PP-090 [Bee Health]
Nitric oxide as a key signalling molecule for antimicrobial peptide production in Apis mellifera

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Honey bees have an evolutionarily improved system of innate immunity, which is the basis of defensive reactions against pathogens. After pathogen recognition by the host cell, several biochemical reactions occur, including the production of nitric oxide (NO), an important signalling molecule that maintains cellular homeostasis and is a key host defense molecule. In the invertebrate immune system, NO is generally thought to regulate insect immune responses through signalling pathways leading to activation of antimicrobial peptide (AmP) production, or by a direct cytotoxic effect leading to the killing of invading pathogens. In bees, knowledge in this area is at its very beginnings. In our study, we focused on modulating NO production's effect on the humoral component of bee immunity, specifically on AmPs production. We achieved this under laboratory conditions by feeding newly emerged honey bees with substances that interfere with the metabolism of NO. After 10 days, bees were injected with lipopolysaccharides to stimulate their immune systems and we studied what happened primarily at the level of apidaecin, abaecin, hymenoptaecin and defesin-1/-2 gene expression and production of these AmPs on protein level. The data we obtained showed apidaecin gene expression is dependent on NO signalling. Moreover, lower levels of NO negatively affected apidaecin, abaecin, defensin-1, and hymenoptaecin production. These results support our hypothesis about the necessity of NO signaling for the production of effector molecules of humoral immunity of bees, such as AmPs. Our research is primarily set up as basic research and we bring a new view on the activation of honey bee immune system. However, it may provide insights that can be used in the near future as another approach to support bee health against pathogen infection.

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