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AEDES ALBOPICTUS AND *AE. TRISERIATUS* EGGS SURVIVE WASTE TIRE PROCESSING

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ABSTRACT. Tires that were either crudely chopped or more finely processed into shreds contained viable eggs. Field-collected remnants of 2–3 chopped tires contained viable *Aedes albopictus* eggs. After shredding tires seeded with mosquito eggs, 34 (4.6%) of an estimated 746 *Ae. albopictus* eggs and 21 (2.7%) of an estimated 774 *Aedes triseriatus* eggs survived. Chopped and shredded tire remnants may serve as a means of dispersing mosquitoes.

Over half of the approximately 250 million tires discarded annually in the United States are deposited in waste tire dumps or landfills. Stockpiled new and used tires can retain water and serve as suitable habitats for immature mosquitoes, including species that can transmit arboviruses such as St. Louis encephalitis virus, La Crosse encephalitis virus, and the dengue viruses. Furthermore, the threat of fire makes large waste tire dumps potential sources of environmental contamination. Some states, including Illinois, have a mandate to reduce their number of waste tires.

When the Used Tire Program of the Illinois Environmental Protection Agency cleans up a waste tire site, the tires are chopped at the site, transported to a tire recycling facility, and shredded. Tire shreds are used as fuel supplements by blending them with coal and burning the mixture in industrial boilers to produce steam, in utility boilers to produce electricity, or in cement kilns to produce energy. A tire chopper cuts each tire into 2 to 6 pieces, and a tire shredder cuts each tire into over 100 pieces. Chopped remnants range in weight from about 100 g to about 5,000 g. We found that the mean weight of tire shreds is 11.4 g (n = 30; SD = 7.2 g). Although the transport of whole tires is the principal means of dispersing tire-inhabiting mosquito larvae and eggs in the United States (Francy et al. 1990), it is unknown whether transport of chopped or shredded tires also contributes to the dispersal of immature mosquitoes. The objective of this preliminary study was to determine whether mosquito eggs can survive the chopping and shredding processes.

Tire remnants from about 2–3 passenger tires were collected immediately after being chopped at a waste tire site in Jasper Co., IL. In the laboratory, the tire remnants were submerged in tap water <3 h after chopping. The tire remnants were removed after 4 days and the water was sieved through a fine mesh (40 meshes/cm). A single larva was recovered and identified in the adult stage as a female *Aedes albopictus* (Skuse).

A colony of *Ae. albopictus* from Chicago, IL and a colony of *Aedes triseriatus* (Say) from Champaign County, IL were used to "seed" tire remnants with eggs. Larvae were reared as in Siegel et al. (1994). One hundred *Ae. albopictus* pupae were placed in water-filled paper cups in each of two 30 × 30 × 30-cm screened cages. Between 600 and 800 *Ae. triseriatus* pupae were allowed to emerge in a cylindrical cage 138 cm high and 140 cm in diameter. Both species were fed blood from guinea pigs 4 to 5 days after emergence of the females.

A scrap passenger car tire was cut into 4 approximately equal pieces. One tire quarter was placed in each of the 2 *Ae. albopictus* cages, and 2 tire quarters were placed in the *Ae. triseriatus* cage. One liter of sod infusion (Lampman and Novak 1996) was poured into each tire quarter. Five days after each species was fed blood the tire quarters were removed from the cages and the eggs on each quarter were counted. The tire quarters were air-dried for 1 h, then weighed.

One tire quarter from an *Ae. albopictus* cage and one tire quarter from the *Ae. triseriatus* cage were shredded in a Untha RS50 shredder with a 3.8-cm screen (Unterwurtzacher Co., Kuchl, Austria) operated by Logan Correctional Industries at the Logan Correctional Center in Lincoln, IL. The remaining tire quarter from each species was used as an unshredded control. The shredded and control tires were submerged separately in nutrient broth (Novak and Shroyer 1978) to hatch viable eggs. They were submerged repeatedly until eggs no longer hatched.

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We counted 1,059 eggs on the *Ae. albopictus* tire quarter before shredding. This tire quarter weighed 2,303 g before shredding and produced 1,995 g of shreds, which is a recovery rate of 87%. Therefore, we would expect to recover 87% of the original 1,059 eggs, or 921 eggs. Because 81% of the *Ae. albopictus* eggs on the control tire quarter hatched, we assumed the same proportion of eggs on the shredded tire quarter would hatch. Therefore, we expected 746 viable eggs, if they survived shredding. Thirty-four (4.6%) of the estimated 746 *Ae. albopictus* eggs survived shredding.

There were 1,436 eggs on the *Ae. triseriatus* tire quarter before shredding. This tire quarter weighed 2,378 g before shredding and 2,352 g after shredding, which is a recovery rate of 99%. Fifty-five percent of the *Ae. triseriatus* eggs on the control tire quarter hatched. Twenty-one (2.7%) of an estimated 774 *Ae. triseriatus* eggs survived shredding.

Tires that were either crudely chopped or more finely processed into shreds had viable eggs. The survival of viable eggs on chopped and shredded tires indicates that tire remnants may serve as a means of dispersing mosquitoes, albeit at a substantially lower rate than whole tires. Future studies will provide a better estimate of the survival rate of *Ae. albopictus* and *Ae. triseriatus* eggs on chopped and shredded tires. Insecticide application and exposure to extreme heat or cold are possible control alternatives, but keeping tire remnants dry is the most practical option in most cases.

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