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Mosquito proboscis: An amazing biomicroelectro mechanical system

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Female mosquito has evolved a special proboscis (mouth), a natural biomicroelectromechanical system (BMEMS), used for penetrating into human skin painlessly and sucking blood. Scanning electron microscope (SEM) observations show that the mosquito proboscis consists of a smaller bundle of long tapering feeding stylets that are collectively called the fascicle and a large scaly outer lower lip called the labium. During blood feeding, only the fascicle penetrates the skin, whereas the labium buckles back and remains on the skin. Here we first observed the dynamic penetrating force variation of the fascicle into human skin to reveal the mechanical principle for the ultimate painless penetration process. Based on the observation of the inserting motion of the mosquito fascicle through a high-speed video, it is found that the smart mosquito does not directly penetrate its feeding fascicle into a victim's skin, but use the micronanosaw-toothed maxillae sawing their way into the tissue of the skin with a variable frequency. It is such a smart BMEMS that makes the mosquito become a high skill skin diver and use a very small force (tens of micro-Newtons) to penetrate its feeding fascicle into human skin.

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