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Expecting More Spillovers, Zoonoses, Diseases and Deaths: Is the Future so Dark?

D. Katterine Bonilla-Aldana
Fundación Universitaria Autónoma de las Américas, katterine.bonilla@utp.edu.co

Wilmer E. Villamil-Gómez
Universidad del Atlántico, hrsincelejo@telecom.com.co

Alfonso L. Rodríguez-Morales
Universidad del Atlántico, Barranquilla, Colombia, alfonso.rodriguez@uam.edu.co

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Editorial

Expecting More Spillovers, Zoonoses, Diseases and Deaths: Is the Future so Dark?

Over the last decades, zoonoses have increased in number and magnitude (1, 2). For a long time, the aetiology of infections transmitted between animals and humans has been diverse, including multiple organisms such as bacteria, viruses, parasites, fungi, and even prions (3-6). The turnover of recent events has led to multiple pathogens jump from animals and humans and cause infection, disease and even death (7, 8). Many of them previously did not affect humans (9). Then, the spillover is a genuine threatening concern that is also associated with emerging epidemics and pandemics, such as those recently affecting globally, as occurred with Swine A H1N1 Influenza in 2009 or the current Coronavirus Disease 2019 (COVID-19), that has led to the most significant social disruption in over the last century, only compared with the 1918 H1N1 Influenza pandemic (5, 10, 11). COVID-19 has affected more than 437 million people globally, causing almost six million deaths (March 1, 2022).

Most of this, not saying probably all, is due to human actions (12-14). We have the fault. These events are linked to disordered human development and their consequences, as the anthropogenic impacts on the environment, led to climate change (15). We are responsible for this situation. As it was wisely stated by a fictional character of the Netflix's series *Dark* (16) the Stranger: "In the end, we will all get just what we deserve", and as another character in that acclaimed series said: "Things only change when we change them. But you have to do it" (Mikkel Nielsen). That means we need to change the course of the events actively. Unbalanced and vulnerable social and environmental issues that are prone, or multiple risk factors, eventually led to emerging and re-emerging zoonoses. As occur with many tropical diseases, and global public health threats, the determinants are especially social and environmental (17-19). Zoonoses are indeed socio-environmental diseases (20). Among zoonoses, many of them, such as Ebola, rabies, multiple viral hemorrhagic fevers, have a high case fatality rate (5, 17-19).

How to avoid this in the near future? How to arrest a Dark future? A future where multiple scenarios or realities may become the worst nightmares of microbe hunters, physicians, veterinarians, and other infectious diseases. Maybe it is not too late, but education on these topics, substantial investment in research, enhanced human-animal-environment interfaces surveillance with a One Health approach, as well as better diagnostic

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approaches (multiplex) and therapeutics and vaccines, are urgently needed to avoid a near-apocalyptic future (20-24). "There are moments when we must understand that the decisions we make influence more than just our own fate" (Claudia Tiedemann character) (16). We need to make the right decisions right now, on all levels, locally, nationally, regionally, and globally. A multidisciplinary approach must prevail in all the public policies that should address the concerns of zoonotic diseases, known and unknown.

There are no reasons to consider that we will not witness more spillovers and new zoonoses in the future. Recently, with alpha and delta coronaviruses, new potential zoonoses, in addition to COVID-19, have been reported from canine and swine species in humans, respectively, in Malaysia and Haiti, in reports published in 2021, but corresponding with samples of patients in 2017-2018 and 2014-2015, respectively. Then, research on coronavirus beyond COVID-19 is needed not only in those countries but globally (25, 26).

With COVID-19, not only animal to human transmission occur, but the opposite. Studies have shown that even in Latin America, especially domestic cats may become infected from humans with COVID-19 (27). Human-to-cat transmission of the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) occurred during the COVID-19 pandemic in multiple countries and continents (28, 29). Other domestic animals, such as dogs, are also affected (30, 31). In other settings, such as farms, minks have become among the most frequently infected animals, and the COVID-19 pandemic has led to devastating animal and economic losses, especially in Europe (31). Wildlife, domestic animals and pets are susceptible and suffering from these spillovers from humans to animals during the COVID-19 pandemic (33, 34).

At the same time, interactions between pathogens have also led to coinfections, including those with COVID-19, such as dengue and less considered viral pathogens, such as Lassa (35, 36). With viruses previously considered more anthroponotic, such as dengue, growing evidence indicates multiple animals may serve as reservoirs, implying potential zoonotic cycles in some ecological sites (37).

"But it ain't the end of the world" (George Segal and Blu Mankuma song played in the Roland Emmerich's film 2012, 38), yet, nevertheless we need to work on this in multiple ways and improve our world, reset the suitable balance between human, animal and environmental health, and make the development ecologically friendly and sustainable as ideally desired.

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D. Katterine Bonilla-Aldana
Semillero de Investigación en Zoonosis (SIZOO), Grupo de Investigación GISCA, Fundación Universitaria Autónoma de las Américas, Pereira, Risaralda, Colombia.
Comité de Medicina Tropical, Zoonosis y Medicina del Viajero, Asociación Colombiana de Infectología, Bogotá, Colombia.
✉ katterine.bonilla@utp.edu.co
https://orcid.org/0000-0002-9412-2556

Wilmer E. Villamil-Gómez
Comité de Medicina Tropical, Zoonosis y Medicina del Viajero, Asociación Colombiana de Infectología, Bogotá, Colombia.
Grupo de Investigación Enfermedades Infecciosas y Control de Infecciones, Hospital Universitario de Sincelejo, Sincelejo, Sucre, Colombia.
Programa del Doctorado de Medicina Tropical, SUE Caribe, Universidad del Atlántico, Barranquilla, Colombia.
https://orcid.org/0000-0002-5492-3455

Alfonso J. Rodríguez-Morales
Grupo de Investigación Biomedicina, Facultad de Medicina, Fundación Universitaria Autónoma de las Américas, Pereira, Risaralda, Colombia.
Maestría en Epidemiología Clínica y Bioestadística, Universidad Científica del Sur, Lima, Perú.
✉ alfonso.rodriguez@uam.edu.co
https://orcid.org/0000-0001-9773-2192