide, soot, cigarette smoke, dust and ozone have been poorly studied. Although they're all respiratory irritants and may reduce airflow in the lungs, it isn't known whether they impair performance in healthy individuals. However, they certainly will affect those who already have respiratory problems.

#### ***Effects Depend Upon Sport***

Will pollution affect your athletes? It depends on their sport.

The sports most affected are those requiring the greatest demands on the cardiovascular system. Passive sports may suffer little or no effect from air pollution.

#### ***Training in the Smog***

To reduce the effects of pollution on training, you should consider the following factors:

- ***Time of Workout***

The main pollution culprit for athletes is carbon monoxide, a product of auto exhaust. Since CO levels are highly related to traffic levels, it's best to avoid training during rush hour. In general, the best times to avoid smog are in the early morning or late afternoon.

- ***Location of Workout***

Obviously, the closer you are to the pollution source, the more CO your athletes will inhale. Keep as far away from cars and roadways as possible.

Runners are at high risk. Tips for runners include staying on the upwind side of the road and standing away from intersections and exhaust pipes when stopped at traffic lights.

And be aware that pollution can also occur indoors. Gasoline-powered resurfacing machines can increase the CO to dangerous levels in hockey rinks. It's wise to keep your skaters away from the ice for as long as possible after resurfacing.

- ***Intensity and Duration of Workout***

The greater the amount of air inhaled and the longer the exposure to the pollution, the greater the effects will be.

As a result, the intensity of exercise and length of workout will have an effect on the pollution dose your athletes receive.



If the day is extremely smoggy, you might work on technique instead of intense conditioning. Or you could alter the workout by reducing running speed and/or reducing the number of sets and repetitions.

### **Competing in the Smog**

Most championship competitions take place in larger urban areas—which are also areas of high pollution risk.

Here are some tips for reducing your athletes' exposure to performance-impairing pollution at smoggy competitive venues.

#### *1. Reduce their exposure to pollution on the way to the competition.*

CO has a cumulative effect and takes hours to clear the bloodstream. Keep car windows rolled up on the drive to the site. Prohibit smoking in the vehicle by parents, spectators and coaches. Cigarettes also produce CO.

#### *2. Arrive at the competition early.*

This will give your athletes time to clear their system of the pollution they've absorbed during the trip (unless there is no place on site that is pollution-free).

For example, it takes three to four hours to eliminate 50% of the CO from your bloodstream.

#### *3. Once at a site with heavy pollution, keep physical activity to a minimum.*

The less you exercise, the less you breathe and the lower your exposure will be to pollution. Keep the warm-up to a minimum.

#### *4. Finally, reduce exposure during the competition.*

*For example, during a road-race, run upwind of traffic.*

These measures might appear extreme, but when pollution levels are high, performance can be impaired. In competitions that can be decided by hundredths of a second or by early fatigue, a few simple measures could mean a great deal.

**Reference:** Peter N. Frykman (Exercise Physiology Division, US Army Research Institute of Environmental Medicine, Natick MA), "Effects of air pollution on human exercise performance." **Journal of Applied**



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