An attractive scent

Arboviruses require a vertebrate host and a vector for transmission. This process involves the localization of an infected host by haematophagous arthropods, which get infected during feeding and become competent for onward transmission. Pathogen-infected hosts may be more attractive for haematophagous arthropods, but it remains unclear whether arboviruses manipulate mosquito attraction to enhance the probability of viral dissemination. Evidence suggests that host odorants (skin volatiles) are key host cues to manipulate the feeding motivation of haematophagous vectors. In this study, Zhang et al. show that flaviviruses promote the proliferation of acetophenone-producing skin commensal bacteria, which enhances mosquito attraction and thus flavivirus transmission.

The authors first showed that Aedes aegypti mosquitoes prefer to seek and feed on mice infected with flaviviruses (dengue virus 2 or Zika virus) than uninfected controls. Further experiments revealed that host CO2 emission or body temperature were not driving this selective behaviour in their experimental settings, and they hypothesized that changes in host volatile production promotes mosquito attraction. Indeed, they identified the host volatile acetophenone, which elicited a significant electrophysiological response of the antenna of A. aegypti and, when applied to animal skin, attracted more mosquitoes than other compounds or mock treatment. In agreement with this, volatile extracts from patients with dengue fever contained high levels of acetophenone and attracted more mosquitoes than extracts from healthy individuals when applied to human skin.

But what is the source of acetophenone? As acetophenone is a common metabolic by-product from bacteria, the authors speculated that this compound is produced by skin commensals. Indeed, they showed that depletion of the skin microbiota strongly decreased the volatilization of acetophenone and rendered the infected mice much less attractive to mosquitoes, similar to uninfected controls. Furthermore, the abundance of acetophenone-producing bacteria, including species in the Bacillus and Staphylococcus genera, was increased on the skin of flavivirus-infected hosts, and mice treated with potent producers of acetophenone were more attractive to mosquitoes than those treated with bacteria that lacked the capacity to produce acetophenone. Finally, infection was shown to suppress the expression of the host antimicrobial protein RELMα, which might explain the expansion of acetophenone-producing commensal bacteria in infected mice. Dietary administration of the vitamin A derivative isotretinoin increased RELMα expression in flavivirus-infected mice, suppressing the expression of the host antimicrobial protein RELMα, and the capacity to produce acetophenone.

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