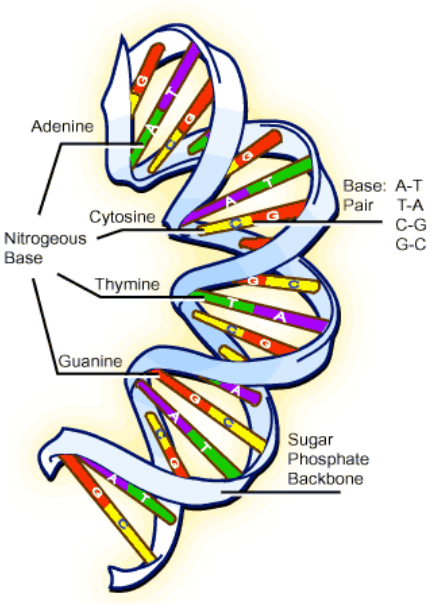
Lecture 2 DNA the Genetic Code

Deoxyribonuclease - DNA - is the molecule that determines the makeup of all beings. It is an amazing simple yet complex code that tells the cell what proteins to make. It is made up of four nucleotide - adenine, guanine, cytosine and thymine. A group of three of these molecules code for one of the 20 amino acids that make up a protein molecule. A dogs entire being is dependent ultimately on just 4 molecules.

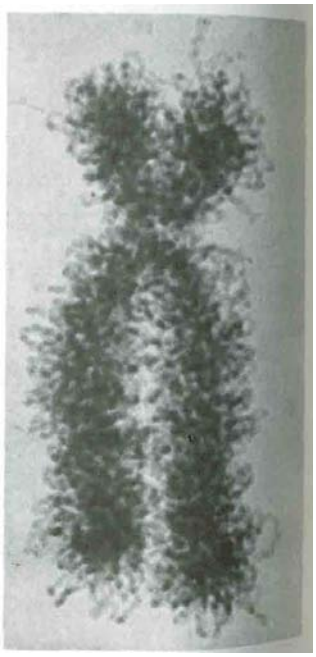
The DNA molecule is two complementary strands of nucleotides linked together.

```
A ---------- T
|            |
A ---------- T
|            |
G ---------- C
|            |
A ---------- T
|            |
T ---------- A
|            |
C ---------- G
|            |
C ---------- G
|            |
G ---------- C
|            |
```

As you can see Adenine (A) is always paired with Thymine (T); Guanine (G) is always paired with Cytosine (C). This chain is twisted into a tight double helix, which together with some RNA and protein form a chromosome.

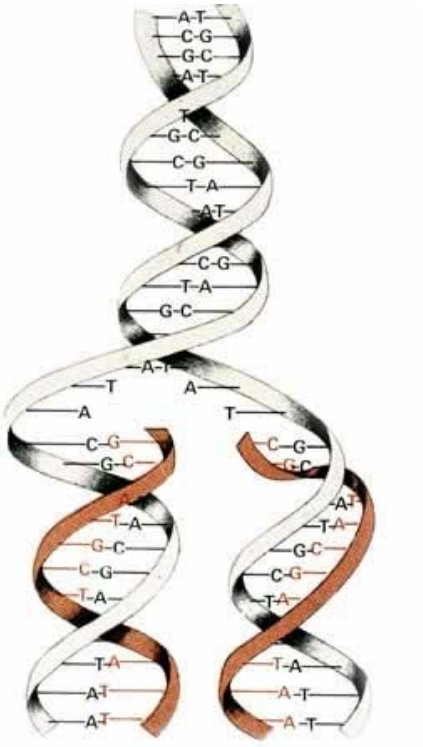


http://www.scq.ubc.ca/wp-content/dna.gif



Electron micrograph of human chromosome (Lehninger, Biochemistry)

When this molecule is replicated during cell division it literally splits down the middle - each side then forms a new chain and spirals once again into a double helix.



There are multiple ways this process can go awry. This is called mutation.
Transitional mutations one base pair is replaced by another - an A-T for a G-C for example.
Tranversional mutations - a purine-pyrimidine pair (ie A-T) is replaced by a pyrimidine-purine pair (T-A).
Insertion - insertion of an extra base pair
Deletion - one or more base pairs are deleted.

In addition to this whole arms of chromosome can drop off, reverse or cross over to another chromosome.

So even if you start out with a perfect dog (we all wish) the puppy can end up with a mutation. I have always found it amazing things go as well in the reproductive process as they do. This is the process that occurs when the chromosomes divide and produce either a new cell (growth) or a gamete (sperm or egg cell).

http://www.biologycorner.com/APbiology/DNA/13-3_replication.html

Next - Cell division