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).
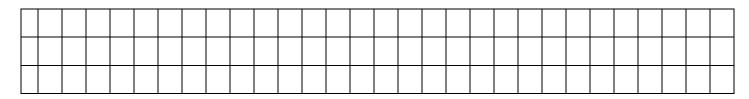
Group Size: 5-50 suggested

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.

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Directions:
1. Enter your traits in the grid above, selecting them from the list below.
(See example in next table.)

Sex - male or female
Eye Color - blue, brown, hazel, or green
Ear Lobes - free or attached
Hairline - widow's peak or no widow's peak
Little Finger - bent or straight
Chin - dimples or no dimples
Tongue - roller or nonroller
Skin - freckles or no freckles

Spelling counts. Please proofread! Punctuation also counts! No spaces between words. 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:

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.

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

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!

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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.
    ▪ Select an animal/species (cat, cow, sheep…)
    ▪ Choose 6-10 visual/physical traits
    ▪ Decide on cuts for your "molecular scisssors"
    ▪ Try it out and modify it as needed (use your own pet, animal projects or pictures)
    ▪ 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/. 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."
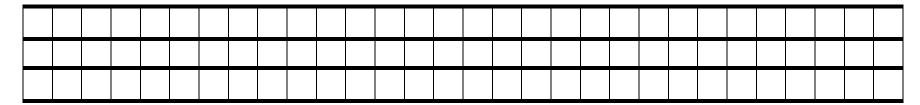• Find out more about fingerprints: how are they unique? What characteristics are looked at in forensics?

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

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(See Example in next table)

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Skin – freckles or no freckles

Spelling counts! Please proofread! Punctuation also counts!
PLEASE DO NOT SKIP SPACES BETWEEN WORDS.

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

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N	T	D	I	M	P	L	E	S	R	O	L	L	E	R	F	R	E	C	K	L	E	S							

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SIZE SORTING TEMPLATE

20+

20

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

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