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Research Article

Complex Links between Natural Tuberculosis and Porcine Circovirus Type 2 Infection in Wild Boar

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Individuals in natural populations are exposed to a diversity of pathogens which results in coinfections. The aim of this study was to investigate the relation between natural infection with tuberculosis (TB) due to infection by bacteria of the *Mycobacterium tuberculosis* complex and porcine circovirus type 2 (PCV2) in free-ranging Eurasian wild boar (*Sus scrofa*). Apparent prevalence for TB lesions and PCV2 infection was extremely high in all age classes, including piglets (51% for TB; 85.7% for PCV2). Modeling results revealed that the relative risk of young (less than 2 years old) wild boar to test positive to PCV2 PCR was negatively associated with TB lesion presence. Also, an interaction between TB, PCV2, and body condition was evidenced: in wild boar with TB lesions probability of being PCV2 PCR positive increased with body condition, whereas this relation was negative for wild boar without TB lesions. This study provides insight into the coinfections occurring in free-ranging host populations that are naturally exposed to several pathogens at an early age. Using TB and PCV2 as a case study, we showed that coinfection is a frequent event among natural populations that takes place early in life with complex effects on the infections and the hosts.

1. Introduction

As opposed to controlled laboratory environments, individuals in natural populations are exposed to a diversity of pathogens (viruses, bacteria, and parasites) which results in coinfections [1]. Each pathogen interacts with the host immune system, generating synergy or antagonism with other pathogens [2]. This has important implications both for the host [3, 4] and the pathogens [5–8]. In the last decade, infectious disease research has shifted from traditional one host–one pathogen approaches to multihost–multipathogen approaches, often incorporating concepts and techniques from community ecology [3, 4, 9]. The community ecology approach is useful for coinfection studies because pathogens interact by competing for resources (bottom-up strategies) or through modifications in the host immune system (top-down strategies) [3].

Regarding synergies among pathogens there are some well-documented cases. For instance, due to its effect on the immune system, the human immunodeficiency virus (HIV) increases the risk of malaria infections [10] and facilitates infection by *Mycobacterium tuberculosis* (*M. tuberculosis*) [11], which causes human tuberculosis (TB). The interaction is reciprocal, since TB, in turn, is known to promote the course