**Diseases in the DNA**

**Topic: neurological disease, DNA**

**Developed by:** Leslie Sibener, Lilian Coie

**Grades:** K-5 adaptable

**Vocabulary words:** Poly, gene, mutation, neurological, DNA

**Materials:** 1 table, 3-5 dice, sheets of paper, pencils/pens, blindfold/cloth

**Time needed:** 5-10 minutes

**Summary:** Learn how several commonly known neurological diseases (PolyQ diseases) are caused by the same mistake in different parts of DNA.

**Prerequisites for Students:** None. Helpful if students understand the concept of DNA.

**Learning Goals:**

* Establish the flow from chromosome, to DNA, to gene as a section of DNA, and finally to nucleotides that are the building blocks of DNA.
* Introduce the idea that there is a specific triplet of building blocks (nucleotides) that becomes toxic if it is repeated over and over again ->define Poly as this repetition
* Think critically about how the amount of the building blocks scale with the severity in the disease (through the activity)

**Background for instructor:**

* DNA is the genetic material that determines not only what we look like, but the diseases we might get. Nucleotides are the building blocks of DNA - Three of them code for different amino acids, which turn into the proteins that make up our body. DNA is in every one of our cells.
* PolyQ disorders, like Huntington’s Disease happen when there are too many CAG’s, which code for glutamine, repeated in the wrong place. The amount of extra insertions often determines how debilitating the disease will be.

**Set-up:** Setup a table with posterboard, pencils/pens, dice, paper

**Lesson Outline:** Introduce yourselves and start by asking the students what they know about DNA. After getting a baseline of what they know, start to through the flowchart on the poster board from chromosome, to DNA, to nucleotides that code for genes.

In genes, triplets of nucleotides code for proteins and there are certain triplets that code for toxic proteins. If there are too many repeats of this triplet, the disease gets worse,

Play the PolyQ game. Explain that the number they role corresponds to an increasing number of triplets they have, showing that with more triplets, the task becomes harder and harder.

* Give the student one die, based off of the number they get, the have a certain level of difficulty to write their name.
* Remind them that the number they roll corresponds to how many triplets they get, and that the more they get, the harder it will be to play.
  + 1: write their name like they usually would
  + 2: write their name with their eyes closed
  + 3: write their name in their non-dominant hand
  + 4: write their name without their thumb
  + 5: write their name by holding the pencil with their wrists
  + 6: write their name by holding the pencil in the crook of their elbow

**Wrap-up, final thoughts**: Connect this game back to the disease. If you don’t get very many repeats, someone might be able to live a perfectly healthy life. But someone else with the exact same disease might have a much harder time if they ended up with more repeats. If you have time, talk to them about how people get these diseases. Remind them that you get your genes from your parents, so this is a familial disease.