Scilight

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Producing water bells with kitchen vials

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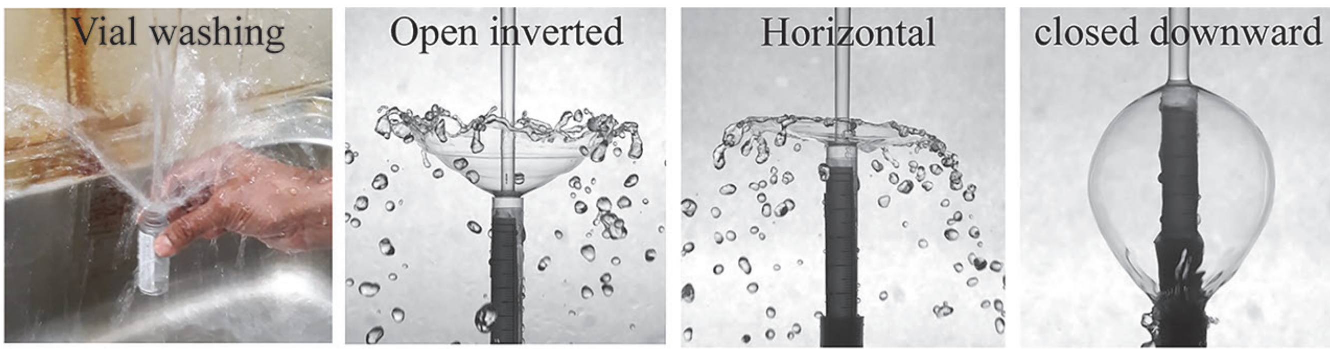
A simple setup with a water jet and a vial can generate the full range of water bell shapes.



When a jet of water impacts a flat surface, it can careen off it in a shape known as a water bell. Water bells come in three shapes: inverted, horizontal, and downward. Traditionally downward bells are produced in experiments using flat disks, while upward and horizontal bells are produced either from collisions between two jets or from a flat disk with a lip.

Mohd et al. developed a new method to produce water bells using a glass vial, accidently discovered while washing kitchen vials. Their method can recreate all three different shapes with the same setup and could aid in a theoretical and practical understanding of these phenomena.

“By changing the control parameters — nozzle diameter, vial diameter, and flow rate — we found that the water sheet forms an upward (inverted umbrella-like) structure that transforms into a horizontal sheet followed by either a downward (umbrella-like) or a closing downward bell,” said author Javed Mohd.

The researchers paired their experimental setup with a theoretical model that predicts the shape of the resulting water bell based on parameters like the capillary number and the diameter ratio between the vial mouth and the water jet. The model can predict whether a particular water bell will be upward or downward facing, but is not yet able to distinguish between open and closed shapes.

“More experiments need to be conducted with different fluids and different geometrical parameters,” said Mohd. “We are planning to conduct exhaustive experiments in this regime to unravel the mystery.”

The team hopes their method can lead to better devices for atomizing liquids with more precise control.

Source: “Open inverted bell and bell formation during the washing of vials,” by Javed Mohd, Amar Yadav, and Debopam Das, *Physics of Fluids* (2022). The article can be accessed at https://doi.org/10.1063/5.0083984.

This paper is part of the Kitchen Flows Collection, learn more here.