Transcript
Lipids

A few introductory words of explanation about this transcript.

This transcript includes the words sent to the narrator for inclusion in the latest version of the associated video. Occasionally, the narrator changes a few words on the fly in order to improve the flow. It is written in a manner that suggests to the narrator where emphasis and pauses might go, so it is not intended to be grammatically correct.

The Scene numbers are left in this transcript although they are not necessarily observable by watching the video.

There will also be occasional passages in blue that are NOT in the video but that might be useful corollary information.

There may be occasional figures that suggest what might be on the screen at that time.

103 TableSecrets

As we mentioned in the Intro to Carbohydrates, the periodic table hides some useful secrets. This column headed by helium has no great urge to make bonds with other atoms. The column to its left wants to make one bond, the second column to its left wants to make two bonds, third column atoms want to make three bonds, and so on. Remembering this information, let's make a fatty acid molecule.

105 FattyAcids

This carbon atom wants to make four bonds, so let's give it a double bond with oxygen. And let's give it a single bond to an OH molecule -- that's a total of three bonds for the carbon…it still wants another. So let's give it another carbon for its fourth bond.

But now we have need of three more bonds for the new carbon. Let's give it two hydrogens and another carbon. Now this NEW carbon needs three more bonds, so we give IT two hydrogens and another carbon. We could keep going making a chain of carbons with each carbon having two side bonds to hydrogen, but let's end it by adding three hydrogen atoms …like this.

This molecule is a molecule of Butyric Acid – it is the shortest chain fatty acid…containing only four carbon atoms.

Here is another fatty acid. It is a molecule of stearic acid. It contains 18 carbon atoms. Notice that all the middle carbons in the chain contain bonds to two

hydrogen atoms. This configuration contains the maximum number of hydrogen atoms possible. So this molecule is termed ”saturated” as in “saturated fat”.

An alternate possibility for an 18-carbon fatty acid is this one. It is a molecule of Oleic acid. And notice that there is a double bond between carbons nine and ten. So each of those carbons have only one bond available for side hydrogens. Since there is a possibility to add hydrogens to this configuration, we say that it is UNsaturated. And since there is only one carbon double-bond we say that it is MONO-unsaturated. If there were two or more, we would say that it is POLY-unsaturated.

Also notice that the carbon double bond causes a kink in the carbon chain. All naturally occurring fatty acids with a double bond, have a kink in their shape at the location of the double bond. But it is possible to manufacture fatty acids that are transformed in shape to do away with the kink. These TRANS-fats, are more stable, so food manufacturers prefer them. But without the kink, they physically pack together easily and tend to clog arteries as a result. Adding hydrogen to replace carbon double bonds is called “hydrogenation”.

110 Fats

Now let’s build a fat molecule from these fatty acid building blocks. We begin with a molecule of glycerol which will form the backbone of the molecule and hold the fatty acids in place. These hydrogen atoms in the glycerol then combine with OH molecules at the end of the fatty acid chains to form three molecules of water, while the rest of the fatty acid chains join to the now exposed oxygen atoms. Three fatty acids joined to the glycerin form a molecule of Triglyceride. And although triglycerides can become hazardous to your health if the level of them in your bloodstream gets unnaturally high, they play an important role in metabolism as energy sources and transporters of dietary fat.