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Why Are Bat-Borne Viruses So Deadly?

The management of future pandemic risk requires a better understanding of the mechanisms that determine the virulence of emerging zoonotic viruses. Bats host viruses that cause higher case fatality rates upon spillover to humans than those derived from any other mammal. In order to disentangle the fundamental drivers of virulence upon spillover, we develop a nested modelling framework that highlights mechanisms which underpin the evolution of viral traits in reservoir hosts that cause virulence following cross-species emergence. Our work offers a mechanistic explanation for the extreme virulence of bat-borne zoonoses and, more generally, demonstrates how key differences in reservoir host longevity, viral tolerance, and constitutive immunity impact the evolution of viral traits that cause virulence following spillover to humans.