

Germs within worms: transmission biology and diversity of *Neorickettsia* bacteria

Vasyl V. Tkach

Department of Biology, University of North Dakota, Grand Forks, USA

It is well known that blood-sucking arthropods serve as vectors of numerous viral, bacterial, and protozoal infectious diseases. It is much less known, however, that parasitic worms may also transmit disease agents, including bacteria. *Wolbachia* in filariae is the best known example due to its association with the river blindness disease in humans. *Neorickettsia* (Rickettsiales, Anaplasmataceae) is a genus that includes a small number of named species and genetic lineages of obligate intracellular bacteria normally endosymbiotic within all stages of digenean complex life cycles, where they are maintained through vertical transmission. Some *Neorickettsia* may be transmitted horizontally from digeneans to their vertebrate definitive hosts where they invade and multiply within various cells types. In some vertebrates, neorickettsial infections of macrophages, monocytes, and other cells result in severe, sometimes fatal, disease. Neorickattsiae are known for causing human Sennetsu fever in Southeast Asia, "salmon dog poisoning" and Potomac horse fever in North America as well several diseases of wild carnivore mammals. Despite significant progress in microbiological, immunological and genomic research on *Neorickettsia* the knowledge of their diversity, transmission and localization within digenean hosts was very limited until recently. This work summarizes recent advances in studies of neorickettsiae focusing on the expansion of knowledge of their transmission biology, diversity, phylogeny, geographic distribution and host range. A particular emphasis is made on the quantitative aspects of their vertical transmission through digenean life cycles and localization in tissues of their digenean hosts. Methods and techniques used in studies of *Neorickettsia* biology and biodiversity are outlined and discussed along with the future directions of basic and applied research on this practically important and biologically fascinating group of endosymbionts.