

Cat ownership is neither a strong predictor of *Toxoplasma gondii* infection nor a risk factor for brain cancer

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Invited reply



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Using a dataset including 37 countries, we recently reported a positive correlation between the national seroprevalence of the protozoan parasite *Toxoplasma gondii* and the national incidence of brain cancer [1]. We further established the significance of this association in a second paper showing that in France, regional mortality rates owing to brain cancer correlated positively with the local seroprevalence of *T. gondii* [2]. These results do not demonstrate causation but suggest that *T. gondii* should be investigated further as a possible oncogenic pathogen of humans.

Benson *et al.* [3] used data from a large UK prospective cohort of middle-aged women among whom 18 per cent owned at least one cat. Comparing brain cancer incidence in women living with a cat or without any pet, they found no correlation between cat ownership and brain cancer. This is an important finding because the popular press is drawn to the headline that pet cats are a health risk to their owners. Our disagreement with Benson *et al.* is that their findings do not inform how *T. gondii* is linked to brain cancer, which was the main finding of our research.

Although cats are a necessary part of the life cycle of *T. gondii*, multiple studies have shown that cat ownership is not a strong predictor of risk of *T. gondii* infection [4,5]. Contact with oocysts from cat faeces can occur through contaminated soil or vegetables [6]. Contact with contaminated soil (combined with poor hygiene) and eating unwashed vegetables are significant risk factors [6]. In addition, undercooked meat consumption has been identified as the chief risk factor for human toxoplasmosis in a number of European countries, including the UK ([7]; see [6] for a review). Thus, cat ownership is not a good proxy of the probability of being infected by *T. gondii*, either through oocysts originating from cats or through *T. gondii* asexual stages. So, while cats are a key host for *T. gondii* and *T. gondii* seems to be a risk factor for brain cancer, cat ownership is not necessarily a significant risk factor for brain cancer, at least not unless other risk factors are accounted for statistically.

To conclude, the study of Benson *et al.* should be reassuring to cat owners, but it does not test whether

T. gondii affects risks of brain cancer. Clearly, what is now needed to assess the role of *T. gondii* in brain cancer risk are studies that compare the seroprevalence of *T. gondii* in individuals with brain cancer with matched controls.

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