

# *Green Genes: a DNA Curriculum*

## Massachusetts 4-H Program

### **Activity #1: Alphabet Traits - A look at DNA fingerprints**

Time: 30-45 minutes

#### Introduction to Group:

Introduce the activity of making a DNA fingerprint. Ask the group what they know about DNA and fingerprints. (They may come up with a variety of answers: that DNA is a building code, Deoxyribonucleic acid and that fingerprints are unique to each person, have loops, circles....) You may ask if they have ever looked at their own fingerprint. (If you have paint or ink pads available you can have students make a fingerprint and compare with others in the group.) From the introductory material you learned that only about 0.1% of DNA makes up genes that are expressed as traits. Ask the youth what is a trait and list some on the board or a large piece of paper. Tell them that by looking at their own physical traits they will make a DNA fingerprint model. This activity helps demonstrate that our DNA is unique and that our DNA contains the information/genes that when expressed help make us unique. Some we can see like color of one's hair leads to the diversity we see around us.

#### Goals:

- Be able to verbally express what a DNA fingerprint is and represents.
- Connect physical traits to gene expression.
- Understand DNA contains information on traits.
- Complete a model DNA fingerprint and compare/contrast with others in the group.
- Compare models and bands to a real DNA fingerprint (Slide in PowerPoint).

Group Size: 5-50 suggested

#### Supplies:

- Copies of the trait grid
- Copies of the Size Sorting Template
- Pencils
- Scissors

#### Teaching Tips:

- Make sure the youth mark all the places on the paper strips where they plan to cut their DNA before they actually cut the strips. (It is easier to work with one long strip than many smaller ones.)
- You may want the youth to compare their strips before cutting.
- Graph paper can be substituted for grid.
- This activity raises many topics for discussion: impact of DNA fingerprinting on forensics and the legal system in America; genetic privacy.



UMass Extension is a unit of the Center for Agriculture in the College of Natural Sciences. UMass Extension is an equal opportunity provider & employer, United States Department of Agriculture cooperating. Contact your local UMass Extension office for information on disability accommodations or the UMass Extension Director if you have concerns related to discrimination, 413.545.4800 or refer to [www.extension.umass.edu/civilrights](http://www.extension.umass.edu/civilrights)



### Debriefing/Reflecting:

- What do the words you placed in the grid/template represent? (Traits)
- Why are the strips of different length? (It depends on the letters present and cuts made....)
- How does your DNA fingerprint model compare to others in the group? How does it differ?
- How does your DNA fingerprint model represent a fingerprint?
- How does your DNA fingerprint model compare to a real DNA fingerprint?

### Apply:

- Would you get the same results with another group? Why?
- What impact does DNA fingerprinting have on forensics and the legal system in America?
- If you have duplicates – how can we change the activity?
- What is the effect of class size? What if 50, 500, 5,000 tried this exercise?

Design an alphabet trait activity for an animal.

- 1 Select an animal/species (cat, cow, sheep...)
- 2 Choose 6-10 visual/physical traits
- 3 Decide on cuts for your "molecular scissors"
- 4 Try it out and modify it as needed (use your own pet, animal projects or pictures)
- 5 Debrief how it worked, what you learned....

### Go further:

- Complete this activity at home or with your friends.
- Try a series of gel electrophoresis activity on-line at [www.bio.umass.edu/biochem/mydna/](http://www.bio.umass.edu/biochem/mydna/). MyDNA Virtual DNA Lab Modules will allow you to cut, sort and run gels all on-line. Just click on Discovery Modules and select one of four activities.
- Plan a mock crime scene and trial using the DNA fingerprints you have done. A "whodunit."
- Find out more about fingerprints: how are they unique? What characteristics are looked at in forensics?

### Reference:

Sentence Splitting: DNA Fingerprinting (adapted for Alphabet Traits activity)

Iowa Academy of Science, <http://ists.pls.uni.edu/biomes-eomes/biomes/PDF/sentencesplittingDNA.pdf>



UMass Extension is a unit of the Center for Agriculture in the College of Natural Sciences. UMass Extension is an equal opportunity provider & employer, United States Department of Agriculture cooperating. Contact your local UMass Extension office for information on disability accommodations or the UMass Extension Director if you have concerns related to discrimination, 413.545.4800 or refer to [www.extension.umass.edu/civilrights](http://www.extension.umass.edu/civilrights)



You should have one continuous set of traits, something like this:

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | E | M | A | L | E | B | L | U | E | A | T | T | A | C | H | E | D | W | I | D | O | W | S | P | E | A | K | B | E |
| N | T | D | I | M | P | L | E | S | R | O | L | L | E | R | F | R | E | C | K | L | E | S |   |   |   |   |   |   |   |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

2. Now, **mark** your traits between the following letters by making a dark line. Mark only when the letters occur in the order shown, not the reverse order:

- E-M E-E B-R E-N
- T-T S-P G-H O-D
- O-F F-R N-R E-W

3. Cut out your traits along the heavy black lines and then tape them together end to end. You should have one long strip with all your trait words in a row, no spaces between any letters. Cut off and discard any empty boxes at the end.

4. Cut along the marks you made in step #2. Arrange your cut traits by length on the Size Sorting Template. Compare with your classmates!



UMass Extension is a unit of the Center for Agriculture in the College of Natural Sciences. UMass Extension is an equal opportunity provider & employer, United States Department of Agriculture cooperating. Contact your local UMass Extension office for information on disability accommodations or the UMass Extension Director if you have concerns related to discrimination, 413.545.4800 or refer to [www.extension.umass.edu/civilrights](http://www.extension.umass.edu/civilrights)

# SIZE SORTING TEMPLATE

- 20+
- 20
- 19
- 18
- 17
- 16
- 15
- 14
- 13
- 12
- 11
- 10
- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1

*Handout 1-3-(Print on white or light colored paper )*



**4-H Youth  
Development Program**  
UMass Extension

UMass Extension is a unit of the Center for Agriculture in the College of Natural Sciences. UMass Extension is an equal opportunity provider & employer, United States Department of Agriculture cooperating. Contact your local UMass Extension office for information on disability accommodations or the UMass Extension Director if you have concerns related to discrimination, 413.545.4800 or refer to [www.extension.umass.edu/civilrights](http://www.extension.umass.edu/civilrights)