

Social status influences infection risk and mortality during a disease epidemic

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In many mammalian societies, such as baboons or spotted hyenas, high-ranking individuals are socially more attractive than low-ranking ones, that is, they have more social interactions with members of their group. As a result, their exposure to contagious infectious diseases should be high. On the other hand, high-ranking individuals have privileged access to food resources and can invest more energy into immune processes, which should reduce their risk of becoming infected and dying as a result. Thus, do individuals in these types of societies have a net benefit from holding a high social position during a disease epidemic? To answer this intriguing question, we studied the effect of social status on infection risk and mortality in the highly social spotted hyena. In 1993/1994 a virulent epidemic of canine distemper virus (CDV) swept through the Serengeti ecosystem in Tanzania and Kenya. The high virulence of this epidemic to lions and spotted hyenas was a consequence of the molecular adaptation of a specific CDV strain to these non-canid species. We used two decades of detailed data on demographic, social and health status in three spotted hyena clans and applied a powerful statistical model which accounts for partial observation of individuals and uncertainty about individual health status. The results show that different mechanisms drive infection patterns among cubs and older animals. High-ranking cubs were less likely to be



Hyenas at clan communal den. Photo credit: Sarah Benhaïem

infected and more likely to survive infection than low-ranking ones. This is a likely consequence of high-ranking cubs having access to more maternal milk so they can allocate more resources to immune processes, preventing disease manifestation and permitting the repair of CDV damaged tissue. In contrast, high-ranking subadult and adult females had a higher risk of infection with CDV than low-ranking ones, most likely because of their higher contact rates with group members. These findings reveal that a high social status can mitigate the negative impact of a virus on mortality in younger age classes whereas a low social status can restrict its transmission among subadults and adults in a free-ranging group-living mammal.