

## Editor's Page

# Environment and the Heart

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**O**ur current knowledge of cardiovascular disease prevention focuses on the detection and treatment of risk factors that are specific for each individual. However, particular attention has been paid in recent years to environmental effects on cardiovascular physiology and pathological states. Specifically, devastation of the global environment may induce detrimental influences on the cardiovascular health of every human being on Earth, which influences would be independent of the presence of other major cardiovascular risk factors.

Cardiovascular physiology fluctuates in accordance with environmental variations during the day (alternation of day and night) or over larger time periods (seasonal variations).<sup>1,2</sup> An impressive number of papers have clearly demonstrated the circadian variation in the occurrence of acute cardiovascular events such as myocardial ischaemia, myocardial infarction, ventricular arrhythmias, cardiac arrest, and thrombotic stroke. Similarly, numerous published studies have reported on the circadian variation in underlying biological variables. Larger multi-year variations of cardiovascular physiology due to the effects of solar or geomagnetic activity have also been demonstrated.<sup>3</sup> Different levels of daily and monthly geomagnetic activity have been implicated in multidirectional changes in the natural history of many cardiovascular syndromes. Previous studies have found that, in periods of high geomagnetic activity, there were more admissions for acute myocardial infarction or strokes, higher outpatient and hospital mortality from acute myocardial infarction, and higher diastolic arterial pressure in healthy subjects and in treated hypertensive patients. Additionally, higher platelet count and a rise in platelet aggregation and plasma fibrinogen level were noted during periods of high geo-

magnetic activity. Moreover, some observed cardiovascular fluctuations that were related to the level of geomagnetic activity also showed differences in the rising and falling phases of the 11-year cycle of solar activity.<sup>3</sup>

The seasonal variation in meteorological parameters has been associated in different parts of the world with the occurrence of cardiovascular diseases. Extremely low or high atmospheric temperatures may trigger the development of cardiovascular diseases in vulnerable, especially older persons. The underlying physiological mechanisms that link cold weather with increased seasonal morbidity and mortality from cardiovascular causes have been extensively evaluated. Cold causes an increase in heart rate, systemic vascular resistance, plasma norepinephrine, levels of vasoconstrictor peptides, and blood pressure. Cold also induces myocardial ischaemia, may precipitate arrhythmias and lead to heart failure decompensation. Factors other than temperature, such as superimposed respiratory infections, behavioural changes around holiday time, including increased food, salt, and alcohol consumption, and emotional and psychological stress, may contribute to the increased mortality during winter.

In a recently published paper, a direct association between meteorological parameters and mortality from myocardial infarction was demonstrated in the Attica region.<sup>4</sup> Ambient temperature and relative humidity are important predictors of acute myocardial infarction mortality, even in the mild climate of a Mediterranean city like Athens. The mean daily number of deaths due to acute myocardial infarction was associated with the average temperature of the previous seven days. Specifically, both high and low ambient temperatures were associated with an increased

number of deaths due to acute myocardial infarction, compared to moderate temperatures. Considering monthly acute myocardial infarction death rates, only mean monthly humidity was independently associated with total deaths from acute myocardial infarction. The higher relative humidity was associated with higher mortality due to acute myocardial infarction.

A significant seasonal variation in deaths was found, with the average daily deaths due to acute myocardial infarction in winter being almost 32% higher compared to summer. The monthly variation was more pronounced for persons older than 70 years. The fact that the number of deaths among the elderly in December was more than twice the number in June indicates that the education of the population of senior citizens concerning the hazards of exposure to cold is inadequate. It may also suggest that, although Athens is a modern city with mostly adequate housing and heating installations, there may be an issue of unsatisfactory provision of these facilities for the elderly.

Global environmental changes are on their way nowadays. Human-related air pollution plays a key factor in these environmental changes. Several studies have shown that even short-term increases in particulate matter air pollution concentrations are associated with acute increases in daily mortality in urban settings.<sup>5</sup> Previous studies have demonstrated that blood group O individuals become more susceptible to the development of ischaemic heart diseases when exposed to certain environmental factors, such as airborne occupational pollutants. Therefore, gene-environment interactions in ischaemic heart disease cannot be excluded. Moreover, we cannot rule out the

negative effects of abrupt increases in particulate matter air pollution concentrations from wildfire smoke on cardiovascular health. Nevertheless, we should not ignore the fact that permitting smoking in public places may induce local micro-environmental negative alterations in urban areas. Last but not least, augmented urban noise in modern crowded cities may induce stress-related negative effects on the cardiovascular system.

Many modern human activities demonstrate negative effects on the environment. Currently, life on Earth seems to be threatened by a global climatic change. We cannot precisely determine the actual consequences of the ongoing global climatic alterations as regards the epidemiology of cardiovascular diseases. However, we should not forget that every human being's functions are in continuous interaction with a global environment that is under threat.

## References

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