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Novel defense by honeybees against mass attack by giant wasps

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Despite being some of the most studied insects in the world, honeybees continue to surprise us with the complexity of their social behaviors. In parts of its range, *Apis cerana* is known to employ spectacular tactics to defend colonies against mass attack by giant hornets (*Vespa mandarinia japonica*). *A. cerana* avert attack by these large predators by balling scout wasps and then simultaneously heating them to lethal temperatures and asphyxiating them until they are dead. In Vietnam, we observed a new response of *A. cerana* to attack by the closely related and similarly sized wasp *Vespa soror* - worker bees search for, collect, and then plaster animal dung (and other 'filth' substances, such as urine, soap scum, and mud) around their colony entrances to thwart attack. Collection of dung and other filth was induced only after visitation by *V. soror* and rates of 'spotting' varied across colonies. Wasps were less inclined to land and chew on hive entrances that were covered with filth spots, preventing predator access to the inside of the nest. Spotting responses were significantly stronger after presentation at entrances of van der Vecht gland extracts from *V. soror* compared to major gland components from *V. mandarinia*. Although we observed *A. cerana* balling smaller species of wasps, we did not observe attempts to ball *V. soror*. A survey of beekeepers in Vietnam indicated that spotting is widespread. Not only is this the first report of an exciting new defense of honeybees against giant wasp predators, it is also the first observation of the collection and manipulation of filth by any *Apis* species. Our findings raise many questions about the behavioral mechanisms that generate *A. cerana*'s coordinated spotting response, as well as the evolutionary path that produced two distinct defenses by *A. cerana* to attack by giant wasps.