Measuring the Presence of Fatty Acid Compounds Generated in the Oral Cavity

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Oral Cavity (Mouth)
Established Senses of Taste

- Sweet, sour, salty, bitter, and umami
The Big Question: Can We Taste Fats?
Significances

• Obesity

• Genetics or behavioral?
Research Questions

• Do our enzymes break down triglycerides (fat) into free fatty acid (FFA) molecules?

• Extract FFAs from saliva?

• Separate FFA mixture into individual components?
Converting Fat into FFAs

Triglyceride (Fat): Triolein

Assumption: Enzymes in Saliva

3 Free Fatty Acid Molecules

Oleic Acid
Other Targeted FFAs

- Linoleic Acid
- Steric Acid
- Palmitic Acid
- *Nonadecanoic Acid (Internal Standard)
Extracting FFA from Saliva

In Vivo Protocol
- Swirl 3 mL of Oil (Oral Processing)
- Kill enzymatic activity with 2mL of ethanol
- Wash with 2:1 Chloroform and Methanol to extract FFAs from emulsion
- Filter solution

In Vitro Protocol
- Same procedure except no oral processing
Extracting FFA from Saliva
Filtered Sample
Separating FFA Mixture

- Gas Chromatography/Mass Spectrometry (GC/MS)
- Separation and identification of components of a mixture
Separating FFA Molecules
Identifying FFA Molecules
Separated FFA Molecules

Abundance

Time (min)

Palmitic

Linoleic

Oleic

Steric

Nonadecanoic
In Vivo Corn Oil/Saliva

Abundance

Time (min)

Linoleic

New corn oil peaks

Palmitic
Sample Complications

- Compounds tend to stick in the auto sampler or the injection port (entrance of the GC/MS)
- Ran methanol through GC/MS multiple times
FFA Instrument Cleanout
Future Experimentation

- Quantifying free fatty acids using a High Performance Liquid Chromatograph (HPLC)
Conclusions

- Developed successful extraction methods
- Separated and identified four FFA molecules
- FFA molecules are sticky little suckers
- Further study will be conducted to determine more effective quantifying methods
References


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