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Genetics heredity unit overview answers

DNA Basics Looking for more? Browse through our archive of articles on general genetic principles. What are genes? Genes are small units of DNA, which contain instructions for how to make proteins. A chromosome contains many genes. How much information is in our DNA? A lot! Your DNA would fill up around 100 encyclopedia volumes. What are mutations? Mutations are permanent changes to the DNA. While some mutations cause disease, many other mutations do not impact health. What is recombination? Recombination is an important process that can help repair broken DNA, and help shuffle the DNA when making eggs and sperm. What does dominant vs recessive mean? A dominant trait can overpower and hide another (the "recessive" trait). The dominant trait is not always the most common one -- how common a trait is has to do with how many copies of that DNA are present in a population. There are many reasons why a particular trait is dominant. How do scientists figure out what gene controls a trait? Scientists compare DNA from people (or animals!) with different versions of the trait, to figure out what piece of DNA is correlated with the trait. For an example, read about how scientists figured out a key gene in eye color! Why can't genetic tests predict all diseases? Some diseases are hard to predict because they are caused by a lot of different genes along with environmental influence. These are known as "complex diseases." Why don't identical twins look the same? Identical twins look slightly different, even though they have identical DNA. Small differences in their environment, life, and experiences can make a big difference! This includes things like diet, exercise, sleep, sun exposure, and more. Blood Types Looking for more? Browse through our archive of blood type articles. What are the most common blood types of a child from any two parents? How does blood type work? There is one gene that determines the ABO part of blood type. A different gene determines positive/negative, or Rh factor. Why do Rh- mothers have pregnancy risks? "Rh incompatibility" is when Rh- mothers carry an Rh+ baby. If untreated, it can lead to severe risks, but it is preventable with the medicine RhoGAM. If you are pregnant, or planning to have a child, talk to your doctor about blood type incompatibility. What blood types can have children together? Any combination can have healthy children. The exception is for Rh- mothers, who can have pregnancy complications. However this is easily prevented with medication. What does it mean to be a "secretor"? If you're a secretor, it means that your ABO blood type (A, B, AB, or O) is not only in your blood, but also in other body fluids like saliva and mucus. Around 80% of people are secretors. While blood type inheritance almost always follows the rules, there can be exceptions. There are rare examples where these inheritance rules are broken. Can two Rh negative parents have an Rh positive child? This can happen if the Rh test was inaccurate. Sometimes people who are Rh positive show up as negative in the test. Can two O parents have a non-O child? This is possible with rare mutations, chimerism, or the Bombay blood group. Can an AB parent have an O baby? This is possible if one parent is a chimera or has the cis-AB blood type. Can an O parent have an AB child? This is possible with rare mutations, chimerism, the Bombay blood group, or if the non-O parent has the cis-AB blood type. Can two A parents have an AB child? This is possible if one parent is a chimera. Can two B parents have an AB child? This is possible if one parent is a chimera. Can two B parents have an A child? This is possible if one parent is a chimera. Can two A parents have a B child? This is possible if one parent is a chimera. Can an A and an O parent have a B child? This is possible if one parent is a chimera, or if the O parent has the Bombay blood group. Can a B and an O parent have an A child? This is possible with rare mutations, chimerism, or if the O parent has the Bombay blood group. How common are chimeras? How could I tell if I am one? Human chimeras are rare, and not well studied. It can be possible to detect it through DNA sequencing, but not always. Eye Color Looking for more? Browse through our archive of eye color articles. What eye color will my children have? It's actually hard to predict! While this simple model of eye color genetics can be helpful, eye color is actually influenced by many different genes. What causes heterochromia (two different color eyes)? Heterochromia is usually caused by quirks during development, eye injuries, or disease, not by genetics. Since it isn't genetic, this trait is usually not passed down to a child. I have an unusual eye color. What causes that? Eye color is complicated! There are lots of genes that influence it, as well as environmental effects. Learn more about the complexity of eye color here. Why do blonde hair and blue eyes tend to go together? Hair and eye color are both a result of how much pigmentation a person has. Since they are influenced by the same genes, hair and eye color are often linked. However, since many genes affect hair color and eye color, it is possible to get all sorts of different combinations! Hair Color Looking for more? Browse through our archive of hair color articles. What hair color will my children have? It's actually hard to predict! Even though we often talk about brown hair being dominant to blond, hair color genetics are complicated. What are my chances of having a red haired child? If red hair runs in your family, you could have a redheaded child! Why do blonde hair and blue eyes tend to go together? Hair and eye color are both a result of how much pigmentation a person has. Since they are influenced by the same genes, hair and eye color are often linked. However, since many genes affect hair color and eye color, it is possible to get all sorts of different combinations! Why is it uncommon to have red hair and brown eyes? Hair and eye color are often linked. More than that, mutations for lighter coloration happened most often in the ancestors of Europeans. So the redhead mutation originally occurred in a group that had a high rate of light eyes (read more here). As more mixing between populations occurs, redheads with brown eyes may become more common! Why does hair color sometimes change with age? Hair color can change as genes turn on and off! Could my hair get curlier as I grow up? Hair texture can change with age, as genes turn on or off. Other Traits Looking for more? Browse through our archive of articles on other traits. How common are chimeras? How could I tell if I am one? Human chimeras are rare, and not well studied. It can be possible to detect it through DNA sequencing, but not always. Twins run in my family. Am I more likely to have twins? Maybe! Fraternal twins can run in families, though identical twins appear randomly. The "risk" for fraternal twins comes from the mom, as fraternal twins are caused when a woman releases multiple eggs. Why don't I look like my parent? Physical appearance is complex. Most children aren't mini versions of their parents ... and sometimes they look quite different! Is vision genetic? Can you inherit nearsightedness or farsightedness? Vision is complicated! Genetics do play a role, but environmental effects matter a lot too. Is a person born gay, or is it a learned behaviour? What about bisexual? Orientation is not a choice for most people, and it is not possible to "unlearn" your sexual orientation. We don't know much about the genetics of bisexuality, but it is also almost certainly not a choice. Is intelligence more of a genetic or environmental trait? The IQ of a child is very unpredictable. Intelligence is a complex trait, influenced by many different genes and the environment. Why am I the only colorblind person in my family? Colorblindness is an X-linked recessive trait, which causes it to be more common in men than women. Since it is recessive, it can skip generations. Everyone else in my family has attached earlobes. Why are mine hanging? Earlobe attachment is a more complicated trait than we were taught in school! Do redheads need more anesthesia? Maybe, but the jury is still out on this question. Relatedness Looking for more? Browse through our archive of relatedness articles. How do paternity tests work? Click here to learn what the markers mean, how they are inherited, and why it's easy to detect parent/child relationships. What is the best test to tell if two people are related? Ancestry tests will give you the clearest answer. These tests are very sensitive, and able to detect even distant relatives! Paternity tests are very accurate for parent/child relationships. But sibling/avuncular are not as good as AncestryDNA or 23andMe at detecting different relationship types. Why don't I look like my parent? Physical appearance is complex. Most children aren't mini versions of their parents ... and sometimes they look quite different! What's the difference between shared centimorgans and shared DNA segments? A shared segment is a piece of DNA that is shared between two individuals. The length of a segment is reported in centimorgans, which is a unit of measurement. Read more about centimorgans vs segments. How can I tell if my sibling and I share both parents, or just one? While both full and half siblings share DNA, full siblings will have stretches of completely identical DNA that is easily detected by ancestry tests. The DNA of full vs half siblings looks different in 23andMe. You will also get an easily interpreted result from AncestryDNA, though it is easiest to load your data into GEDmatch to compare sibling types. Why do the results from my genetic test give me an inexact percentage? While you would share on average 50% of your DNA with a full sibling (or 25% with an aunt, 12.5% with a cousin, etc), the actual amount of shared DNA will vary. Check out this interactive tool for shared DNA to understand what the range of shared DNA may be: Shared cM Project Why do I share 50% of my DNA with a full-sibling, but only 25% with a half sibling? Click here to learn about heredity, how much DNA you inherit from each parent, and how that relates to % relatedness. How is it possible that siblings share 50% DNA, while humans and chimpanzees are 98% alike? There are many ways to compare two sets of DNA! All humans are actually very, very similar at the DNA level. There are only a handful of differences between any two humans -- so sometimes it's easiest to compare what percent of those spots are different between two people. Can you calculate shared DNA in more complicated families? Like ones that intermarry, or with incest? While the actual amount of shared DNA will vary, you can calculate the theoretical amount of shared DNA for any relative type. This article walks through an example of how to do that. Is it possible to detect incest in a genetic test? It may be possible, but you probably won't be able to say conclusively unless you look at the parents' DNA as well. What genetic information does a father pass on? You get half of all your DNA from your dad! Dads pass on much more than just a Y chromosome. How much DNA do you share with each grandparent? You'll share around 25% DNA with each grandparent, but the exact amount may vary. What are the risks in marrying a cousin? The risk in marrying a relative is lower than many people think. Children of first cousins are only 2x more likely to be born with a birth defect than children of non-related individuals. And the risk for children of second cousins is similar to that of unrelated individuals. Ancestry Looking for more? Browse through our archive of ancestry articles. How do ancestry tests work? Ancestry tests compare your DNA to a set of people with known ancestries. Your ancestry is then assigned based on how similar you are to those people. But this means they are limited by who is in the database! If no one from Croatia is in the reference data, ancestry from there will not be detected. Read more on how ancestry tests work. My ancestry percentage doesn't make sense! Why did I get this number? The ancestry DNA percentages aren't completely solid. There are a few things to keep in mind: Instead of viewing it as "I'm 25% Italian", you should think of it as just saying that you have Italian ancestry. It can be difficult for these test to distinguish between closely related groups, so your "Italian" ancestry might just show up as "Southern European." Even though you may have an ancestor from Italy, they might have had Greek, African, or Spanish ancestry themselves. A very small percent value may not indicate true ancestry. Your DNA ancestry does not need to define your cultural ancestry. Why don't my sibling and I have the same ancestry results? Siblings often have slightly different results. Even though you both have 50% of your DNA from mom and 50% from dad, it may not be the same 50%. Why don't identical twins have the same ancestry results? Even people with the same DNA can get different results! This is due to how the algorithms in the genetic tests define ancestry. Why are mitochondrial DNA and the Y chromosome good for detecting distant ancestry? Mitochondial and Y DNA are inherited differently than other types of DNA, and do not change very much between generations. This makes them particularly useful for detecting ancient ancestry. Other cool stuff Want more? Browse through our archive of articles tagged "other fun stuff"! Can I cure my disease with gene therapy? Unfortunately, probably not. Gene therapy is an experimental technique that is still being studied. While there are promising results coming out of clinical trials, they are not widely available yet. You can also search for clinical trials online at ClinicalTrials.gov. I have a genetic disease. Can I prevent my child from inheriting it? Yes! Through Preimplantation Genetic Diagnosis, it is possible to screen potential embryos for inherited genetic disorders. I would like to get rid of my red hair and fair skin. Is there any way to fix my broken MC1R gene? Gene therapy for appearance would be very cool, but we can't do this (yet). What is CRISPR and why is it so great? CRISPR/Cas9 is a revolutionary genome editing tool that is changing modern biology. Click here to read an older article on how hard it used to be! Are genetically modified foods bad for me? Genetically modified foods are generally safe, and labeling foods as GMOs might not be a great idea. Genetically engineered foods will help keep our growing population fed! Are all humans the same subspecies? Yes! All modern humans are very, very similar. Our DNA is 99.9% identical! Could we grow an organ in a lab? Not yet, but scientists are working on this. Could we use gene editing to regrow a limb? Maybe in the distant future, but not right now. Could we bioengineer immortality? Possibly, but aging is a hard problem to solve. How can chimps and humans have different chromosome numbers? Click here, here, or here to learn more about chromosome number can change in the course of evolution. And click here for some information on chromosome number in our distant cousins, the Neanderthals and Denisovans. Would it be possible to bring back Neanderthals? It might be possible to bring back Neanderthals, though it would be quite challenging. "De-extinction" is a hot topic right now in genetics, and we may be able to bring back woolly mammoths soon! What kinds of careers can you have with a biology degree? You can have many different types of jobs, that need different degrees and education levels. Click here for a flowchart of what careers you can pursue in genetics, organized by minimum required education level.

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