Exercising in pollution: How to counsel patients

Chronic exposure to air pollution is undoubtedly harmful; we are familiar with its associations with brain cancer, asthma, and cardiovascular disease. We are also well versed in the health benefits of exercise, from reducing stroke risk to chronic pain and mood disorder management. How then do we weigh the risk of exercising in pollution against the detrimental health effects of a sedentary lifestyle? It's important for physicians to advise healthy patients whether, how, where, and when to exercise in air pollution.

Dr Michael Koehle is a UBC professor and exercise medicine specialist who researches exposure to pollution during exercise in healthy individuals and measures surrogate outcomes such as lung and endothelial function to predict health risk. He and his colleagues have examined cyclists breathing in diesel generator exhaust in a laboratory setting, measuring lung function and exercise performance. Under these conditions, lung function did not improve as it typically does during exercise, but was not worsened. Blood vessel function and performance outcomes were similar.[1]

Dr Koehle has also examined the physiological effects with varying intensity of exercise in air pollution. Contrary to what was expected, performance and lung function don't significantly worsen with increased intensity and ventilation. With this in mind, physicians could consider counseling patients to limit outdoor workout duration and instead opt for shorter, higher intensity workouts.

This article is the opinion of the Athletics and Recreation Committee, a subcommittee of Doctors of BC's Council on Health Promotion, and is not necessarily the opinion of Doctors of BC. This article has not been peer reviewed by the BCMJ *Editorial Board.*

Although diesel is a major offender, road pollution is in fact a complex mixture of pollutants including ozone, nitrogen monoxide and dioxide, ultrafine particles, black carbon, and carbon monoxide. Even so, Dr Koehle's findings are similar to other studies globally. A real-world pollution study from Barcelona[2] and an epidemiological study in Copenhagen[3] have also found that health outcomes are not worsened by air pollution. That said, we still know that air pollution is harmful, and reducing overall exposure is important.

Emphasize to your patients the importance of separating from pollution in space and time.

Air quality varies significantly in urban areas from one area of the city to the next, depending on traffic density, truck corridors, wind, and other factors. A 2019 report measuring air quality over 2 years in Vancouver and Toronto reveals that Vancouver has unsafe levels of pollution in proximity to major roadways, especially highways and truck routes (diesel trucks contribute disproportionately to pollution).[4] Emissions concentrations in high wind can be 4 times lower or 6 times greater just downwind from a major road. Pollution also worsens during weekdays, rush hour, and in wintertime.

Emphasize to your patients the importance of separating from pollution in space and time. Consider alternative commuting paths and avoid proximity to highways and large-truck corridors. Plan sporting activities in quieter residential neighborhoods. Limit exposure during high pollution times like rush hour and on weekdays, in colder temperatures, in low wind or downwind, or when the air quality index is high. Check Environment Canada's website or use an app such as Plume Air Report for current air quality data and forecasting.

Finally, consider your patients with respiratory disease and asthma. Ensure they take their bronchodilator, have their medication on hand, and do proper warmups. Bronchodilators have shown to be beneficial for asthmatics in poor air quality, despite opening up the airways to more emissions.[5]

Our health is being impacted by climate change and pollution, and air quality may become a more serious concern in the future. Physical activity is important, however, and it is still reasonable to advise healthy patients to continue exercising, and to do so in the safest way possible. ■

—JoyAnne Krupa, MD

References

1. Giles LV, Carlsten C, Koehle MS. The effect of pre-exercise diesel exhaust exposure on cycling performance and cardio-respiratory variables. Inhal Toxicol 2012;24:783-789.
2. Kubesch NJ, de Nazelle A, Westerdahl D, et al. Respiratory and inflammatory responses to short-term exposure to traffic-related air pollution with and without moderate physical activity. Occup Environ Med 2015;72:284-293.
3. Andersen ZJ, de Nazelle A, Mendez MA, et al. A study of the combined effects of physical activity and air pollution on mortality in elderly urban residents: The Danish Diet, Cancer, and Health Cohort. Environ Health Perspect 2015;123:557-563.
4. Southern Ontario Centre for Atmospheric Aerosol Research. Near-road air pollution pilot study. 2019. Accessed 3 February 2020. www.socaar.utoronto.ca/wp-content/uploads/2019/10/SOCAAR-Near-Road-Air-Pollution-Pilot-Study-Summary-Report-Fall-2019-web-Final.pdf.
5. Koch S, Carlsten C, Guenette J, Koehle M. Forced expiratory volume in 1 second is not affected by exposure to diesel exhaust and cycling exercise in individuals with exercise-induced bronchoconstriction. ISEE Conference Abstracts. September 2018. https://ehp.niehs.nih.gov/doi/10.1289/isesisee.2018.O01.03.61.