Wildebeest or malaria parasite -- same rules determine number of offspring

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Whether you are dealing with the number of wildebeest on the Serengeti or the number of malaria parasites in the human body, new research shows the same ecological framework determines breeding numbers and population size.

New research published today in *Proceedings of the National Academy of Sciences* by a Biotechnology and Biological Sciences Research Council (BBSRC) Fellow shows that the same community ecology principles that determine how different animal species on the savannah affect each other's population sizes through competition for food and hunting by predators also affect parasite species interacting within the microcosm of a single host.

The research has important implications for treating many human and animal infections, including malaria and viruses. These infections rarely occur singularly and the research at the University of Edinburgh suggests that a range of drugs used to treat infection by parasitic worms may alter the effectiveness of anti-malarial and anti-viral treatments by affecting the level of competition among parasite species.

The research, conducted by Dr Andrea Graham, a BBSRC David Phillips Fellow at the University of Edinburgh, examined data from a large number of animal studies of coinfection. A microparasite infection such as malaria often occurs in people already suffering from other parasites, such as worms. The research shows that these multiple infections affect each other by competing for host nutrients or by

generating an impaired immune system response.

The effect is the same as if a large herd of wildebeest started to eat all the available food in an area of the Serengeti. Analogously, the study found that if a host was suffering from a worm infection that caused a reduction in a nutrient needed by another parasite in the body at the same time, the second parasite would be reduced in number. Conversely, if a worm infection suppressed the immune response, other parasites would explode in numbers, just as zebras would rapidly breed in the absence of lions.

Dr Graham said: “People and animals do not normally suffer just one parasite infection at a time. By applying the same ideas used in studies of big ecosystems to parasites I have been able to show that we need ecological thinking in order to understand and thus control multiple infections. This approach will help us to most effectively treat diseases such as malaria in a world that’s full of co-infected hosts.

“Researchers have mostly studied and treated viral and bacterial infections in isolation. This is because multiple-species infections were previously thought to be far too complex to be understood. Now I’ve shown that we need to think like ecologists to make the problem more controllable.”

Professor Nigel Brown, BBSRC Directory of Science and Technology, said: “This research focuses on understanding the fundamental biology of parasite infections but has huge practical implications. Ecological principles are here shown to have huge potential in understanding and treating parasitic disease, and shows the importance of interdisciplinary thinking in science and medicine.”

Source: Biotechnology and Biological Sciences Research Council