

# Reply to “Saved by cabbage, killed by cabbage, and COVID-19”

Jean Bousquet<sup>1</sup> and Josep Anto<sup>2</sup>

<sup>1</sup>Université Versailles, St-Quentin-en-Yvelines

<sup>2</sup>ISGLoBAL

October 23, 2020

To the Editor,

We appreciate the interest and comments of Soriano and Ancochea<sup>1</sup> regarding our papers<sup>2</sup>. Further to the suggestion that “it would be of interest to repeat their statistics conducted during the first wave of COVID-19, again with the current estimates during the ongoing second wave, or later ones”, we would like to emphasize that our geographical observation was a type of anecdotal evidence that contributed to formulating a hypothesis. In a previous paper, we found that after adjusting for potentially relevant country-level confounders, there was a negative ecological association between COVID-19 mortality and the consumption of cabbage and cucumber in European countries<sup>3</sup>. In this study, we acknowledged that “As in any ecological study, any inference from the observed association should be made at the country level, as the possibility of ecological fallacy precludes inferences at the individual level; and that further testing in properly designed individual studies would be of interest”. Indeed, what would be useful is testing the hypothesis in robust observational studies and/or clinical trials.

Regarding our observation that COVID-19 could be considered as a disease of the Anthropocene<sup>4</sup>, other authors have recently provided a more complete description of the links between the disruption of the natural ecosystems that characterize the Anthropocene and the occurrence of zoonosis<sup>5 6</sup>.

1. Soriano J and Ancochea J. Saved by cabbage, killed by cabbage, and COVID-19. *Allergy* 2020; in press.
2. Bousquet J, Anto JM, Czarlewski W, et al. Cabbage and fermented vegetables: from death rate heterogeneity in countries to candidates for mitigation strategies of severe COVID-19. *Allergy* 2020. DOI: 10.1111/all.14549.
3. Fonseca S, Rivas I, Romaguera D, et al. Association between consumption of vegetables and COVID-19 mortality at a country level in Europe. *MedRxiv* 2020; 10.1101/2020.07.17.20155846
4. O’Callaghan C and Anto J. COVID-19: The Disease of the Anthropocene. *Env Res* 2020; 187: 109683.doi: 109610.101016/j.envres.102020.109683. Epub 102020 May 109615.
5. Morens DM and Fauci AS. Emerging Pandemic Diseases: How We Got to COVID-19. *Cell* 2020; 182: 1077-1092. 2020/08/28. DOI: 10.1016/j.cell.2020.08.021.
6. Roche B, Garchitorena A, Guegan JF, et al. Was the COVID-19 pandemic avoidable? A call for a “solution-oriented” approach in pathogen evolutionary ecology to prevent future outbreaks. *Ecol Lett* 2020 2020/09/02. DOI: 10.1111/ele.13586.

JM Anto

ISGlobal, Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain. IMIM (Hospital del Mar Research Institute), Barcelona, Spain. Universitat Pompeu Fabra (UPF), Barcelona, Spain. CIBER Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain.

J Bousquet

Charité, Universitätsmedizin Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Comprehensive Allergy Center, Department of Dermatology and Allergy, Berlin, Germany. MACVIA-France, Montpellier, France.