Using Flat Capillary Tubes to Analyze *Tetrahymena* Movement

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For Educational Purposes – March 2016
Preface
This module describes how to use flat capillary tubes to analyze *Tetrahymena* movement, and we hope that this method will provide students with an additional tool to design and implement their own independent lab investigations into the movement of this single-cell organism.

Disclosures
The authors declare that they have no conflicts of interest related to any product, brand, company, or website discussed in this module. In fact, we encourage readers to experiment with different supplies and equipment to improve upon this exercise or to fit their needs.
Introduction

While there are many different types of chambers that can be used to hold *Tetrahymena* for viewing under the microscope, capillary tubes are ideal given their fixed dimensions. Although more expensive than standard glass slides, the uniformity in a given set of tubes allows for a better comparison of results between samples. In addition, unlike glass slides and cover slips, which can often trap air bubbles that interfere with *Tetrahymena* movement patterns, capillary tubes typically do not suffer from this problem when loaded correctly.

Most frequently, we use No. 5012 flat, rectangular Borosilicate capillary tubes from VitroCom (https://www.vitrocom.com/products/view/5012), which measure 0.1 mm x 2.00 mm (width) x 50 mm (length) and cost $25.00 for set of 45 tubes at March 2016 prices (Fig. 1). However, the company has many other types of miniature tubes available.

![Figure 1. A container of Borosilicate flat capillary tubes from VitroCom.](image)

Also, although readers can use round or cylindrical capillaries, we have found that students often have difficulty focusing on *Tetrahymena* activity given the extra layers of depth in these tubes, which is why we prefer the flat, rectangular capillaries described above.

Procedure

To load a sample of *Tetrahymena* into a flat capillary tube, first, take one out of its container (be careful, though, since the tube is very fragile). Also, make sure to only touch the ends of the capillary tube, as smudges near the center (where students will be recording their videos) are very hard to clean off and will obstruct the view once the tube is placed under the microscope (Fig. 2). Alternatively, students may want to consider wearing examination gloves to avoid leaving fingerprints or smudges on the glass capillary.
Figure 2. When removing a capillary tube from its container, be careful to touch only the ends or wear examination gloves to avoid leaving smudges on the glass.

Next, place one end of the glass capillary into the microfuge tube containing the *Tetrahymena* sample. Capillary action will then suck up the *Tetrahymena* cells into the capillary tube (Fig. 3).

Figure 3. Loading a *Tetrahymena* sample into a flat capillary tube using capillary action.
Once the tube has been loaded, place a small blob of LocTite Fun-Tak (or similar mounting putty) on each end of the capillary tube and place the capillary tube onto a slide (Fig. 4). This step is important because the putty will create a seal, which will prevent air from getting into the capillary. As a result, the *Tetrahymena* cells will be less likely to accumulate near the ends of the tube due to the presence of oxygen there (a phenomenon known as “aerotaxis”).

![Figure 4. Using LocTite Fun-Tak or other mounting putty to seal the ends of a capillary tube (left) and then placing that tube on a standard glass for viewing (right). A finished capillary tube on a glass slide (bottom).](image)

Also, because the fun-tak or other putty will stick to your fingers as you handle it, please be careful as you mount the capillary tube onto the slide, so as not to pull the putty off the ends of the capillary tube.

Next, wait 10 minutes for the *Tetrahymena* cells to equilibrate to their new environment. We have observed that it tends to take at least 10 minutes for the *Tetrahymena* to resume normal movement after being transferred.
Then, record videos of swimming *Tetrahymena* cells near the center of the capillary tube, as described in the lab manual that accompanies this module (Fig. 5).

![Digital Microscope Suite 2.0](image)

**Figure 5.** Using a Celestron Digital Imager and its related Digital Microscope Suite software to record a video of swimming *Tetrahymena* cells near the center of a flat capillary tube.