

EDITORIAL UVODNIK

ANTIMICROBIAL RESISTANCE – A CROSSROADS OF HEALTH, EQUITY, AND SUSTAINABILITY

ANTIMIKROBNA REZISTENCIJA – RASKRSNICA ZDRAVLJA, JEDNAKOSTI I ODRŽIVOSTI

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Abstract

Antimicrobial resistance is one of the most complex global health challenges, posing substantial threats to public health, economies, and sustainable development. This editorial explores the multifaceted nature of antimicrobial resistance, which intersects human, animal, and environmental health. Misuse of antibiotics in clinical settings, agricultural practices, and environmental contamination has accelerated the proliferation of resistant pathogens. The One Health approach, which underscores the interconnectedness of these sectors, is critical for effectively addressing antimicrobial resistance. International organizations, such as Food and Agriculture Organization, World Health Organization, World Organisation for Animal Health, and United Nations Environment Programme, advocate for coordinated, cross-sectoral effort to combat antimicrobial resistance, highlighting its connections to neglected tropical diseases, food systems, and climate change. Although the recent United Nations General Assembly Declaration on antimicrobial resistance marks progress, substantial gaps persist, particularly in the context of antimicrobial overuse in agriculture and veterinary medicine. Civil society groups and public health advocates have raised concerns regarding the absence of concrete global targets and regulatory frameworks. In the absence of stronger international commitments, antimicrobial resistance will continue to disproportionately affect low- and middle-income countries, further exacerbating global health inequalities. Ultimately, this editorial emphasises the need for sustainable funding, stronger policies, and global cooperation to tackle antimicrobial resistance and promote health equity. The One Health approach offers a pathway to mitigate the burden of antimicrobial resistance, protect human rights, and promote universal access to effective treatments.

Key words: Drug Resistance, Microbial; One Health; Health Inequities; Public Health; Environmental Health; Human Rights

An extraordinary nexus of challenges

According to the United Nations, antimicrobial resistance (AMR) ranks among the top 10 global health threats facing humanity. The emergence of “superbugs”, including bacteria no longer treatable by antibiotics, poses one of the most significant and complex global health challenges of our time. AMR’s complex-

Sažetak

Antimikrobna rezistencija predstavlja jedan od najsloženijih globalnih zdravstvenih izazova, koji pretil javnom zdravlju, ekonomiji i globalnom razvoju. Ovaj uvodnik istražuje višestruku prirodu antimikrobne rezistencije, koja povezuje ljudsko, životinjsko i zdravlje životne sredine. Neadekvatna upotreba antibiotika u kliničkom okruženju i poljoprivredi, “ruku pod ruku” sa zagađenjem životne sredine, dodatno je pogoršala rast otpornosti patogena. Pristup „jedno zdravlje“ (*One Health*), koji naglašava međusobnu povezanost ovih sektora, ključan je za efikasno rešavanje antimikrobne rezistencije. Međunarodne organizacije, različite agencije Ujedinjenih nacija, zalažu se za koordinisanu, međusektorsku akciju u borbi protiv antimikrobne rezistencije, prepoznajući njene veze sa zanemarenim tropskim bolestima, prehrambenim sistemima i klimatskim promenama. Iako nedavna Deklaracija Generalne skupštine Ujedinjenih nacija o antimikrobnoj rezistenciji predstavlja pozitivan korak, i dalje postoje značajni nedostaci, posebno u vezi sa prekomernom upotrebom antimikrobnih sredstava u poljoprivredi i veterini. Predstavnici civilnog društva i stručnjaci za javno zdravlje izrazili su zabrinutost zbog manjka konkretnih globalnih ciljeva i regulatornih okvira. Bez izričitijih međunarodnih obaveza, antimikrobna rezistencija će nastaviti da nesrazmerno pogađa zemlje sa niskim i srednjim prihodima, dodatno pogoršavajući svetske zdravstvene neravnopravnosti. Konačno, ovaj tekst naglašava neophodnost održivog finansiranja, izričitijih politika i globalne saradnje kako bi se našlo rešenje za antimikrobnu rezistenciju i unapredila zdravstvena ravnopravnost. Pristup „Jedno zdravlje“ nudi put za smanjenje tereta antimikrobne rezistencije, uz očuvanje ljudskih prava i promovisanje univerzalnog pristupa efikasnim tretmanima.

Ključne reči: Amikrobna rezistencija na lekove; jedno zdravlje; zdravstvene nejednakosti; javno zdravlje; ekološko zdravlje; ljudska prava

ity stems from its multifaceted nature, intersecting human, animal, and environmental health, and its potential to erode decades of medical progress. AMR emerges from a nexus of factors, making it a challenge that transcends borders and sectors.

Human health lies at the core of the AMR crisis. The misuse and overuse of antibiotics in clinical settings continue to drive the proliferation of resistant

Abbreviations

UN	– United Nations
AMR	– antimicrobial resistance
NCDs	– non-communicable diseases
UNGA	– United Nations General Assembly
FAO	– Food and Agriculture Organization
WHO	– World Health Organization
WOAH	– World Organisation for Animal Health
UNEP	– United Nations Environment Programme
NTDs	– neglected tropical diseases
LMICs	– low- and middle-income countries
EPHA	– European Public Health Alliance
HCWH	– Health Care Without Harm

pathogens, particularly in countries with weaker healthcare infrastructures [1, 2]. However, the problem extends beyond hospitals and clinics. In animal husbandry, antibiotics are often overused to promote growth and prevent disease in livestock, facilitating the transfer of resistant bacteria passing from animals to humans through food systems, direct contact, or environmental pathways [3, 4].

Environmental factors also significantly contribute to AMR. Antibiotic residues from pharmaceuticals and agricultural runoff enter soil and water systems, creating reservoirs for resistant bacteria. These environmental reservoirs further complicate efforts to control AMR, as they can spread resistant genes across microbial communities worldwide [5]. This issue is intricately linked to other global health crises, including climate change [6] and the transformation of food systems [7]. With climate change affecting both the spread of infections and food production practices, the misuse of antimicrobials increases, thereby accelerating resistance. By altering ecosystems, climate change influences the spread of infectious diseases and impacts the effectiveness of antimicrobial treatments. Moreover, our food systems keep contributing to the rise of non-communicable diseases (NCDs), and AMR further burdens this landscape by limiting treatment options for infections that arise as secondary complications in patients with chronic conditions [8].

Recent publications, including the March 2024 issue of *The Lancet* [9] and reports released ahead of the United Nations General Assembly (UNGA) High-Level Meeting on AMR, underscore the urgency of addressing AMR. They emphasize that AMR is not only a public health crisis but also an economic, environmental, and social threat, with the potential to cause millions of deaths annually and severely undermine global development goals.

One Health to address it all

Addressing the AMR challenge requires a holistic One Health approach, which recognizes the intercon-

nectedness of human, animal, and environmental health. In recent years, the One Health concept has gained prominence, with organisations such as the Food and Agriculture Organization (FAO), World Health Organization (WHO), World Organisation for Animal Health (WOAH), and United Nations Environment Programme (UNEP) collaborating through Quadripartite Secretariat for One Health to drive policies and actions that integrate all these dimensions [10, 11].

This approach highlights the interdependency of sectors such as animal husbandry, food safety, and environmental health with combating AMR [10, 12]. For example, controlling zoonotic diseases, which can be transmitted from animals to humans, is essential for preventing the spread of resistant bacteria. Equally important are the strengthening of laboratory services and improvement of surveillance of resistant pathogens across species, as well as strict regulation of antimicrobials in veterinary settings to prevent resistance proliferation.

The One Health approach also extends to tackling neglected tropical diseases (NTDs) [13], which are prevalent in many low- and middle-income countries (LMICs). These diseases often require antimicrobial treatment, and without proper stewardship, they risk accelerating resistance in regions already struggling with high rates of infectious diseases. Integrating AMR strategies into broader efforts to control NTDs and improve environmental health is therefore vital to the global AMR response [14].

Recent collaborative efforts by the FAO, UNEP, WHO, and WOAH, leading up to the UNGA High-Level Meeting on AMR, have emphasised the importance of coordinated, cross-sectoral action [15]. Such collaboration is critical to equipping the world to address the AMR crisis in a comprehensive, balancing public health needs with animal health and environmental sustainability.

Much left to desire

The recent UNGA Declaration on Antimicrobial Resistance [16, 17], with its meaningful global commitments and targets to advance the fight against AMR, marked an important step forward, received broad support from member states, international organisations, the commercial sector, and civil society. While the declaration acknowledges the growing threat of AMR and calls for coordinated action across human, animal, and environmental health sectors, significant gaps remain that must be addressed to ensure a comprehensive global response to AMR.

Despite the strengths, the final version of the declaration falls short of many ambitious goals, especially in regulating over-the-counter sales and antibiotic use in food systems - areas strongly advocated by civil society organisations and public health groups [18]. Although the declaration highlights the need for a global framework to tackle AMR, it lacks specific commitments to curb the overuse of antimicrobials in agriculture and food production. For instance, a proposal to reduce antimicrobial use in agriculture by 30% over the next six years was replaced by “strive to meaningfully reduce”, leaving countries without a clear target. This dilution resulted from pushback by the agriculture and veterinary drug industry, along with meat-producing nations [19]. Civil society groups have expressed concerns that, without firm regulations and a binding framework, progress against AMR will remain slow and uneven [20].

Antimicrobial resistance respects no borders, and a collective response is still urgently needed. More concerted efforts from governments, civil society, and international organisations are necessary to fill the gaps left by the UNGA declaration. This includes establishing stronger regulatory frameworks, allocating more resources to LMIC, and setting more ambitious targets for reducing antimicrobial use in agriculture.

The win-wins and other happy endings

It is no surprise that AMR crisis bears a huge economic impact. According to the most extensive modelling to date, drug-resistant pathogens could threaten the food supply for over two billion people and increase healthcare costs by \$159 billion annually by 2050. The EcoAMR series (Health and Economic Impacts of AMR in Human and Food-Producing Animals), led by WOA, projects a return of \$28 for every \$1 invested in drug innovation and healthcare improvements [21].

The One Health approach not only protects public health and the economy but also helps preserve ecosystems from the effects of unconstrained antimicrobial use. By implementing strategies such as better waste management and regulation of antibiotic use in agriculture, the contamination of ecosystems can be reduced, which is crucial for maintaining environmental health [22].

Most importantly, AMR endangers basic human rights by limiting access to effective treatments, with resistant infections disproportionately affecting LMIC where healthcare access is limited. Addressing AMR through a One Health approach directly supports reduction of health inequalities by expanding healthcare access and promoting equity in health outcomes globally [23]. It prioritises universal access to essential

medicines, reduces the disparities between high- and low-income countries, and aligns with the principle of health as a human right.

The role of global civil society organisations cannot be overstated, among others in ensuring that the health equity and human rights aspects of AMR crisis are properly addressed. In Europe, organisations such as the European Public Health Alliance (EPHA), Health Care Without Harm (HCWH), ReAct, and others have been at the forefront of advocacy, ensuring that AMR remains a priority even when other public health issues dominate the headlines. However, for civil society to sustain this critical role, they need sustainable funding and support from governments and international bodies [24]. Through the recent approval of the resolution on Social participation for universal health coverage, health and well-being, Members States have committed to implementing, strengthening and sustaining regular and meaningful social participation in health-related decision-making processes. It is now their responsibility to ensure that civil society organisations are adequately resourced, enabling them to continue their vital work in raising awareness, improving antimicrobial stewardship, and pushing for stronger policy measures [25].

About EPHA

European Public Health Alliance is the leading public health civil society organisation in Europe, advocating for better public health policies. During the last decade, EPHA has been promoting an integrated approach to AMR by addressing the interconnections between human, animal, and environmental health, ensuring that policies reflect this interconnectedness [26]. Through coordinating its AMR Stakeholder Network [27], supporting the Members of the European Parliament Interest Group on AMR, and collaborating in the European Commission-funded One Health AMR European partnerships, EPHA fosters cross-sectoral cooperation among stakeholders and policymakers, helping build more resilient systems to address both climate-related health impacts and AMR.

European Public Health Alliance's work focuses on raising awareness among, healthcare professionals, patient organisations, and policymakers, enhancing their understanding on the prudent use of antimicrobials. This includes topics of infection prevention, surveillance and control, health literacy, and proper waste disposal. Together with its members and partners, EPHA advocates for better antimicrobial stewardship by sharing best practices across healthcare and related sectors, applying an interdisciplinary, multistakeholder

approach [28]. It has consistently advocated for AMR prioritisation on the global agenda and promoted trans-

parent, evidence-based policymaking by translating research findings into policy recommendations.

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