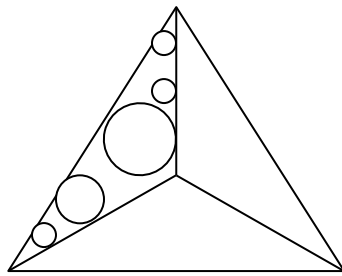


BBB-Ball

Purpose: To demonstrate the selectivity of the blood-brain barrier, or BBB, under three conditions: (1) normal, (2) when there is a deficiency of Glut1 transporters, and (3) when suffering from bacterial meningitis. With time, the concept that many molecules must travel through channels will be introduced.

Materials: Timer, Styrofoam craft balls of five varying sizes to denote five different molecules, a sheet of plywood (6'x6'), skill saw, jigsaw, five kids.

Procedure: Cut the plywood board into an equilateral triangle using your skill saw. Divide this board into three equal sections with vertical sheets approximately 2' high. Cut holes in the plywood to represent space between the lipids of the bilayer and channels; the normal section should have holes for only your three smallest balls, Glut1 deficiency should have holes for only the two smallest balls, and the bacterial meningitis condition should have holes for all fives. This is



roughly diagramed below. In all three scenarios, five kids will be asked to volunteer to play a game. Each volunteer will be assigned a different molecule/ion (O_2 , K^+ , glucose, glutamate, or penicillin in increasing size) to toss at the board, the object being to get the most of their molecule through in a given time. Record scores and relate that to how the BBB is functioning under all three conditions.

Issues: Permeability is not based solely on size, lipid solubility and charge are also factors. Channel specificity and receptor binding will also be largely ignored.

Lesson Plan: Children will learn that the BBB is selective, often based on size, under normal conditions. They will also recognize that this selectivity can be altered under undesirable conditions, Glut1 deficiency and bacterial meningitis. Their understanding will be assessed by presenting novel molecules and asking them to hypothesize about its ability to pass through the BBB.