No evidence of suitability of prophylactic fluids for wildfire prevention at landscape scales

Cristina Santín[a,1], Stefan H. Doerr[a], Juli G. Pausas[b], Emma C. Underwood[c], and Hugh D. Safford[c,d]

Yu et al. (1) propose a viscoelastic fluid as a prophylactic fire-retardant treatment in landscapes at high risk of wildfires. We argue that, while the idea is worth exploring further, their data do not support its suitability for real landscape-scale applications.

First, they report their fluid is environmentally benign because it is "biodegradable and nontoxic." No tests under field conditions were performed. Nontoxicity was assessed by changes in apoptosis of human cells in culture, and biodegradability by oxygen demand and biochemical methane production tests in the laboratory. Their tests did not assess effects of the fire retardant on plant functioning, nor did they evaluate potential impacts on nonhuman animals or microbial communities (2–4). Effects on soils were also overlooked (5), even though a substantial fraction of the sprayed fluid is not retained on the vegetation (figure 2B in ref. 1). Impacts on water quality or on ecosystem services provided by vegetation were not considered either (4, 6). The authors' comment on the "insignificant amounts of soluble phosphorus" released to the environment is not supported with data.

Second, to support their statement that the retardant has "persistent retention to target vegetation throughout the peak fire season" the authors simulated weathering by dropping water on treated vegetation in the laboratory. This approach does not provide an environmentally meaningful assessment of the longevity of the product, as rain is uncommon during the California fire seasons, and misses key aspects of weathering in natural settings, such as exposure to wind, sunlight, or extreme temperatures. Even in the presence of rain, simulating precipitation events using 0.64 to 1.27 cm of water does not adequately reflect weather patterns in California, where diurnal rainfall often exceeds 7 cm (7).

Third, the study does not include an assessment of the economic feasibility of the treatment, production costs, or details of how to apply the retardant at the landscape scale. The authors propose its application in "high-risk" areas; in their California example, high-risk areas cover about half of the state (figure 1 in ref. 1). Even if only the wildland–urban interface was treated, this area would exceed 12,000 km^2 (8).

Finally, once fire matures, the retardant becomes ineffective (figure 6 in ref. 1); thus, it would only be suitable for reducing ignition risk directly at the ignition source and, unlike conventional fuel reduction treatments, would not be effective in reducing spread of an approaching fire.

Human exposure to wildfire is an increasing global concern. Projected increases of both severe fire weather and wildland–urban population growth in California, and in many regions worldwide, call for fire research and management communities to collaboratively provide society with tools to safely coexist with fire (9). While research on alternative mitigation treatments, such as that presented by Yu et al. (1), is essential, their application should not be promoted without a proper evaluation of effectiveness, environmental impact, practical and economic feasibility, and without considering their usefulness in comparison—and integration—with conventional fuel treatments and fire prevention approaches whose costs and benefits are already well understood (6, 10).

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[a]College of Science, Swansea University, SA2 8PP Swansea, United Kingdom; [b]Centro de Investigaciones sobre Desertificación, Consejo Superior de Investigaciones Científicas, 46113 Montcada, Spain; [c]Department of Environmental Science and Policy, University of California, Davis, CA 95616; and [d]Pacific Southwest Region, US Department of Agriculture Forest Service, Vallejo, CA 94592

Author contributions: C.S., S.H.D., J.G.P., E.C.U., and H.D.S. wrote the paper.

The authors declare no competing interest.

[1]To whom correspondence may be addressed. Email: c.santin@swansea.ac.uk.

First published February 20, 2020.

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