

# One health research ethics

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Emerging and re-emerging infectious diseases (EIDs) present major threats to public health, global security, and economic development. Coronavirus disease 2019 (COVID-19) is the latest EID to demonstrate the devastation, suffering, and scale of death that an EID can cause. Pandemics involving emerging and re-emerging infectious agents and associated infectious diseases, climate change, urbanization, biodiversity loss and financial instability have been identified as the most critical global issues today (1). Close to three-quarters of today's EIDs are known to be of zoonotic origin (where infectious agents spread to humans from domestic or wild animals), and their frequency and economic impact are on the rise (2).

A review of major epidemics in the past 100 years identified 15 major EIDs and determined that their origins were most probably due to changes in agricultural practices and/or contact between human and non-human species (3). The reasons for zoonotic changes are complex as they involve human health and social behavior, animal behavior and interactions with humans, and environmental factors. Since the turn of the century, at least 17 deadly zoonotic or vector-borne global outbreaks have occurred (4). A recent example was the 2014-2016 Ebola outbreak in West Africa, which clearly showed how a zoonotic EID can quickly become an international health crisis (5). The ongoing COVID-19 pandemic demonstrates the same issues on an even more global level (6). An International Livestock Research Institute publication identified zoonotic diseases as major obstacles to poverty alleviation, affecting 1 billion livestock keepers, leading to at least 2.5 billion cases of human illness and 2.7 million deaths annually (2). The report estimated that more than one in seven livestock in low-income countries is infected with zoonotic agents.

The global burden of EIDs is particularly severe in low-resource regions where skilled personnel are lacking, community capacity is low, and inter-agency communication and community outreach are challenging. Despite the high population density and fertility rate in many African countries, the capacity to prevent, detect and control such diseases is inadequate. The US Centers for Disease Control and Prevention (CDC) reported that less than 20% of the countries in eastern and central Africa are prepared to prevent such diseases (7). As most of the African population is very young, with more than 40% under the age of 15, children are disproportionately affected (8). In addition, a large number of pastoralist communities (more than 10 million in Ethiopia alone), whose day-to-day survival depends on animals, remains extremely vulnerable. As such, it is not surprising that regions such as East Africa are known hotspots for EIDs (9).

Research is urgently needed to better understand EIDs and develop effective interventions to prevent their development and treat them when they occur. Given the involvement of human, animal, and environmental factors in EIDs, they require a multifaceted, multisectoral, and multidisciplinary research strategy encompassing the One Health approach. According to the Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE) and the World Health Organization (WHO) Tripartite, One Health is defined as an integrated approach that helps to prevent and mitigate health threats at the animal-human-plant-ecosystem interface to achieve public health, food and nutrition security, sustainable ecosystems and fair-trade facilitation (10). As such, One Health requires a collaborative approach, working locally, nationally and globally, and involving many professions and disciplines to work together on research, education and public health interventions, including prevention, preparedness and response in ways that will improve human and non-human health (11). Zoonotic EIDs are particularly well suited to being investigated through a One Health approach because of the way zoonotic microbes commonly emerge: through disruptions in the environment (often due to environmental pressure), they go from an original non-human species host to becoming infectious to humans.

One Health has gained significant attention in recent years. The biennial World One Health Congress (held virtually in 2020) brings together One Health scientists and many international organizations (12). The Congress has emphasized the need for increased connections between One Health science and global health security, thus encouraging governments and international institutions to give more attention to One Health science. While the emphasis to date has been on the science of One Health, ethical issues arise as with any area of scientific research. Some calls have been made for research into the ethics of One Health (13), but relatively little attention has been given so far to the ethical and philosophical aspects of the One Health approach (14). More attention to these issues is needed, even though One Health remains primarily a scientific approach to addressing EIDs. Foremost among the ethical and philosophical issues is a presumption underlying many public health approaches that human health should be prioritized over the well-being of non-human species and environmental concerns (13). For example, when an emerging pathogen with zoonotic potential has been identified in domestic animals, the culling of those animals has been justified as ethical on the basis that the benefits to humans outweigh the harms to non-humans. Such balancing of benefits and harms is integral to the ethical evaluation and justification of animal research more generally.

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Ethics policies in animal research are often justified within traditional ethical frameworks, which simply assume that human health should be prioritized even to the detriment of animal life. However, a One Health approach would call for giving serious consideration to other ways of balancing the benefits and burdens of policies on humans, animals (agricultural and wild), and the environment (13). Within animal research ethics, calls are being made to consider animal welfare, social benefit to animals, and other issues (15,16). Environmental ethics, particularly around global warming, are also being added to the interplay of human and animal ethics. Approaches to ethics are needed that build upon the interrelatedness and interdependence of humans, animals and the environment.

These developments add to the complexity of ethical issues in EID research, which has practical implications for One Health research. Such research projects will often involve human, animal and environmental factors that are regulated and overseen by several governmental departments. One project may need to seek approval to conduct its research from committees charged with overseeing human research subject ethics, animal ethics, and environmental impact. Given the cross-border nature of EIDs, approvals may be needed in a number of countries. In addition to the numbers of applications, different committees can take diametrically opposed perspectives on the ethical issues, leading to contradictory recommendations and requirements. This could stall research approvals indefinitely, resulting in important work never being conducted. To date, the documentation of these challenges and proposed modes of dealing with and improving these processes are scarce, but starting to appear (17-19).

One Health research faces another challenge because of the way most zoonotic EIDs occur as outbreaks, often in humanitarian settings. The Ebola outbreak and the COVID-19 pandemic have highlighted the importance of initiating relevant research quickly and at the same time ensuring that ethical review remains rigorous and thorough. Humanitarian crises have too frequently been treated as outliers in formulating health programs, while their frequency should lead to them being prioritized in research (5). However, this requires ways to address complex ethical and methodological issues that arise when conducting research during humanitarian crises. The multidisciplinary, collaborative approach that characterizes One Health has an important role here, but faces these same challenges itself.

Our research team has just received funding for a project that will allow us to begin addressing such challenges, focusing on African countries. The One Health Ethics and Regulatory Procedures (OHEARP) Supplement project, funded by the National Institutes of Health Fogarty International Center, will include research on the ethical and regulatory challenges faced by researchers and members of ethics review-related committees, and make recommendations to address

those challenges in the future. The project will take place during 2021 and will mainly seek to better understand the ethical and regulatory complexities of One Health research. First, the investigators will conduct a survey to explore the ethical and regulatory challenges faced by One Health researchers and the various committee members that review such research. This will give us a better understanding of the ethical challenges faced, and lead to recommendations for relevant policies and regulations. We will also develop training and support programs to help strengthen the capacities and ethical decision-making skills of One Health researchers and applicable review committees. We see this as the beginning of a process that will inform countries, institutions and organizations in their work to strengthen research capacity for the One Health approach. We welcome correspondence, encourage participation, and would like to learn about any similar initiatives from the readership.

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