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ONE HEALTH:

HOLISTIC and SUSTAINABLE SOLUTIONS

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TURKISH ACADEMY OF SCIENCES

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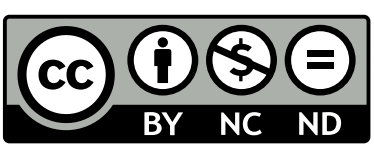

CONTENTS

FOREWORD

In today's world, the challenges we face in the areas of health, environment, and food are becoming increasingly complex, and solving these problems requires interdisciplinary and holistic approaches. Climate change, loss of biodiversity, environmental pollution, food security issues, zoonotic diseases, and antimicrobial resistance are no longer topics that concern only specific sectors or countries; they have become socio-economic and social structural risk areas that directly affect the common future of humanity on a global scale. In this context, it is clear that approaches that consider human health independently of nature and other living beings are clearly no longer sustainable.

This work, titled “One Health: Holistic and Sustainable Solutions,” serves as a comprehensive reference source that addresses the current One Health approach, which considers human, animal, and environmental health as interconnected systems, along with its scientific foundations and practical dimensions. The studies discussed in the book aim not only to address the consequences of health problems but also to evaluate the ecological, environmental, and socioeconomic factors that contribute to these problems. The analysis and resolution of social problems also necessitates special socio-psychological analyses focused on individual awareness, education, and cultural values. In this respect, the work offers an important perspective for the development of protective and preventive health policies.

The work addresses topics such as the sustainability of food systems, the effects of the climate crisis on agriculture, water, and energy systems, the impact of environmental pollutants on food quality and public health, the vital importance of biodiversity in terms of ecosystem services, and the strengthening of nature-based solutions, all in light of scientific data. At the same time, topics such as air pollution, extreme weather events, water management, soil health, and the role of new technologies in environmental and agricultural monitoring processes provide concrete examples of the practical application areas of the One Health approach. This multidimensional framework elevates the book beyond an academic work, making it a guiding resource for policymakers, practitioners, and society.

One of the book's strongest points is its emphasis on the relationship between scientific knowledge and policy, education, and community participation. It clearly states that in order to produce lasting and effective solutions, the science-policy partnership must be strengthened, inter-institutional collaboration must be developed, and the community

must be actively involved in these processes. It is stated that strong and sustainable collaborations between universities, public institutions, civil society organizations, and the private sector will be decisive in building resilient health and food systems.

Prepared with the contributions of competent and experienced scientists in the field, this work fills an important gap in terms of understanding, disseminating, and implementing the One Health approach in our country. In addition to its contribution to academic literature, I believe it will be a long-term reference source with the holistic perspective it offers to decision-makers and practitioners. I would like to thank the editors, authors, reviewers, and all institutions and stakeholders who supported the process in the preparation of this book. I hope that this work will make important contributions to a healthier environment, safer food systems, and a more resilient society.

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PREFACE

The health, environmental, and food-related challenges facing humanity are now so intertwined that they can no longer be addressed as separate issues. Climate change, loss of biodiversity, environmental pollution, food security problems, and global pandemics are multidimensional crises with common causes and consequences. This situation highlights the inadequacy of an approach that assesses human health solely through medical services. The protection and promotion of health requires a holistic approach to the relationship between humans and the environment they live in, as well as the animal and plant communities that they co-exist with.

The One Health approach represents a contemporary and inclusive perspective that arises precisely from this necessity. This approach, which views human, animal, and environmental health as interconnected systems, aims to focus not only on the consequences of health risks but also on the conditions that give rise to them. The increase in zoonotic diseases, the global spread of antimicrobial resistance, and the acceleration of environmental degradation make the importance of preventive and integrated policies more visible every day. The COVID-19 pandemic has reminded the world of the strong link between ecosystem destruction and human health.

Today, food systems are at the center of climate crisis and sustainability debates. Population growth, urbanization, and changing consumption habits are putting serious pressure on agricultural production. Production models based on chemical ingredients, excessive water use, and monoculture practices may increase yields in the short term, but in the long term, they weaken ecosystem services and create new risks for public health. It is impossible to talk about safe food without healthy soil and water systems. Therefore, agricultural policies need to be rethought in line with environmental sustainability and public health goals.

The effects of environmental factors on food quality and nutrition constitute one of the most critical dimensions of the One Health approach. Pesticide residues, endocrine disruptors, heavy metals, and microplastics are absorbed into the human body through the food chain and cause long-term health problems. It is a fundamental public health issue that food is not only produced in sufficient quantities, but also that it is safe and nutritious. In this regard, preventing environmental pollution, strengthening monitoring systems, and conducting risk assessments based on scientific data are of great importance.

Biodiversity is an element that is often overlooked but is indispensable for the continuity of life. The fragmentation of habitats and the destruction of natural areas under the pressure of agriculture and urbanization lead not only to the loss of species but also to a decrease in the capacity of ecosystems to renew themselves. However, biodiversity is a fundamental safeguard that increases the resilience of food systems, stabilizes disease risks, and ensures the continuity of ecosystem services. Ecosystem restoration, nature-based solutions, and ecological planning in urban areas are emerging as strategic tools for both environmental health and societal well-being.

The effects of climate change on health are becoming increasingly visible. Extreme heat waves, floods, and storms cause not only physical injuries but also mental health problems. Air pollution is a decisive factor in the increase in respiratory diseases. Industrial waste and agricultural pollutants affect large populations through soil and water systems. In combating these complex risks, the opportunities offered by new technologies such as artificial intelligence and remote sensing in environmental and agricultural monitoring processes provide important opportunities for more effective and timely interventions.

Water management is another fundamental component of the One Health perspective. The depletion and contamination of water resources disrupt ecosystem functioning and directly threaten public health. Pesticide and nitrogen loads from agricultural activities reduce water quality and make access to safe water difficult. Water reuse, greywater applications, and careful management of wastewater will be decisive for protecting both agricultural production and public health in the future. Microplastic pollution, with its not yet fully understood effects, stands before us as a new area of risk.

Policy, education, and community participation play a crucial role in solving all these problems. It is essential to effectively transfer scientific knowledge into decision-making processes, strengthen data-driven management approaches, and enhance inter-institutional collaboration. Strong ties between universities, public institutions, civil society, and the private sector will contribute to building resilient health systems. Raising public awareness and strengthening individual responsibility are indispensable for long-term success.

This book addresses the One Health approach within a multidimensional framework, aiming not only to identify problems but also to discuss feasible and sustainable solutions. Prepared with the contributions of experts in the field, this work strongly emphasizes the necessity of holistic thinking and collective action for a healthier future in Türkiye and around the world. With the understanding that the most valuable legacy we can leave to future generations is a healthy environment and a resilient society, we hope this work will find scientific and social resonance.

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REFERENCES

Bakiika, H., Obuku, E. A., Bukirwa, J., Nakiire, L., Robert, A., Nabatanzi, M., ... & Lamorde, M. (2023). Contribution of the one health approach to strengthening health security in Uganda: a case study. *BMC Public Health, 23*(1), 1498.

Buregyeya, E., Atusingwize, E., Nsamba, P., Nalwadda, C., Osuret, J., Kalibala, P., ... & Bazeyo, W. (2021). Lessons from a community based interdisciplinary learning exposure: benefits for both students and communities in Uganda. *BMC Medical Education, 21*(1), 5.

Cai, C., Jung, Y. S., Pereira, R. V. V., Brouwer, M. S. M., Song, J., Osburn, B. I., McKenzie, J., van der Poel, W. H. M., & Qian, Y. (2024). Advancing One Health education: integrative pedagogical approaches and their impacts on interdisciplinary learning. *Science in One Health, 3,* 100079. https://doi.org/10.1016/j.soh.2024.100079

Cella, E., Giovanetti, M., Benedetti, F., Scarpa, F., Johnston, C., Borsetti, A., Ceccarelli, G., Azarian, T., Zella, D., & Ciccozzi, M. (2023). Joining Forces against Antibiotic Resistance: The One Health Solution. *Pathogens, 12*(9), 1074. https://doi.org/10.3390/pathogens12091074

Centers for Disease Control and Prevention. (2025, April 14). One Health history. U.S. Department of Health and Human Services. https://www.cdc.gov/one-health/about/one-health-history.html

Chiu, E. S., Lee, J., Malmberg, J., Fagre, A., Dannemiller, N. G., Stuchin, M., ... & Huyvaert, K. P. (2020). Teaching wildlife disease outbreak response through a collaborative one health workshop. *Journal of veterinary medical education, 47*(4), 402-407.

Couto, R. de M., & Brandespim, D. F. (2020). A review of the One Health concept and its application as a tool for policy-makers. *International Journal of One Health, 6*(1), 83–89. https://doi.org/10.14202/IJOH.2020.83-89

Food and Agriculture Organization of the United Nations, United Nations Environment Programme, World Health Organization, & World Organisation for Animal Health. (2022). One Health joint plan of action (2022–2026). https://openknowledge.fao.org/items/fddae6a2-e7ef-4a2a-ad54-2463dbbb0b32World

Health Organization. (2025, September 12). One Health Joint Plan of Action. Retrieved: https://www.who.int/teams/one-health-initiative/quadripartite-secretariat-for-one-health/one-health-joint-plan-of-action.

Gibbons, J., Williams, R., & Loneragan, G. (2025). Texas Tech University School of Veterinary Medicine One Health Sciences: Engaging the future. *One Health, 21*, 101123. https://doi.org/10.1016/j.onehlt.2025.10112

Haxton, E., Lindberg, A., Troell, K., & Redican, K. J. (2015). One Health education meets science. *Infection Ecology & Epidemiology, 5,* 30264. https://doi.org/10.3402/iee.v5.30264

Hemida, M. G., & Abduallah, M. M. B. (2020). The SARS-CoV-2 outbreak from a One Health perspective. *One Health, 10,* 100127. https://doi.org/10.1016/j.onehlt.2020.100127.

Henley, P., & Shyaka, A. (2025). Cultivating resilience and adaptability through hands-on One Health. *Global Health Action, 18*(1), 2478694.

Hobusch, U., Scheuch, M., Heuckmann, B., Hodžić, A., Hobusch, G. M., Rammel, C., Pfeffer, A., Lengauer, V., & Froehlich, D. E. (2024). One Health Education Nexus: Enhancing synergy among science-, school-, and teacher education beyond academic silos. *Frontiers in Public Health, 11*, 1337748. https://doi.org/10.3389/fpubh.2023.1337748

İzmir Veteriner Hekimleri Odası Veteriner Halk Sağlığı Çalışma Grubu. (n.d.). Tek Sağlık. İzmir Veteriner Hekimleri Odası. https://vethekimder.org.tr/TR,10/tek-saglik.html

Linder, D., Cardamone, C., Cash, S. B., Castellot, J., Kochevar, D., Dhadwal, S., & Patterson, E. (2020). Development, implementation, and evaluation of a novel multidisciplinary One Health course for university undergraduates. *One Health, 9,* 100121. https://doi.org/10.1016/j.onehlt.2019.100121.

Mackenzie, J. S., & Jeggo, M. (2019). The One Health approach-Why is it so important? *Tropical Medicine and Infectious Disease, 4*(2), 88. https://doi.org/10.3390/tropicalmed4020088

Marvasi, M., Casillas, L., Vassallo, A., & Purchase, D. (2021). Educational activities for students and citizens supporting the One-Health approach on antimicrobial resistance. *Antibiotics, 10*(12), 1519. https://doi.org/10.3390/antibiotics10121519

McEwen, S. A., & Collignon, P. J. (2018). Antimicrobial resistance: a one health perspective. Antimicrobial resistance in bacteria from livestock and companion animals, 521-547.

Metekia, W. A., BHU, & CH. (2020). Tek sağlık ve tek tıp: Literatür taraması. *Veterinerlik ve Halk Sağlığı Dergisi, 1*(3), 91–95. https://doi.org/10.31559/vmph2020.1.3.4

Mullins, G., Jagne, J., Stone, L., Konings, E., Howard-Grabman, L., Hartman, F., & Fulton, M. (2010). 'One World One Health'in practice: Integrating public health and veterinary curricula on emerging infectious diseases in Africa. *International Journal of Infectious Diseases, 14,* e377-e378.

Rabinowitz, P. M., Natterson-Horowitz, B. J., Kahn, L. H., Kock, R., & Pappaioanou, M. (2017). Incorporating One Health into medical education. *BMC Medical Education, 17*(1), 45. https://doi.org/10.1186/s12909-017-0883-6

Roopnarine, R. R., & Boeren, E. (2022). A focus on methodology: A mixed-methods approach to conduct a comprehensive evaluation of the need for One Health education for medical and veterinary students in the context of COVID-19. *Environmental Health Insights, 16,* 11786302221080826. https://doi.org/10.1177/11786302221080826

Shearer, A. E., & Kniel, K. E. (2021). Foodborne illness outbreak investigation for one health postsecondary education. *Journal of Microbiology & Biology Education, 22*(2), 10-1128.

Stroud, C., Kaplan, B., Logan, J. E., & Gray, G. C. (2016). One Health training, research, and outreach in North America. *Infection Ecology & Epidemiology, 6*(1). https://doi.org/10.3402/iee.v6.33680

Şahintürk, P. (2022). Tek Sağlık Uygulamalarının Değerlendirilmesi: Standardize Edilmiş Güncel Yöntemler. *Balıkesir Sağlık Bilimleri Dergisi, 11*(Supplement 1), 51-58.

Taştan, R. (2020, Mayıs 18). Tek Sağlık ve Biyogüvenlik dersi. Kocaeli Üniversitesi. https://avesis.kocaeli.edu.tr/rtastan/dokumanlar.

Tufts University Cummings School of Veterinary Medicine. (n.d.). D.V.M./Master of Public Health Program. https://vet.tufts.edu/dual-degree-programs/dvmmaster-public-health-program

Türk Mikrobiyoloji Cemiyeti Tek Sağlık Çalışma Grubu. (2019, Kasım 21–23). Ulusal Tek Sağlık Sempozyumu ve Çalıştayı. Ankara Üniversitesi Eczacılık Fakültesi. https://www.tmc-online.org/index.php?func=ActivityDetails&ID=77

Türkiye Tabipler Birliği. (n.d.). Tek Sağlık. https://www.ttb.org.tr/kutuphane/covid19-rapor_6/covid19-rapor_6_Part78.pdf

Türkiye'de Tek Sağlık: Sorunlar ve Çözüm Önerileri Çalıştayı [Çevrimiçi toplantı]. https://vethekimder.org.tr.

Veteriner Hekimleri Derneği. (2022). Dünyada Tek Sağlık. https://www.vhsd.org.tr/dunyada-tek-saglik/

Wilkes, M. S., Conrad, P. A., & Winer, J. N. (2019). One Health–One Education: Medical and veterinary inter-professional training. Journal of Veterinary Medical Education, 46(1), 14–20. https://doi.org/10.3138/jvme.1116-171r

World Health Assembly. (2021). Resolution WHA74.7: Strengthening WHO preparedness for and response to health emergencies. World Health Organization https://apps.who.int/gb/ebwha/pdf_files/WHA74/A74_R7-en.pdf (World Health Assembly, 2021)

World Health Organization. (2023, July 24). One Health definition and principles. https://cdn.who.int/media/docs/default-source/one-health/ohhlep/one-health-definition-and-principles-translations.pdf

World Health Organization (WHO). (2022). Quadripartite Memorandum of Understanding (MoU) signed for a new era of One Health collaboration. https://www.who.int/news/item/29-04-2022-quadripartite-memorandum-of-understanding-(mou)-signed-for-a-new-era-of-one-health-collaboration

World Organisation for Animal Health (WOAH). (2022). UN Environment Programme joins Quadripartite Alliance for One Health. https://rr-asia.woah.org/en/news/un-environment-programme-joins-quadripartite-alliance-for-one-health/

Zinsstag, J., Schelling, E., Waltner-Toews, D., & Tanner, M. (2011). From "one medicine" to "one health" and systemic approaches to health and well-being. Preventive *Veterinary Medicine, 101*(3–4), 148–156. https://doi.org/10.1016/j.prevetmed.2010.07.003

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INDEX

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W

Y

Z

Based on the premise that human health forms an inseparable whole with animals, plants, and the environment, this book offers a holistic perspective on today's most complex global challenges through the One Health approach. Interconnected risk areas such as climate change, environmental pollution, loss of biodiversity, food safety, zoonotic diseases, and antimicrobial resistance are addressed within an interdisciplinary framework. Prepared with contributions from leading experts in their fields, this work highlights the importance of preventive and sustainable approaches by focusing not only on the consequences of health issues but also on their underlying causes.

While evaluating the interactions between environmental, agricultural, water, and health systems in light of scientific data, the book presents a broad range of solutions, spanning from nature-based solutions to new technologies, and from policy development to public participation. Aiming to strengthen the science-policy interface and serve as a guiding resource for decision-makers and society, this work demonstrates why the One Health approach is indispensable for building more resilient ecosystems, healthy food systems, and a strong societal structure.

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