

Some homemade simple tools and their use in handling of the fruit fly, *Drosophila melanogaster*

Drosophila melanogaster is a model organism widely used in biological research and biology education. Transferring adult flies is a common but difficult practice as flies fly. A set of homemade tools can be used to tackle this tricky issue. Cut two pipette tips and glue them together to make an elongated tip, make two holes in two sponge stoppers, insert the elongated tip and a funnel into the holes respectively to make T(ip)/F(unnel)–stoppers. Since flies can only move unidirectionally in the tip/funnel and only one fly is allowed to pass through the opening of the tip at a time, the T/F-stoppers make transferring of the flies (e.g. adding male flies to an already prepared cross) much easier and more controllable, with a few flies escape during transfer.

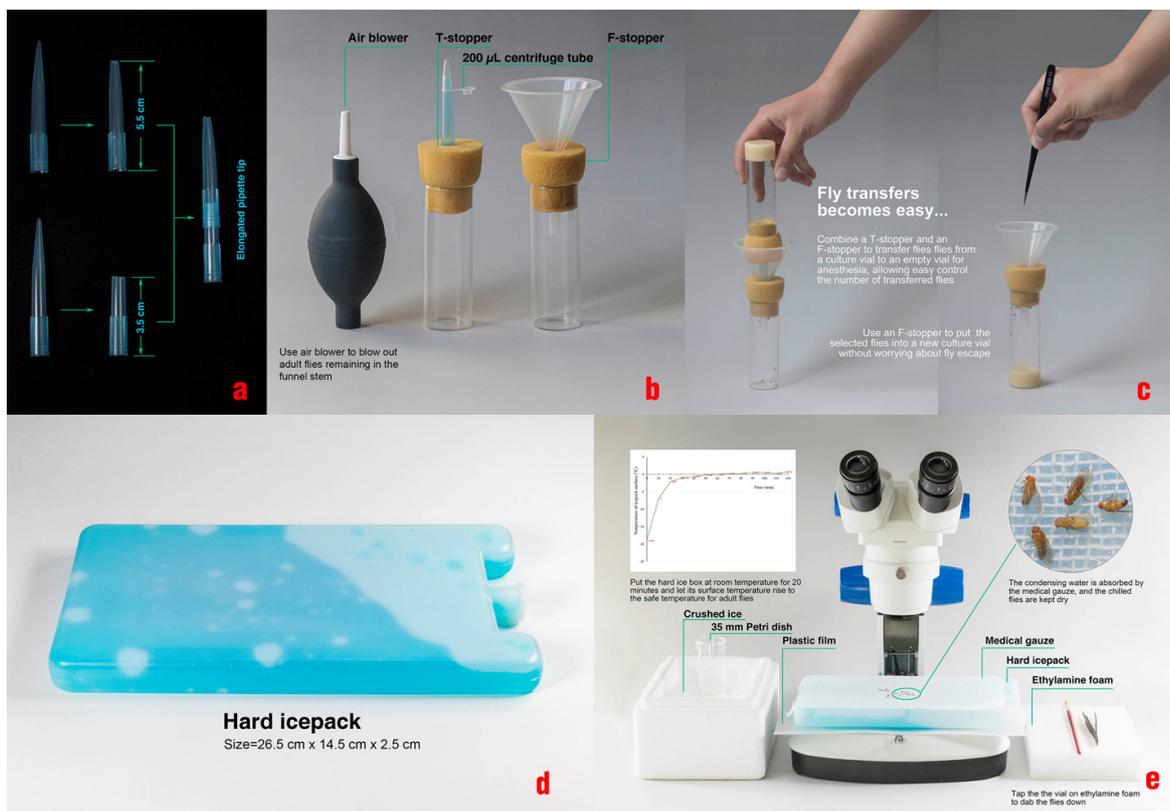


Fig. 1. T/F-stoppers and chilling anesthesia of flies. (a) Show how to make an elongated pipette tip; (b) T/F-stoppers and an air blower; (c) Two examples of using T/F-stoppers to transfer fruit flies; (d) A hard icepack used for chilling anesthesia of flies and its dimensions and (e) Various tools for chilling anesthesia of flies.

To anesthetize flies for observation, chill flies in crushed ice and dump them on the cold ($\geq -2^{\circ}\text{C}$) surface of a hard icepack and examine them under a stereomicroscope. The icepack is covered with a piece of medical gauze which soaks up the condensed water and keeps the flies dry, so their wings or other organs are intact when being transferred. Flies will remain immobile as long as they remain on the cold surface, and will regain

consciousness at room temperature within 30 seconds, and there are no concerns with excessive or inadequate anesthesia concentrations. An icepack can work for more than 100 minutes. All these make chilling anesthesia of flies truly feasible. Flies can be chilled and inspected in any suitable place in a lab. Both the icepack and gauze are inexpensive and reusable. Compare to ether or CO₂, chilling is the least harmful to flies and harmless to lab personal, thus is particularly friendly to a teaching lab.

If the flies are no longer needed and do not to be weighed after the observation, heat them in a microwave oven for 80 seconds and examine their carcasses. Microwaving reduces the weight of flies but does not distort their body shape, change their traits (e.g. body color, wing size) or make the carcasses crisp, and the carcasses can be used for counting, sorting or measuring. Compared to over-etherizing, deep freezing or throwing into a morgue, microwaving is a faster, more convenient way to kill adult flies for observation or discard.

To collect fly eggs, make a bottle-shaped egg collection cage with acrylic according to the engineering drawing, or with a beverage bottle. Use the T/F-stopper to dump flies into the cage, and pour out the flies when the medium plates need to be changed or the egg collection is over. The flies do not need anesthetizing before and after egg collection.

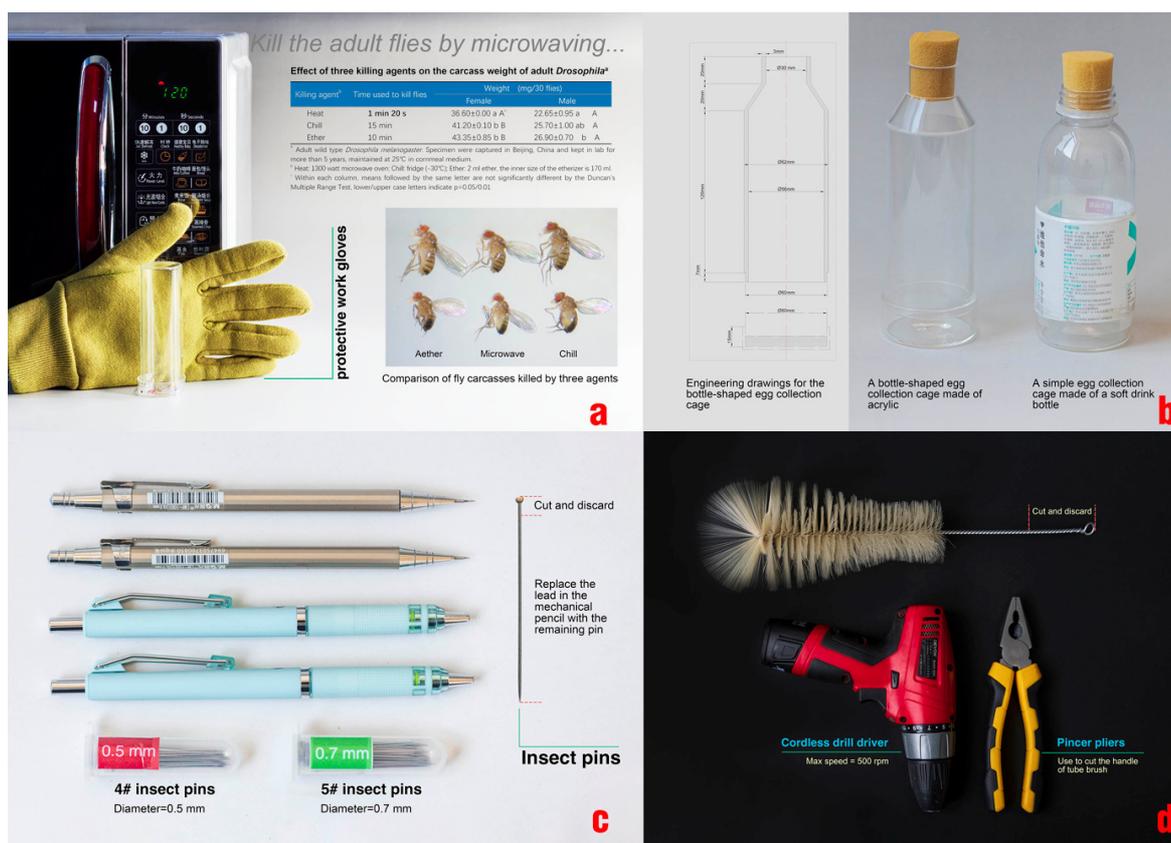


Fig. 2. Some other tools for handling fruit flies. (a) Killing adults by microwaving; (b) Bottle-shaped egg collection cages; (c) Materials required to make Mechanical pencil dissecting needles; (d) Materials needed to make cordless tube brush driver.

Obtain a mechanical pencil and an insect pin that match the diameters of its lead refill. Cut and discard the wide end of the pin and replace the lead with the remaining part to make a mechanical pencil dissecting needle. Press the click button and feed out the pin to conduct a dissection and push it completely back into the pencil shaft after the experiment for safety. Cut and discard the end of the handle of a test tube brush and insert the handle into the drill chuck to make a cordless tube brush driver. This labor-saving tool can be used to clean glassware such as fly culture vials. All the tools /methods described here have been proved to be robust, reliable and easy-to-handle, and can be used to tackle the difficult issues of fly handling.

Daxiang Yang

*Department of zoology and animal physiology, college of biological sciences,
China agricultural university, 100193, Beijing, China*

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Daxiang Yang

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