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One Health training manual

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Tripartite collaboration among the
Food and Agriculture Organization, World Health Organization, Ministry of Agriculture and Land Reclamation, Ministry of Health and Population, and Ministry of Environment
that work together to strength the One Health approach.

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1.1 Introduction

Worldwide exponential growth in human and livestock populations, changing migration patterns, and environmental degradation have transformed the environment in which human–animal populations coexist. One of the challenges that faces humanity is the spread of infectious diseases that emerge (or re-emerge) from the interfaces between animals-humans and the ecosystems in which they live.

"One Health", the concept discussed in this chapter, promotes incorporating human medicine, veterinary medicine, public health, and environmental science for the future control of infectious diseases. We will show that One Health is a requisite concept when developing policies and determining interventions to address current challenges threatening today's globalized world.

The purpose of this chapter is to present an overview of the One Health movement, and to demonstrate its recent global development. We will examine One Health from different perspectives especially that of human health and veterinary medicine, whether domestic or wildlife, and the role of environmental science. This is then followed by exploring the importance of One Health in food safety and food security. We will see how the Sustainable Development Goals (SDGs), as defined by the United Nations, would greatly benefit from the applications of One Health to ensure that by 2030 all people enjoy peace and prosperity. Moreover, One Health approach to major challenges e.g., prevention of zoonotic diseases and antibiotic resistance will be presented. The present chapter will be concluded with discussing two crucial issues i.e., multidisciplinary research and the role of legislations; to pave the way for inter-sectoral collaboration.

1.2 The concept of One Health

One Health is a collaborative, multidisciplinary, and multisectoral approach that can address urgent, ongoing, or potential health threats at the human-animal-environment interface at subnational, national, global, and regional levels. This approach includes ensuring balance and equity among all the relevant sectors and disciplines.

One Health is an emerging concept that aims to bring together human–animal–environmental health to achieve a harmonized approach for disease detection and prevention.

The concept and principles of One Health are not new. Indeed, the threats and consequences that emerge from the interface between ecosystems, animal populations and

human populations have been, and continue to be, the basis for many of the events that shape history.

One Health concept has a solid scientific basis and a rich heritage whose time has come. The scope of One Health is impressive, broad, and growing and the concept clearly encompasses ecosystem health, social sciences, ecology, noninfectious and chronic diseases, wildlife, land use, antimicrobial resistance, biodiversity, and much more.

In the twentieth century, human and veterinary health professionals became increasingly specialized and technically, institutionally, and even culturally separate. James Steele (1913-2013) and Calvin Schwabe (1927–2006) of the United States of America have been recognized for their visionary leadership in promoting the ecological nature of animal-human health. In 1947, Steele established the veterinary public health unit in what has become the Centres for Disease Control and Prevention in the United States of America and helped establish graduate education in public health as a new veterinary specialty. His warnings about the socio-economic consequences of zoonotic diseases led to the establishment of a veterinary public health unit by the WHO.

Health experts from around the world met on September 29, 2004, for a symposium focused on the current and potential movements of diseases among human, domestic animal, and wildlife populations organized by the Wildlife Conservation Society and hosted by The Rockefeller University. The symposium resulted in the publication of the 'Manhattan Principles on One World – One Health' whose title led to the coining of the term 'One Health' in its current context. Using case studies on Ebola, Avian Influenza, and Chronic Wasting Disease as examples, the assembled expert panelists delineated priorities for an international, interdisciplinary approach for combating threats to the health of life on Earth. "Manhattan Principles" list 12 recommendations for establishing a more holistic approach to preventing epidemic - epizootic disease and for maintaining ecosystem integrity for the benefit of humans, their domesticated animals, and the foundational biodiversity that supports us all.

"Manhattan Principles" was followed by two additional international developments. In 2008, WHO, the World Organization for Animal Health (OIE) and the Food and Agriculture Organization of the United Nations (FAO), with the support of the United Nations Children's Fund and the United Nations System Influenza Coordination, developed an unprecedented tripartite agreement to work more closely together to address the human–animal–ecosystem interface. Then, in June 2012, the World Bank published an assessment of the economic benefits of One Health.

Over the past decade, multiple international meetings, symposia, publications, university programs, health management measures and research projects have served to create an ever-expanding community of practice and an increasing number of networks advancing the use of the term and the tenets and principles captured by One Health.

1.3 Growing need for One Health approaches

The complex interconnection of humans-animals (domestic and wild) and their respective social and ecological environment is evident in the current global health challenges which warrant critical attention to be focused on integrated approaches to health protection and promotion.

As the human population continues to increase across the world, considering the interconnectedness of people, animals and the environment becomes more important, especially in the control of emerging and re-emerging diseases such as zoonoses. Addressing such health issues from a single sector without considerations of the complexity of the entire system (humans-animals-plants-environment) can be slower and costly.

Innovative approaches, including working in collaboration across sectors, are therefore important in addressing the complex challenges that the world is facing today. It is Important to note that the One Health approach extends to research, training and service delivery, focusing not only on diseases but also on health at individual, population and ecosystem levels.

The Food and Agriculture Organization of the United Nations (FAO) has instinctively understood the concept of One Health and the need to reach out across sectoral and disciplinary divides to effectively combat diseases that have their origins in animals but hold the potential to devastate local and national economies and populations, both of humans-animals. In 2011, FAO's animal health service adopted One Health as integral to its approach, especially in communication area. Past efforts at communication, national, regional, and international, have been driven by emergencies and the need for rapid results and response, often with a strong single disease focus. One Health calls for communication strategies for preventing emerging diseases that may not yet be posing a health threat. FAO's Emergency Centre for Transboundary Animal Diseases (ECTAD) has had a worldwide focus on building capacity within regions to fight Highly Pathogenic Avian Influenza (HPAI) H5N1 and other high impact diseases, developing networks of surveillance and diagnosis, improving coordination, and undertaking measures for improved policy and regional engagement in preventing and responding to pathogens that move from animals to humans or animals to animals or across distant borders. By turning its attention to the important area of strategic communication against emerging infectious diseases, FAO is bringing its core strengths in coordination, collaboration, and ground level understanding of communities to the important dimension of the role of communication in staying ahead of emerging infectious pathogens. One Health, with its focus on anticipating emerging animal-human health threats and tackling existing ones through better use of pre-emergence surveillance and detection science, calls for far-sighted strategies in every sphere, communication included.

1.4 Disciplines engaged in One Health

Population growth and the globalization of economic networks have resulted in a rapidly changing, highly interconnected world. The resulting demands for living space, land, food, water, and energy have become an increasing challenge. Never before have global issues of environmental sustainability and the health of humans-animals been so closely interconnected.

These health and sustainability consequences of global change are economically, socially, medically, and environmentally costly, and as such, their control can be considered a global public good. The complexities and breadth of such threats demand interdisciplinary solutions that address the connections between human-animal health, as well as the underlying environmental drivers that impact health. One Health is a growing global strategy that is being adopted by a diversity of organizations and policy makers in response to the need for integrated approaches.

A- Human or public health domain

The world population currently has a growth rate of 1.2 percent per year, and the next century will represent a period of exponential growth. It is estimated that 90 percent of the global population growth will take place in the developing world and the world's fastest growth will actually take place in peri urban settings that are now a part of almost all large cities in developing countries. Today almost 1 billion people inhabit these sites. Global slums are creating unprecedented conditions where new emerging and reemerging diseases are highly probable outcomes.

There is further concern that developing countries lack the public and animal health infrastructures needed to quickly detect an emerging health threat or to effectively respond to or control such threats. In an interconnected world, this reality makes the entire world riskier and more vulnerable. Meanwhile, we are now witnessing an era characterized by the phenomenal relocation, migration, and movement of people worldwide. The global economy is a key driver causing people to shift from rural settings to urban centres. Furthermore, new diasporas are being created as populations relocate globally due to the changing economy and job availability, and large populations of refugees are being created due to social and political unrest. In addition to this unique human relocation phenomenon, people are also traveling more. Today more than 1 billion people across international borders each year. Not only are people on the move, but animals, vectors, food, and other commerce are also on the move and microbes are given unprecedented opportunities to migrate rapidly. The world is literally in motion and on the move. To add further to this risk, people are invading new territories and changing habitats and a substantial part of the world's surface has been inexorably altered, threatening the environment and its sustainability.

Finally, there are growing segments of our human population that have acquired vulnerabilities to certain diseases. We now have growing populations of immunocompromised individuals, including cancer patients, organ transplant patients, and HIV/AIDS patients, who are part of a growing cohort with greater susceptibility to infectious diseases.

One of the key factors determining health is poverty. Poor health is both a cause of and a result of poverty. Often people are trapped in poverty for a lifetime, and their health and quality of life are also reduced and threatened over an entire lifetime. While poverty takes many tolls, one of the most tragic has been its inexorable link with infectious diseases.

Approximately 1 billion people live on less than $2 a day. Worldwide, almost two thirds of the rural poor and one-third of the urban poor depend on livestock to provide them with essential household income and a source of food and nutrients. Poor livestock keepers are found especially in Southeast Asia, Africa, and India. This large global population is threatened by zoonotic diseases because of their proximity to livestock and dependence on animal products. Zoonotic diseases carry a double impact. They add substantially to disease morbidity, mortality, and loss of productivity of livestock and poultry themselves but may also produce illnesses in their keepers. A study by the International Livestock Research Institute highlighted a strong association among poverty, hunger, livestock keeping, and zoonoses.

Globally, the top 13 zoonotic diseases are responsible for 2.4 billion cases of illness and 2.2 million human deaths per year. Examples of these zoonoses include gastrointestinal parasites, leptospirosis, cysticercosis, bovine tuberculosis, rabies, brucellosis, toxoplasmosis, and Q fever.

Livestock and poultry production is rapidly increasing in the developing world, where the demand for protein from animal sources is rapidly expanding and the production of livestock and poultry holds the promise of a path out of poverty.

A One Health perspective is essential to reducing the huge economic, social, and health impact of zoonoses in developing countries. These diseases often involve wildlife as well as domestic animals, and almost all of these zoonoses are amenable to agriculture-based interventions, which gives further credence to One Health strategies.

B- Animal health domain

By 2050, the world's population is expected to grow to 9.6 billion, and based on current consumption patterns, food production would have to increase by 70 percent in order to feed the extra mouths, and demand for meat protein is projected to double. A major global trend today is the substantial growth and expansion of food animal populations due to the growing demand for protein from animal sources in human diets. In 2011 there were more than 24 billion food animals produced to help feed more than 7 billion people.

The Food and Agriculture Organization of the United Nations describes a new agricultural revolution and predicts that there will be a demand for a 50 percent increase in animal proteins over the next 1 to 2 decades. This remarkable agricultural revolution is based on the relative increase in wealth in many developing countries and the subsequent change in diets toward more animal products.

In addition to the need to produce an unprecedented number of food animals, this livestock revolution is driving profound changes in how livestock and poultry are produced, where they are produced, and the environmental consequences of this phenomenon. While literally billions of food animals will need to be produced using more integrated, larger, and specialized production systems, they will be reared and produced to a progressively greater extent in the developing countries of the world. These facts point to the need for veterinarians to play a greater role in helping to tackle global challenges, through improving animal health and in helping society understand the broader challenges of sustainable animal agriculture. This includes the need for environmental protection, good

animal welfare and public health education on healthy levels of dietary meat intake. As part of this phenomenon, there will be an expansion of grazing lands and more grain crops will need to be produced to feed these animals. Major issues including environmental sustainability, nutrient management, and an enlarging carbon footprint are growing and emergent challenges.

The growth in companion animals and recreational animals such as horses is also on the rise. Exotic animal pets are popular, and the illegal export and movement of these animals is a growing problem both because of human exposure to potentially new zoonotic agents and because of the emergence of novel diseases in new animal species. HIV/AIDS, malaria, and tuberculosis represent the major infectious diseases today. However, all three are likely to have had their origin in animal populations and subsequently adapted and become capable of person-to-person transmission.

C- Environmental domain

Our environment has continued to undergo changes, mostly to the detriment of our various ecosystems. The threat to the health of our environment is largely anthropogenic. Over the last 50 years, human activities – particularly the burning of fossil fuels – have released enough carbon dioxide and other greenhouse gases to trap additional heat in the lower atmosphere and affect the global climate. In the last 130 years, the world has warmed by approximately 0.85 °C. Each of the last 3 decades has been successively warmer than any preceding decade since 1850. Sea levels are rising, glaciers are melting, and precipitation patterns are changing. Extreme weather events are becoming more intense and frequent. While we are concerned about the sustainability of the environment itself, we also understand more clearly that diseases, too, are often a result of environmental disruption and changes.

The increasing incidence of Lyme disease is very much the result of human changes to the environment, especially on the East Coast of the United States. Forests have been reduced and fragmented and development has chased off predators; thus, an expanding population of deer and white-footed mice helped preserve both Ixodes ticks and the Borrelia organism. The disease consistently spills over into human populations sharing these new ecological sites. When ecosystems are disrupted along with our natural biodiversity, we often remove the protective effects of multiple species.

Some scientists have referred to today's era as part of Earth's sixth mass extinction, with unprecedented loss of plant and animal species largely due to disruptive human activities. Therefore, there is a rising concern that the protective and buffering effect of biodiversity is being lost and microbes could enter directly into people without first infecting other species that are no longer available as hosts. Habitat disruption and alteration of land use also affect vector populations. An additional concern is climate change and the potential of changing the geographic range of disease vectors. There are more than 3 000 species of mosquitoes, some of which are very efficient and effective disease transmitters. Historians estimate that mosquitoes may be responsible for half the deaths in human history.

Malaria, yellow fever, and recently a serious dengue epidemic are vector-borne diseases. The animal disease "bluetongue", discovered recently and now found across much of Europe, may be a consequence of the expansion of the Culicoides (biting midge) vector due to warmer temperatures. In addition, Schmallenberg virus (SBV), an emerging disease affecting domestic ruminants in

Europe, is a newly found orthobunyavirus and likely transmitted by Culicoides vectors. These vectors seemingly have established new geographic niches, possibly due to warmer temperatures. Rift Valley fever has caused both animal and human epidemics in Africa after flooding rains have greatly increased the population of mosquitoes. Cholera, caused by Vibrio cholerae, may be associated with typhoons that flood Bangladeshi lowlands and produce a favorable environment for plankton growth and subsequent larger numbers of vibrio organisms that live off the plankton and then infect people. An epidemic outbreak of cholera in Haiti that followed a devastating earthquake appears to have been introduced into the water supplies by an infected aid worker from Asia.

Recent events have demonstrated that fungi are becoming greater global threats to agriculture, forests, and wild animals than was previously understood. Countless amphibians have been killed; some species have become extinct; and some food crops such as wheat, rice, and soybeans have all experienced serious fungal infections. One third of the world's amphibian population is globally threatened or extinct due to an epidemic of fungal infections. Increased global trade and travel, changing agricultural practices, and perhaps global warming are responsible for the increase in fungal infections and their geographic shift.

Two major animal crises—the profound decline in amphibian species and a disease outbreak in North American bats—have given us new cause for concern. Batrachochytrium dendrobatidis is a fungus whose spores survive in streams and ponds and is responsible for a tragic loss of biodiversity in Central and North America and Australia. Bat white-nose syndrome is caused by Geomyces destructans and has killed approximately 6 million bats in the United States. These fungi can persist in the environment and live outside their hosts for years. In addition, cryptococcal meningitis (Cryptococcus neoformans) is estimated to cause 1 million human infections annually, especially in immunocompromised populations. Cryptococcus gattii, which has spread into western Canada and the northwestern United States from Australasia, is a fungus that has infected people, domestic animals, marine mammals, and forests. This fungus has shifted in both its geographic location and ecologic niche. Scientists have been able to identify only a small percentage of the global fungal species. They are clearly part of the 21st-century convergence of people and animals in a changing environment. There is further speculation that fungi may adapt very well to globalization and now represent another emerging triple threat to health.

Nature supports many of our human endeavors. Forests help filter our water, bees and birds help pollinate our crops, and our many diverse animal species help serve as filters and buffers for infectious microbes, thus protecting people from exposure to potential pathogens.

The fundamental human threats to biodiversity include overexploitation of species, habitat destruction, and exotic species introduction (referred as the "evil trio"), have led to ecosystem disruptions causing alteration of disease transmission patterns. Adding pathogen pollution, global toxification, and global environmental change linked to climate (the "savage sextet") compound the pervasive biodiversity loss. Perhaps from these, the most insidious factor is climate change, which has a profound effect on all ecological processes including increased precipitation in some regions and drought in others; increased erosion of the coastal zone with rising sea levels; increased tsunamis, hurricanes, and

tropical storms; and the inability of many species to adapt to the relatively rapid changes in climatic regimes, potentially resulting in mass extinctions.

As we experience warmer temperatures across the globe, there is concern that the ranges and life cycles of vectors may change significantly and alter the exposure of humans to vector-borne and waterborne diseases. Our understanding of these dynamics gives us a new appreciation of the term "ecology of disease." Thus, if our natural world breaks down, our human-animal health can be negatively affected, often in ways we have never experienced.

D- Food safety or food born illness

Animal health and public health domains are even more connected today through our food systems and form an important interface with growing concerns. Food imports and exports represent one of the world's largest trade and commercial markets. Current Global food systems are remarkable but also add to the risk of transporting microbes. Microbes can move worldwide faster than their incubation periods, and the threat to both human-animal health is increasing, with food and water as potential vehicles for the dissemination of pathogens.

The CDC now estimates that there are approximately 48 million food-borne illnesses in the United States every year, resulting in 128 000 hospitalizations and 3 000 deaths annually. Although we lack similar global data, a rough extrapolation suggests that there could be as many as 1 billion such illnesses worldwide each year. Without question, the burden of food-borne disease represents a huge health care cost. Several food-borne diseases such as norovirus and hepatitis are transmitted directly from person to person with food as a common vehicle; however, many food-borne illnesses are zoonotic and are transmitted across domains. CDC studies have also demonstrated changing patterns of attribution. Plant-derived foods such as leafy greens, tomatoes, and sprouts have been implicated in more and more food-borne disease outbreaks. In the recent past, transmission has been linked to peanut butter, pizza, spinach, ice cream, cookie dough, pet food, melons, mangoes, peppers, and carrot juice. There is also concern about the concept of "stealth" vehicles in transmission.

There are numerous food ingredients that are often mixed in with foods, such as spices, that can be vehicles for transmission but are often not considered in outbreak investigations.

In addition to the traditional food-borne pathogens such as Escherichia coli and Salmonella, Campylobacter, and Listeria spp., new outbreaks often reveal new agents. The FoodNet System, which analyzes outbreaks, has revealed adenoviruses, sapoviruses, picobirnaviruses, and Saffold virus as potential pathogens. To further complicate our understanding of the safety of our food, transmission vehicles can change when microbes are given new opportunities. For example, the Nipah virus, first found as a zoonotic disease outbreak in Malaysia that killed pigs and people associated with them, has recently been found as a contaminant in date palm sap, a food source in Bangladesh. Pteropus fruit bats are the asymptomatic carriers. Trypanosoma cruzi is the parasite that causes Chagas disease and is usually transmitted to people via reduviid insects, yet it has recently been found in sugar cane juice in Brazil. There is a remarkable spectrum of foods and pathogens involved in food-borne illnesses and this is an ever-changing dynamic.

Produce is of growing importance as a vehicle for food-borne pathogens, yet animal reservoirs are often the origin of these

infections. One Health gives us the proper lens to view and better understand this linkage and, more importantly, to develop new insights for changing our interventions and prevention strategies. In many instances, ill people are the endpoint of a complicated epidemiological cycle and serve as indicator hosts; however, if we continue to focus exclusively on food-borne illness by responding to human outbreaks and just conducting retrospective analyses, we will miss the true sites of origin of these diseases and we will forgo critical prevention strategies in other domains.

One Health is a mindset that is proactive and preventive; it helps to shift our attention "upstream" to the ecological, animal, and environmental sources responsible for these illnesses and, therefore, helps us to identify the most effective points for the initiation of food safety actions.

1.5 Applications of One Health to Sustainable Development Goals (as defined by the United Nations)

The One Health approach can provide integrated and collaborative solutions to several important global health and sustainability issues.

The SDG, also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. Countries have committed to prioritize progress for those who are furthest behind. The SDGs are designed to end poverty, hunger, AIDS, and discrimination against women and girls. The creativity, knowhow, technology and financial resources from all of society is necessary to achieve the SDGs in every context. Adopting a One Health approach could help in achieving the SDGs by strengthening cross-sectoral collaboration and approaching problems with a preventive focus.

In fact, most of the seventeen (SDGs) could benefit from a strategic application of the One Health approach. (Table 1).

Figure 1. Sustainable Development Goals as defined by the United Nations

Table 1. Sustainable Development Goals as defined by the United Nations and their relevance to One Health

Sustainable Development Goals	Potential Benefits of One Health Approach
No Poverty	Improved crop and livestock production; better understanding of how climate change will affect food security.
Zero Hunger	
Good Health and Well-being	Understand risk factors of disease emergence; vector control; and relevance of animal reservoirs of disease.
Quality Education	Indirect relevance.
Gender Equality	
Clean Water and Sanitation	8 Safe and affordable drinking water requires investment in infrastructure, providing sanitation facilities, and encouraging hygiene.
Affordable and Clean Energy	Investing in solar, wind and thermal power, improving energy productivity
Decent Work and Economic Growth	Indirect relevance.
Industry, Innovation and Infrastructure	
Reduced Inequalities	
Sustainable Cities and Communities	Making cities sustainable especially in the developing world
Responsible Consumption and Production	Indirect relevance.
Climate Action	Recognize the importance of addressing climate change
Life Below Water	Protection of marine and coastal ecosystems from pollution.
Life on Land	Reducing the loss of natural habitats and biodiversity
Peace, Justice and Strong Institutions	Indirect relevance
Partnerships for the Goals	Integrate health, environmental control, energy, trade, business, and infrastructure systems to improve health.

Source: author's own elaboration.

1.6 One Health approach and prevention of zoonotic diseases

zoonotic diseases are commonly spread at the human-animal-environment interface – where people and animals interact with each other in their shared environment. Zoonotic diseases can be foodborne, waterborne, or vector-borne, or transmitted through direct contact with animals, or indirectly by fomites or environmental contamination.

A comprehensive literature review identifies 1 415 species of infectious organism known to be pathogenic to humans, including 217 viruses and prions, 538 bacteria and rickettsia, 307 fungi, 66 protozoa and 287 helminths. Out of these, 868 (61 percent) are zoonotic, that is, they can be transmitted between humans and animals, and 175 pathogenic species are associated with diseases considered to be `emerging'. The majority of emerging or reemerging infectious diseases originate in animals. In addition to the emergence of zoonotic pathogens, an estimated 20 percent of all human illness and death in the least developed countries are attributable to endemic zoonoses.

Several less enticing "lingering" zoonotic and other diseases also cause significant human and economic losses. These "neglected zoonoses" such as rabies, bovine-induced human tuberculosis, brucellosis, and echinococcosis are major causes of morbidity and mortality among poor people. They are also almost certainly the most under-reported diseases. More than 55 000 people die of rabies each year, and about 95 percent of these deaths occur in Asia and Africa. Of the 1.6 million annual human deaths from tuberculosis, between 2 and 8 percent is estimated to be of bovine origin.

The World Health Organization (WHO) reported that in 2005 alone 1.8 million people died from food-borne diarrheal diseases such as Escherichia coli, Campylobacteriosis, and Salmonellosis. The global impact of emerging and endemic zoonoses on both human and animal populations make their control and prevention a natural starting point for collaboration between human and animal health sectors.

Addressing zoonotic diseases at human – animal –environment domains.

Zoonotic diseases often fall between the foci of agencies and institutions that specialize in human health, veterinary services, and wildlife conservation. One Health's holistic understanding of ecology and our connectedness gives us new insights into the control and prevention of disease and improvement of our health. Much of the recent focus of One Health has been limited to emerging infectious diseases, yet the concept clearly embraces environmental and ecosystem health, social sciences, ecology, noninfectious and chronic diseases, wildlife, land use, antimicrobial resistance, biodiversity, and much more.

The Spanish flu pandemic that killed between 50 and 100 million people between 1918 and 1919 had largely faded from public memory by the late 1990s and early 2000s, when outbreaks of SARS and HPAI took place.

The emergence of influenza A(H1N1) in March 2009 provided still another reminder of the persistent risk of emerging infectious diseases of zoonotic. Understanding the mechanisms that underlie newly emerging and reemerging infectious diseases is one of the most difficult scientific problems facing society today. The natural reservoirs and transmission rates of most emerging infectious diseases are affected primarily by environmental factors, such as seasonality or meteorological events,

typically producing nonlinear results that are inherently unpredictable.

Owing to their transboundary nature, protection from highly infectious zoonotic diseases with pandemic potential is generally considered a global public good. Control of these diseases clearly fulfills the criteria that are defined by the International Task Force on Global Public Goods (Table 2).

Table 2. Activities for prevention and control of diseases at animal-human-ecosystem interface and their status as a public

Activity		Diseases of Low Human Epidemic Potential	Diseases of Moderate to High Human Epidemic Potential
1. Preparedness	• Risk analysis	Global	Global
	• Preparedness plan	National/Regional	Global
	• Animal vaccine development	Private	Global
2. Surveillance	• Public health, veterinary and wildlife	Global	Global
	• Diagnostic capacity	Global	Global
	• Managerial and policy arrangements	National	Global
3. Outbreak control	• Rapid response teams	National/Regional	National/Global
	• Vaccination	National/regional/private	Regional/global
	• Cooperation among human, veterinary, and wildlife services	National	Global
	• Compensation schemes	National/private	Global
4. Eradication plans		National/regional/private	Global
5. Research		National/regional/private	Global

Source: Contributing to One World, One Health: A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human- Ecosystem Interface 2008.

Wildlife and emergence of zoonosis.

Wildlife is defined as free-roaming animals (mammals, birds, fish, reptiles, and amphibians). The diversity of wildlife species is immense. Much has been studied about the implication of domestic or companion animals in the transmission of zoonotic diseases. But only little is known about the involvement of wild animals in transmitting these diseases. Throughout times, wildlife has always played a role in transmitting zoonotic diseases, for example, bubonic plague, a bacterial disease for which rats and fleas play a chief role in transmission, has caused substantial illness and death around the world since ancient times.

Since wild animals seem to be involved in the epidemiology of most zoonoses and serve as major reservoirs for transmission of zoonotic agents to domestic animals and humans, our discussion in this section will focus on emerging and re-emerging zoonoses. Emerging zoonosis is a zoonosis that is newly recognized, newly evolved, or has occurred previously but shows an increase in incidence or expansion in geographical, host or vector range.

At least 250 zoonoses were listed as emerging and re-emerging zoonotic diseases during the last 70 years. These diseases have been spread rapidly throughout the world with increasing incidence along with geographical range. Among 175 reported emerging diseases, 132 diseases are considered to be emerging zoonotic diseases. Another report estimated that about 60.3 percent of the emerging diseases can be categorized under zoonoses. Among them, 71.8 percent originated from wildlife. Examples of major emerging zoonoses include Avian Influenza, bovine spongiform encephalopathy (BSE), rotavirus infection, norovirus infection, Ebola, hantavirus infection, West Nile fever, canine leptospirosis, MRSA infection, cat scratch disease, Middle East respiratory syndrome (MERS), severe acute respiratory syndrome (SARS), and the most recent coronavirus disease 2019 (COVID-19). On the other hand, rabies, brucellosis, Japanese encephalitis, tuberculosis (M. bovis), and Schistosoma japonica infection are re-emerging zoonoses in many parts of the world.

The incrimination of wild animals in the epidemiology and transmission of zoonotic diseases is alarming. The emergence and re-emergence of these pathogens is dependent on their transmission patterns among wild animals, domestic animals, and humans. Factors impacting these processes are discussed in section 7-1.

For the prevention and control of emerging and re-emerging diseases including zoonoses, the collaborations and partnerships of multi sectoral personnel (One Health) e.g., wildlife biologists, veterinarians, physicians, agriculturists, ecologists, microbiologists, epidemiologists, and biomedical engineers to ensure favorable health for animals, humans, and our environment.

Zoonoses and One Health

One Health is directly linked in the prevention and control of zoonoses. The recommendations provided by "One Health" approach to prevent and control zoonoses are:

- Developing "Zoonotic Disease Unit" for betterment of the human and animal health agencies.
- Developing national strategy for "Zoonotic Disease Unit".
- Engaging leadership among multi-sectoral researchers and relevant personnel to

prioritize zoonotic disease research.

- Adopting veterinary public health policies with collaborators from other countries.
- Reviewing the zoonotic diseases on a regular (2–5 years) basis to address the emerging and re-emerging diseases through regular surveillance, epidemiological implementations, and laboratory diagnosis.

1.7 One Health and antibiotic resistance (a One Health challenge)

antibiotic resistance happens when germs like bacteria and fungi develop the ability to defeat the drugs designed to kill them. That means the germs are not killed and continue to grow. One reason for this occurring resistance is that natural resistomes are present in different environmental niches. These environmental resistomes function as an antibiotic resistance gene. Antibiotic resistance has the potential to affect people at any stage of life, as well as the healthcare, veterinary, and agriculture industries, making it one of the world's most urgent public health problems.

Antimicrobial Resistance is a complicating factor in the control and prevention of zoonoses. The use of antibiotics in animals raised for food is widespread and increases the potential for drug-resistant strains of zoonotic pathogens capable of spreading quickly in animal and human populations.

Given the important and interdependent human, animal, and environmental dimensions of antimicrobial resistance, it is logical to take a One Health approach when addressing this problem. This includes taking steps to preserve the continued effectiveness of existing antimicrobials by eliminating their inappropriate use and by limiting the spread of infection. Major concerns in the animal health and agriculture sectors are mass medication of animals with antimicrobials that are critically important for humans, such as third generation cephalosporins and fluoroquinolones, and the long-term, in-feed use of medically important antimicrobials, such as colistin, tetracyclines, and macrolides, for growth promotion. In the human sector it is essential to prevent infections, reduce over-prescribing of antimicrobials, improve sanitation, and improve hygiene and infection control. Pollution from inadequate treatment of industrial, residential, and farm waste is expanding resistomes in the environment. Numerous countries and several international agencies have included a One Health approach within their action plans to address antimicrobial resistance. Necessary actions include improvements in antimicrobial use regulation and policy, surveillance, stewardship, infection control, sanitation, animal husbandry, and alternatives to antimicrobials.

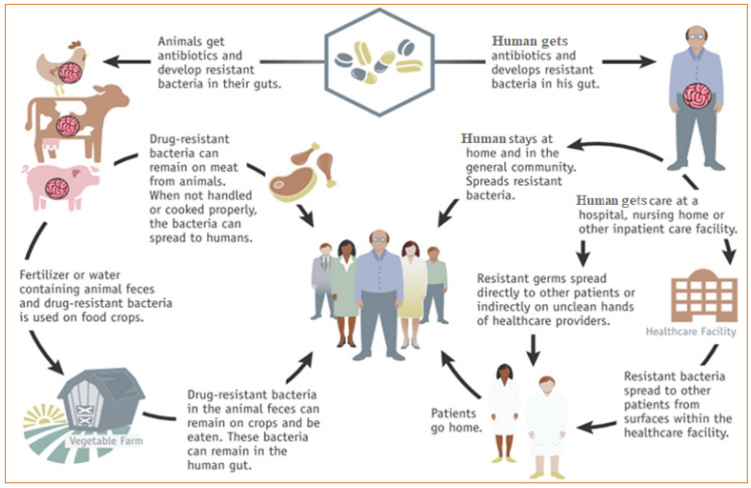
WHO has published guidelines aiming to help preserve the effectiveness of antimicrobials that are important for human medicine by reducing their use in animals. These guidelines present evidence-based recommendations and best practice statements on use of medically important antimicrobials in food-producing animals, based on the WHO List of Critically Important Antimicrobials for Human Medicine (WHO CIA List). These guidelines aim primarily to help preserve the effectiveness of medically important antimicrobials, particularly those antimicrobials judged to be critically important to human medicine and help preserve the effectiveness of antimicrobials for veterinary medicine, in direct support of the WHO global action plan. Recommendations and Best Practice Statements as suggested by WHO are summarized in (Table 3).+**7.1 One**

Table 3. WHO recommendations and best practice statements on the use of medically important antimicrobials in food-producing animals

Recommendations	
Recommendation 1: Overall antimicrobial use	• We recommend an overall reduction in use of all classes of medically important antimicrobials in food-producing animals.
Recommendation 2: Growth promotion use	• We recommend complete restriction of use of all classes of medically important antimicrobials in food-producing animals for growth promotion.
Recommendation 3: Prevention use (in the absence of disease)	• We recommend complete restriction of use of all classes of medically important antimicrobials in food-producing animals for prevention of infectious diseases that have not yet been clinically diagnosed.
Recommendation 4: Control and treatment use (in the presence of disease)	• We suggest that antimicrobials classified as critically important for human medicine should not be used for control of the dissemination of a clinically diagnosed infectious disease identified within a group of food-producing animals. • We suggest that antimicrobials classified as highest priority critically important for human medicine should not be used for treatment of food-producing animals with a clinically diagnosed infectious disease.
Best practice statements	
Best practice statement 1	• Any new class of antimicrobials or new antimicrobial combination developed for use in humans will be considered critically important for human medicine unless categorized otherwise by WHO.
Best practice statement 2	• Medically important antimicrobials that are not currently used in food production should not be used in the future in food production including in food-producing animals or plants.

Source: author's own elaboration.

Figure 2. Examples of how antibiotic resistance spread



Source: Centres for Disease Control and Prevention (CDC). 2013. ***Antibiotic resistance threats in the United States, 2013***. Atlanta, United States of America. Available at: www.cdc.gov/drugresistance/ threat-report-2013/pdf/ar-threats-2013-508.pdf.

1.8 One Health and multidisciplinary research.

It is clear that no one discipline or sector of society has enough knowledge and resources to prevent the emergence or resurgence of diseases in today's globalized world. Only by breaking down the barriers among agencies, individuals, specialties and sectors can we unleash the innovation and expertise needed to meet the many serious challenges to the health of people, domestic animals, and wildlife and to the integrity of ecosystems.

Responding to pandemic threats requires global cooperation and global participation. Influenza pandemics, for example, are an economic issue: the World Bank has suggested that a low-level pandemic could globally reduce production by almost 1 percent of gross domestic product, a moderate pandemic by almost 2 percent and a serious pandemic by as much as 5 percent, which would result in a serious economic recession. The growing globalization of health risks and the importance of the human-animal-ecosystem interface in the evolution and emergence of pathogens, suggests that the best solution appears to be a One Health approach.

A new social contract between science and society is the only way forward. To achieve this, communication of scientific discoveries and practices should improve drastically. The communication around vaccinations should also be intensified. Making scientific information available across traditional media such as newspapers remains a struggle and misinformation around scientific data persists.

To win the disease battles of the 21st Century while ensuring the biological integrity of the Earth for future generations requires interdisciplinary and cross-sectoral approaches to disease prevention, surveillance, monitoring, control, and mitigation as well as to environmental conservation more broadly. The World Bank urges the world's leaders, civil society, the global health community and institutions of science to:

1. Recognize the essential link between human, domestic animal and wildlife health and the threat disease poses to people, their food supplies and economies, and the biodiversity essential to maintaining the healthy environments and functioning

ecosystems we all require.

2. Recognize that decisions regarding land and water use have real implications for health. Alterations in the resilience of ecosystems and shifts in patterns of disease emergence and spread manifest themselves when we fail to recognize this relationship.

3. Include wildlife health science as an essential component of global disease prevention, surveillance, monitoring, control and mitigation.

4. Recognize that human health programs can greatly contribute to conservation efforts.

5. Devise adaptive, holistic and forward-looking approaches to the prevention, surveillance, monitoring, control and mitigation of emerging and resurging diseases that take the complex interconnections among species into full account.

6. Seek opportunities to fully integrate biodiversity conservation perspectives and human needs (including those related to domestic animal health) when developing solutions to infectious disease threats.

7. Reduce the demand for and better regulate the international live wildlife and bushmeat trade not only to protect wildlife populations but to lessen the risks of disease movement, cross-species transmission, and the development of novel pathogen-host relationships. The costs of this worldwide trade in terms of impacts on public health, agriculture and conservation are enormous, and the global community must address this trade as the real threat it is to global socioeconomic security.

8. Restrict the mass culling of free-ranging wildlife species for disease control to situations where there is a multidisciplinary, international scientific consensus that a wildlife population poses an urgent, significant threat to human health, food security, or wildlife health more broadly.

9. Increase investment in the global human and animal health infrastructure commensurate with the serious nature of emerging and resurging disease threats to people, domestic animals and wildlife. Enhanced capacity for global human and animal health surveillance and for clear, timely information-sharing (that takes language barriers into account) can only help improve coordination of responses among governmental and nongovernmental agencies, public and animal health institutions, vaccine / pharmaceutical manufacturers, and other stakeholders.

10. Form collaborative relationships among governments, local people, and the private and public (i.e.- non-profit) sectors to meet the challenges of global health and biodiversity conservation.

11. Provide adequate resources and support for global wildlife health surveillance networks that exchange disease information with the public health and agricultural animal health communities as part of early warning systems for the emergence and resurgence of disease threats.

12. Invest in educating and raising awareness among the world's people and in influencing the policy process to increase recognition that we must better understand the relationships between health and ecosystem integrity to succeed in improving prospects for a healthier planet.

1.9 One Health and legislation.

One Health is an approach to designing and implementing programs, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes". FAO is committed to promoting One Health in the food and agriculture sectors and to the protection of the human rights to health and to a healthy environment. This involves coordination across various sectors, ranging from plant and animal health, food safety, nutrition and biodiversity, to climate change, forestry and environmental protection. It also requires embedding the principles of gender equality, economic and social responsibility into FAO normative and operational capacity development activities.

To this end, FAO closely collaborates with the World Health Organization (WHO), the World Organisation for Animal Health (OIE), the UN Environment Programme (UNEP), other UN System entities and international organizations.

Legislation is a powerful means by which countries and regional organizations translate the One Health objectives into concrete, sustainable and enforceable rights, obligations, and responsibilities, paving the way for inter-sectoral collaboration. Legal areas involved in One Health in the food and agriculture sectors as suggested by FAO are summarized in (Table 4).

Table 4. Legal areas involved in One Health in the food and agriculture sectors

Legislation	Comment
Sanitary and phytosanitary measures	• influence the international trade in food and agriculture products and regulate the movement of pathogens associated with such trade.
Food safety and quality legislation	• Direct contribution to One Health. • The basis for governments to control the safety and quality of food products and prevents the transmission of food-borne diseases, including zoonosis.
Environmental protection legislation	Legislation concerning: • Degradation of ecological systems • Pollution control • Environmental impact assessment (EIA).
Conservation and sustainable use of biodiversity	Legislations aiming at preventing threats from: • Anthropogenic activities to biodiversity
Forestry, wildlife and fisheries legislation	Legislations ensuring: • Conservation and management of forests and their resources. • Halting the degradation of biodiversity.
Antimicrobial Resistance (AMR)	Essential legislations addressing: • The abuse, overuse, misuse and release into the environment of antimicrobials and resistant bacteria to minimize the development and spread of (AMR).

Source: author's own elaboration.

Module 2. One Health platform in Egypt

2.1 First One Health technical group established in Egypt (four way linking)

In November 2010, WHO, FAO and the OIE carried out a joint assessment mission to Egypt to identify key partners, national initiatives, current efforts, and existing operational tools and systems for the epidemiological and virological surveillance of influenza in both the public and animal health sectors. The team assessed the existing systems of data collection, traceability and exchange, and the reporting of influenza within the public and animal health sectors. This mission was the first step towards initiating the Four Way Linking Framework in Egypt.

The mission identified the major partners that should be included in a Four Way Linking Framework, including epidemiology and laboratory departments in the Ministry of Health and Population (MOHP) and the Ministry of Agriculture and Land Reclamation (MOALR).

The Four way linking describe the four institutes that start to meet and collaborate when Egypt reported Avian Influenza first human case and many outbreaks at animal sector.

The four way linking was descripting the ministry and laboratory at both animal and human sectore with Participants included representatives of the four main sectors and disciplines involved in the control of (HPAI) in Egypt – public health epidemiology (Epidemiology Unit, MOHP); public health virology (Central Public Health Laboratory [CPHL]); animal health epidemiology (General Organization for Veterinary Services [GOVS]); and animal health virology (Central Laboratory for Quality Control of Poultry Production [CLQP])

2.2 History of four-way linking establishment in Egypt

The first Four Way Linking workshop was held in Egypt, September 2011. Participants included representatives of the four main sectors and disciplines involved in the control of (HPAI) in Egypt – public health epidemiology (Epidemiology Unit, MOHP); public health virology (Central Public Health Laboratory [CPHL]); animal health epidemiology (General Organization for Veterinary Services [GOVS]); and animal health virology (Central Laboratory for Quality Control of Poultry Production [CLQP]) – in addition to academia (Cairo University). The workshop focused on risk assessment and the importance to individual institutions as well as overall national efforts to keep the flow of data collection, data linkage and support implementation of joint risk assessment (JRA).

Representatives of both the animal and human health sectors in Egypt acknowledged the importance of collaboration in the Four Way Linking Framework. Such cooperation will help to fill the gaps evident in data sharing and will improve communications and the flow of information necessary for an informed national risk assessment.

Following the workshop, action was taken to establish the Four Way Linking Task Force (Four Way Linking task force) and regular meetings have subsequently been conducted. This task force was the first technical One Health committee established in Egypt. The Four Way Linking task force meetings facilitate data sharing and performing a risk assessment of the HPAI situation.

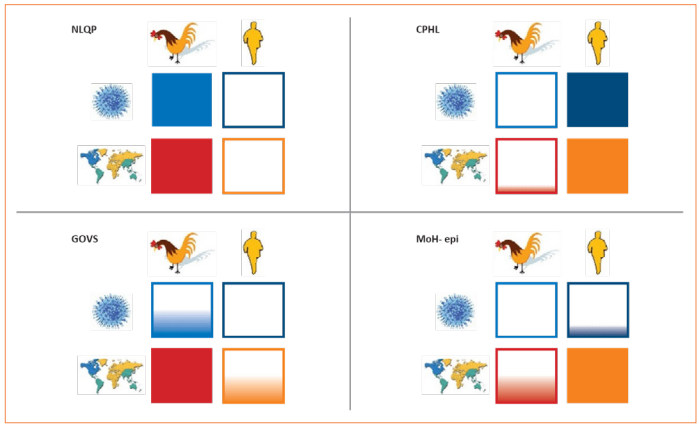
The members of the Four Way Linking task force worked in the epidemiology and surveillance administrations of the MOHP and the GOVS, the CPHL, the CLQP, WHO–Egypt and the FAO Emergency Centre for Transboundary Animal Diseases–Egypt (FAO–ECTAD–Egypt).

Since 2011, the Four Way Linking task force group has been working efficiently. the Four Way Linking task force serves as an official technical wing for policy decision-making processes on zoonotic influenza viruses. The Four Way Linking task force's role is critical in the absence of any One Health structure that could combine the efforts of the Ministries in charge of controlling Avian Influenza.

Each stakeholder was asked to describe their sources of epidemiological and virological information on influenza H5N1 in animals and/or people, the types of information received and its form, any analyses or syntheses produced in the institution, and onward transmission and dissemination of information and materials. Where appropriate, questions about control and policy were also addressed. From this information, a flow chart of the organizations and their linkages was produced, along with a summary of good practices, constraints, and gaps.

A schematic overview of where virological and epidemiological ( ) data were present in the animal health ( ) and the public health sectors ( ) was designed after on the basis of the stakeholders' feedback (Figure 3).

Figure 3. Mapping of the data distribution. the colored blocks represent the relative amount of data available to institutions of each functional stream: when data are available the block is filled, when data are absent the block is empty, the amount of filling represents the proportion of total data that are thought to be available



Source: Simona Forcella, Nasr El-Din El Tantawy, Yilma Jobre Makonnen, Amira Abdelnabi. 2015. *The development of a four-way linking framework in Egypt: An example of the FAO, OIE and WHO joint activities to facilitate national risk assessment*. France. OIE. 10.12834/VetIt.220.680.1.

With changing of disease situation and presence of global emerging diseases the expanding of Four Way Linking task force's was crucial beyond influenza to include other emerging diseases, such as Middle East respiratory syndrome coronavirus (MERS–CoV) and other zoonotic diseases of importance in the country. In addition, other partners from technical institutions have been added to the task force, including the following:

- Ministry of Environment (MOE)
- United States Naval Medical Research Unit (NAMRU-3)
- United States Centres for Disease Control and Prevention (CDC)
- Zoonotic disease departments in both the Ministry of Health and Population and the Ministry of Agriculture and Land Reclamation
- Animal Health Research Institute
- Veterinary Vaccine and Serum Production Institute
- Vaccine and Serum Research Agency (VACSERA)
- Central Laboratory for Evaluation of Veterinary Biologics.

The Four Way Linking task force has been approved by the Egyptian Government but has not been formally institutionalized. The effort started by institutionalizing the Four way linking task force 's function within the government as a One Health Technical Advisory Group (OH-TAG). This group would serve as a technical wing for the Ministerial National Supreme Committee for Control of Avian Influenza. The OH-TAG would be an expansion of the Four Way linking task force, with the addition of members with expertise in other zoonotic diseases from both public and animal health sectors. The Four Way Linking Framework targeted the following two aspects in understanding health threats at the human–animal interface:

1. information sharing and linkage among governmental public health and animal health sectors
2. Joint Risk Assessment. A task group responsible for JRA involving the MOHP and MOALR was established. This task group was created by the Four Way Linking task force, demonstrating the commitment of both Ministries to conducting regular JRAs.

2.3 Operationalization of the national One Health platform in Egypt (to be function)

Operationalization of National One Health Platform in Egypt that mean to be function, the overall roles and responsibilities of those involved should be agreed upon and committed to by all participating entities. This platform's aim is to provide a comprehensive, strategic approach to concurrent and future health challenges involving those facing public and animal health, and environmental impacts. National authorities play a key role in devising, financing, and implementing planned interventions.

The successful establishment and operationalization of the National One Health Platform in Egypt therefore contribute significantly to the overall goal of improving public health, food safety and security, and the livelihoods of poor farming communities. The National One Health Platform in Egypt assist in the mitigation of disease risks. This mitigation achieved through enhanced collaboration among all the relevant sectors, especially between the veterinary, environment and human medical professionals focused on addressing critical needs.

The platform improves the sharing of information and data, knowledge exchange and collaboration among all sectors, and will increase efficiency in the use of resources through better multisectoral, One Health coordination, collaboration and communication. Harmonization among sectors can result in coherence in communication approaches, and integrated messages, specifically supporting faster and better coordination during crises.

The continuous collaboration will lead to a reduction in the likelihood of zoonotic disease emergence, decreased uncertainty in disease mitigation decisions and increased accuracy in the measurement of societal benefits through the integrated valuation of the impact of disease mitigation on human and animal health.

Role of the national One Health platform in Egypt

- provide technical assistance in all human–animal–environment health-related issues, guiding decision-makers in issuing policies.
- refine strategies and interventions related to disease mitigation and control measures.
- facilitate and harmonize preparedness and response plans among all partners across all relevant sectors.
- work with various projects' technical groups on specific activities.
- assist in finding solutions to overcome the challenges facing disease control strategies and to communicate these solutions to more senior decision-makers in related Ministries.
- identify ways to leverage existing programmes and capacity building efforts to have a major impact at a minimal cost.
- ensure regular data collection and information sharing by facilitating effective communication and coordination between all stakeholders.
- devise adaptive, holistic and forward-looking approaches to the prevention, surveillance, monitoring, control and mitigation of endemic and emerging diseases that fully account for the complex interconnections among species.

There are different degrees to which One Health can become institutionalized and a number of mechanisms to achieve this institutionalization (e.g. guidelines, legislation, regulation, policy and administrative frameworks).

The national One Health platform in egypt using the existing structure consists of the following

1. A technical One Health group called the One Health Technical Advisory Group (OH-TAG, previously Four Way Linking Task Force). As a technical group, the OH-TAG responsible for develop new tools and strategies for controlling zoonotic diseases, review and approve JRAs, ensure a system for information sharing, and supervise and review joint epidemiological reports. The group's duties will be performed through sub-groups of technical personnel within the relevant Ministries. Facilitators of the OH-TAG have an important role in ensuring that the collaboration is fruitful and results in joint actions, drafting the agenda for meetings, recording the minutes of those meetings, and providing technical support when needed.

2. The Ministerial National Supreme Committee for Control of Avian Influenza is planned to have its remit extended to cover all zoonotic diseases/One Health issues, and its membership will include representatives of all relevant Ministries. This Supreme Committee is the highest level in the One Health platform and its role will relate to policy and endorsement of actions among all relevant Ministries. Currently, resources are not targeted towards a One Health platform since no actual working structure exists. The mechanism of resource mobilization for the implementation of One Health policies will be guided by the Ministerial National Supreme Committee, which will include a representative of the Ministry of Finance.

The transformation of the Four Way Linking Task Force to the OH-TAG is the first action that has been taken towards institutionalizing One Health in Egypt. The group Focal Points (i.e. One Health Officers) from all concerned entities, with the objective of facilitating collaboration and cooperation among governmental agencies, academic institutions and health science professions The aim is to help with the assessment, treatment and the prevention of zoonotic disease transmission. The OH-TAG differs from the Four Way Linking Task Force in that the goal is to institutionalize the OH-TAG. Also, the OH-TAG's scope of collaboration could be expanded to encompass all zoonotic and emerging diseases of concern in Egypt in addition to other One Health issues, such as antimicrobial resistance and food safety.

Current members and structure of the One Health technical advisory group (OH-TAG) and One Health technical working group (OH-TWG)

The group could consist of representatives of the Ministries engaged in One Health (Ministry of Health and Population [MOHP], Ministry of Agriculture and Land Reclamation [MOALR], Ministry of Environment [MOE]), with the possibility of other Ministries being added, upon request, as needed. The OH-TAG could be co-chaired by representatives of the MOHP and the MOALR as the main responsible Ministries.

- **Official/government members:**

1. Representatives of the MOHP (preventive [Epidemiology and Disease Surveillance Unit, zoonotic diseases administration], Central Public Health Laboratory)

2. Representatives of the MOALR (preventive, zoonotic diseases [General Organization

for Veterinary Services], Animal Health Research Institute

3. [National Laboratory for Quality Control on Poultry Production, Virology Department, others], Central Laboratory for Evaluation of Veterinary Biologics, the Veterinary Serum and Vaccine Research Institute)

4. Representatives of the MOE (relevant departments)

5. Representatives of other entities, such as universities/research organisations, the private sector, etc.

- **Observers (international support):**

1. Representatives of the United States Agency for International Development (USAID)

2. Representatives of the Centres for Disease Control and Prevention (CDC)

3. Representatives of the other development partners

- **Facilitators:**

1. Representatives of the Food and Agriculture Organization of the United Nations Emergency Centre for Transboundary Animal Diseases–Egypt

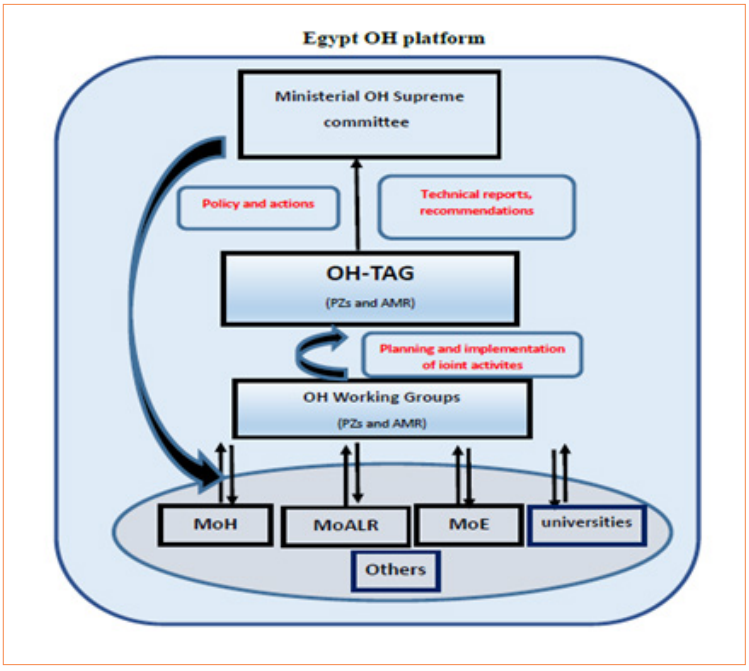
2. Representatives of the World Health Organization Country Office, Egypt (WHO Egypt)

3. Representatives of other organizations

One Health technical working group (OH-TWG)

The working groups will operate under the umbrella of the One Health Technical Advisory Group (OH-TAG) and will constitute a small group of subject matter specialists on rabies and AMR. each TWG members will be drawn from the Ministry of Agriculture and Land Reclamation, Ministry of Health and Population, Ministry of Environment, Cairo University, WHO and FAO.

Figure 4. Proposed governance structure



Source: author's own elaboration.

Terms of reference of the (OH-TAG)

- Sustain a mechanism for coordination and regular information sharing among partners to facilitate preparedness and/or response to potential diseases of public health or animal health concern and keep monitoring to ensure that a One Health coordination mechanism is in place.
- Ensure mutual collaboration and cooperation between all Ministries involved at all levels.
- Identify priority zoonotic diseases for the country and update the list based on changes in the epidemiological situation.
- Provide technical recommendations related to One Health activities (zoonotic diseases, antimicrobial resistance, etc.) to the Ministerial National Supreme Committee for Control of Avian Influenza.
- Provide technical assistance in reviewing, developing and regularly updating joint strategies for zoonotic diseases control.
- Provide technical recommendations for Ministries on zoonotic disease surveillance, prevention and response.
- Provide technical assistance to implement collaborative research on zoonotic diseases in order to provide evidence for intervention and policy formulation.
- Design the scope of the risk assessment for zoonotic diseases of concern (e.g. highly pathogenic Avian Influenza, Middle East respiratory syndrome coronavirus [MERS–CoV], any other emerging diseases) and guide its development.
- Issue a quarterly epidemiological report on major zoonotic diseases with epidemic potential (Avian Influenza, MERS–CoV, any other emerging or re-emerging disease).

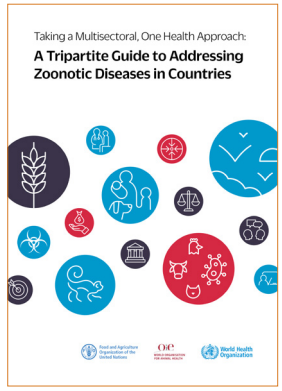
Module 3. One Health approach translated into specific technical activities

3.1 Tripartite Zoonoses Guide (TZG)

In 2019, the Tripartite organizations – the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE), and the World Health Organization (WHO) – developed the *Tripartite Zoonoses Guide (TZG)*, which was the summation of a global effort of more than 100 experts worldwide to provide guidance and explain best practices for addressing zoonotic diseases in countries. This includes supporting countries in understanding national contexts and developing capacities for strategic technical areas.

Currently, practical common approaches, operational tools and measures to combat zoonoses to support multisectoral and national collaboration are insufficient. In recent years, various regional initiatives, vigorously carrying out advocacy actions for the intersectoral collaboration approach, are developing, including, the Regional Strategy for Health Security and Emergencies 2016-2020 and the concept note of the FAO-OIE-WHO tripartite advocating the One Health approach which emphasizes the need for collaboration between these three organizations and other stakeholders in order to operationalize the One Health approach.

The TZG) has been jointly developed by the FAO, OIE, and WHO to support countries in taking a multisectoral, One Health approach to address zoonotic diseases. It provides principles, best practices and options to assist countries in achieving sustainable and functional collaboration at the human–animal–environment interface. Taking a multisectoral, One Health approach is necessary to address complex health threats at the human–animal–environment interface, such as rabies, zoonotic influenza, anthrax, and Rift Valley fever. Such zoonotic diseases continue to have major impacts on health, livelihoods, and economies, and cannot be effectively addressed by one sector alone. By using the TZG and its associated operational tools, countries can build or strengthen their national capacities in:



1. Multispectral and One Health coordination
2. Mapping country context
3. Strategic planning and emergency preparedness
4. Surveillance for zoonotic diseases and information sharing
5. Coordinated investigation and response
6. Joint risk assessment for zoonotic disease threats

7. Risk reduction, risk communication, and community engagement
8. Workforce development

Options for monitoring and evaluating the impact of these activities are included allowing countries to make improvements in their zoonotic disease frameworks, strategies and policies. Moreover, taking the One Health approach presented in the TZG helps countries to make the best use of limited resources and reduces indirect societal losses, such as impacts on livelihoods of small producers, poor nutrition, and restriction of trade and tourism.

By working together and collaboratively, our global health systems are improved in a sustainable way ensuring an efficient prevention of the global health risks.

3.2 Joint risk assessment for zoonotic disease threats

In this context, FAO, OIE and WHO are working together to address health risks at the human–animal–environment interface and are developing global strategies and standard tools to ensure a consistent and harmonized approach worldwide. Among these standard tools is the recent published guide "A Tripartite Guide to Addressing Zoonotic Diseases in Countries through the multisectoral One Health approach" associated with other operational tools including standard tool.

Three Operational Tools (OTs) have been developed to support national staff in these efforts: (1) the Multisectoral Coordination Mechanism OT (MCM OT), (2) the Joint Risk Assessment OT (JRA OT), and (3) the Surveillance and Information Sharing OT (SIS OT). These tools can be used independently or in coordinated efforts to support national capacity for preparedness and response, ultimately linking to existing international policies and frameworks, and supporting efforts for global health security. Specifically, the JRA OT provides additional support on the area of risk assessment to countries implementing the TZG.

Zoonotic diseases, classified as either endemic or emerging, pose risks to both animal and public health. Activities to identify, assess, manage and reduce risks from zoonotic diseases benefit from coordination and collaboration between ministries and other agencies within a country that are responsible for various aspects of human–animal–environment health.

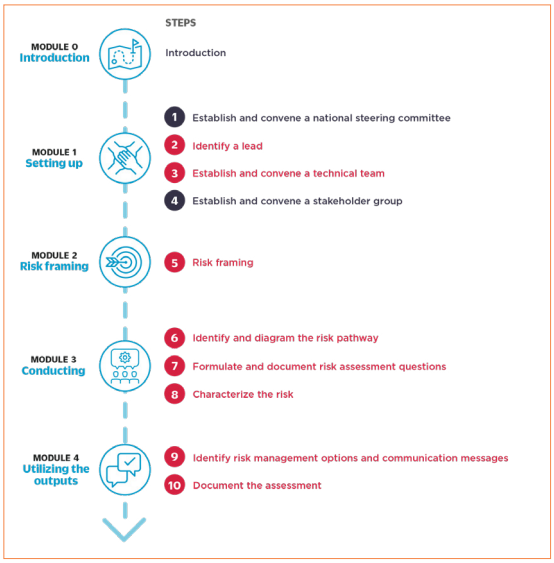
Although it is important for the human–animal health, and other sectors to conduct their own assessments to manage risks within the context of each sector, bringing together national information and expertise from all the relevant sectors to jointly assess health risks from zoonotic disease is necessary to fully understand and manage shared risks at the human–animal–environment interface. When involved sectors contribute data, knowledge, and expertise to the assessment, the amount and quality of information available to estimate risks increases significantly as does the validity of the assessment itself.

The success of a joint risk assessment (JRA) depends on effective communication among the sectors throughout the process, ideally leading to a consensus1 on the outcome of the assessment and production of a joint or aligned assessment document. The JRA process is normally iterative (repeated

periodically), so regular exchanges between sectors fosters intersectoral understanding of the perceptions, needs, mandates, and constraints of all involved sectors.

JRA includes discussion on risk management options and communication needs (risk analysis), and provides recommendations. This allows decision-makers to build and implement science-based risk management measures and communication messages aligned between sectors or implemented jointly. The 10 steps of the joint risk assessment (JRA) process divide into 4 modules (Figure 5.). This allows different participants to be included in various modules of the JRA.

Figure 5. Modules and steps of joint risk assessment



Source: WHO, FAO, OIE, 2020. *Joint Risk Assessment Operational Tool (JRA OT) - Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries.* Geneva, WHO. https://iris.who.int/bitstream/handle/10665/340005/9789240015142-eng.pdf.

In Egypt, the JRA workshop is being coordinated by the Ministry of Health (MOH), Ministry of Agriculture and Land Reclamation (MOALR), and Ministry of Environment (MOE), along with FAO and WHO county offices. The first JRA workshop in Cairo organized "from 5th to 7th October 2020", which benefitted 47 One Health practitioners drawn from the human–animal–environment health sectors. Followed by a step-down training organized for JRA from 5 to 8 July 2021, to expand the national capacity using "Joint Risk Assessment" tool, to support the country to master the use of this tool, and take concrete measures to combat zoonotic diseases. The step down was involving 17 facilitators in addition to 23 subnational officers from relevant ministries MoPH, MoALR and MoE from Fayoum and Qaliobia involved in Avian Influenza activities and act as JRA technical experts. The workshop enabled health experts to jointly assess Avian Influenzas and brucellosis as selected priority health hazards, while being trained on the use of the JRA tool for assessing the risk level of other priority health hazards in the future. The final two JRA reports with recommendations including risk management and communication developed and disseminated among the relevant ministers.

3.3 One Health Zoonotic Disease Prioritization (OHZDP)

The Centres for Disease Control and Prevention (CDC) developed the One Health Zoonotic Disease Prioritization (OHZDP) process which utilizes a multisectoral, One Health approach to prioritize zoonotic diseases of greatest concern for One Health collaboration. The OHZDP process utilizes mixed methods approaches, is scalable to use at subnational, national, and regional levels, and is locally adaptable. The OHZDP process enables a country or region to bring together representatives from human–animal–environment health sectors and other relevant partners to prioritize zoonotic diseases of greatest concern that should be jointly addressed by human–animal–environment health sectors. Additionally, next steps and action plans for addressing the priority zoonotic diseases will be developed jointly across all sectors using a multisectoral, One Health approach.

During the OHZDP workshop, participants will finalize an initial list of zoonotic disease for prioritization, develop criteria and questions, weight the criteria, finalize a priority zoonotic disease list, and develop recommendations for next steps and action plans for the priority zoonotic diseases. The government of Country has the option to request a 2-day facilitator training to allow national representatives to use the OHZDP process and facilitate the country's workshop; this will also allow Country to have the capacity to conduct future workshops or to use this tool to establish other disease priorities.

After getting a high-level commitment from all side, the process will require a minimum of 60 days to prepare for a two-day in-country workshop. Preparation includes collecting information and data on zoonotic diseases of concern to human–animal health in order to prepare a list of emerging and endemic zoonoses for prioritization during the workshop.

During this period we need the following:

- Identify core planning team
- Identify and share list of zoonotic diseases from each sector (hiring consultants)
- Generating one list of zoonotic diseases for Egypt
- Conduct country specific Literature Review for the listed diseases (around three working months) through a consultant
- Identify voters (Max 12, 4 voters from each sector)
- Identify and train the facilitators by the core planning team
- Identify advisors (WHO- FAO- Academia)
- Conduct facilitators training course involving national counterpart, FAO and WHO staff who will assist during the country workshop.

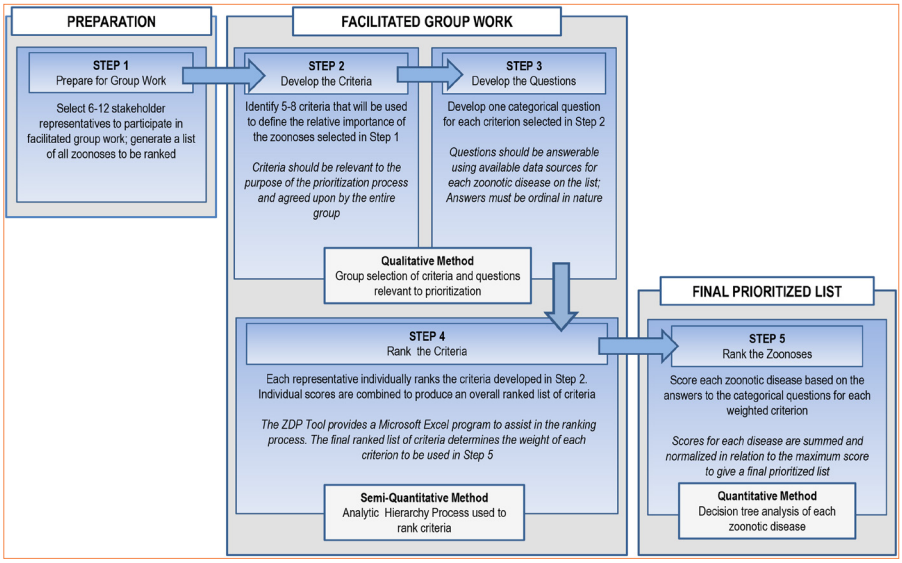
There are three types of workshop participants: facilitators, voting members, and advisors. Facilitators represent government staff from human–animal–environment health sectors who will be responsible for facilitating the OHZDP workshop. Voting Members are government staff whom equally represent the sectors actively involved in zoonotic disease prevention and control. Advisors are key partners and stakeholders that can support the final priority zoonotic disease list and post-workshop collaborative activities. **The outcomes of the OHZDP process are:**

- Prioritized list of zoonotic diseases of greatest concern that are agreed upon by all sectors working at the human–animal–environment interface.

- Discussions about next steps and action plans for identifying areas for multisectoral, One Health engagement for the prevention and control of the prioritized zoonotic diseases
- Understand the roles and responsibilities of other sectors working at the human–animal–environment interface
- Gathering One Health stakeholders together to continue enhancing One Health networks
- Final report highlighting outcomes from the workshop to advocate for One Health priorities

For more information on the OHZDP process, please U.S. CDC's One Health Office's webpage on the OHZDP Process.

Figure 6. Stages and steps of One Health Zoonotic Disease Prioritization process developed by centres for disease control and prevention (CDC)



Source: Cassidy L. Rist, Carmen S Arriola, Carol Rubin. 2014. *Prioritizing Zoonoses: A Proposed One Health Tool for Collaborative Decision-Making.* US. PubMed. 10.1371/journal.pone.0109986.

3.4 Antimicrobial Resistance (AMR) - national action plan

In 2015, WHO developed Global Action Plan (GAP) on Antimicrobial Resistance and called upon, through a Resolution of the World Health Assembly (WHA68.7) all countries to develop their respective *National Action Plans (NAP)* in alignment with GAP before May 2017. The Global Action Plan on AMR provides a broad framework for combating AMR. GAP advocates One Health approach for combating AMR thus involving animal health and environmental areas also in these global efforts. A large number of important institutions, organizations and agencies actively worked together in developing the NAP to ensure proper implementation.

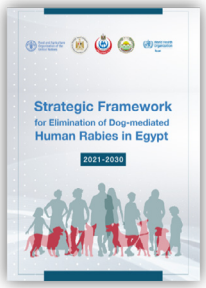
The Operational Plan to implement NAP has identified various activities that need to be carried out by different sectors in a time bound manner to meet the targets set in this NAP. A monitoring and Evaluation (M&E) Plan has also been proposed to keep track of the progress made and modifying the operational plan, if needed.

3.5 Strategic framework for elimination of dog mediated human rabies in Egypt

Rabies is a zoonotic disease, which can be transmitted to humans by animal bites or scratches, mainly dogs. Globally the estimated number of deaths caused by human rabies is 65 000 cases annually. The disease is still common in different countries with rabid dogs responsible of 99 percent of human rabies.

In Egypt, rabies and animal bite incidents are both an important public health issue. The Ministry of Health and Population (MoHP) offers PEP free of charge at more than 300 centres all over the country. Animal bites is increasing annually with enormous economic burden due to costs of PEP beside other losses related to lost working days, consumed resources, and sometimes related human disabilities or even deaths.

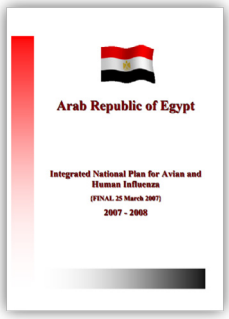
These were the drivers for development of the joint *Strategic Framework for elimination of dog-mediated human Rabies in Egypt* through a consultative process involving key stakeholders sharing actively in prevention and control of rabies in Egypt. It is a result of joint work with effective participation of representative from relevant organizations and institutions who shared their valuable experience which was essential to get proper vision of the problems and set priorities for actions.



3.6 Integrated national plan for avian and human influenza

The *Integrated National Plan for Avian and Human Influenza* has developed in response to the rapid spread of Avian Influenza (in particular H5N1) in 2007 in Egypt. While Egypt has been dealing with Avian Influenza management in the animal health sector for some three years, the growing concern that the H5N1 virus might mutate into a human pandemic virus has generated the need for more comprehensive planning that combines efforts in both animal and human health sectors with more broad inter-sectoral planning to help prevent, prepare for and respond to a possible pandemic.

The Integrated National Plan is based on avalible information from relevant sectors, including MOA and MOHP plans, as well as the Ministry of Defense and the Information and Decision Support Centre in the Prime Minister's Office. The plan was multispectral and multidiscipline comprehensive in terms of broad sectoral coverage and general activity categories but not in terms of defining the complete set of actions, and corresponding resource requirements, to manage Avian and Human Influenza. The document reveal an excellent example of collaboration between various sectors during the Avian Influenza crisis 2006.



Module 4. One Health practical sessions

Part 1. One Health concept

Zoonotic diseases commonly spread at the human-animal-environment interface, where people and animals interact with each other in their shared environment. Health issues at this interface cannot be effectively addressed by one sector alone. Dealing with these risks requires integrated action from both the human–animal health sectors as well as from the environmental sector, in addition to support and consultation from other relevant sectors from different organizations or health-related sectors or disciplines. This multi-sector approach is referred to as 'One Health'.

1. What is the definition of One Health? In what are other areas does a One Health approach fit?	2. What are the expected benefits of an effectively-implemented One Health approach for zoonotic disease control and prevention?
One Health is a collaborative, multidisciplinary, and multi-sectoral approach that can address urgent, ongoing, or potential health threats at the human-animal-environment interface at different levels. This approach ensures balance and equity among all relevant sectors and disciplines. In addition to addressing zoonotic diseases, a One Health approach facilitates initiatives that deal with antimicrobial resistance, food safety, vector-borne diseases, and environmental contamination or climatic changes.	1. Efficient coordination and communication between all relevant sectors, i.e.: • All sectors understand their specific roles and responsibilities. • All sectors have the information they need. • Human and financial resources are effectively used and equitably shared. • Gaps in infrastructure, capacity and information are identified and addressed jointly. 2. Decisions are based on accurate and shared assessments of situations. 3. Responses to zoonotic disease events and emergencies are timely and effective. 4. Accountability to each other and to decision makers ensures action by all sectors.

Part 2. Understanding national context

Different organizations and institutions have developed their own methods and procedures to guide their respective countries towards the establishment and implementation of a multi-sectoral, One Health approach.

However, these methods or procedures still need to be adapted to the context of each respective region or country. Such initiatives cannot be achieved without understanding both the basic concepts of a One Health approach and considering the country-specific or regional context and priorities.

Understanding country context includes understanding the national strategic orientation or direction, identifying stakeholders, and clarifying existing priorities. Furthermore, having a full picture of the available infrastructure and how to make proper use of it can facilitate more impactful and sustainable activities.

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 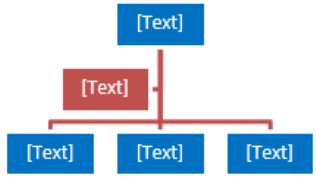
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• Meetings, workshops, and training
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• 4-way link for Avian Influenza
• Rabies post-exposure prophylaxis guidelines
• Draft national strategy for elimination of rabies by 2030
• Draft One Health strategic framework</td></tr>
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Part 3. Prioritisation of zoonotic diseases and related activities

Prioritising zoonotic diseases and agreeing on which to work collaboratively is essential and must be done jointly by all relevant sectors using a multi-sectoral, One Health approach. It is also necessary to prioritize associated technical activities and ensure that they are clearly set with assigned roles and responsibilities.

8. Do you think that setting zoonotic disease priorities is essential? Please clarify.
• Strengthening linkages between various stakeholders in the field of zoonosis from human, animal, and environmental health sectors with other relevant partners, on the grounds of trust, transparency, and equity. • Supports the formulation/strengthening of multi-sectoral, One Heath coordination, collaboration, and communication mechanisms. • Reflection of the local context – national or subnational – as a flexible and adaptable process taking into consideration criteria relevant to the country under observation. • Provides real-time, precise results that guide decision makers, such as a list of priority zoonotic diseases, next steps and the associated action plan. • Proper installation and adequate use of limited resources to achieve proper control and prevention of priority zoonotic diseases.

9. What are the criteria that should be considered when prioritising zoonotic diseases in a given country?	**10. Using a multi-sectoral One Health approach, what are the specific technical activities for collaboration and coordination that should be addressed in the process of control and prevention of zoonotic diseases?**
• The epidemiological situation • The severity of disease • The availability of effective control strategies • The potential to cause an epidemic or pandemic in humans or animals • Social and economic impacts • Bioterrorism potential	• Strategic planning and emergency preparedness • Surveillance and information-sharing • Coordinated investigation and response • Joint risk assessment of zoonotic disease threats • Risk reduction, risk communication, and community engagement • Workforce development

Part 4. Brucella and One Health

At the end June 2021, the public health team conducted a visit to a fever hospital in governorate (x). Active surveillance was done with initial figures showing an increase in the number of patients suffering from a variety of symptoms including fever, back pain, myalgia, and generalized body pain. A few cases presented with symptoms of nausea, high fever & vomiting, chills, and rigors.

Most of the cases were treated as outpatients with a mix of antibiotics, and an adequate level of recovery was observed, but 3 cases are still hospitalized with severe symptoms.

11. Is this observation of public health concern that necessitates further action?Why?	
• Yes, Based on the above scenario there are more cases occurring than expected in a defined period.	
12. At this point in time, what additional response are you going to request from the local health authorities? Data analysis for a clear picture of the situation, lab test results, patient interviews, immediate actions, etc.	**13. Could this outbreak be a result of a zoonotic disease? If so, which authorities should be notified? Should they join the investigation team?**

• Disaggregation of cases by time, person, and place to either confirm or exclude the possibility of an outbreak.
  • **Time:** Onset of cases: gradual or sudden, peak.
  • **Person:** Number of people affected, severity of illness, vulnerable groups.
  • **Place:** Geographical distribution of cases.
• Review of the case investigation form to identify possible risk factors.
• Preliminary diagnosis and differential diagnosis.
• Laboratory test results.
• Interviewing hospitalized patients may be recommended in the case of incomplete data.
	• Yes, it could be a result of a zoonotic disease.
	• In this case, different authorities should join the investigation team. These can include local veterinary authorities, the local environmental agency, and local administrative authorities. They must be contacted to raise this issue and verify if there really are reports of morbidities or mortalities in animals.
	• If confirmed, human–animal reports will be studied for possible linkages.

It was raised by a relative of one of the patients that a few deaths and abortions were reported in livestock in the area where they live.

Part 5. Brucella and One Health (cont.)

Reviewing lab records, interviewing hospitalized patients and noting down a detailed history of events, as well as carrying out further investigations revealed that Brucella was the cause of the reported cases. Brucellosis is a priority zoonotic disease in Egypt and is included in the National Disease Surveillance System. It is also known as 'Malta fever' or 'Undulant fever'. Its onset may be sudden or gradual, and it is characterized by a continuous, intermittent, or irregular fever. The infection is almost invariably transmitted by direct or indirect contact with infected animals and animal products. It affects people of all age groups and genders.

As a result of this diagnosis, public health authorities immediately notified senior veterinary authorities at the central level and a joint investigation team was mobilized.

14. Describe the composition of a joint investigation team, and the roles and responsibilities that are required to control this situation.
The team consists of epidemiologists, laboratory specialists from both public health and veterinary authorities, physicians, veterinarians, food safety professionals and environmental specialists. Health education and communication officers and local administrative authorities can also be called upon. Collectively as a team: 1. Review the evidence for an outbreak and the results of epidemiological and laboratory investigations. 2. Identify risk factors and gather any necessary information. 3. Decide on joint measures to control the outbreak 4. Manage on-going arrangements for communication across governments 5. Coordinate with other agencies and stakeholders as necessary 6. Monitor the implementation and effectiveness of the measures 7. Decide when an event is controlled or finished 8. Prepare a report for the event containing recommendations for further action 9. Carry out a formal debrief and publish a joint report including any lessons learned Roles and responsibilities can be allocated by technical area of expertise

Data revealed that most of the diagnosed cases were geographically located within 3 adjacent villages in the governorate of (x). The investigation team decided to undergo a joint field visit and interview the residents.

15. What should they do at the start of this joint field visit?	16. What information will they request from residents during the interviews?

• Review data from routine surveillance records or reports on cases either in human–animal
  • Primary health care unit
  • Veterinary Unit
	• Demographic data (e.g. name, age, gender, occupation, etc.)
	• **Risk factors**
	  • Direct or indirect contact with diseased or aborted animals
	  • Ingestion of raw milk or its products
	• Previous or current presentation with clinical symptoms or signs related to brucella.

A review of records at both the primary health care unit and the Veterinary Unit at each village along with the results of the survey revealed a number of suspected animal and human cases.

17. What do you recommend as a next step?	18. What actions do you recommend in the near future to assess the risk?
• Drawing of samples and testing for suspected human-animal cases. Reporting of all confirmed cases to each side (human-animal health).	• Joint Risk Assessment

19. What are the corrective actions to be taken? Give examples with the responsible authority for each.

Actions	Responsible Authority
• Treatment of human cases.	
• Slaughtering and compensation for animal cases.	
• Health education and awareness.	

Part 6. Joint risk assessment

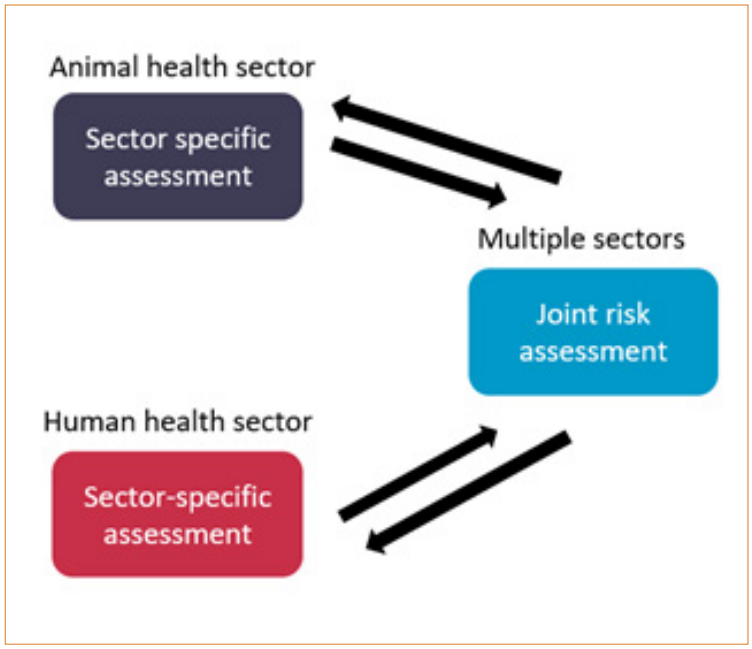
Joint Risk assessments are Operational Tool for conducting national joint qualitative risk assessments at national or subnational level focused on the human-animal-environment interface an event or priority zoonotic disease (single hazard) . Although it is still important for different sectors to do sector-specific assessments to manage risks within the context of the sector; however, bringing together information and expertise from all the relevant sectors to jointly assess health risks arising from zoonotic diseases allows all sectors to evaluate, understand and manage shared risks, and to ensure that management and communication is aligned.

20. Define "Risk Assessment" and explain why it is described as "Joint" in this situation?	21. Explain why Risk Assessment is described as "Joint" in this situation?
• Risk assessment is a systematic process for gathering, assessing, and documenting information to estimate the risk level for a situation in a specific time period and location. • It is an iterative process based on the best information available during the assessment. • Risk assessments link results directly to management decisions, providing evidence for decisions on risk management and risk communication.	• Zoonotic diseases require a joint approach to risk assessment as they pose risks to both animals and people. Effectively identifying, assessing, managing, and reducing risks from these diseases require coordination and collaboration among the ministries and other agencies responsible for human-animal-environment health.

22. What is the difference between joint risk assessment and sector-specific risk assessment methods?

- Sector specific risk assessment methods:
- Required to manage unique risks related to each sector guided by sectoral context, perspectives, priorities, and mandates.
- Can be operationally different.
- Do not directly align to support expertise and data gathering from many sectors.
- Cause confusion when sectors have differing approaches to risk assessment, some times resulting in different results with different decisions.
-
- While joint risk assessment method:
- Identifies joint hazards.
- Creates a national structure and approach for conducting JRAs at the national or subnational levels.
- Involves all relevant sectors in technical risk assessment and fosters regular communication among sectors.
- Allows decision makers to implement evidence-based approaches for risk management and communication with no conflict between different entities.

Figure 7. Information from sector-specific risk assessments inform the JRA and vice versa



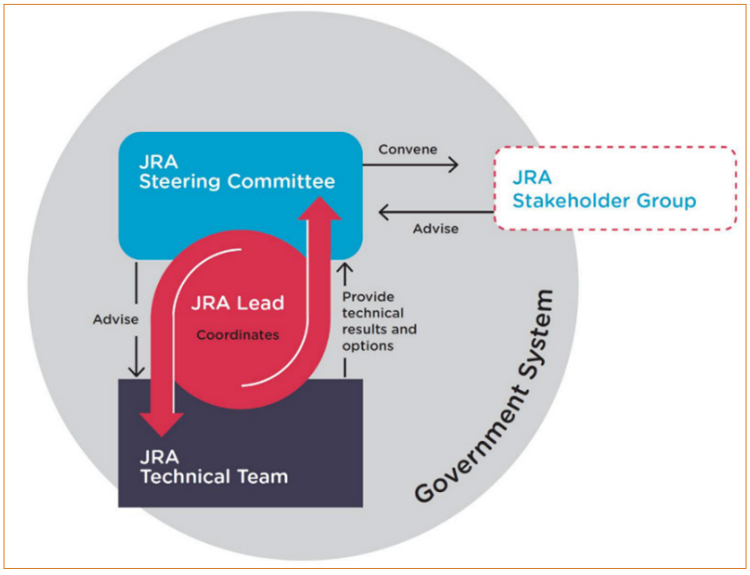
Source: WHO, FAO, OIE, 2020. *Joint Risk Assessment Operational Tool (JRA OT) - Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries.* Geneva, WHO. https://iris.who.int/bitstream/handle/10665/340005/9789240015142-eng.pdf.

The joint risk assessment includes the following 10 steps that be grouped into 4 modules, as follows:

Module	1. Setting up the JRA	2. Risk framing for the JRA (Completed by the JRA steering committee)	3. Conducting the JRA (Completed by the JRA technical team)	4. Utilizing the JRA outputs
Step	1. Establish and convene a national JRA steering committee. 2. Identify a JRA lead. 3. Establish and convene a JRA technical team. 4. Establish and convene a JRA stakeholder group.	5. Risk framing.	6. Identify and diagram the risk pathway. 7. Formulate and document risk assessment questions. 8. Characterise the risk.	9. Identify risk management options and communication messages. 10. Document the assessment.

The JRA Steering Committee members from relevant ministries or an already existing multisectoral coordination mechanism that may function as the JRA Steering Committee convened, decided to perform a joint risk assessment, identified the JRA Lead, and discussed the process with the JRA lead and proposed JRA Technical Team. Additionally, external stakeholder group are identified as there advise is needed through the process.

Figure 8. Setting up elements: example of a JRA organizational structure



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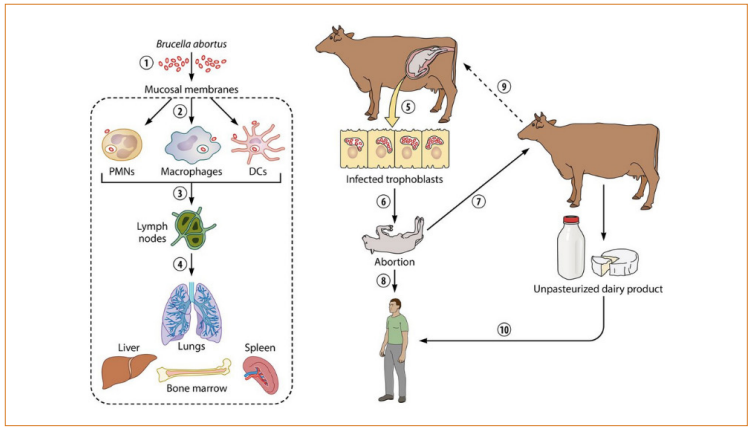
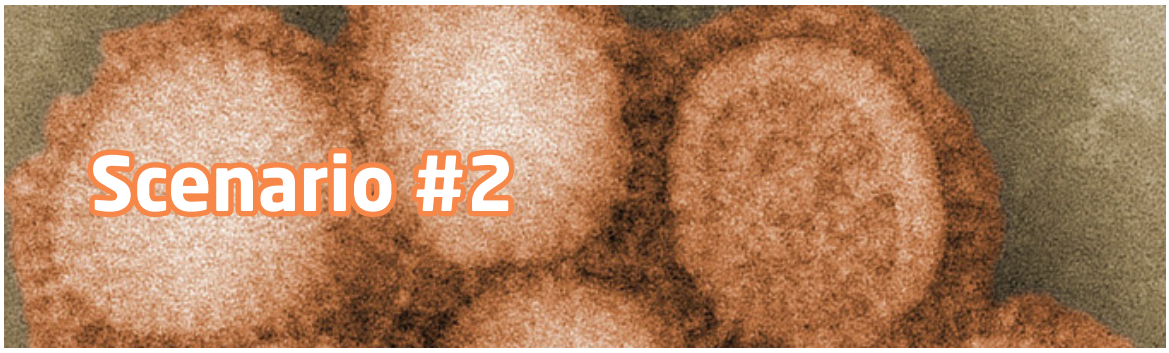
23. The composition of the JRA Technical Team depends on the hazard assessed. In this situation could you nominate members of the JRA technical team?	24. Considering this event, please define the members of the external stakeholder group

Establishing a stakeholder group is important to engage the private sector, industry, academia, and other relevant stakeholders in the JRA process and subsequent implementation of risk management measures. The stakeholder group normally has no technical or decision-making function; however, they provide perspectives from outside ministries on potential impacts of management measures.

Figure 9. Cycle of brucella abortus in the bovine host and humans



Source: WOAH (World Orgnisation for Animal Health). 2024. WOAH. Paris. https://www.woah.org.



Scenario #2

Part 1. One Health concept

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 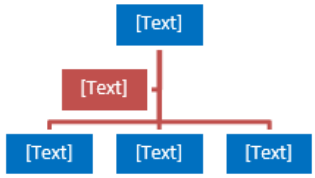
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Part 3. Prioritisation of zoonotic diseases and related activities

Prioritising zoonotic diseases and agreeing on which to work collaboratively is essential and must be done jointly by all relevant sectors using a multi-sectoral, One Health approach. It is also necessary to prioritize associated technical activities and ensure that they are clearly set with assigned roles and responsibilities.

8. Do you think that setting zoonotic disease priorities is essential? Please clarify.
• Strengthening linkages between various stakeholders in the field of zoonosis from human–animal–environmental health sectors with other relevant partners, on the grounds of trust, transparency, and equity. • Supports the formulation/strengthening of multi-sectoral, One Heath coordination, collaboration, and communication mechanisms. • Reflection of the local context – national or subnational – as a flexible and adaptable process taking into consideration criteria relevant to the country under observation. • Provides real-time, precise results that guide decision makers, such as a list of priority zoonotic diseases, next steps and the associated action plan. • Proper installation and adequate use of limited resources to achieve proper control and prevention of priority zoonotic diseases.

9. What are the criteria that should be considered when prioritising zoonotic diseases in a given country?	10. Using a multi-sectoral One Health approach, what are the specific technical activities for collaboration and coordination that should be addressed in the process of control and prevention of zoonotic diseases?
• The epidemiological situation. • The severity of disease. • The availability of effective control strategies. • The potential to cause an epidemic or pandemic in human–animal. • Social and economic impacts. • Bioterrorism potential.	• Strategic planning and emergency preparedness. • Surveillance and information-sharing. • Coordinated investigation and response. • Joint risk assessment of zoonotic disease threats. • Risk reduction, risk communication, and community engagement. • Workforce development.

Part 4. Rift valley fever and One Health

A high incidence of abortion was reported among pregnant sheep and cattle with high mortalities in young lambs and calves during the fall in the governorate of (Y). Further investigations by local veterinary authorities showed that other susceptible animals presented with a variety of symptoms including fever, listlessness, and disinclination to move. Some affected animals showed inappetence, mucopurulent nasal and ocular discharges, jaundice and bloody diarrhoea. Clinical examination revealed that the disease was more severe in sheep and cattle with high morbidity and mortality rates in neonatal animals.

11. Is this observation a public health concern that necessitates further action?Why?	
• Yes, Based on the above scenario, an extraordinary event is occurring in the animal population, with high morbidity and mortality.	
12. At this point in time, what additional response are you going to request from the local veterinary authorities? Data analysis for a clear picture of the situation, lab test results, interviews with owners, immediate actions, etc.	**13. Could this outbreak be a result of a zoonotic disease? If so, which authorities should be notified? Should they join the investigation team?**

• Disaggregation of cases by time, person, and place to either confirm or exclude a possible outbreak
  • Time: Onset of cases: gradual or sudden, peak
  • Person: Number of people affected, severity of illness, vulnerable groups
  • Place: Geographical distribution of cases
• Review of the epidemiological investigation form to identify possible risk factors
• Preliminary diagnosis and differential diagnosis
• Laboratory test results
	• Yes, it could be a result of a zoonotic disease.
	• In this case, different authorities should join the investigation team. These can include local health. authorities, the local environmental agency, and local administrative authorities. They must be contacted to raise this issue and verify if there really are reports of morbidities or even mortalities among humans.
	• If confirmed, human–animal reports will be studied for possible linkage.

It was raised by an interviewee that a few human cases of fever of unknown origin were present in the neighbourhood.

Part 5. Rift valley fever and One Health (cont.)

The veterinary directorate were concerned that the disease could spread. They contacted senior veterinary authorities at the central level and officially requested assistance. Based on the information gathered, the regional situation in neighbouring countries and the timing of this outbreak, the central veterinary authorities suggested a list of infectious agents that are the most likely contributors to this event. Rift Valley Fever was at the top of this list.

As a result, they decided to urgently contact the corresponding public health authorities to notify them and a joint investigation team was mobilized.

14. Describe the composition of a joint investigation team, and the roles and responsibilities that are required to control this situation.

The team consists of epidemiologists, laboratory specialists from both public health and veterinary authorities, physicians, veterinarians, vector control professionals and environmental specialists. Health education and communication officers and local administrative authorities can also be called upon. Collectively as a team:

1. Review the evidence for an outbreak and the results of epidemiological and laboratory investigations.
2. Identify risk factors and gather any necessary information.
3. Decide on joint measures to control the outbreak.
4. Manage on-going arrangements for communication across governments.
5. Coordinate with other agencies and stakeholders as necessary.
6. Monitor the implementation and effectiveness of the measures.
7. Decide when an event is controlled or finished.
8. Prepare a report for the event containing recommendations for further action.
9. Carry out a formal debrief and publish a joint report including any lessons learned.

Roles and responsibilities can be categorized according to different technical areas.

Data revealed that most of the diagnosed cases were geographically located within 3 adjacent villages in the governorate of (y). The investigation team decided to undergo a joint field visit and interview the residents.

15. What should they do at the start of this joint field visit?	**16. What information will they request from residents during the interviews?**

Review data from routine surveillance records or reports on cases either in human–animal.
• Primary health care unit.
• Veterinary Unit.
	• Demographic data (e.g. name, age, gender, occupation, etc.)
	• **Risk factors**
	  • Direct or indirect contact with diseased or aborted animals.
	  • Exposure to insect bites.
	• Previous or current presentation with clinical symptoms or signs.

A review of records at both the primary health care unit and the Veterinary Unit at each village along with the results of the survey revealed a number of suspected animal and human cases.

17. What do you recommend as a next step?	**18. What actions do you recommend in the near future to assess the risk?**
• Drawing of samples and testing for suspected human-animal cases. Reporting of all confirmed cases to each side (human-animal health).	• Joint Risk Assessment

19. What are the corrective actions to be taken? Give examples with the responsible authority for each.

Actions	Responsible Authority
• Vector control	
• Treatment of human cases	
• Health education and awareness	

Part 6. Joint risk assessment

Joint Risk assessments are Operational Tool for conducting national joint qualitative risk assessments at national or subnational level focused on the human-animal-environment interface an event or priority zoonotic disease (single hazard) . Although it is still important for different sectors to do sector-specific assessments to manage risks within the context of the sector; however, bringing together information and expertise from all the relevant sectors to jointly assess health risks arising from zoonotic diseases allows all sectors to evaluate, understand and manage shared risks, and to ensure that management and communication is aligned.

20. Define "Risk Assessment" and explain why it is described as "Joint" in this situation?	21. Explain why Risk Assessment is described as "Joint" in this situation?
• Risk assessment is a systematic process for gathering, assessing, and documenting information to estimate the risk level for a situation in a specific time period and location. • It is an iterative process based on the best information available during the assessment. • Risk assessments link results directly to management decisions, providing evidence for decisions on risk management and risk communication.	• Zoonotic diseases require a joint approach to risk assessment as they pose risks to both animals and people. Effectively identifying, assessing, managing, and reducing risks from these diseases require coordination and collaboration among the ministries and other agencies responsible for human–animal–environment health.

22. What is the difference between joint risk assessment and sector-specific risk assessment methods?

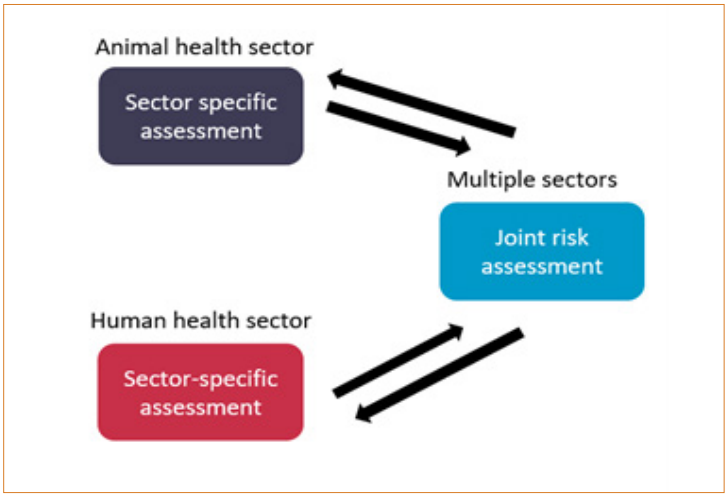
Sector specific risk assessment methods:

- Required to manage unique risks related to each sector guided by sectoral context, perspectives, priorities, and mandates.
- Can be operationally different.
- Do not directly align to support expertise and data gathering from many sectors.
- Cause confusion when sectors have differing approaches to risk assessment, some times resulting in different results with different decisions.

While joint risk assessment method:

- Identifies joint hazards.
- Creates a national structure and approach for conducting JRAs at the national or subnational levels.
- Involves all relevant sectors in technical risk assessment and fosters regular communication among sectors.
- Allows decision makers to implement evidence-based approaches for risk management and communication with no conflict between different entities.
- Identifies missing information and knowledge gaps.

Figure 10. Information from sector-specific risk assessments inform the JRA and vice versa.



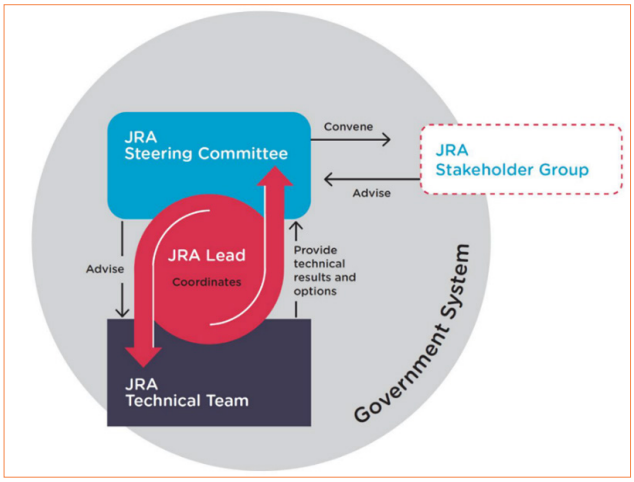
Source: WHO, FAO, OIE, 2020. *Joint Risk Assessment Operational Tool (JRA OT) - Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries.* Geneva, WHO. https://iris.who.int/bitstream/handle/10665/340005/9789240015142-eng.pdf.

The joint risk assessment includes the following 10 steps that be grouped into 4 modules, as following:

Module	1. Setting up the JRA	2. Risk framing for the JRA (Completed by the JRA steering committee)	3. Conducting the JRA (Completed by the JRA technical team)	4. Utilizing the JRA outputs
Step	1. Establish and convene a national JRA steering committee. 2. Identify a JRA lead. 3. Establish and convene a JRA technical team. 4. Establish and convene a JRA stakeholder group.	5. Risk framing.	6. Identify and diagram the risk pathway. 7. Formulate and document risk assessment questions. 8. Characterise the risk.	9. Identify risk management options and communication messages. 10. Document the assessment.

The JRA Steering Committee members from relevant ministries or an already existing multisectoral coordination mechanism that may function as the JRA Steering Committee convened, decided to perform a joint risk assessment, identified the JRA Lead, and discussed the process with the JRA lead and proposed JRA Technical Team. Additionally, external stakeholder group are identified as there advise is needed through the process

Figure 11. Setting up elements: example of a JRA organizational structure



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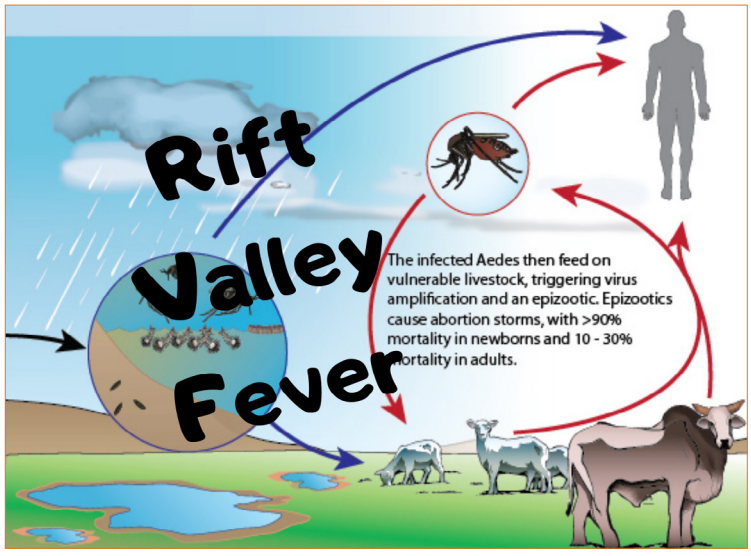
23. The composition of the JRA Technical Team depends on the hazard assessed. In this situation could you nominate members of the JRA technical team?	24. Considering this event, please define the members of the external stakeholder group

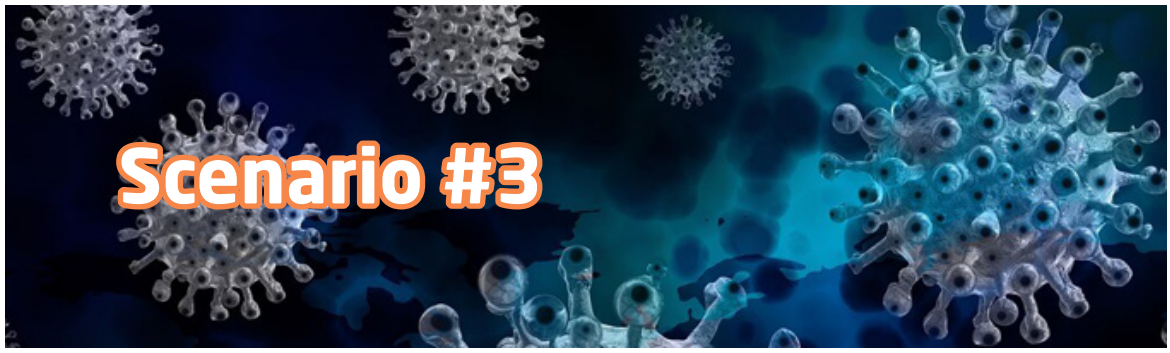
Establishing a stakeholder group is important to engage the private sector, industry, academia, and other relevant stakeholders in the JRA process and subsequent implementation of risk management measures.

The stakeholder group normally has no technical or decision-making function; however, they provide perspectives from outside ministries on potential impacts of management measures.

Figure 12. Ecological cycle for the rift valley fever virus (RVFV)



Source: WOAH (World Orgnisation for Animal Health). 2024. WOAH. Paris. https://www.woah.org.



Part 1. One Health concept

Zoonotic diseases commonly spread at the human-animal-environment interface, where people and animals interact with each other in their shared environment. Health issues at this interface cannot be effectively addressed by one sector alone. Dealing with these risks requires integrated action from both the human–animal health sectors as well as from the environmental sector, in addition to support and consultation from other relevant sectors from different organizations or health-related sectors or disciplines. This multi-sector approach is referred to as 'One Health'.

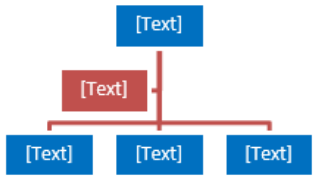
1. What is the definition of One Health? What are other areas in which One Health approach fits?	2. What are the expected benefits of an effectively-implemented One Health approach for zoonotic disease control and prevention?
One Health is a collaborative, multidisciplinary, and multi-sectoral approach that can address urgent, ongoing, or potential health threats at the human-animal-environment interface at different levels. This approach ensures balance and equity among all relevant sectors and disciplines. In addition to addressing zoonotic diseases, a One Health approach facilitates initiatives that deal with antimicrobial resistance, food safety, vector-borne diseases, and environmental contamination or climatic changes.	1. Efficient coordination and communication between all relevant sectors, i.e.: • All sectors understand their specific roles and responsibilities. • All sectors have the information they need. • Human and financial resources are effectively used and equitably shared. • Gaps in infrastructure, capacity and information are identified and addressed jointly. 2. Decisions are based on accurate and shared assessments of situations. 3. Responses to zoonotic disease events and emergencies are timely and effective. 4. Accountability to each other and to decision makers ensures action by all sectors.

Part 2. Understanding national context

Different organizations and institutions have developed their own methods and procedures to guide their respective countries towards the establishment and implementation of a multi-sectoral, One Health approach.

However, these methods or procedures still need to be adapted to the context of each respective region or country. Such initiatives cannot be achieved without understanding both the basic concepts of a One Health approach and considering the country-specific or regional context and priorities.

Understanding country context includes understanding the national strategic orientation or direction, identifying stakeholders, and clarifying existing priorities. Furthermore, having a full picture of the available infrastructure and how to make proper use of it can facilitate more impactful and sustainable activities.

<table>
<tr><th>3. As a public health specialist working in the field of control and prevention of zoonotic diseases, what are the main responsible governmental authorities that contributes to the One Health approach in Egypt?</th><th colspan="2">4. Do you have an idea of the sectors or departments within governmental authorities responsible for the control and prevention of zoonotic diseases? Please provide examples.</th></tr>
<tr><td>• Preventive sector - Ministry of Health and Population.
• General Organization of Veterinary Services - Ministry of Agriculture and Land Reclamation.
• Ministry of Environment.</td><td colspan="2">Yes I do,
 
</td></tr>
<tr><th>5. List any other stakeholders involved in the process of control and prevention of zoonotic diseases.</th><th>6. Coordination and collaboration between different partners is crucial for achieving adequate control and prevention of zoonotic diseases. Could you describe an area of such joint activities?</th><th>7. Is there a strategy, plan, protocol or framework for collaboration on zoonotic disease control and prevention at a national level?</th></tr>
<tr><td>National
1. Governmental
• Ministry of Local Development
• Ministry of Higher Education
• Research Institutes
• Others
2. Non-Governmental

International
• WHO
• CDC
• FAO
• OIE</td><td>A wide range of activities are regularly organized jointly:
• Meetings, workshops, and training
• Surveillance and information-sharing
• Field investigations
• Prevention and control activities
• Risk assessments
• Simulation exercises</td><td>Yes, e.g.:
• 4-way link for Avian Influenza.
• Rabies post-exposure prophylaxis guidelines.
• Draft national strategy for elimination of rabies by 2030.
• Draft One Health strategic framework.</td></tr>
</table>

Part 3. Prioritisation of zoonotic diseases and related activities

Prioritising zoonotic diseases and agreeing on which to work collaboratively is essential and must be done jointly by all relevant sectors using a multi-sectoral, One Health approach. It is also necessary to prioritize associated technical activities and ensure that they are clearly set with assigned roles and responsibilities.

8. Do you think that setting zoonotic disease priorities is essential? Please clarify.	
• Strengthening linkages between various stakeholders in the field of zoonosis from human–animal–environmental health sectors with other relevant partners, on the grounds of trust, transparency, and equity. • Supports the formulation/strengthening of multi-sectoral, One Heath coordination, collaboration, and communication mechanisms. • Reflection of the local context – national or subnational – as a flexible and adaptable process taking into consideration criteria relevant to the country under observation. • Provides real-time, precise results that guide decision makers, such as a list of priority zoonotic diseases, next steps and the associated action plan. • Proper installation and adequate use of limited resources to achieve proper control and prevention of priority zoonotic diseases.	
9. What are the criteria that should be considered when prioritising zoonotic diseases in a given country?	**10. Using a multi-sectoral One Health approach, what are the specific technical activities for collaboration and coordination that should be addressed in the process of control and prevention of zoonotic diseases?**
• The epidemiological situation • The severity of disease • The availability of effective control strategies • The potential to cause an epidemic or pandemic in humans or animals • Social and economic impacts • Bioterrorism potential	• Strategic planning and emergency preparedness • Surveillance and information-sharing • Coordinated investigation and response • Joint risk assessment of zoonotic disease threats • Risk reduction, risk communication, and community engagement • Workforce development • (should we align with technical capacities in One Health strategic framework)

Part 4. Avian Influenza and One Health

In a village (X) which is common with backyard raising of poultry, the veterinary officer working at the village clinic notified the authorities about reports of dead poultry along the side of the river. Further investigations by local veterinary authorities revealed that people are speaking within the local community about a disease affecting poultry resulting in its death.

11. Is this observation a public health concern that necessitates further action?Why?
• May be, Based on the above scenario, an extraordinary event that needs to be clarified is occurring in the animal population.

The veterinary officer was having dinner with a group of friends, and they raised that issue. One of his friends, who is working as a public health officer at the primary health care unit said that yesterday he referred 2 previously healthy persons who raises poultry in this village with respiratory illness to the central hospital as they were not responding to antibiotics.

12. At this point in time, what additional response are you going to request from the local public health authorities? Data analysis for a clear picture of the situation, lab test results, interviews with cases and contacts, immediate actions, etc.	13. Could this outbreak be a result of a zoonotic disease? What is most likely to be? If so, which authorities should be notified? Should they join the investigation team?

• Ensure cross reporting between public health authorities and veterinary authorities.
• Disaggregation of cases by time, person, and place to either confirm or exclude a possible outbreak.
  • **Time:** Onset of cases: gradual or sudden, peak.
  • **Person:** Number of people affected, severity of illness, vulnerable groups.
  • **Place:** Geographical distribution of cases.
• Review of the epidemiological investigation form to identify possible risk factors, and discover linkages between human and poultry cases.
• Preliminary diagnosis and differential diagnosis.
• Draw samples for Laboratory testing.
	• Yes, it could be a result of a zoonotic disease.
	• especially if linkage between human–animal reports was confirmed.
	• In this case, different authorities should join the investigation team. These can include local health authorities, the local environmental agency, and local administrative authorities. They must be contacted to raise this issue and agree on next steps.

According to the above mentioned scenario and further action taken with data collected

Part 5. Avian Influenza and One Health (cont.)

Laboratory investigations on both human–animal side confirmed the diagnosis of Avian Influenza.

As a result, both public health and veterinary authorities decided to urgently send a joint team to the field.

14. Describe the composition of a joint investigation team, and the roles and responsibilities that are required to control this situation.
The team consists of epidemiologists, laboratory specialists from both public health and veterinary authorities, physicians, veterinarians, vector control professionals and environmental specialists. Health education and communication officers and local administrative authorities can also be called upon. Collectively as a team: 1. Review the evidence for an outbreak and the results of epidemiological and laboratory investigations. 2. Identify risk factors and gather any necessary information. 3. Decide on joint measures to control the outbreak. 4. Manage on-going arrangements for communication across governments. 5. Coordinate with other agencies and stakeholders as necessary. 6. Monitor the implementation and effectiveness of the measures. 7. Decide when an event is controlled or finished. 8. Prepare a report for the event containing recommendations for further action. 9. Carry out a formal debrief and publish a joint report including any lessons learned. Roles and responsibilities can be categorized according to different technical areas.

Data revealed that most of the diagnosed cases were geographically located within 3 adjacent districts. The investigation team decided to undergo a joint field visit and interview the residents.

15. What should they do at the start of this joint field visit?	16. What information will they request from residents during the interviews?

• Review data from routine surveillance records or reports on cases either in humans or animals.
  • Primary health care unit
  • Veterinary Unit
	• Demographic data (e.g. name, age, gender, occupation, etc.)
	• **Risk factors**
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A review of records at both the primary health care unit and the Veterinary Unit at each village along with the results of the survey revealed a number of suspected animal and human cases.

17. What do you recommend as a next step?	18. What actions do you recommend in the near future to assess the risk?
• Drawing of samples and testing for suspected human–animal cases, Reporting of all confirmed cases to each side (human–animal health).	• Joint Risk Assessment

19. What are the corrective actions to be taken? Give examples with the responsible authority for each.

Actions	Responsible Authority
• Health education	
• Applying preventive measures	

Part 6. Joint risk assessment

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While joint risk assessment method:

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Figure 13. Information from sector-specific risk assessments inform the JRA and vice versa

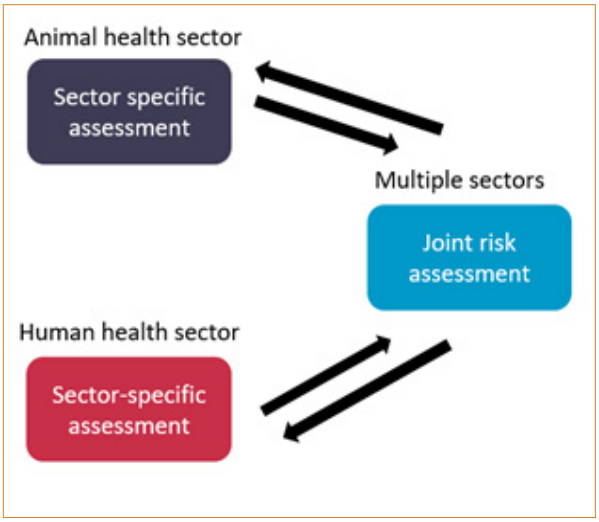

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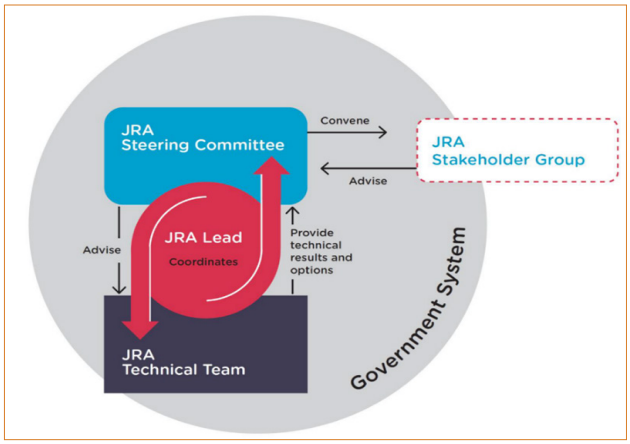
Figure 14. Setting up elements: example of a JRA organizational structure



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Establishing a stakeholder group is important to engage the private sector, industry, academia, and other relevant stakeholders in the JRA process and subsequent implementation of risk management measures.

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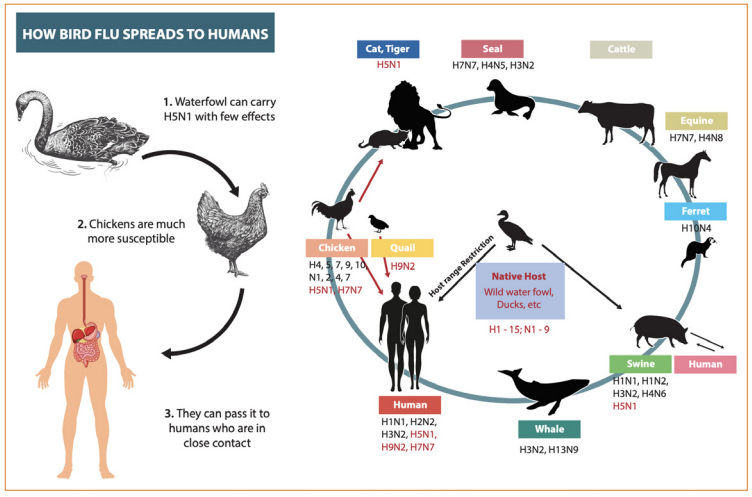
Figure 15. Examples of how Avian Influenza spread to human



Source: WOAH (World Orgnisation for Animal Health). 2024. WOAH. Paris. https://www.woah.org.

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