



G7 GERMANY Science 7 Dialogue

The Need for a One Health Approach to Zoonotic Diseases and Antimicrobial Resistance

The health of humans, domestic and wild animals¹, plants and the wider environment is closely linked and interdependent. The disruption of global ecosystems fosters the emergence of human pathogens from animal populations and vice versa (zoonotic diseases). Furthermore, the most effective means to treat infectious diseases, namely antimicrobial drugs, is losing effectiveness due to increasing antimicrobial resistance (AMR), mainly driven by misuse of antimicrobials in humans, animals and plants. Addressing these problems is a major global challenge, which is made more complex by the effects of climate change, human population growth, migration and biodiversity loss. Given these complexities, there is an urgent need for integrated approaches to effectively and sustainably address these global problems, taking into account all contributing factors in a comprehensive manner: The One Health approach mobilises multiple sectors, disciplines and communities at all levels of society to recognise the interconnectedness of health and ecosystems, and to work together to foster well-being and tackle threats to health.² Zoonoses and AMR are two important aspects of One Health.

According to WHO estimates, 75% of emerging human infectious diseases are zoonoses.³ Sustained human-to-human transmission of zoonotic pathogens (such as bacteria, viruses, fungi, parasites or prions) may result from initial spillover(s) from animals and cause regional and international outbreaks, or global pandemics. The growing number of close contacts between animals and humans in agriculture, in households and in the natural environment significantly increases the risk of animal-to-human and human-to-animal transmission. Zoonoses can also cause disruptions in the production and trade of animal products for food and other uses, resulting in significant economic consequences.

AMR occurs when pathogens become resistant against the drugs used to control them. When antimicrobials become ineffective, treatment of infectious diseases can be difficult and, in some cases, impossible, and the risks of disease spread, severe illness and death increases. Antimicrobial-resistant microbes can spread between humans, animals and the environment through, for example, food, water, aerosol and faeces from antibiotic-treated

1 The word “animals” in this text means non-human animals.

2 World Health Organization *et al.*, 2021. *OHHLEP Annual Report 2021*, https://cdn.who.int/media/docs/default-source/food-safety/onehealth/ohhlep-annual-report-2021.pdf?sfvrsn=f2d61e40_6&download=true (p. 13).

3 International Livestock Research Institute *et al.*, 2012. *Mapping of poverty and likely zoonoses hotspots, Zoonoses project 4, Report to Department for International Development, UK*, https://cgspace.cgiar.org/bitstream/handle/10568/21161/ZooMap_July2012_final.pdf (p. 12).

organisms used as fertiliser. Major sources of AMR are the widespread use of antibiotics in livestock farming and the excessive and unsustainable use in the treatment of infectious diseases in humans. AMR can affect anyone, at any age, in any country.

Besides the obvious impact on individual animal and human health and well-being, zoonoses and AMR have an increasing impact on populations, ecosystems, economies and on society at large.⁴

4 Regarding AMR, the World Bank estimates that it will cost the global community approximately \$3.4 trillion by 2030. Jonas *et al.*, 2017. *Drug-resistant infections: a threat to our economic future (Vol. 2): final report (English)*, World Bank Group, <http://documents.worldbank.org/curated/en/323311493396993758/final-report>.

In recent years, the connection between human, animal and environmental health has been increasingly recognised. However, the SARS-CoV-2 pandemic has highlighted the urgent need for more sustained and integrated structures, mechanisms and tools for effective prevention and preparedness. These can only be achieved if science, politics, industry and society collaborate at the national and international levels.

Recommendations

We call on the G7 governments to provide the following leadership in implementing a One Health approach in order to address the global challenges posed by zoonotic diseases and antimicrobial resistance (AMR):⁵

(1) Implement the One Health approach at the global, regional, national and local levels.

- Provide adequate long-term financing mechanisms for One Health implementation, e.g. for surveillance, control and prevention of zoonoses and AMR.
- Develop and regularly adapt action plans according to the latest scientific evidence.
- Ensure communication and coordination of the One Health approach globally across all levels of society and promote global public engagement on the need to tackle zoonoses and AMR.
- Educate and sustain a One Health-competent workforce from initial education through dedicated academic curricula, to lifelong learning.
- Provide educational material to the public to aid the understanding, prevention and treatment of infectious diseases in the context of One Health.
- Increase awareness of the prudent use of antimicrobial drugs in the general population, in the food chain, including livestock farming and aquaculture. This includes implementing new and strengthening existing antimicrobial stewardship programmes.
- Invest in One Health systems for early detection and surveillance of pathogen spillovers and AMR.

5 In the context of the One Health approach, antiviral drugs are also of importance. The science academies of the G7 states address this topic in their statement on “Antiviral Drugs: Increasing Preparedness for the Next Pandemic” (2022).

(2) Seize opportunities of new digital technologies and artificial intelligence for the prevention and control of zoonoses and AMR.

- Increase the use and employ the full range of digital technologies in prevention, monitoring, surveillance, management and basic and clinical research.
- Establish international standards for data format and quality (FAIR principles)⁶ as well as internationally compatible regulatory frameworks.
- Reduce barriers to data exchange at national and international levels whilst allowing for appropriate data safety and protection, accommodating the requirements of health emergencies.
- Create linked data sets on pathogens in humans, animals, plants and the environment.
- Promote the development and foster the availability of large well-characterised and standardised data sets for the use of artificial intelligence.

(3) Foster research and development focused on One Health.

- Promote research to improve the understanding of the mechanisms and the epidemic potential of pathogen spillover from animals to humans, and vice versa.
- Promote the development of diagnostics, antimicrobial therapies and vaccines for use in animal and human hosts of zoonotic diseases.
- Promote the interaction among pharmaceutical industry, public bodies and civil society for the development of antimicrobial drugs and alternative therapies in the context of One Health.
- Invest in research on determinants of health, including the links between climate change, biodiversity loss, food systems, poverty, and the spread of zoonotic diseases and AMR.

6 The acronym FAIR means findable, accessible, interoperable and reusable. The FAIR principles define the criteria for handling sustainable research data.

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