

### **Bitter or sweet? The same taste bud can tell the difference**

**Purpose:** To dispel the myth that there are different regions on the tongue that sense particular “taste's”. To give a basic description of how it is that the brain gets different signals from the same taste bud to distinguish between bitter and sweet substances and also explain how an intracellular mechanism could be similar yet produce different results.

#### **Materials required:**

- ◆ Plywood
- ◆ Scrap wood
- ◆ Nails
- ◆ Wood Glue
- ◆ Marbles
- ◆ Ping- Pong balls
- ◆ Chocolate (Sweet, Bitter and one that is both sweet and bitter)
- ◆ Wires
- ◆ two switches
- ◆ Two small bulbs
- ◆ Batteries
- ◆ 2 transparent rubber pipes, each approx. 2 meters long

**Procedure:** Following an explanation of some concepts that familiarize the kids with the anatomy of the tongue ie the presence of taste buds and their cellular structure, the kids will be asked to split roles. One kid from the group will be the taster whose gustatory transduction will be demonstrated. Two other kids will represent the sweet receptors that have two proteins(each kid is one protein) and one kid will represent the bitter receptor with only one trans membranous protein. The taster will be handed a piece of chocolate and then asked to follow an instruction after tasting it. The other kids are now going to demonstrate the biochemical events within and on the taste bud cells of the taster. The taster after tasting the chocolate essentially becomes either the sweet or the bitter tastant himself and passes on a signal to either of the two receptors. The signal could be a circular ball for the sweet receptor or a square shaped piece of block for the bitter receptor. The receptor kids will be “activated G protein coupled receptors” after receiving the signal and will then press a piston(Phospholipase C) that would release a marble(which would signify IP3 converted from PIP2). This marble would go down a swirling pipe and land on a see-saw kind of apparatus that would lead to the falling of the ping pong balls(release of calcium). These balls will fall into the basket-caps worn by either of the two kids sitting next to the see-saw. These two kids represent the neurotransmitter which will then go on and turn on a switch that is meant only for one of them. That switch will be shown to light a bulb of a particular color in the brain model which would be indicative of the taste (either sweet or bitter). In another demonstration the taster will be given a chocolate that is bitter-sweet. In this case the taster will activate both receptors which will eventually lead to the lighting of both bulbs in the brain indicating that the taste is both bitter and sweet.

**Issues:** As the interactive demonstration begins we would need to make sure that the kids understand that the taster is the one who becomes the tastant after tasting the chocolate. The demonstration would essentially show what is happening inside the tasters taste buds. The phenomenon of gustatory transduction is much more complex than what would be shown; at the same time the model does not show how other basic tastes like salty and sour are perceived. We make a distinction between the tastes by telling the kids that there are two different cells for the tastes when actually certain cells in taste buds have the ability to be stimulated by two or more different tastants. We intend not to incorporate this idea in the model as it would complicate matters too much.

**Lesson plan:** The Children will learn the basic anatomy of the tongue and a simplified idea of signal transduction and neurotransmitter release in taste cells. They would also get to know how this simplified model explains the perception of different tastants. We intend to hand out a questionnaire which would ask the 5<sup>th</sup> graders some specific points and also a few questions that would need inductive reasoning. We would also ask them to draw a picture to explain what they understood.