

Human Health Risk Assessment of the Aerial Adulticiding Conducted in 2007 in Sacramento County

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Since the first outbreak in the Western Hemisphere in New York City in 1999, West Nile virus (family Flaviviridae, genus *Flavivirus*, WNV) has become a major concern in the United States. It has spread throughout the country since then, reaching California in the summer of 2003 (Reisen et al. 2004). WNV was first detected in Sacramento County in the summer of 2004, when it was associated with low level transmission to humans and horses (Armijos et al. 2005). In 2005, there was a severe outbreak of WNV in Sacramento County (Elnaiem et al. 2006), which prompted management of mosquitoes through aerial spraying of pyrethrins over the northern part of the county. The use of insecticides in areas where they have traditionally not been used or have been used less frequently has raised concerns by the public about health risks from insecticide use (Peterson et al. 2006). Likewise, the aerial spraying events in Sacramento County seemed to have generated concerns about the safety of the product used by Sacramento-Yolo Mosquito and Vector Control District (SYMVCD) to manage adult mosquito populations in the 2005 outbreak.

In 2007, after considering the increase in numbers and infection rates of *Culex tarsalis* Coquillett and *Cx. pipiens* L. mosquitoes in the north area of Sacramento County, the District conducted aerial spraying of Evergreen® EC-60-6 over about 215 km² on the nights of July 30, 31, and August 01 using a fixed wing Piper Aztec aircraft. Human health risk assessments had been previously modeled for truck-mounted applications of pyrethrins and piperonyl butoxide (PBO) at higher rates than the ones

used by SYMVCD, and different spraying schedule (Peterson et al. 2006). We conducted a human health risk assessment for six different subgroups after exposure from aerially applied pyrethrins and PBO at 0.0025 and 0.025 lbs/acre respectively, over 3 days, in Sacramento County, using more recent deposition data. In this study we compare these results to the ones reported by the human health risk assessment conducted by Peterson and colleagues (2006) (Table 1).

The values from the previous study represented a conservative approach where risks were most likely overestimated (Peterson et al. 2006) and the authors concluded that human health risk from residential exposure to insecticides used to control adult mosquitoes were low and not likely to exceed levels of concern. Our assessment was based on the aerial application conducted in Sacramento County in 2007, and our risk quotients were 2.4 to 5.4 times lower than the ones reported by Peterson and colleagues for pyrethrins, and 1.5 to 3.3 times lower for PBO. We conclude that human exposure would most likely result in negligible risk. Our study and the current weight of scientific evidence do not support the perceptions that human health risks from exposure to the pyrethrins insecticide applied by SYMVCD in Sacramento County in 2007 may be greater than the risk from WNV.

Table 1. Acute risk quotients (RQs)¹ for pyrethrins and piperonyl butoxide (PBO) for each subgroup.

Subgroups	Peterson et al. 2006		Sacramento Co. 2007	
	Pyrethrins	PBO	Pyrethrins	PBO
Adult males	0.0081	0.0004	0.0015	0.0002
Adult females	0.0085	0.0004	0.0018	0.0002
Children (10-12 yrs)	0.0113	0.0006	0.0021	0.0004
Children (5-6 yrs)	0.0190	0.0009	0.0040	0.0006
Toddlers (2-3 yrs)	0.0245	0.0012	0.0064	0.0009
Infants (0.5-1.5 yrs)	0.0218	0.0010	0.0091	0.0003

¹RQs = total acute potential exposure ÷ reference dose (RfD), representing exposure ÷ toxic endpoint.

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