**Group 3:** Cell & Developmental Biology (UC Boulder, Aug 2011)

**Teachable Tidbit:** Cell Communication – “Don’t Kill the Messenger”

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**Group Members:** Mark Burleson and Lee Hughes (University of North Texas)

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**Who**: Introductory biology for majors (freshmen & sophomores)

Easily adaptable for small or large classrooms

Designed for a classroom where students can interact with 3-4 people

At least 1 group member has internet access (computer or smart phone)

**When**: Cell communication unit in first half of the semester

Follows units on biomolecules, cell structure, and membrane structure/fxn

**What**: General theme of unit is cell communication

Explained using model of the neuromuscular junction

**Overall learning goal for tidbit:**

Understand how drugs and toxins interfere with cell communication

**Learning objectives for tidbit:**

1. Describe how toxins could interfere with cell communication (Bloom’s 2)
2. Examine various toxins’ mechanism of action (Bloom’s 3/4)
3. Apply knowledge of cell communication to design a new product (Bloom’s 5)

[Outline of learning goals, learning objectives, activities, and alignment for the entire unit on cell communication is located in the folder for this tidbit.]

**Overall Tidbit Framework**

1. Review of general concepts of cell communication – message, receiver, response

**EnGuagement**: Clicker question – put sequence in order (see .ppt file in folder)

Draw diagram on board when going over answers

1. What types of cells in the body need to communicate?

**EnGuagement:** Shout-out cell pairs, write on white board or doc board

1. Mini-lecture on neuromuscular junction (nerve-muscle communication)
   1. Demonstrate similarities between general cell-cell communication and NMJ
   2. Describe components w/o using terminology (nerve terminal, synaptic cleft, receptor on muscle cell)
   3. Sketch graph of muscle contraction for students – time vs. force
2. Video hook to demonstrate importance of NMJ
   1. Princess Bride – “Battle of Wits” – iocane poison/toxin
   2. Wikipedia entry on fictional toxins (modified to include, “It affects the neuromuscular junction”)
3. Group activity **EnGuagement** – matching toxins/venoms with site of action and effect
   1. Give each group (1) a notecard listing a different toxin or venom (our examples included botox, tetrototoxin, sarin, etc.), and (2) large whiteboard or paper with the time vs. force graph of normal muscle contraction drawn on it
   2. Instruct groups to look up toxin on internet, and discuss where the toxin comes from and how it disrupts communication at the NMJ
   3. Instruct groups to predict their toxin’s effect on muscle contraction, and graph the response on the whiteboard/paper containing the normal trace (normal and toxin traces should be different colors)
   4. Draw the NMJ on a large whiteboard or document projector. Have one representative from each group come to the front of the room to place their toxin on the drawing at the point where it disrupts NMJ signaling, and tape their graph on the board/walls
   5. The group representative then describes their toxin, toxin source, site of action, and affect on muscle contraction to the entire class. Discuss similarities/differences.
4. Assign homework

**Summative assessment** – predict where along the NMJ the iocane toxin could target, then design an antidote against iocane and defend why your antidote will work

**Materials Needed**

Clickers

Iocane video clip from Princess Bride (in folder for this tidbit)

Large post-its/notecards to list toxin (different colors for different toxins or sites of action)

Large white paper or whiteboard for each group for drawing muscle contraction graph

Thick colored markers for students to draw graph