Understanding and Communicating the Risks of Urban Fires on Eggs Produced from Backyard Chickens in California

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Background

While wildfires are a longstanding threat to California, recent fire events may portend the "new reality" of increased wildfire incidence within urban areas. This can result in distribution of ash debris that has been shown to contain toxic levels of various heavy metals, and constitute a mechanism by which these are spread throughout the environment. In many cases these urban fires geographically overlap with backyard poultry, which has become a growing phenomenon due to their relative ease to raise and their ability to produce eggs for human consumption.

Current Research/Work

As part of our ongoing research, we are assessing the presence of heavy metals and other contaminants commonly associated with urban fires in eggs from backyard chickens raised near fire affected areas. Specifically, using a "Citizen Science" approach we:

- Surveyed owners and collected eggs from over 300 backyard poultry premises in California.
- Using Mass Spectroscopy, tested the eggs for the presence of 6 heavy metals.

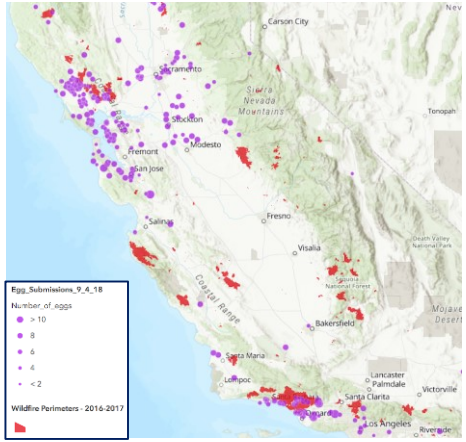

Figure 1. Map of California showing 2016-2017 wildfire perimeters and egg submission at each premise that participated in the research.

Preliminary Results

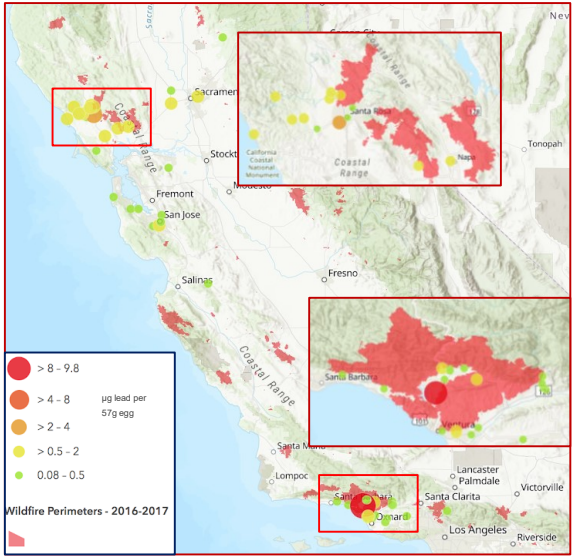

Figure 2. µg of lead per standard sized egg (57g). Insets highlight the regions of recent major wildfires, including Santa Rosa/Napa County (top) and Ventura County (bottom).

- Preliminary results found that eggs in sampled regions contained lead ranging from 0.001 ppm to 0.173 ppm.
- Overall, 17.6% of the eggs submitted (40% of premises with heavy metal results available) surpassed the California Proposition 65 Maximum Allowable Dose Level (MADL) of lead consumption associated with reproductive harm (0.5 µg/day).
- Concentrations of other metals such as cadmium, arsenic, copper, nickel, and mercury were well below toxic levels.

Future Work

Our preliminary results, in combination with the scientific literature, demonstrate the need for science based extension efforts for all backyard chicken owners with respect to the risk of toxic contamination of eggs from the urban environment. Supported by a 2-year USDA grant, further efforts will include:

- As part of a 2-year USDA extension based grant, training and outreach of various stakeholder groups in urban areas affected by fires in California.
- Continued analysis of heavy metals in eggs from backyard poultry - Only 52 from the 343 samples submitted have been fully analyzed.
- Quantification of fire retardants (PBDEs) and previously banned chemicals such as PCBs.
- Generation of additional maps to better understand the spatial and temporal relationship between the presence of toxic chemicals in eggs and various abiotic factors including proximity to wildfire.
- Development of statistical models and application of machine learning based approaches to determine the factors associated with elevated toxin levels (e.g. proximity to wildfire, age of residence, proximity to Superfund sites, etc.).
- Developing best practices in risk communication to the public and policy makers.

Figure 3. Shows Toxic lead sources commonly found around homes. Note that 148 of the premises currently under study were constructed before 1978, when the federal ban on lead-containing paints was enacted.