

Succession Science: Are Fingerprint Patterns Inherited?

A Father's Day inheritance investigation from Science Buddies
June 12, 2014

Can you read clues to your relations through your fingertips?
George Retseck

Introduction

Have you ever seen a child who looked just like his or her father when the latter was younger? We can often tell that two people are related because they have several similar physical traits, such as facial features or hair color. This is because children receive half of their DNA (genetic blueprints) from each parent. But what about something small, such as fingerprints—are they an inherited trait? Fingerprints are used to identify people because each person's fingerprints are unique, but people can have similar fingerprint patterns. This Father's Day you could do this activity with your family to investigate whether fingerprint patterns are random or influenced by genetics. You'll be able to see if your fingerprint pattern is just one more trait that you can thank your father (and mother) for giving you.



Background

You started getting your own unique fingerprints even before you were born! During weeks 10 through 24 of development ridges form on the epidermis (outermost skin layer) of a fetus's fingertips. The patterns that these ridges make on each finger and thumb are known as fingerprints, which are static and do not change with age—so an individual will have the same fingerprints from infancy to adulthood. The patterns change size, but not shape, as the person grows. (To get a better idea of how that works you can model the change in size by inking your fingerprint onto a balloon and then blowing up the balloon.) Because each person has unique fingerprints that do not change over time, these prints can be used for identification. For example, police use fingerprints to determine whether a particular individual has been at a crime scene.

Although the exact number, shape and spacing of the ridges changes from person to person, fingerprints can be sorted into three general categories based on their pattern type: loop, arch and whorl.

Materials

- At least one pair of parents and their genetic son(s) or daughter(s) (The more members of the nuclear family that are available, the better the results will be.)
- Magnifying glass (optional)

Preparation

- Look at some drawings or pictures of the three basic fingerprint pattern types: loop, arch and whorl. In a loop pattern the ridges enter from either side, curve up and then exit usually from the same side they

entered. In a whorl pattern the ridges are usually circular. In an arch pattern the ridges enter from one side, make a small rise in the center and exit generally on the opposite side.

- Become familiar with what the different types look like so you can readily identify them. Note that there is some variation on these basic types, such as the "tented arch," which looks like a more sharply curved version of the typical arch.

Procedure

- Gather family members together so that you can look at their fingerprints as a group.
- One at a time, look at each person's right index finger where their fingerprint is. By looking at the pattern on the finger, characterize the pattern as a whorl, arch or loop. You could use a magnifying glass to look at their finger more closely.
- Look at the fingerprint pattern of other family members, one at a time, and characterize each as one of the three basic patterns.
- *What type of fingerprint pattern do they have?*

- *What type of fingerprint patterns do other family members have? Do you see any trends?*

- *Overall, does it look like fingerprint patterns are inherited? Explain.*

- *In other words, did siblings usually have the same fingerprint pattern and did people have fingerprint patterns in common with their parents?*

- **Extra:** Toes also have ridge patterns. *Do "toe prints" follow the same rules as fingerprints?*

Observations and results

- Did you see some examples of fingerprint patterns being inherited?

There is an inheritance component to fingerprint patterns but the genetics of how they are inherited are complicated. (Multiple genes are involved.) Fingerprints are also affected by a person's environment while developing in the womb. Because of this, you may have seen some examples of fingerprint patterns likely being inherited (such as a son and/or daughter having the same pattern type as their father). But this may not have always been the case for individuals you know to be closely related. To more clearly see how fingerprint patterns are inherited, you would need to use a much larger sample size, such as described in the first "Extra" step. Because each person's fingerprints are unique, and not even identical twins—who share the same DNA—have identical fingerprints, this also shows that fingerprints are not completely controlled by genetics.