Extended construction details:

The MozzieDrome host-seeking assay features a circadian entrainment enclosure, a video-recording platform, a mosquito arena, with CO2 delivery components. Acrylic sheets for all custom-built components were processed with a laser cutter and/or a hand drill.

Circadian entrainment enclosure**.**The overall enclosure of the MozzieDrome is constructed with 1/4'’ black acrylic sheets. A 60 x 45 x 45 cm open box with ventilations is constructed with five finger edge joints with a 60 x 45 cm open face. The open box is assembled with acrylic cement. A 60 x 45 cm panel is installed with door hinges and latches secured with screw and nuts over holes created with a hand drill. Black foam tape was applied to the rims of the open box and them secured with duct tape. Black-out curtains were installed and used during experiments to completely cover the open door to ensure a tight, light-proof seal. Four rubber feet were sticked on the bottom of the box to provide elevation and soften vibration. The bottom of the box has ventilation holes that is then covered with an elevated black acrylic platform to ensure a complete dark environment. The pre-cut holes on top of the box were equipped with two USB cooling fans secured with hot glue, and then covered with an elevated platform and then another “cap”. The center of the top of the box has hole for camera placement. The lighting system of the MozzieDrome uses white LED strips covered with a 1/8’’ white translucent acrylic sheet to provide diffusion. The diffusion sheet has a pre-cut hole in the middle to allow camera to image through and holes around the edges to avoid blockage of air circulation. The white LED light is controlled together with the CO2 delivery system with a Matlab code to provide animals with LD (12 h light: 12 h dark, with 30 min transitions) and DD entrainments.

Video-recording platform. The video-recording platform features a camera mount that is installed on the camera hole on top of the overall enclosure and an IR light platform that provides illumination for videography. The camera mount was constructed with 1/4'’ black acrylic sheets with finger edge joints and a sliding front door. The bottom of the camera mount is equipped with black foam tape and the camera mount is installed on top of the overall enclosure with screw and nuts over holes created with a hand drill. An IR longpass filter is taped from the inside of the overall enclosure to block visible light from entering the enclosure and prevent visible light interfering with video acquisition. The IR light platform is constructed with 1/4’’ clear acrylic sheets. Backlight IR illumination was provided with a custom-built light box which was constructed with finger edge joints that was secured with acrylic glue. The light box was taped with reflective sheet and installed with strips of 840 nm IR light. On top of the light box, two sheets of Kimwipe were laid to provide diffusion. Surrounding the light box, we constructed a side IR light source with 1/4’’ clear acrylic sheets that was secured with acrylic cement. Mounted around this acrylic frame is 840 nm IR light covered with a white tape to provide diffusion. Both the side and the back lighting are powered with a 12V DC power source and turned on throughout experiments.

Mosquito arena. The mosquito arena was constructed with 1/8’’ clear acrylic sheets. A 10 x 20 x 30 cm rectangular tube (with 10 x 20 cm open faces) was constructed with finger edge joints and secured with acrylic cement. On the 10 x 30 cm sides, two pre-cut holes xx mm in diameter were designed to accommodate sugar feeders. The open faces were covered with mesh sheets that is secured on one 20 cm sides of the rectangular tube with hot glue. Mesh sheets have overhangs that allows them to be taped to the rectangular tubes on the adjacent sides. A stand for sugar feeder was constructed with 1/8’’ clear acrylic sheets and acrylic cement to sit on the rims of the side IR light source.

CO2 delivery system. The CO2 delivery system uses 1/4’’ OD tubings and 1/8’’ ID tubings. A solenoid valves were used to control the flow speed of CO2 by adjusting the duration of an on/off cycle according to readings from a flow meter. Custom mixed 10% CO2 was supplied to the solenoid valve, and the output side of the solenoid that is normally open is sealed with a short 1/4’’ OD tubing with a cap. The CO2 supply flows through the solenoid valve, a pressure-reducing chamber, a digital flowmeter, and a panel-mount flowmeter before entering the overall enclosure. Inside the overall enclosure, a T-spliter was used to divert the CO2 stream into two diffuser pads. The two diffuser pads were secured on the side IR light source.