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A new hypothesis to explain Ebola's high virulence

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A recommendation of

Sofonea MT, Aldakak L, Boullosa LFVV, Alizon S. 2017. Can Ebola Virus evolve to be less virulent in humans? *bioRxiv* 108589, ver. 3 of 19th May 2017; doi: [10.1101/108589](https://doi.org/10.1101/108589)

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The tragic 2014-2016 Ebola outbreak that resulted in more than 28,000 cases and 11,000 deaths in West Africa [1] has been a surprise to the scientific community. Before 2013, the Ebola virus (EBOV) was known to produce recurrent outbreaks in remote villages near tropical rainforests in Central Africa, never exceeding a few hundred cases with very high virulence. Both EBOV's ability to circulate for several months in large urban human populations and its important mutation rate suggest that EBOV's virulence could evolve and to some extent adapt to human hosts [2]. Up to now, the high virulence of EBOV in humans was generally thought to be maladaptive, the virus being adapted to circulating in wild animal populations (e.g. fruit bats [3]). As a logical consequence, EBOV virulence could be expected to decrease during long epidemics in humans. The present paper by Sofonea et al. [4] challenges this view and explores how, given EBOV's life cycle and known epidemiological parameters, virulence is expected to evolve in the human host during long epidemics. The main finding of the paper is that there is no chance that EBOV's virulence decreases in the short and long terms. The main underlying mechanism is that EBOV is also transmitted by dead bodies, which limits the cost of virulence. In itself the idea that selection should select for higher virulence in diseases that are also transmitted after host death will sound intuitive for most evolutionary epidemiologists. The accomplishment of the paper is to make a very strong case that the parameter range where virulence could decrease is very small. The paper further provides scientifically grounded arguments in favor of the safe management of corpses. Safe burial of corpses is culturally difficult to impose. The present paper shows that in addition to instantaneously decreasing the spread

of the virus, safe burial may limit virulence increase in the short term and favor of less virulent strains in the long term.

Altogether these results make a timely and important contribution to the knowledge and understanding of EBOV.

References

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Appendix

Reviews by Virginie Ravigné and François Blanquart, authors' replies and recommender's decisions:
<http://dx.doi.org/10.24072/pci.evolbiol.100022>