

“ONE HEALTH” AND LIVESTOCK FARMING

Denis STANCIU¹, Daniel MIERLIȚĂ^{1#}, Claudia Terezia SOCOL^{1#},

¹ University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410078, Oradea, Romania

REVIEW ARTICLE

Abstract

It is well known that human, animal, and plant health are interdependent and linked to the health of their ecosystems. Interference in this linked chain is able to lead to an increment of the risk of new diseases both in human and animal related to development and spreading. "One Health" is a concept known from ancient times, being observed as connection between disease and various environmental factors, including air, water, diet and lifestyle, but which is still of interest nowadays, as an integrative effort of multiple disciplines to attain optimal health for people, animals, and environment, that should be put it into practice as a cooperative effort of the whole society of the world. Such approach targeting the balance and optimization of global health needs specific actions to be taken to bring significant ecologically and economically improvements also in animal farms. The application of "One Health" concept in animal farms is mainly related to the enhancement of animal welfare, animal products quality, and food security, the diminution of infectious diseases and drug-resistant pathogens, and the storage and processing of manure in an environmentally friendly manner.

Keywords: One Health; global health; animal welfare; animal products; zoonotic diseases; environment.

#Corresponding authors: dadi.mierlita@yahoo.com; csocol@uoradea.ro.

INTRODUCTION

The World Health Organization (WHO) defines One Health as a collaborative effort of various disciplines, that are working at local, national and global levels, to attain optimal health for people, animals and the environment (Little, 2012). Health care, the most important factor in life, nowadays raises an increasingly common problem. The entire planet needs a restructuring that needs to be started both in the social sector and in terms of the environment. The well-being, functionality and beauty of the planet are at their highest level when the human, animal and environmental sectors, its three important and vital sectors, are in close contact and collaborate with the main interest of the planet's influence for the better (Bertoni, 2021). Moreover, "One Health" could be used to identify and manage health risks as well as positively model the coexistence, sustainability, and well-being of various interrelated systems (Rabinowitz et al., 2018).

One Health facts and forecasts are showing that cca 60% of pathogens causing human diseases are of animal origin, meanwhile cca 75% of emerging infectious diseases in humans are of animal origin. Besides, over 70% additional animal protein will be needed for

feeding by 2050 and over 20% of global animal production losses are related to animal diseases, which are a direct threat for the population from rural areas from financial point of view, considering the direct dependence on animal livestock. Additionally, humans critically impacted the environment, i.e. 75% terrestrial and 66% marine (WHO, 2022).

The zootechnical sector shows a particular importance because it is considered by many authors a wicked problem that encompasses complex aspects of environment and decisions related to the animal health, depending also on politics (Alonso et al. 2020).

Animal welfare science and animal welfare policy-making need to develop new methods to address global discussions about food security and sustainability as farm animal welfare becomes an increasingly significant component of modern global livestock production (Buller et al., 2018). The Organization for Animal Health (OIE) refers to animal wellbeing related to its living environment, taking into account several factors. If an animal is healthy, comfortable, well-nourished, safe, able to express natural behaviour, and not experiencing negative emotions like pain, fear, or distress, it is said to be in a good state of wellbeing. (WOAH/OIE, 2013).

On the other side, zoonoses are diseases or infections that are naturally transmitted from animals to humans, being one of the greatest threats to public health that are primarily caused by the complex relationship between humans, animals and the environment. Around 60% of human infectious diseases that are currently present are zoonotic, and 75% of emerging infectious diseases (including Ebola, HIV, influenza, COVID-19), have an animal origin. Managing zoonotic pathogens at their animal's source is the most effective and cost-effective method of protecting people ((EMRO/WHO, 2001; WOAHO/OIE, 2023).

This paper highlights the application of "One Health" concept in animal farms, showing aspects related to the enhancement of animal welfare, animal products quality, and food security, the diminution of infectious diseases and drug-resistant pathogens, and the storage and processing of manure in an environmentally friendly manner. The available published literature, case studies, and various data from public entities, scientific papers, and websites were reviewed for this study, showing key information related to the importance of maintaining efficiency and cleaning on farms to ensure quality products and reduce pollution. Sources that had the most up-to-date information were used to get insights.

Drug-resistant pathogens

Antibiotics have helped to save the lives of humans and livestock, but the overuse of such drugs resulted in an alarming proliferation of antibiotic-resistant pathogens (WHO, 2020). Bacteria is able to divide rapidly, as fast as every 15 to 20 minutes within and in each cell division process there is a chance of occurrence of mutation, which could result in drug resistance. Besides, bacteria could gain antibiotic-resistance genes directly from other bacteria via horizontal gene transfer, enabling antibiotic resistance to spread quickly (Mancuso et al., 2021). Further, antibiotic-resistant organisms can be acquired via food. Antibiotics use in animal feeding generate a chain for passing antibiotics to animals and humans, or even to water and soil. Thereby, the use animal manure to fertilize the land may also put humans and animals at increased risk, by ingesting drug-resistant microorganisms (Alegbeleye et al., 2020).

The gut microbiome, which consists in symbiotic microbial cells, has a protective role both in humans and animals, against various

pathogens by stimulating the innate and adaptive immune system to fend off intruders. It also produces antimicrobial products and signals, and helps to maintain the structure and functioning of the gastrointestinal tract. Antibiotics disrupt the balanced gut microbiome, thus weakening the body's natural defences against various diseases (Yoo et al., 2020).

"One Health" perspective makes it clear that to reduce antibiotic resistance takes a systems approach involving agriculture, animal husbandry, and medicine. (McEwen and Collignon, 2018). Finding solutions to push microbiome toward preventing infections is still a challenge. "One Health" approach challenge humans to simultaneously consider aspects of health and wellbeing of humans, animals, and the surrounding environment (Figure 1). Animal farming is directed to meet food supply requirements, which shows an increment trend as human population, but in the same time it should meet health criteria in humans, animal welfare and health, next to the integrity of the ecosystem (Doughrate, 2021).

Besides, the coronavirus pandemic, is the latest example of pathogen passed from animals to humans, which had a great impact on world human population and definitely it will be not the last one (Sampath et al., 2021).

Air quality in animal farms

The implementing of "One Health" in animal livestock production may be achieved through work organization and engineering solutions. Strategic partnerships and collaborative efforts are addressed to find solutions depending on species (Doughrate, 2021). For example, for poultry production efforts are carried out for optimizing air quality to reduce hazards. An improved quality of air in poultry farms will result in a decrement of inhalation exposures both in animals and the farm workers, thus showing a positive impact on animal and human health (Gržinić et al., 2023).

A better understanding for joined efforts to reduce health risks

The prevention and control of human diseases transmitted by animals demands the early identification and managing of zoonoses; this timing is essential for the transmission from animals to humans and for saving lives (Shiferaw et al., 2017).

“One Health” practices in animal husbandry can curb the spread of antimicrobial resistance. Forecasts indicate that if the use of antimicrobial grow up to 67% until 2030 will significantly increase costs and will force 24

millions more people into poverty, and up to 2050 will result in 10.000.000 deaths (ILRI, 2021).

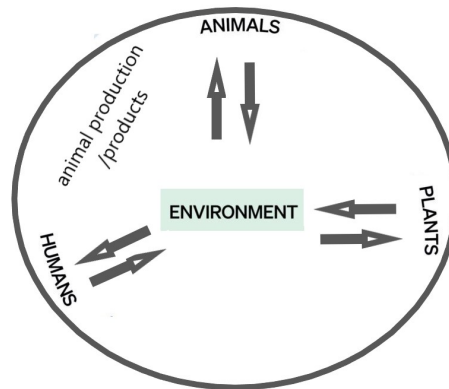


Figure 1 “One Health” relationship for pathogens transmission

Foods safety is in line with healthier people, livestock and environment, thus healthy people need safe food provided by healthy animals or vegetables in a clean or healthy environment (Herrero et al., 2023). Humans directly benefit from investments in the health and welfare of farm animal livestock, at the same time this being a safeguard of the national economies (Thumbi et al., 2015).

In order to prevent or control zoonoses multi-sectoral programs are carried out; rabies, avian flues, viral fevers or other zoonotic diseases are relevant examples. Moreover, for finding solutions related to current issues as antimicrobial resistance, food safety, health and climate change multi-sectoral, multidisciplinary, next to “One Health” efforts could be referred (Belay et al., 2017). By ensuring adequate climate conditions and sustainable practices in agriculture may drive to a decrement of pathogens spread or the development of new forms, thus reducing the risks for health (Singh et al., 2023).

“One Health” gaps and perspectives

Beside the financial side of various fields, human, animal, agriculture and environment need to collaborate in an integrated system of knowledge working for enabling real outcomes, including for prevention.

The “One Health” gaps mainly refer its implementation. “One Health” practice

examples identification and sharing will lead to the achievement of favourable results. Moreover, methods for preventing and dominating the health risks and pathogens spreading are also needed to be better defined and improved, in hand with routine and emergency protocols of implementation at various levels and an integrated system for monitoring and control. All these aims to minimize trade-offs and maximize co-benefits including health, in a sustainable and integrated manner.

Research initiative should also be directed to enforce “One Health” global goals, next to the educational ones, all together enabling a full understanding.

Zoonoses spread harbour a complex and variety of factors related to farm animal trading, farming, agriculture, environment, food systems and health. Furthermore, specific databases will also help for such purposes. On the other hand, strengthening the collaboration and target policies still need to be applied.

The complex health risks and burdens go over the limits of the conventionally management of various systems, demanding for a global health initiative in humans and food systems, for ensuring sustainable livestock pathways enabling healthier animals, humans and environments.

The actual “One Health” concept encourage the change from binary dietary

choices, meaning animal based food vs plant-based food, to a better understanding of the complex linkages between animals, humans and environments, for implementing an optimal management of these relationships for achieving maximum benefits (Ferrari et al., 2022).

CONCLUSIONS

The health of humans, animals, and ecosystems are closely interlinked, thereby changes in this complex relationship could increase the risk of diseases both in human and animal, collaborative and coordination actions being required between these sectors.

The application of "One Health" in animal farms is mainly related to the enhancement of animal welfare, animal products quality, and food security, the diminution of infectious diseases and drug-resistant pathogens, and the storage and processing of manure in an environmentally friendly manner.

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