

**Promoters/ Inhibitors of Nerve-Muscle Signals**

**Purpose:** To demonstrate the signaling of pharmaceutical drugs at the nerve-muscle synapse through ion channels. This should relay a functional model of how the drug nicotine affects the ACh receptor-channel and its effects on functional system of the skeletal muscle. Our project is in two parts an interactive game, and a model to demonstrate the concepts of the game.

**Materials:** Plexi-glass, Gumballs of different colors, plastic tubing, Plaster of Paris, modeling clay, paint, two plastic funnels, plastic glue. Paper for labels, a ball labeled Acetylcholine.

**Procedure:** To help demonstrate how Nicotine effects nerve muscle interactions, we will have the children partake in a game allowing them to become the axon and nerve muscle. First, we will split the kids up into three groups. Next, we will tell the first group to get in a straight line. They will be the axon. Group two will consist of one child. He/she will be wearing the label Nicotine. Lastly, group three will form a circle, connecting their hands and they will be representative of the nerve muscle. To demonstrate how a normal axon/ nerve muscle stimulation occurs without Nicotine, we will have group one high five each other down the row to represent signaling. Next, the last person in the line will toss the “Ach” ball to the nerve muscle group which will cause them to start high five around the circle at a normal speed. Next, to show the effects of Nicotine on the nerve muscle response, we will place the child with the Nicotine label in between the two groups. We will have them continue the process again, however, this time we will have “Nicotine” intercept “Ach” and carry it to group three where they will proceed to high five at a more rapid pace. This will demonstrate to the children that Nicotine increases the stimulation in the nerve muscle system.

A model will be created consisting of a “pinball” like appearance. The main shoots and ion channels will be constructed from plexi-glass with plastic tubes to go into the functional system. Two kids will insert the initial Acetylcholine and Nicotine (represented by gumballs) into a set of funnels. The system with both Acetylcholine and Nicotine will have a quicker release compared to the system with only Acetylcholine. Tubes representing ion channels will contain Na<sup>+</sup> ions that can be released by a trap door by the kids. The effect of the drug is demonstrated by the fast release of Na<sup>+</sup> ions to produce a working functional system (skeletal muscle). This process is observed by all children. The demonstration should illustrate the effect of Nicotine and it’s active signal on the nerve muscle synapse. Kids will get a reward of candy from the promoted system.

**Issues:** Possible malfunction of model, not enough kids involved in the model. There won’t be enough children to participate in the game, however, we can fill in where need be. Some comprises of scientific accuracy occurred in order to simplify the model. The simplification of the model and game included removing some of the complex signaling systems. The subtypes of acetylcholine and nicotine have chemical processes of EPSP that needed removal to aid in concise learning for the kids. The actual expected fast EPSP for the nicotine receptor is 20-30 msec duration. Other factors that had to be excluded from the model and game are the chemical properties of the channels in order to function. Finally, the model does not display antagonists, because it would be too much information for this demonstration. It should be noted that indeed Curare acts as an antagonist against the nicotinic receptor.

**Project breakdown:**

Liz: Model and diagrams Chelsey: Model and diagrams Mariah: Game labels and diagram