WORKERS FEEL HEAT AND AIR POLLUTION: EXPANSION OF THE ROLE OF HEAT STRESS PROGRAMS

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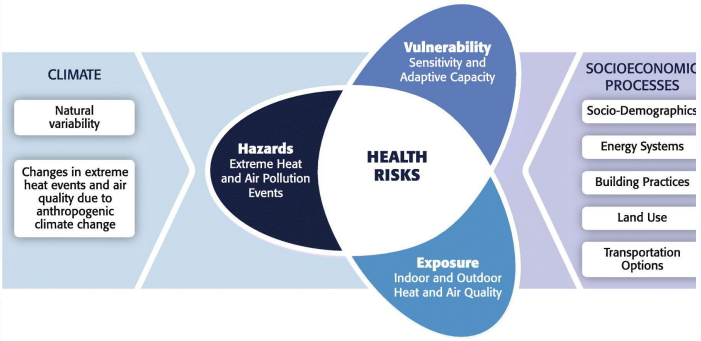
Introduction

Increasing earth's surface temperatures, and its contribution to the deterioration of air quality has resulted in increasing cardiopulmonary related health risks. Globally, over one billion workers are exposed to these changing climatic conditions including increases in heat indices, ground ozone(O_3) levels as well as heightened concentrations of particulate matter (PM), including both PM_{10} (less than 10 microns) and $PM_{2.5}$ (less than 2.5 microns). Scientific literature supports the health benefits of establishing air quality indices and subsequent action alerts for the general community. The aim is to review literature on medical monitoring programs that can identify those workers who are at increased risk for the health effects of both elevated ambient temperatures and poor air quality and determine the role of an occupational program that takes into account both air quality index (AQI) and heat index.



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Methodology

An extensive literature review was conducted using search terms: air pollution, heat stress, heat-related illness, heat index, worker health, occupational surveillance programs and air quality index as well as specific health categories. The articles were organized into relevant headings.

Results

Increasing temperatures drive the chemical production of air pollutants such as O_3. Soot and particulate matter absorb heat which consequently drive up temperature even further. Co-exposure to heat and air pollution compounds health harms. A systematic review by Hu et al showed that PM_{10} and O_3 increased the heat-related all-cause and non-accidental mortality. Individuals with underlying cardiopulmonary disease are particularly vulnerable. The interaction was relevant to both outdoor and indoor workers. In our search, we did not find any studies, programs or cases that included both heat and air pollution as part of worker surveillance programs. Better understanding of interactions between air pollution, temperature and human health was identified as a knowledge gap and the need to further study their mechanisms of actions was highlighted.

Discussion

In order to adequately protect workers in the face of increasing global temperatures, heat stress prevention programs need to incorporate the synergistic effects of temperature and air pollutants. Programs which take into account not only heat and humidity but also local concentrations of O_3, PM and other pollutants will result in a decrease of heat related illnesses, particularly for those employees who have underlying cardiopulmonary disease.

To accomplish this, research is needed to design heat stress pilot programs which measure health outcomes of heat stress and AQI monitoring programs in order to find how to most effectively keep workers safe while simultaneously minimizing interruptions in workplace productivity. In our research we identified studies that highlight the mechanisms of interaction between climate, air pollution and heat, with a few studies focusing on health. But focus on occupational health was scarce. Increasing temperatures are occurring with climate change and air pollutants can accelerate this increase and contribute to public health risks. Ultimately, improved environmental legislation needs to be put in place which improve air quality and control the release of greenhouse gases in order to prevent this rapidly increasing health risk from accelerating further.

Conclusion

The following is a summary of the fundamental components of a heat stress prevention in workers:

1. Training and education.
2. Monitor daily heat index and heat warning advisories.
3. Hydration and rest and shade.
4. Acclimation and optimization of work hours.

Based on our literature review we have added the following recommendations to the above regimen:

- Identify high risk groups susceptible to air pollution through medical surveillance.
- Monitor local AQI.
- Obtain physiologic measurements on employees and monitor those with increased susceptibility.

Lindsley M, Cadorette M. Preventing Heat-Related Illness in the Workplace. Workplace Health & Safety. 2015;63(4):192-192. doi:10.1177/2165079915588400

References

See accompanying document for references.