Editorial

Global Warming—the German Picture

Dennis Nowak

Editorial to the articles:

"Projection of Temperature-Related Myocardial Infarction in Augsburg, Germany" by Kai Chen et al.

and

"The Association of Climatic Factors with Rates of Surgical Site Infections" by Seven Johannes Sam Aghdassi et al.

and

"Health Risks and Interventions in Exertional Heat Stress" by Dieter Leyk et al.

in this issue of Deutsches Ärzteblatt International

As a consequence of global warming, heatwaves, droughts and forest fires have been occurring more frequently and with much greater intensity than before. The number of extreme rainfall events is on the increase, sea levels are rising and presently inhabited islands will disappear beneath the waves. Infectious diseases are on the rise, including surgical site infections, but also non-communicable diseases. Increasing ozone and particle concentrations are having noticeable effects on respiratory (1) and cardiovascular morbidity and mortality. A rise in pollen burden is expected to result in an increase in allergic disease. It is equally conceivable that, as a consequence of traumatizing extreme weather events, more people will experience mental health problems.

From a political perspective, climate change has the potential to cause new international conflicts, war and migration. It amplifies existing health risks such as poverty, hunger and malnutrition, lack of education, and displacement of people by escape and expulsion. It is likely that those most affected by climate change will be people living in the low and middle income countries of the Global South who have contributed the least to global warming with their greenhouse gas emissions and who lack the means to finance adaptation measures. However, global warming will also be experienced in our latitudes and our patients will be affected too.

Hence, it is only logical that *Deutsches Ärzteblatt* has, for the first time, dedicated its current issue to selected aspects of rising temperatures in Germany (2–4).

Impact on health

Based on data from the Augsburg region, Chen et al. (2) calculated the likely number of additional myocardial infarction events related to global warming. Their projections for Germany amounted to more than 1000 myocardial infarction events per year which could be prevented if the global warming would only reach 1.5 °C (compliance with the Paris Climate Protection Agreement) instead of 3.0 °C. The warmer the temperature, the greater the number of deaths will be. At the same time, there will be fewer cold-related deaths, but the magnitude of this aspect will be significantly smaller.

Based on empirical data, Aghdassi et al. (3) describe that the rate of surgical site infection increases with temperature. Their calculations are based on a dataset from the Nosocomial Infection Surveillance System (OP-KISS), compiled during the years from 2000 to 2016, comprising data on surgical site infection from more than 1400 hospital departments and 2 million operative procedures. The increase in risk of surgical site infection was primarily attributable to the temperature range above 20 °C.

Leyk et al. (4) performed an extensive literature search on heat stress prevention, risk factors, diagnosis and management. The authors describe the body's compensatory mechanisms and the signs and symptoms which occur in case of exertional heat stress. A key message is that heat-related events—especially in association with physical exertion and even in the presence of seemingly unproblematic ambient temperatures—can occur all of a sudden and may cause life-threatening heat stroke, an already common condition. It is quite possible that the incidence of heat stroke will increase during periods of extreme heat. The list of predisposing factors for heat stroke is manageable and holds the key to prevention.

Years of life lost

For the years 2030 to 2050, the World Health Organization expects 250 000 additional deaths due to global warming (5), resulting from non-communicable diseases (e.g. myocardial infarction, see [2]) and communicable diseases, such as malaria and diarrhea. Despite the undeniably critical nature of the problem, I see this traditional calculation of additional—or rather it should read premature—deaths as at times difficult to understand for clinicians and could imagine that years of life lost due to environmental exposure per person (6) would be an appropriate measure. This definition would allow to adjust different risks to a common and more familiar scale and make them comparable.

Prevention

To follow the arguments of the three articles in this issue (2–4), an effective primary prevention of global warming would be the key to the prevention of additional myocardial infarctions, surgical site infections and life-threatening heat-related events. What else can be done and what role can physicians play here?

Of course, the publicly discussed, already well-published carbon reduction measures should be supported—from energy generation to reduced energy consumption, e.g. targeting individual transport and aviation—to the protection of natural resources, e.g. the rainforest. At the same time, we should be realistic and plan for secondary prevention. This includes nationwide heat protection plans, such as the elaborate plans already existing in Austria. In Germany, at least recommendations for the creation of heat action plans are available (7). Another option to

Institute and Outpatient Clinic for Occupational, Social and Environmental Medicine,

Hospital of the University of the Ludwig-Maximilians-Universität München, Munich, Germany: Prof. Dr. med. Dennis Nowak

consider are training courses for medical assistants and nurses for the protection of patients (8).

Personal initiative

Returning to primary prevention, the question arises: How can each one of us start to improve his or her own carbon balance? As early as in 2007, an editorial published in the British Medical Journal highlighted the fact that the air travel of the 15 000 delegates at the American Thoracic Society meeting in San Diego in 2006 generated about 11 000 tons of carbon dioxide—equivalent to the carbon dioxide produced in one year by, at that time, 550 US citizens, 11 000 people in India and 110 000 people in the Republic of Chad in Central Africa (9). While these figures are no longer current—more recent ones could not be found—the relations remain interesting. It is no consolation that there are even bigger conferences. Each of us can calculate and improve his or her own carbon balance: the German Federal Environment Agency provides a very good online carbon dioxide calculator for this end (10).

Conflict of interest
The Institute headed by Prof. Nowak received a grant from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) for an educational offering for medical assistants (MFA) and nurses in outpatient care (www.klimawandelundbildung.de, funding code 03DAS093).

References

1. D'Amato G, Cecchi L, D'Amato M, Annesi-Maesano I. Climate change and respiratory disease. Eur Respir Rev 2014; 23: 161–169.
2. Chen K, Breitner S, Wolf K, Rai M, Meisinger C, Heier M, Kuch B, Peters A, Schneider A, on behalf of the KORA Study Group: Projection of temperature-related myocardial infarction in Augsburg, Germany: moving on from the Paris Agreement on Climate Change. Dtsch Arztebl Int 2019; 116: 521–7.
3. Aghdassi SJS, Schwab F, Hoffmann P, Gastmeier P: The association of climatic factors with rates of surgical site infections—17 years' data from hospital infection surveillance. Dtsch Arztebl Int 2019; 116: 529–36.
4. Leyk D, Hoitz J, Becker C, Glitz KJ, Nestler K, Piekarski C: Health risks and interventions in exertional heat stress. Dtsch Arztebl Int 2019; 116: 537–44.
5. World Health Organization: Climate change and health. www.who.int/news-room/fact-sheets/detail/climate-change-and-health 2018 (last accessed on 7 July 2019).
6. Morfeld P, Erren TC: Warum ist die „Anzahl vorzeitiger Todesfälle durch Umweltexpositionen" nicht angemessen quantifizierbar? Gesundheitswesen 2019; 81:144–9.
7. Bundesministerium für Umwelt: Handlungsempfehlungen für die Erstellung von Hitzeaktionsplänen zum Schutz der menschlichen Gesundheit www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/hap_handlungsempfehlungen_bf.pdf 2017 (last accessed on 18 July 2019).
8. Schoierer J, Mertes H, Wershofen B, Böse-O'Reilly S: Fortbildungsangebote zu Klimawandel, Hitze und Gesundheit für medizinische Fachangestellte und Pflegefachkräfte in der ambulanten Versorgung. Bundesgesundheitsbl 2019; 62: 620–8.
9. Roberts I, Godlee F: Reducing the carbon footprint of medical conferences. BMJ 2007; 334: 324–5.
10. Umweltbundesamt: CO_2-Rechner. https://uba.co2-rechner.de/de_DE/ (last accessed on 7 July 2019).

Corresponding author
Prof. Dr. med. Dennis Nowak
Institut und Poliklinik für Arbeits-, Sozial- und Umweltmedizin
Klinikum der Universität München
Ziemssenstraße 1, 80336 München, Germany
dennis.nowak@med.uni-muenchen.de

Cite this as:
Nowak D: Global warming—the German picture. Dtsch Arztebl Int 2019; 116: 519–20. DOI: 10.3238/arztebl.2019.0519