
Exposure of Yellow-legged gulls to *Toxoplasma gondii* along the Western Mediterranean coasts: tales from a sentinel

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Abstract

Tracking and anticipating the dynamics of infectious agents in wild populations requires gathering a large number of samples, if possible at several locations and points in time, which can be a challenge for some species. However, in an abundant and widespread species such as the yellow-legged gull (*Larus michahellis*), it has been suggested that testing for the presence of specific maternal antibodies in egg yolks sampled on the colonies could be an effective way to quantify the exposure of breeding females to infectious agents. We used this approach to explore spatio-temporal patterns of exposure to *Toxoplasma gondii*, a protozoan responsible for toxoplasmosis in warm-blooded species. Samples gathered from 2008 to 2016 in 20 colonies from France, Spain, Tunisia and Algeria were analysed using an immunoassay to detect antibodies specifically directed against *T. gondii*. Relatively high and variable antibody prevalence was detected. These results are discussed in light of host behaviour and in relation to patterns observed for other infectious agents with contrasting modes of transmission: a tick-borne flavivirus and avian influenza viruses. The potential efficiency of different field sampling designs to detect the spread of an agent are then compared under various transmission scenarios. We notably compare the benefits of including the tracking of individual gull exposure and accounting for spatial heterogeneities within colonies. We conclude that large gulls and other related species could be useful wildlife sentinels for tracking the emergence of certain infectious agents, notably by using egg sampling as an alternative to blood sampling.

Keywords: eco epidemiology, *Toxoplasma gondii*, egg, maternal antibodies, immunoassay, sampling strategy, yellow legged gulls, *Larus michahellis*, Mediterranean

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