The science of animal welfare in the One Health–One Welfare agenda: local solutions for global challenges

F. Galindo* [(1)], J.N. Marchant [(2)] & T. Tadich [(3)]

(1) Faculty of Veterinary Medicine and Zootechnics, National Autonomous University of Mexico, Avenida Universidad 3000, 04510 Mexico City, Mexico

(2) A World of Good Initiative, 8 The Green, Suite A, Dover, DE 19901, United States of America

(3) Animal Welfare Program, Austral University of Chile, Isla Teja Campus, Independencia 641, Valdivia 5110566, Chile

*Corresponding author: galindof@unam.mx

Summary

In recent years, the importance of working holistically on the global One Health and One Welfare agendas has become evident. The success of these policies in addressing shared challenges depends on a science-based global strategy for animal welfare that allows local efforts to resolve conflicts related to how human beings take advantage of natural resources, including domestic and wild animals. These policies need to be developed jointly by the World Organisation for Animal Health, the World Health Organization and the Food and Agriculture Organization of the United Nations and in line with the United Nations' Sustainable Development Goals. They should be based on scientific evidence, gathered from existing information and through transdisciplinary research, to quantify synergies and trade-offs between environmental, social, economic and animal welfare criteria. This approach will make it possible to articulate and implement local policies and solutions associating animal welfare with efficient and sustainable livestock production, biodiversity conservation and disease prevention, mitigation of greenhouse gas emissions and climate change, economic and rural development, biomedical research based on ethical principles, and responsible animal ownership.

Keywords

Animal welfare – One Health – One Welfare – Public policies – Sustainability.

Introduction

One Health–One Welfare

For more than a decade, there has been talk of the importance of strengthening the links between animal and human health and implementing a One Health agenda at a global level [1]. This concept is based on the triad of public health, animal health and ecosystem health. The latter term, although difficult to define, refers to a 'healthy' ecosystem in which ecological processes and the provision of environmental services (e.g. carbon sequestration, biodiversity and disease prevention, pollination, clean water, food) are preserved and guaranteed. The concept of Ecohealth refers to the interaction between environmental conservation and human health [2] and measures how biodiversity loss, climate change and water pollution, among other environmental factors, influence outbreaks of infectious and non-infectious diseases; this topic has become increasingly relevant as a result of the SARS-CoV-2 coronavirus pandemic. Undoubtedly, the scientific approach to animal welfare has a close relationship with this triad, in particular with animal health and ecosystem health, since animals' biological systems of response to environmental challenges, including mental states, behaviour and physiological responses to stress and pain, are closely linked to the immune response and mechanisms of disease transmission, as well as to the incidence and prevalence of infectious and non-infectious diseases.

Recently, the importance of implementing a One Welfare agenda with the aim of improving human, social and animal welfare has been integrated into the global discussion [3]. Although the One Welfare approach does not explicitly emphasise ecosystem health, it integrates the environmental agenda by explaining how the conservation of natural resources, environmental sustainability and, in general, the provision of ecosystem services affect social and animal welfare.

Both agendas, One Health and One Welfare, emphasise the interaction between human and animal health but at the same time integrate the environmental or ecological component. In both cases, in order for successful global policies to be designed and implemented, it is very important to apply the science of animal welfare correctly and thus standardise a clear and scientific language that translates into a comprehensive global policy, ideally developed by the World Organisation for Animal Health (WOAH), the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) and complemented by the Sustainable Development Goals outlined in the United Nations' 2030 Agenda. These policies will need to be articulated

effectively to enable the implementation of science-based local policies and solutions that will incentivise stakeholders.

Scientific basis for animal welfare

Animal welfare is a scientific discipline that gained importance during the second half of the 20th century. In its beginnings, the study of animal welfare focused on the biological study of animal behaviour [4], but it has progressively become an interdisciplinary science, encompassing, in addition to ethology and physiology, pathology, health and epidemiology, immunology, endocrinology and neuroscience [5]. WOAH's definition, 'the physical and mental state of an animal in relation to the conditions in which it lives and dies', is based on a term [6] that refers to systems for coping with environmental challenges including emotional states, behaviour, and pathophysiological responses and their effects. This approach integrates the components of biological functioning, 'naturalness' and feelings. It is important to emphasise that there is currently a growing interest in studying positive emotional states and not just negative ones [7].

Scope of animal welfare policies: local solutions to global problems

Animal welfare, sustainable livestock production and food security

Food security refers to everyone's access to sufficient and safe food to lead a healthy life [8]. It requires a reliable source of food and resources to buy it. The world population has been projected to reach 9.6 billion by 2050 [9]. In parallel with this increase, the demand for food of animal origin is expected to grow. Today, more than one billion people are food insecure [9], a number that will increase as the world's population increases. To correct this, it is necessary to improve the distribution and storage of food to reduce waste and thus understand how much food production needs to increase [5]. As a result of the pressure that this demand for animal and agricultural production will place on natural resources, sustainability has become the primary paradigm in food production. Livestock farming has been associated with increased greenhouse gas emissions, deforestation, loss of biodiversity and pollution of water bodies [10,11]. Hence, there is a need to intensify livestock production using systems that are efficient and sustainable, ensuring the protection of ecosystems and addressing social and animal welfare conflicts. In this context, animal welfare is part of a complex matrix of sustainability criteria and should be seen as a crucial element for sustainable animal production, from moral, economic and future markets points of view [12].

Thus, there is an urgent need for globally sustainable food systems [13]. The main emphasis has been on economic and environmental sustainability, but ethical and social sustainability is also a critical element [14].

The projected increase in animal production will be achieved by higher numbers of animals and increased productivity, but there will also be a shift from a diet of animal products to crop-based food, either because of concerns about animal welfare, which are present in all cultures [15], or sustainability, or for perceived health benefits associated with a plant-based diet [5,16].

Global policies must implement local solutions to integrate animal welfare as an essential component of sustainability and food security. This is very important because systems are implemented or adapted in a dynamic and economically interconnected world, and care must be taken to develop systems according to the cultural needs of a region and refrain from imposing practices developed in other cultural contexts [17]. In many cases, integrating animal welfare into livestock production systems can result in increased biodiversity, habitat restoration and the recovery of traditional production systems that improve the quality of life for people and animals [12], for example by incorporating working animals and thus reducing the use of fossil fuels.

Animal welfare and conservation

Within the scientific community, it has long been perceived that the concept of animal welfare may conflict with the concept of conservation. There are several explanations for this. On one hand, efforts made for *in situ* conservation are related to practices that compromise the well-being of individual animals within a population, such as hunting practices, removal of individuals or ecological tourism. In these cases, and as in many areas related to the application of animal welfare science, there is a moral dilemma that requires a scientific approach to measure and quantify the synergies or trade-offs of these practices and to propose a science-based agenda that benefits the majority of individuals within a population, allowing the population to remain healthy while ensuring conditions that translate into a ‘healthy’ ecosystem. On the other hand, many conservation biologists define the concept of animal welfare as synonymous with animal protection, ignoring the scientific basis of the concept of animal welfare. If one uses the WOAH definition of animal welfare, referring to the biological condition of the individual in relation to the way in which it faces environmental challenges, not only do the two approaches not conflict, but also animal welfare becomes an important tool for *in situ* and *ex situ* conservation.

While the concept of animal welfare refers to individuals and conservation refers to populations, communities or ecosystems, in the case of *in situ* conservation, anthropogenic practices cause welfare problems for individuals as well as populations and communities. The growth of agricultural and industrial activities has increased the rates of destruction of ecosystems, causing habitat fragmentation. As well as potential direct effects on animal welfare, such as increased mortality, fragmentation can also impact animal welfare at population and evolutionary levels and, as a consequence, decrease biological diversity worldwide [18]. Ecosystem fragmentation is one of the most severe environmental problems and can have irreversible consequences. The fragmentation of natural vegetation generally has very severe impacts on the physical and biological environment, such as changes in the water cycle and chemical elements in the soil, as well as in temperature and erosion. These physical changes in turn cause biotic changes by generating environments that are favourable for species extinction and for the proliferation of exotic species and generalist species that are tolerant to disturbance. Generalist species can displace other species through mechanisms such as competition and predation, and potentially by the introduction of infectious agents.

When a habitat fragment is smaller, there is a higher population density and greater intra- and inter-species competition for resources, and as a consequence, there are higher levels of stress in the animals. The impairment of the immune response by prolonged stress and the rate of contact between individuals of different species, including domestic animals, facilitates the transmission of certain infectious agents with risk to animal and public health [19].

However, in the case of *ex situ* conservation, the types of challenges that animals face are more related to states of chronic stress as a result of different forms of captivity. In this sense, it is very important to generate more scientific information on the biological needs, including behaviour, of non-domestic species that are kept in captivity for breeding or rehabilitation purposes.

In conclusion, there are numerous global problems related to wildlife removal, illegal wildlife trade, changing ecosystem fragmentation and inefficient management plans for the use of wildlife. Hence, there is an urgent need to work more on issues related to the interaction between animal welfare science and conservation. While these areas are frequently perceived as conflicting, they should not be. Animal welfare science is a tool for implementing successful conservation programmes. In this sense, there are many opportunities to link information on animal behaviour and welfare and conservation

biology in order to develop and promote global policies and define action strategies for resolution of local conflicts.

Animal welfare, rural development and social benefit

According to WOAH, working equids are donkeys, horses and mules that are intended for or used in traction, transport and income generation [20]. Globally, it is estimated that there are more than 115 million equids [21], most of which contribute significantly to the livelihoods of rural communities, carrying water and fodder for livestock, agricultural products and other important household items [22]. In addition, equids participate in draught work, mainly for agricultural activities such as tilling the land. In 2017, WOAH developed Chapter 7.12. of the *Terrestrial Animal Health Code* (*Terrestrial Code*) establishing guidelines to ensure the welfare of working equids [20]. For working animals, it is also essential to consider the various forms of human–animal interaction and how they can affect both animal and human welfare [23]. All WOAH Members should seek to ensure that the guidelines and recommendations contained in the *Terrestrial Code* are included in both current regulations and public policies. Working equids provide critical work for thousands of families in low- and middle-income countries, so their inclusion in government programmes is key to the resilience of rural communities.

Animal welfare and quality biomedical research

The number of animals used for biomedical research globally is increasing, although it is still common to hear that the number of animals used for this purpose is small in relation to the social benefit it produces. Conservatively, this number may be above 120 million animals per year [24], distributed across virtually all WOAH Members but mainly in the Northern Hemisphere, where most animal research is done. It is estimated that 90% of the total number of animals used for biomedical research are rodents, birds and fish [25], but other mammalian species are used for this purpose as well (e.g. dogs, cats, non-human primates, pigs and sheep).

What is relevant to question is whether existing public policies justify the number of animals used for this purpose and whether it can be ensured that the knowledge generated is reliable and can be applied. In this sense, for a research result to be valid and to be applied, methodological rigour – e.g. variability of environmental conditions and variability of test subjects (appropriately relevant species, sex, age, etc.) – is needed so that results of animal models can be extrapolated and applied directly to an inherently variable population of humans [24,26].

In order to work on a global policy towards the welfare of animals in biomedical research, questionable practices must be considered and amended by the ethics committees of the responsible institutions, in a consistent fashion, and ethics committees must be established in institutions where there are none. Likewise, the paradigm of the 'three Rs', which in many countries is still unknown to many researchers, must be respected at all times. This paradigm calls on researchers to seek the 'replacement' of animals by alternatives or natural models of the disease, 'refine' experiments so that they are less invasive and painful through the use of analgesics and anaesthetics, and 'reduce' the number of animals used [27]. Refinement protocols should also meet the behavioural, physiological and health needs of the animals, for example by applying the five-domain principle before, during and after experiments [28].

Companion animal welfare

In a world with an ever-growing urban population, the number of companion animals has also been growing steadily. However, there is still a need for education and proper compliance with legislation on responsible ownership of companion animals. Abandonment of dogs and cats remains common in many regions, and overpopulation of these animals remains a problem, in particular in disadvantaged communities, with indirect consequences on public health, animal welfare and the environment. Animal adoption programmes have had many limitations, and frequently these animals return to the vicious cycle of abandonment and overpopulation of dogs and felines, including feral animals.

Although quality of life in companion animals has recently been evaluated, there is some resistance within the broader field of animal welfare to the use of that term, either because of the perceived temporal limitations of its coverage or because of the anthropomorphism and subjectivity associated with a definition that includes the assessment of an animal's psychological state by indirect methods [5]. However, research is increasingly focusing on indicators of positive rather than negative welfare, and on measures of the animal's affective state, meaning that as methods and measures evolve and refine, there may be a shift towards a concept of animal welfare that is more in line with definitions of quality of life than current definitions of animal welfare [29].

For this reason, there is a great challenge in terms of conducting more scientific research on the welfare of dogs and cats, which translates into education of humans responsible for these animals and outreach efforts to implement better legislation and public policies

so that Veterinary Services, at the local level, can respond to the paradigm of quality of life and responsible ownership of companion animals more efficiently [5].

Conclusions

Success in the One Health and One Welfare agendas depends on the correct application of the science of animal welfare. Intergovernmental bodies (WHO, WOAH, FAO) must develop comprehensive policies in the face of the current global challenges related to the way humans interact with domestic and wild animals. Such policies in turn will make it possible to design local solutions to these global problems for the benefit of people, animals and the environment.

References

[1] Gibbs EPJ. The evolution of One Health: a decade of progress and challenges for the future. Vet. Rec. 2014;174(4):85-91. https://doi.org/10.1136/vr.g143

[2] Morand S, Guégan JF, Laurans Y. From One Health to Ecohealth, mapping the incomplete integration of human, animal and environmental health. Institut du développement durable et des relations internationales (IDDRI) Issue Brief No. 04/20. Paris (France): IDDRI; 2020. 4 p. Available at: https://www.iddri.org/sites/default/files/PDF/Publications/Catalogue%20Iddri/D%C3%A9cryptage/IB0420EN-OneHealth.pdf (accessed on 5 September 2024).

[3] Pinillos RG, Appleby MC, Manteca X, Scott-Park F, Smith C, Velarde A. One Welfare – a platform for improving human and animal welfare. Vet. Rec. 2016;179(16):412-3. https://doi.org/10.1136/vr.i5470

[4] Brown J. Animals and us: 50 years and more of applied ethology. Wageningen (the Netherlands): Wageningen Academic Publishers; 2016. Applied ethology: what's the buzz?; p. 79-94. https://doi.org/10.3920/978-90-8686-828-5_3

[5] Marchant-Forde JN. The science of animal behavior and welfare: challenges, opportunities, and global perspective. Front. Vet. Sci. 2015;2:16. https://doi.org/10.3389/fvets.2015.00016

[6] Broom DM. Indicators of poor welfare. Br. Vet. J. 1986;142(6):524-6. https://doi.org/10.1016/0007-1935(86)90109-0

[7] Boissy A, Manteuffel G, Jensen MB, Moe RO, Spruijt B, Keeling LJ, *et al*. Assessment of positive emotions in animals to improve their welfare. Physiol. Behav. 2007;92(3):375-97. https://doi.org/10.1016/j.physbeh.2007.02.003

[8] World Bank. Poverty and hunger: issues and options for food security in developing countries. A World Bank policy study. Washington, DC (United States of America): World Bank Group; 1986. 69 p. Available at: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/166331467990005748/poverty-and-hunger-issues-and-options-for-food-security-in-developing-countries (accessed on 5 September 2024).

[9] Putting a number on hunger: different measures for different purposes. Rome (Italy): Food and Agriculture Organization of the United Nations; 2023. Available at: https://www.fao.org/interactive/measuring-hunger/en (accessed on 26 October 2023).

[10] Galindo F, Tadich T, Ungerfeld R, Hötzel MJ, Miguel-Pacheco G. Animals and us: 50 years and more of applied ethology. Wageningen (the Netherlands): Wageningen Academic Publishers; 2016. The development of applied ethology in Latin America; p. 211-26. https://doi.org/10.3920/978-90-8686-828-5_10

[11] Galindo F, Williams D, González-Rebeles C, Zarza H, Ávila-Flores R, Olea-Pérez R, *et al*. Tropical conservation: perspectives on local and global priorities. Oxford (United Kingdom): Oxford University Press; 2017. Conservation and livestock production in tropical Mexico; p. 381-4.

[12] Broom DM, Galindo FA, Murgueitio E. Sustainable, efficient livestock production with high biodiversity and good welfare for animals. Proc. R. Soc. B. 2013;280(1771):20132025. https://doi.org/10.1098/rspb.2013.2025

[13] Pérez-Lombardini F, Mancera KF, Suzán G, Campo J, Solorio J, Galindo F. Assessing sustainability in cattle silvopastoral systems in the Mexican tropics using the SAFA framework. Animals (Basel). 2021;11(1):109. https://doi.org/10.3390/ani11010109

[14] Von Keyserlingk MAG, Martin NP, Kebreab E, Knowlton KF, Grant RJ, Stephenson M, *et al*. Invited review: sustainability of the US dairy industry. J. Dairy Sci. 2013;96(9):5405-25. https://doi.org/10.3168/jds.2012-6354

[15] Sinclair M, Lee NYP, Hötzel MJ, de Luna MCT, Sharma A, Idris M, *et al*. International perceptions of animals and the importance of their welfare. Front. Anim. Sci. 2022;3:960379. https://doi.org/10.3389/fanim.2022.960379

[16] Beardsworth AD, Keil ET. Vegetarianism, veganism, and meat avoidance: recent trends and findings. Br. Food J. 1991;93(4):19-24. https://doi.org/10.1108/00070709110135231

[17] Marchant JN, Doyle RE, Hötzel MJ, Iyasere OS, Sinclair M. Editorial: the emergence of animal welfare science and policy in Africa, Asia and Latin America. Front. Vet. Sci. 2023;10:1171229. https://doi.org/10.3389/fvets.2023.1171229

[18] Suzán AG, Galindo MF, Ceballos GG. La importancia del estudio de enfermedades en la conservación de fauna silvestre. Vet. Mex. 2000;31(3):223-30. Available at: https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=7190 (accessed on 12 September 2024).

[19] Pedernera-Romano C, Aurioles-Gamboa D, Valdez RA, Brousset DM, Romano MC, Galindo F. Serum cortisol in California sea lion pups (*Zalophus californianus californianus*). Anim. Welfare. 2010;19(3):275-80. https://www.doi.org/10.1017/S0962728600001652

[20] World Organisation for Animal Health (WOAH). Terrestrial animal health code. Paris (France): WOAH; 2024. Chapter 7.12. Welfare of working equids; 9 p. Available at: https://www.woah.org/fileadmin/Home/eng/Health_standards/tahc/2023/chapitre_aw_working_equids.pdf (accessed on 18 October 2024).

[21] FAOSTAT corporate statistical database. Rome (Italy): Food and Agriculture Organization of the United Nations; 2024. Available at: https://www.fao.org/faostat/en/#home (accessed on 18 October 2024).

[22] Tadich TA, Stuardo Escobar LH. Strategies for improving the welfare of working equids in the Americas: a Chilean example. Rev. Sci. Tech. 2014;33(1):203-11. https://doi.org/10.20506/rst.33.1.2271

[23] Tadich T, Rodrigues JB. The Routledge international handbook of human-animal interactions and anthrozoology. New York (United States of America): Routledge; 2023. Working animals and human-animal interactions; 14 p. https://doi.org/10.4324/9781032153346

[24] Téllez Ballesteros E, Vanda Cantón B. Cuestionamientos éticos a la generación de conocimiento en la investigación biomédica con animales no humanos. Rev. Bioet. Derecho. 2020;49:173-89. Available at: https://revistes.ub.edu/index.php/RBD/article/view/26808/31364 (accessed on 12 September 2024).

[25] Animal and Plant Health Inspection Service. Animal Welfare Act and Animal Welfare Regulations. Washington, DC (United States of America): United States Department of Agriculture; 2023. § 2132: Definitions; p. 5-8. Available at: https://www.aphis.usda.gov/media/document/17164/file (accessed on 15 November 2023).

[26] Greek R, Kramer LA. Animal experimentation: working towards a paradigm change. Leiden (the Netherlands): Brill; 2019. Chapter 17. The scientific problems with using non-human animals to predict human response to drugs and disease; p 391-416. https://doi.org/10.1163/9789004391192_018

[27] Würbel H. More than 3Rs: the importance of scientific validity for harm-benefit analysis of animal research. Lab Anim. 2017;46(4):164-6. https://doi.org/10.1038/laban.1220

[28] Tadich T, Tarazona AM. Handbook of bioethical decisions, Vol. I: decisions at the Bench. Cham (Switzerland): Springer International Publishing; 2023. Replacement, reduction and refinement: ethical considerations in the current applications of the 3Rs; p. 667-83. https://doi.org/10.1007/978-3-031-29451-8_35

[29] Taylor KD, Mills DS. Is quality of life a useful concept for companion animals? Anim. Welfare. 2007;16(S1):55-65. https://doi.org/10.1017/S0962728600031730