Special Issue

Bees: Physiology, Immunity and Developmental Biology

Message from the Guest Editors

Bees are essential pollinators with complex biological systems. Their physiology includes specialized adaptations for flight, pheromone-based communication, and efficient foraging. Their immune system is innate, using mechanisms like antimicrobial peptides and phagocytosis to fight pathogens. Developmental biology in honey bees is regulated by diet—especially royal jelly—and hormones such as juvenile hormone and ecdysone, which determine caste differentiation and guide metamorphosis. However, global bee populations are in decline due to multiple stressors. Key factors include pathogen infections (e.g., Varroa destructor mites, viruses), pesticide exposure (particularly neonicotinoids), habitat loss, climate change, and nutritional stress from monoculture agriculture. These pressures compromise immunity, disrupt development, and reduce colony survival, posing serious threats to both ecosystems and agriculture.

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