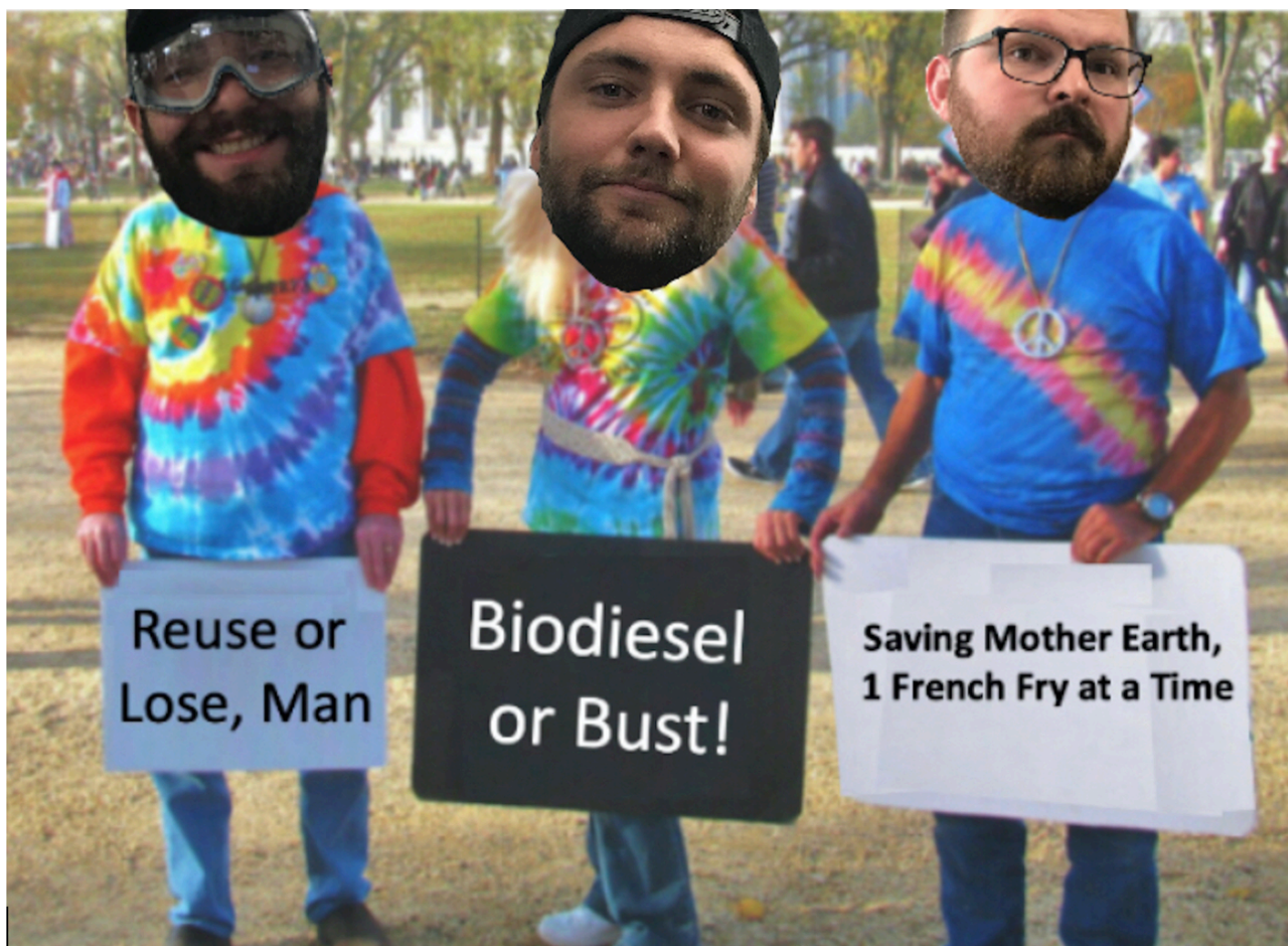
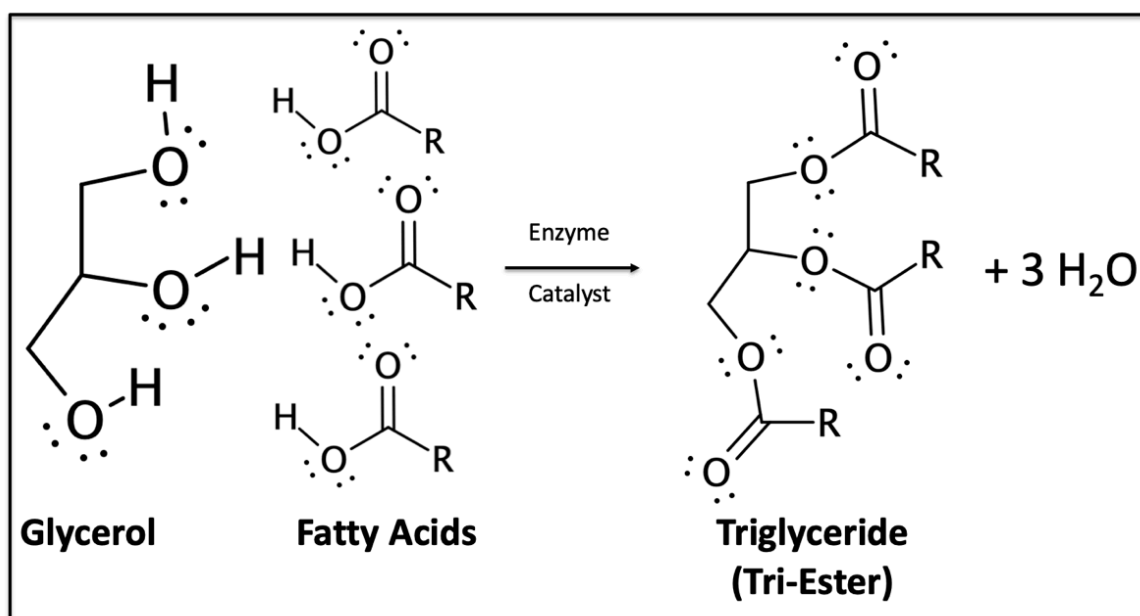


## Introduction for Biodiesel

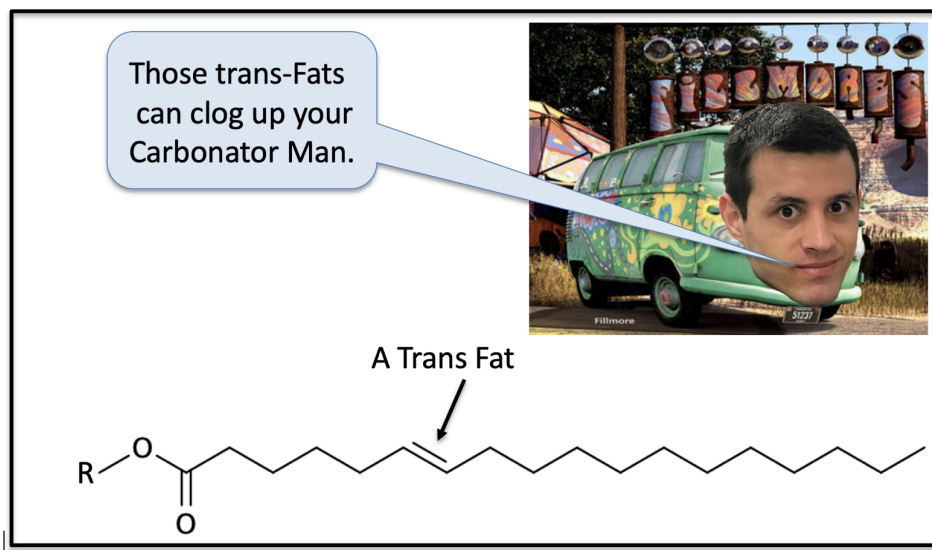


You will be making Biodiesel from Vegetable Oil via Basic Transesterification. Vegetable Oil is composed mainly of Triglycerides, below. "A lot of Big words here, I'll try to clarify."

Triglycerides = A Tri-Ester that is made from a molecule that has three alcohols (Glycerol)...

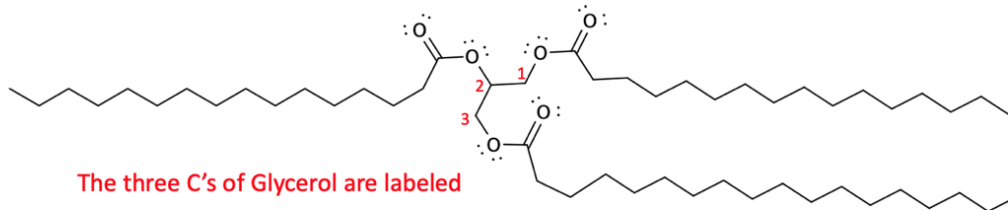


In fats the R groups are long alkane or alkene chains of ~18 Carbons. The alkenes can be cis or trans. You probably have heard about trans fatty acids and how they raise our “Bad Cholesterol” levels and lower our “Good Cholesterol” levels. The trans term refers to the alkene stereochemistry in these long chains. The trans-Fats result from poor processing of the natural cis-Fats.

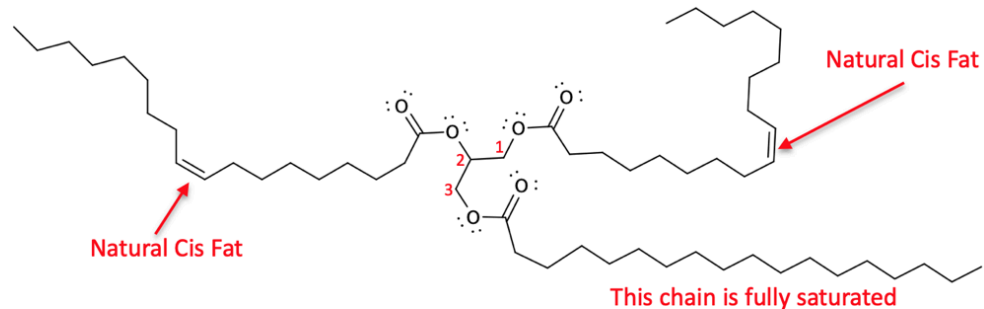


Some other common terms used in nutrition, most people have heard are, “Saturated Fats”, “Mono-Unsaturated Fats” and “Poly-Unsaturated Fats”. The “Saturation” term is referring to the Hydrogen atoms on the long fatty carbon chain. If the chain is “Saturated”, has the maximum number of Hydrogen atoms, then it will have no alkene double bonds. “Mono-Unsaturated Fats” have a single double bond and “Poly-Unsaturated Fats” have 2 or more double bonds...

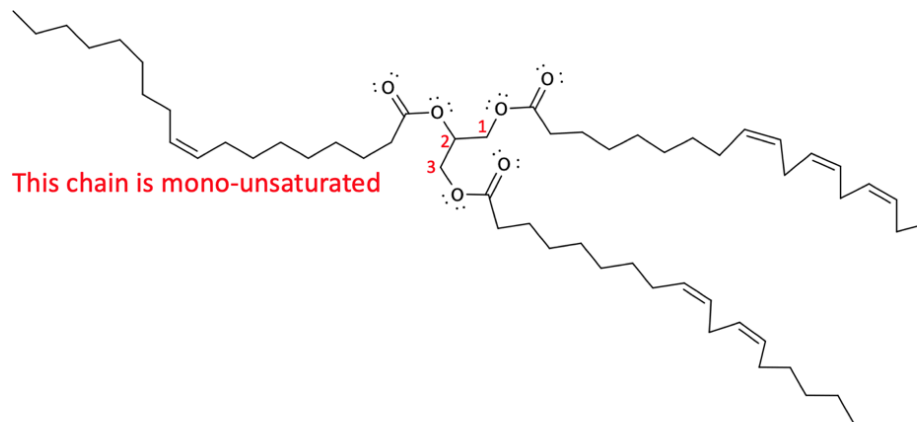
### Saturated Fat (Chains are saturated with H's): Solid like Butter



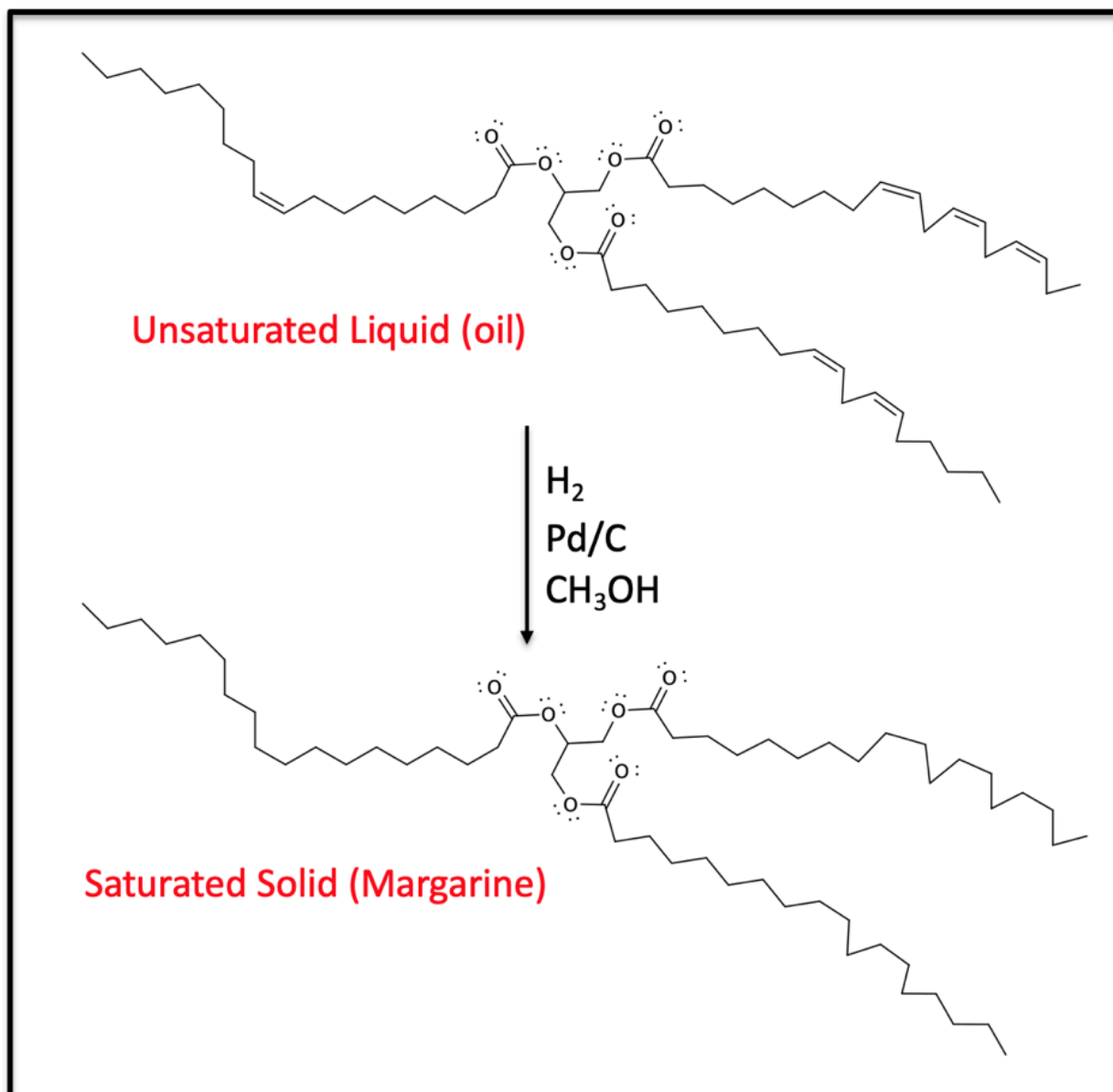
### Mono-unsaturated Fat (Chains can have one cis-alkene): Oil



### Poly-unsaturated Fat (Chains can have 2 or more cis-alkenes): Oil



Unsaturation (alkenes), lowers the melting point of the Triglyceride fats. Fully saturated fats are solids at room temperature. Butter is a saturated fat and the white solid you see in a Rib Eye stake is as well. Mono- and Poly-unsaturated fats are oils at room temperature. Vegetable oil and Canola Oil are Unsaturated Fats. The Unsaturated Fats can be made saturated by Hydrogenation. This is how margarine (fake butter) can be made...



Fat is an essential part of our lives. It's what all of our cell walls are primarily made of, but it can get a bad "Wrap". Get it, Fat is what "wraps" around to form the Lipid Bilayer of our cells, "Bad Wrap", HaHaHaHa, OK, I'll stop.





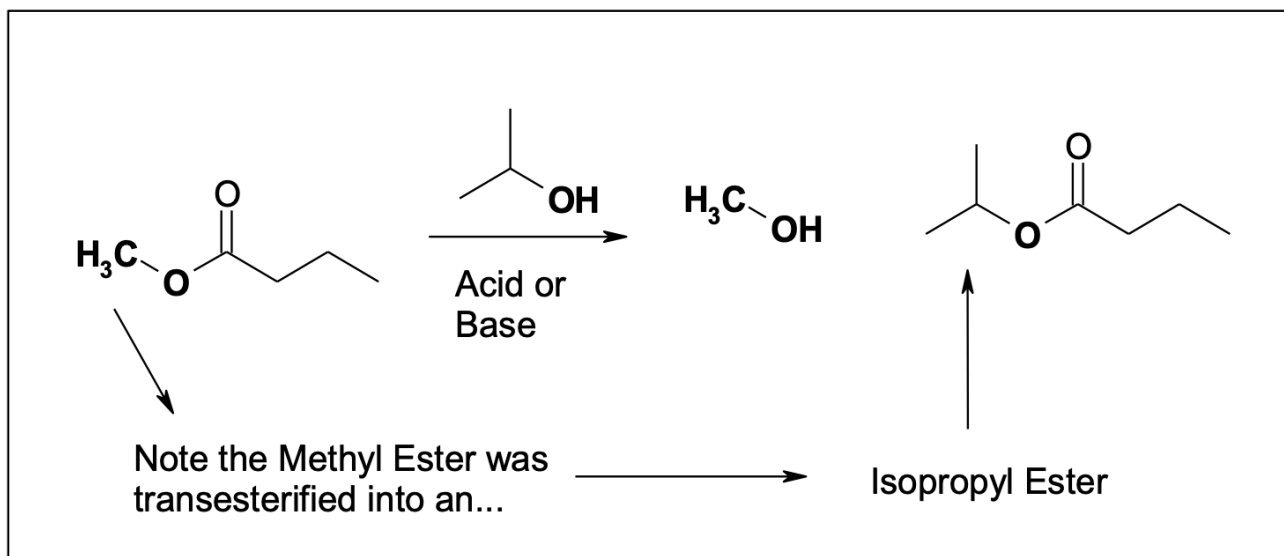


the duo aim to to make fat visible without falling into preconceived notions of what fat is  
image by hanneke wetzer

<https://www.designboom.com/art/fatberg-island-arne-hendriks-mike-thompson-amsterdam-11-10-2016/>

OK, back to your experiment...

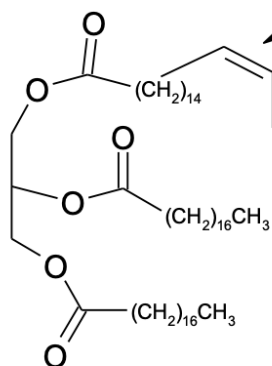
We will make Biodiesel via Transesterification, a reaction that changes esters “-OR” group...



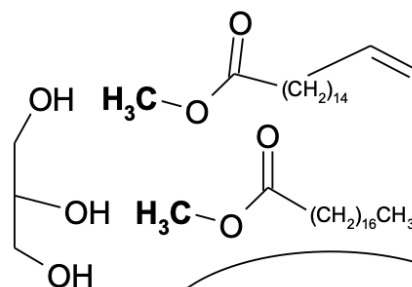
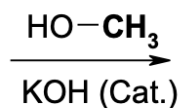
In this experiment you will exchange the Glycerol in Vegetables oils Triglyceride for methanol's...

**In Vegetable Oil**

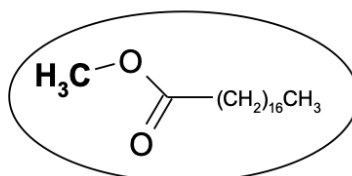
**This is a Cis-Fatty Acid**



**Triacylglycerol  
(Triglyceride)**

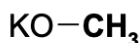


**Glycerol**

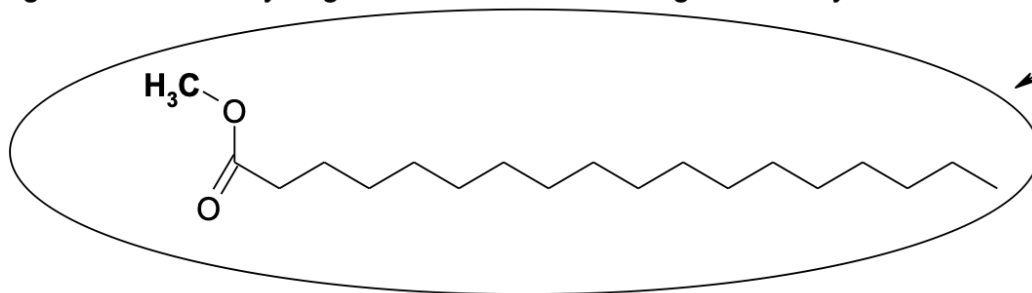


**Fatty Acid MethylEsters  
(Biodiesel)**

Methanol and  
KOH will make  
Potassium Methoxide...



I'm drawing this one out so you get a better understanding of the fatty acid structure...



Biodiesel can be made utilizing some Green Chemistry principles. The byproducts of this reaction are the KOH, a catalyst (Green) which can be recycled (Green) and Glycerol which can be used in other applications (Green). The Biodiesel fuel can be used directly or mixed with regular diesel fuel. When burned, Biodiesel has the smell of French fries cooking! While Biodiesel does burn cleaner than regular diesel it still produces carbon dioxide, a Greenhouse gas.





I drove here on Biodiesel, Man.

Think Rearrangement!

Groovy, me too Man, Peace.

I Dig it man, you have to Rearrange your mind.