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Ecological study identifies potential association between antimicrobial resistance and climate change

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New research presented at this week's 29th European Congress of Clinical Microbiology & Infectious Diseases (ECCMID) in Amsterdam, Netherlands (13—16 April 2019), identifies a novel association between antibiotic resistance and climate change. The study was conducted at the Institute of Infection Control and Infectious Diseases, University Medical Center Göttingen (UMG), Germany, in collaboration with the Hannover Medical School (MHH), Germany. The lead author is Professor Simone Scheithauer of UMG.

Antimicrobial resistance (AMR) is a threat across Europe with burdens mainly peaking around the Mediterranean Basin. Recently, the association of AMR with climate gained increased attention, since resistance increased with increasing local temperatures in the USA.

This new research investigated whether the explanatory strength of climate variables holds true in a region with diverse healthcare systems and societies and whether a climate change dimension can be identified, using Europe as a case region.

The researchers conducted a 30-country observational study across Europe (see below for list of countries). The six-year prevalence of carbapenem resistant Pseudomonas aeruginosa (CRPA), Klebsiella pneumoniae (CRKP), multiresistant Escherichia coli (MREC), and Methicillin resistant Staphylococcus aureus (MRSA) was determined

based on data published by the European Centre for Disease Prevention and Control (ECDC).

Statistical analysis and computer modelling were performed to identify associations between AMR and seasonal temperature, including potential socioeconomic and health system related confounders. The team found significant associations of CRKP, MREC and MRSA with the warm-season mean temperature, which had a higher contribution to MRSA variance than outpatient antimicrobial drug use.

Furthermore, CRPA was significantly associated with the warm-season change in temperature. The authors also used their models to estimate AMR in four other countries, not included in the database used (Belarus, Serbia, Switzerland and Turkey). The results displayed varying degrees of accuracy compared to empirical data, with comparatively good matches for CRPA in all countries except Belarus.

The authors conclude: "Our study identified a novel association between AMR and climatic factors in Europe. These results reveal two aspects: climatic factors significantly contribute to the prediction of AMR in different types of healthcare systems and societies, while climate change might increase AMR transmission, in particular carbapenem resistance."

They add: "While these results remain hypothetical as it is unknown if any causal association exists, future analysis of AMR and climatic developments is necessary to determine whether potential climate change effects on AMR become stronger."

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