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Red specks on honey bees (*Apis mellifera*)

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Invertebrates comprise over 90% of all living species, yet only a few are kept in captivity. Honey bees (*Apis mellifera*) are kept for both laboratory research and agricultural production. Their remarkable communication system, in which they dance to communicate the spatial location of food and other resources to their nest mates, has served as a model system for studying the mechanisms and evolution of complex behavior. Experimental analysis of honey bee behavior ranges from behavioral physiology and biochemistry, neurobiology, sensory physiology, and general physiology to circadian rhythms and photoperiodism. In the past 10 years, neurobiological analysis of aspects of honey bee learning and memory has helped to determine general or species-specific properties in neural systems[1].

Researchers use honey bees to investigate a wide range of additional subject areas, including the following:

- Aging and longevity[2,3]. In social insects, different castes can have very different life spans. Worker bees typically live 3–6 weeks during the spring and summer, while they can live 4–5 months in the winter.
- Development of new antimicrobial agents[4]. In response to infection and mechanical injury, insects produce considerable amounts of antimicrobial proteins and peptides. Recent advances in insect immunology have resulted in a set of new antibacterial peptides and clarified their mode of action.
- Vision and recognition[5,6,7]. Insects are proving to be excellent models for investigating how optic flow guides locomotion and navigation.
- Hymenoptera venoms. Bees, wasps and ants are ubiquitous in nature, and their stings often cause life-threatening allergic reactions. Their venoms are complex mixtures containing simple organic molecules, proteins, peptides, and other bioactive elements[8]. Isolation and characterization of these venoms has led to advances in the immunodiagnosis and immunotherapy of Hymenoptera venom allergies[9].

FIGURE 1 | Red discoid structures on the body and head of a dead honey bee (*Apis mellifera*). The arrows point to the red structures.

FIGURE 2 | A swarm of honey bees. The arrow points to a red discoid structure on one honey bee.

Worldwide, honey bees are integral to agriculture because they are the most plentiful and often the most efficient pollinators of crops. Maintaining commercial populations of pollinating honey bees is vital to US and European agriculture. Honey bees also produce the natural foodstuff honey, and manipulation of the bees' behavior can coax the insects to deposit their honey on man-made wooden frames. Systematic research on bees, including the rearing, exploitation, and practical use of bees and their products, is published regularly in agricultural journals.

Environmental scientists also use honey bees to detect environmental contaminants. Honey bees are currently being used to monitor a variety of environmental pollutants, including many trace elements, radionuclides, and chemicals[10]. Bioassays with honey bees and purified transgene products (*i.e.*, proteins) are also used to assess the potential impacts of genetically modified plants on the environment[10].

The biology department of Tufts University School uses bee colonies for research. One colony produced a swarm that temporarily settled on a picnic table about 500 meters from the original colony site. The author collected the swarm in a cardboard box and placed them in an empty hive body. The colony was not disturbed for three weeks, after which a quick visual inspection was performed in order to assess the health status of the colony. During this inspection, the author saw small red dots on the body of a few dead bees found in the bottom tray of the hive. The author examined the red dots, and upon closer examination, the red appendages appeared to be actively moving on the dead bees (**Figs. 1** and **2**).

What are the red dots? Are they common in honey bees? How would you treat this?

What's your diagnosis?

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