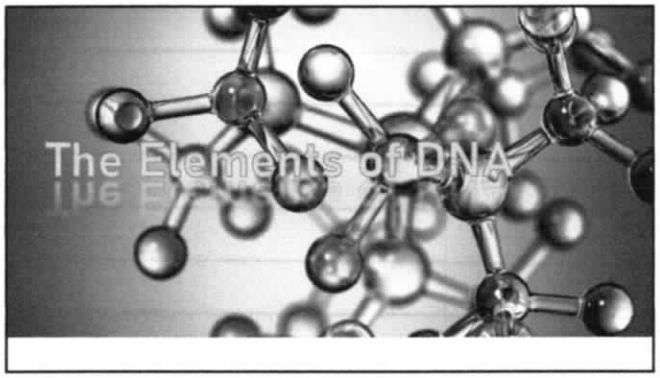
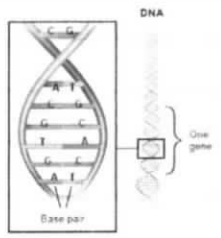


1

What carries the genetic information?

- The first cell of a new human being forms during fertilization when an egg cell (from the mother) combines with a sperm cell (from the father). This cell has the genetic information that includes the encoded building instructions for the whole body. From now on, every time a cell divides, a complete copy of this genetic information is passed on to the two new ("daughter") cells.



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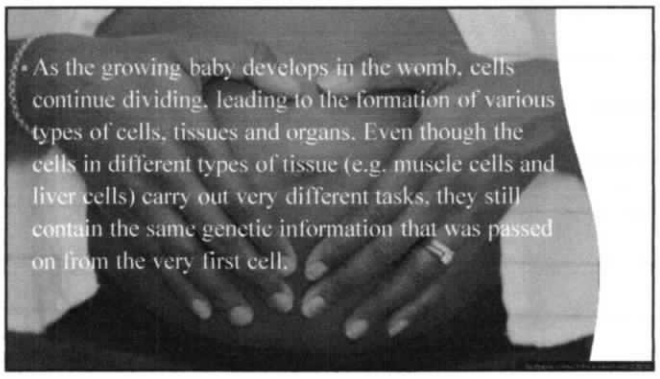


3

When people talk about genes being passed on, they generally don't mean genes being passed on from cell to cell during cell division. Instead, they usually mean genes being passed on from parents to children. This is known as "heredity" or "inherited genes."

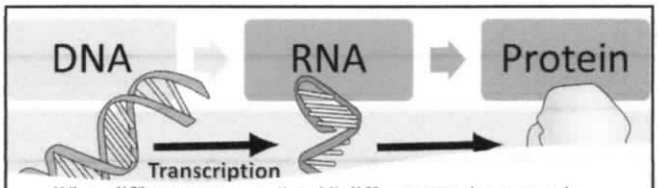
4

- Genetic information is all of the information stored in our DNA. DNA stands for "deoxyribonucleic acid."
- The strands of DNA look like a twisted ladder, known as a double helix. Each step of this ladder is made up of two bases. There are four different bases:
  - adenine (A)
  - thymine (T)
  - guanine (G)
  - cytosine (C)
- The different types of bases result in different kinds of "ladder steps."

5

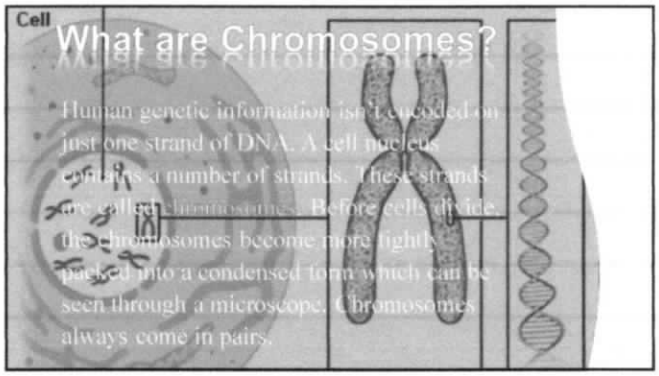
The order (sequence) of the different steps produces a code of letters. This code serves as building instructions for the cell to make proteins. The sequence of genetic information that contains the building instructions for a specific protein is called a gene. Genes vary in length, from a few hundred to over 100,000 bases. The DNA typically has sections before each gene that act as switches. These sections are responsible for the fact that certain genes are only activated in muscle cells while others are only activated in liver cells.

6



- When different genes are "read," different proteins are made – each with their own function. For instance, some proteins are used as enzymes or hormones to regulate specific processes in the body. Other proteins are used as building blocks in the body or serve to transport things in the bloodstream. The cell nucleus contains a lot of proteins, too: Some help to read the DNA code, while others help to support the structure of the DNA.

7



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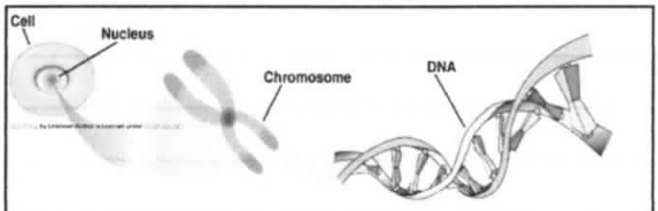
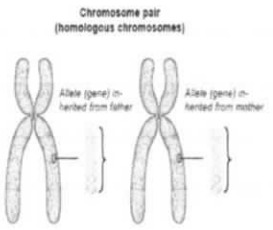


Human beings have 22 pairs of chromosomes that look identical, also known as autosomes. The pairs of chromosomes are sorted according to what parts of the genetic information they have, and then numbered from 1 to 22. Every cell nucleus has another pair of chromosomes too: the two sex chromosomes. Women have two X chromosomes, whereas men have one X chromosome and one Y chromosome.

9

What influence do genes have?

- What we look like and how our body functions is determined by a combination of our genes, our lifestyle and our environment.
- So it's usually not possible to say that a particular characteristic or trait is due to a specific gene. Also, many traits are influenced by different genes working together – like your height or skin tone. Some genes affect several traits as well.
- Another complicating factor is that the genes come in pairs. That means that there are two of every gene. The different versions of the genes are known as alleles. One is inherited from the father, and one from the mother. Even if both versions of the gene have the same task, they may be slightly different to each other.

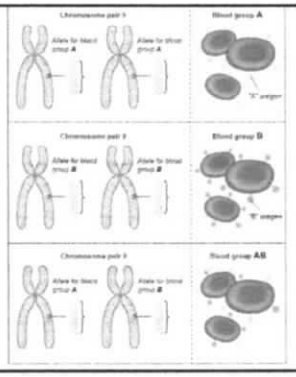


10

- Sometimes these different versions of genes (alleles) result in different traits. The blood groups are one example:

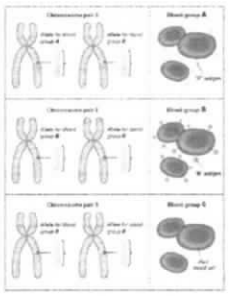
Some of the blood group traits are determined by genes on chromosome 9. If someone has the allele for blood group A on both chromosomes, then a certain protein called the A antigen is produced on the surface of their red blood cells. If the allele for blood group B is on both chromosomes, then the B antigen is produced on the blood cells. If one chromosome has the allele for blood group A and the other chromosome has the allele for blood group B, both of the antigens are produced, and the person has the blood group AB.

11



12

What do the terms "dominant" and "recessive" mean?



- In the blood group example, the A allele and B allele are equally "strong." But sometimes one allele of a gene is "stronger" than the other and determines what trait is expressed, overriding the other allele – the stronger allele is known as the "dominant" allele. The weaker allele is referred to as "recessive."
- This also applies to blood groups. Besides the two alleles for A and B, there is another allele that doesn't lead to the production of A or B antigens on the red blood cells. This "non-antigen" allele is recessive, though. So someone who has one chromosome with the non-antigen allele and one with the A allele will still have blood group A. Only if both chromosomes have the non-antigen allele will that person have red blood cells without any antigens on them – known as blood group "O."

13

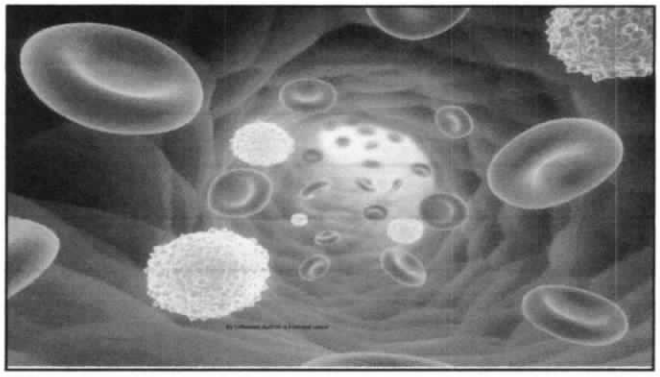
- This blood group example also shows that the same traits and characteristics don't necessarily come from identical genetic information: Some people who have blood group A have the allele for A antigens on both chromosomes, and others have the allele for A antigens on one and the allele for no antigens on the other.

14

Why do we have two versions of most genes?

- Inheriting one gene from the mother and one from the father has some advantages. For instance, if one of the chromosomes has a recessive allele that causes a disease, the healthy dominant allele on the other chromosome may be able to reduce the severity of the disease or even prevent it. Also, mixing the genes can create completely new combinations of genes, which may help future generations to better adapt to environmental conditions or may protect them from diseases.

15



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