Model Proposal

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Purpose: The purpose of this model is to demonstrate the action of neurotransmitters and enzymes in the synapse.

Method: First we will teach the group of kids about the purpose of the synapse. We will use a poster board to visually show the mechanics of the synapse and synaptic transmission. After this short instruction, we will teach the kids how to play Synaptic Tag. For Synaptic Tag we will mark off a space twenty feet long by fifteen feet wide. We will mark one side of the rectangle to be the presynaptic terminal and the opposing side will be the postsynaptic dendrite. Two of the kids will be assigned the role of enzyme they will wear a sign that says "Enzyme." They will stand in the synaptic cleft. The rest of the children will then put on signs that say "Neurotransmitter." When the signal is given, the neurotransmitters will try to run across the synapse without being tagged by either of the enzymes. If they are tagged, they do not get to go to the postsynaptic cell. The neurotransmitters who are not tagged will run to the postsynaptic cell to trigger an action potential. We will also have a situation when the enzymes will be partially inhibited by a drug. In this situation, the enzymes will have to stand in one place unable to move their feet. This should limit the action of the enzymes. We will run through these different options a few times so that the kids will have the opportunity to play the role of both the neurotransmitter and the enzyme. The enzymes will only be allowed to tag one person at a time since a real enzyme would only be able to deactivate one neurotransmitter at a time. The neurotransmitters will have to stay in the bounds of the synapse so that they will not be able to easily escape the enzymes. If the neurotransmitters run outside the boundary, they will be recycled back to the presynaptic cell. After playing this game a few times we will return to the poster board and allow the kids explain the mechanism of the synapse.

Materials:

Paper (laminated)
String
Colored Tape
Poster Board

Weaknesses:

1) The neurotransmitter does not enter into the postsynaptic cell.
2) Having the enzyme touch the neurotransmitter does not accurately represent the mechanism of inactivation.
3) Drugs do not immobilize the enzymes like in our representation.
4) The act of the neurotransmitters running toward the postsynaptic cell and the enzymes actively seeking the neurotransmitters does not accurately model the diffusion and random collisions in a real synapse.
5) There is no "boundary" to the synapse, whereas our play-field will have boundaries.