Vaccines, Apes, and Conspiracy

Emilio Mordini, Responsible Technology and University of Haifa

In their target article (Edwards et al. 2018), Edwards, Norell, Illari, Clarke, and Neuhaus advocate for "a response to Ebola rooted in a One Health approach to infectious disease," proposing to test the safety and effectiveness of novel vaccines in wild apes, employing what they call "a 'pluralistic' approach to evidence."

Although the expression "One Health" is relatively recent, the origins of the concept are older, dating back to the 19th and early 20th centuries (Atlas 2012). In the 1990s, French–Croatian historian of medicine and scientist Mirko D. Grmek introduced the notion of "pathocenosis," assuming that "the frequency and the overall distribution of each disease, above and beyond various endogenous and ecological factors, depends on the frequency and distribution of all other diseases in the same population. A sort of congruence unifies not only all the diseases in a given population, from now on in almost all the populations of the world, but also the totality of microbes" (Grmek 1990, 158). The concept of "pathocenosis" implies that "new diseases flourish after major demographic upheavals" (159). In 2005, Armelagos and colleagues (Armelagos et al. 2005) suggested that we are entering what they called the "third epidemiological transition." After (i) the Neolithic transition, associated with the agricultural revolution and the emergence of parasitic and pathogen infections, and (ii) the Industrial transition, marked by the shift from infectious to chronic and degenerative disease, today's globalization would represent the third epochal transition, characterized by "the co-existence of infectious diseases typical of the first epidemiological transition (some 10,000 years ago) and degenerative disease of the second" (Armelagos et al. 2005). There is no doubt that globalization processes are deeply affecting the ecology of transmissible diseases, altering epidemiological patterns, and increasing multihost and zoonotic transmission. This makes the One Health paradigm—which is based on the recognition of the interdependence between human, animal, and environmental health—paramount to understanding and facing today's emergence of novel pathogens and new strains.

Within such a wide landscape, however, Edwards and colleagues' proposal goes beyond the simple recognition that traditional disciplinary boundaries between human and veterinary medicine and environmental research must be crossed, suggesting a more radical approach based on "preventing Ebola in animals, too, thereby interrupting predictable chains of transmission of Ebola from animals to humans (and vice versa)" (35). Their original and innovative perspective raises two main perplexities, hardly dispelled by authors. Both perplexities are deeply rooted in the very rationale of the One Health paradigm, in the complexity of the current epidemiological transition.

The first perplexity is inherently ethical, concerning the principles of responsibility, precaution, and respect for animals. Vaccines are not drugs, which aim to cure an individual, but ways "to modify the state of immunization of a population … to prevent, control, or eliminate an infectious disease in a community" (Mordini 2000). This implies responsibility toward the whole community affected: "When we plan a vaccination campaign, we try to fight against an infectious disease by increasing the number of hosts who are resistant (immune) to the microorganism that produces the disease" (Mordini 2000). Herd immunity refers to the lowered probability of contagion occurring because of the higher level of immunity in the vaccinated community. In principle, if a large proportion of the population is immune, there is a reduced chance of transmission of the infectious agent. If the goal is herd immunity, universal vaccination is usually required. The vision of "interspecies herd immunity," which is one the scientific cornerstones of Edwards and colleagues (Edwards et al. 2018), would then require us to vaccinate most apes and humans within a given territory, which seems not easy to achieve. In fact, it is impossible to exclude the presence of clustered subpopulations of humans and apes, which could be hard to reach. Moreover, when transmission involves physical contact, such as in the case of Ebola, herd immunity is quite difficult, if not impossible, to reach. A further objection to Edwards and colleagues' proposal concerns the principle of precaution: "When we raise the herd immunity in a community, we modify the spectrum of a disease" (Mordini 2000). It is an ethical tenet to question ourselves on potential new risks we could generate. We have no idea of the potential impact of a novel vaccine on a population of wild apes in dynamic equilibrium with humans. "Dynamics underlying infections are quite complicated,

Address correspondence to Emilio Mordini, Responsible Technology SAS, 12 rue de Ia Chaussee d'Antin, Paris 75009, France; Health and Risk Communication Center, University of Haifa School of Public Health, 199 Aba Khoushy Ave., Mount Carmel, Haifa 31905, Israel. Email: emilio.mordini@rtexpert.com

and vaccination alters these dynamics, changing the frequency, severity, and patterns of disease presentation" (Mordini 2000), potentially also the distribution of the infection among different categories of hosts. After Grmek and Armelagos's seminal contributions, scholars today speak of disease ecology (Wilcox and Gubler 2005) to point out the complex interactions between different infectious agents, their primary and secondary reservoirs, the accidental hosts, and the whole environment. This complexity provides one of the main justifications to the One Health paradigm, but it also demands a rigorous application of the principle of precaution. Before implementing Edwards and colleagues' proposal, we need further research to exclude any major risks for the environment, wildlife, and human communities. Current rules on preclinical studies are designed to protect humans, animals, and the environment, and we should think twice before bypassing them. Finally, the use of animals for scientific purposes should strictly comply with ethical regulations, with awareness that wild animal studies are much more complicated and ethically challenging than studies with lab animals.

The second perplexity raised in Edwards and colleagues' article is that of communication, concerning the likely impact of their proposal on the public opinion. Today, doing science is doing communication (National Academies of Sciences, Engineering, and Medicine 2017). The Ebola outbreak has contributed to generating a myriad of conspiracy theories about Western governments, "Big Pharma" secret plans, mysterious and clandestine experiments on apes, top-secret labs in Africa, escaped engineered viruses, bioweapons, and so on (Falade and Coultas 2017). This has also been echoed by the recent "Clade X Exercise", a pandemic simulation mirroring the 2014 Ebola outbreak, hosted by the Johns Hopkins Center for Health Security in May 2018 (Center for Health Security 2018). There are many possible explanations to justify the flourishing of urban legends surrounding Ebola and other emerging infectious diseases (Gesser-Edelsburg et al. 2015). One of them is particularly relevant to Edwards and colleagues' proposal. Scientific theories describing the current epidemiological transition are too sophisticated and nuanced to be metabolized by members of the public, who are searching for straightforward causal explanations. People today are overinformed; they do not aim to acquire more facts, but rather they wish to connect dots, to find narratives providing them with nice causal chains (Mordini 2018). They do not seek the truth, but rather the best narrative.

In 2016, a team of researchers from the University of California Irvine, led by Miryha G. Runnerstrom, published a study (Koralek et al. 2016) based on an online survey of 797 undergraduates at the University of California, Irvine (UCI), and Ohio University (OU) during the peak of the 2014 Ebola (EVD) outbreak. Researchers found that about one-third of all participants firmly thought that "There is a cure for Ebola, but the government is keeping it from the public." This study is revealing because it shows that even educated university students are vulnerable to overinterpretation and prefer compact stories over basic truths. People like to bind facts together, and stories—no matter if they are fake—provide them with such an opportunity. Edwards, Norell, Illari, Clarke, and Neuhaus's proposal would then risk being taken as indirect proof of the ghastliest conspiracy theories. A measure such as testing a new vaccine on apes in the wild could become socially feasible only if it is supported by an ad hoc communication strategy. Otherwise, it would risk generating an epidemic even worse than Ebola: an epidemic of mistrust and fake news (Mordini 2016).

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