Introduction

Throughout history, dietary fats and carbohydrates have been the number one energy sources for athletes training in low-through-high intensity workouts. Many of our sources suggest that because we believe there is an abundant amount of fat supply in our bodies, replacing carbohydrates with more dietary fats could help surpass the fatigue that comes with the loss of carbohydrates that get used up rigorously with exercise.

Others choose to consume low-to-no amounts of dietary fats, mostly within the female population. Low-to-no dietary fat brings upon negative results as does excessive amounts of dietary fats. Throughout this presentation, we will be discussing the history, biochemistry, the effects of different amounts of fats, while touching upon current articles related to our topic. We believe that there needs to be a middle ground for dietary fat intake depending on the needs of the athlete. Any amount on either end of the spectrum is one that may cause negative health results.
Setting the Stage

- History/Background
  - fat functions
  - Essential Fatty acids
  - everything gets stored as fats
  - provide the most energy
  - long duration, endurance activity

Function of Dietary Fat:

- Energy source – dietary fat provides 9 kcals/gm
- Body insulator – aids in maintaining body temperature
- Transporter and absorber of fat soluble vitamins – A, D, E and K
- Provides essential fatty acids
- Protects internal organs
- Improves taste, aroma and texture of food
- Assists in satisfying ones appetite
- Key part of immune health

Energy source

- Used as fuel during exercise
- Primary source of energy in endurance exercises
  - This is due to the depletion of CHO stores, and the need to rely on fat storage for remaining energy needs.

Vitamin Interaction

- Lipids found in the body act as carriers for the transport of vitamins throughout the body and individual cells
- Fat allows the body to absorb vitamins A, D, E and K. Without the presence of lipids in the body absorption cannot occur and deficiencies in the fat soluble vitamins will occur. (P)


Immune Health and Hormones

- Cholesterol - provides cell fluidity
- Fat (adipose tissue - comprised of lipids) in the body provides protection for organs from shock and trauma
- Lipid (or Phospholipid) derived hormones are receptor sites for steroid hormones – eicosanoids
  - Eicosanoids provide an on-site reaction on the body such as inflammation, fever, pain to indicate distress.

The Controversy /New direction of thinking

Effects of Excessive Fats

- Moderation is key when it comes to the intake of dietary fats. Normal range 20-35%. Too many fatty acids, somewhere around 45% and above, is not a healthy amount. Too much of dietary fats can overpower the sources of carbohydrates and proteins causing improper metabolism of these nutrients.
  - Heart disease
  - Obesity
  - If you eat fat in excess above the 35% range, make sure it is mono- or polyunsaturated.

Effects of Fat Deficiency

- Deficiencies in fat halt bodily development especially for those who are active; these including gymnasts, dancers, runners who sometimes lower their fat intake because of their image. However, the downside of that is that their menstrual cycles start acting up and they start having to deal with health implications. Men will also have to deal with bodily changes, this including a decrease in testosterone serum.
  - No benefits with diets less than 15% fat in exercise
  - Hormonal issues
  - Decrease in fat oxidation/ fatigue
  - Good fats aid in health

Recommendations

- No more than 10% saturated fatty acids; Cholesterol no more than 300 mg/day

- Essential Fatty Acids: Omega -3’s (alpha linolenic)1.1-1.6 grams, Omega-6 (linoleic acid) fatty acids-> 2 percent of calories in a 2,000 calorie diet.

- Fat Replacers

- LDL’s and HDL’s
Research Article #1


- **Purpose** – “determine the relationship between energy intake, energy availability, dietary fat and lower extremity injury in adult female runners.”
- **Hypothesis** – “…runners who develop overuse running-related injuries have lower fat intake compared to non-injured runners.”
- **Results** – “of 86 well trained female runners studied 47 reported injury. Of those 47, 37 sought medical attention. The injured runners had significantly lower intakes of total fat and % of kcals from fat compared to injured runners.”
- **Significance** – The study showed a connection between injury and fat intake in female runners. Thus, fat intake is the “best dietary predictor of correctly identifying 64% of future injury.”

Research Article #2


Summary: The purpose of this study was to test the effects of a high-fat diet with carbohydrate loading versus a high-carbohydrate diet with carbohydrate loading during high intensity sprint performances. The goal is to test these diet effects on VO2 max, substrate utilization; heart rate variability, muscle recruitment, effort perception and overall performance during varying distance sprint runs. This was a single blinded crossover experiment with eight endurance trained male athletes. Participants are required to complete one high-fat diet week which includes six days of high-fat and the seventh being a high-carbohydrate loading diet. After this there is a two-week break period between the high-fat diet and the high-carbohydrate diet. During the fourth week there is a high-carbohydrate diet given for six days, the seventh being carbohydrate loading. Experimenters believe that because glycogen is the primary source of fuel during high intensity workouts, a high-fat diet will help store and spare carbohydrate needs; therefore benefitting the energy needs for sprint performances. In conclusion, they found their hypothesis to be faulted. High fat diets did not help intense aerobic activity needs of 1km sprints. Fats compromised the ability to oxidize glycogen. The 4km were not affected. Aside from this there was an increase in fat oxidation, and heart rate. The most important thing to note is that the fat oxidation overpowered that of glycogen, which made it hard to perform intense sprint activities.
Research Article #3


• **Purpose** - Determine the connection of dietary lipid intake and the levels of ghrelin and leptin in the body during before, during and after exercise of well trained endurance athletes.

• **Hypothesis** - “dissimilar lipid intake will have an opposite impact on ghrelin and leptin as well as their possible modulators, insulin and cortisol levels during standardized exercise”

• **Results** -
  - Cortisol = no change after HFD; levels increase during last hr of exercise after LFD
  - Leptin = pre-exercise levels lower after LFD than HFD, during exercise no change after HFD; small but significant decrease in leptin levels after LFD
  - Insulin = pre-exercise levels were not significantly different in HFD or LFD, but LFD had a significant decrease in the AUC insulin concentration compared to HFD
  - Gherlin = pre-exercise levels not significantly different after HFD or LFD. During exercise LFD showed significantly higher AUC of gherlin concentration than HFD

• **Significance** - the study shows that “hormones that are involved in energy homeostasis respond differently during times of negative energy balance with an increase in ghrelin and a decrease in leptin and insulin. Changes which are dependant on the intake of dietary fat.”

Research Article #4


Summary: The purpose is to determine the independent and combined effects of aerobic exercise and omega three fatty acids (n-3fa) on lipids and lipoproteins cholesterol concentrations. Sedentary, normoglycemic, and nonsmoking men between the ages of 19-47 were assigned to three consecutive days of treadmill walking and 42 days of 4.55g/day intake of omega-3. Experimenters believe that both exercise and omega-3 supplementation would bring improvements in blood lipid serums. They found that exercise reduced serum concentrations of total cholesterol and triglycerides. They also found that omega-3 intake did not change lipid serum or the concentration of lipoproteins. The omega-3 did however cause a shift in HDL believing to reduce the risk of heart disease. Going against the hypothesis, experimenters found that the Omega-3 and exercise activity combined do not make any definite changes but do alter lipid shapes. Experimenters believe combined they do no more than what exercise and omega-3 complete independently of one another.
Research Article #5


- **Purpose**: The study aimed at assessing the role of a “high protein, low calorie, polyunsaturated fatty-acid (PUFA) supplemented diet on the anthropometric measurements and red blood cells membrane fatty acid concentration, as well as plasma antioxidant levels of non-pro volleyball players”. Two groups were observed: one group eating a Mediterranean diet (A) and the other consuming a high protein, low calorie diet with a fish oil supplement (B).

- **Results**: BMI and total body fat was lowered in B, while not changing in group A. B had an increase in RBC membrane PUFA due to the fish oil consumption. The body fat in B decreased while remaining unchanged in A. The plasma antioxidant level in both groups was increased. When compared to A, the fatty acid composition in the RBC of B showed a decrease in linoleic acid and arachidonic acid while increasing its eicosapentenoic acid and docosahexenoic acid.

- **Significance**: When using a fish oil supplement during times of physical activity there is an increase in RBC PUFA content which has shown to improve its blood flow in the body. There are many health benefits found in PUFA reduced triglycerides including anti-inflammatory effects, reduced insulin response to glucose and benefits for cardiovascular health and cancer prevention. But more studies need to be made to explore the pro-oxidant effects of fish oil supplements.

- **Conclusion**: It is best if an athlete can give his/her body and muscles enough fuel to provide for their training regime as well as proper balance of nutrients needed during these exercises. The study concluded that all of this could be found when following the Mediterranean diet.

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Dietary recommendations

- According to sports nutritionists Susan Kundrat and Nancy Clark, a healthy diet for athletes consists of 20-30% of dietary fat*+

- Less than 1% of that should be trans fat*

- Clark suggests that an athlete should limit their intake of “hard fats,” such as butter or lard, and use “soft fats,” like olive oil and canola oil, instead.+

- **Calculation**: *
  1. Estimate daily calories and multiply by 25% = number of fat calories you can eat in a day
  2. Divide the number of fat cal by 9 = number of grams of fat per-day

  \[
  \frac{(2200\times.25)}{9} = 61 \text{ gm/day}
  \]

Human Ecological Model

- **External Factors** – Society has a long term love hate relationship with fat.
  - Love: taste, texture, smell and our bodies need for lipid in the body.
  - Hate: too much can have a negative effect on the waistline, cardiovascular health. Word associated with body mass not just macronutrient.
- **Internal factors** – pressure from external factors and societal beliefs. Personal pallet or taste in food. Religious, moral, personal beliefs can also have an impact on their choice of food that will provide the needed fat.
- Fear of the unknown: much more of the input that an individual receives from the external focuses on not becoming overweight... which they often connect directly to fat-intake. The more they know about the benefits of consuming the proper amount of fat, the less fearful they may become.

**Conclusion**

After extensive research, we have concluded that fat intake needs not be too much or too little. Relying on fats for energy output is not the logical way to prepare for physical activity. We feel that carbohydrates and fats really do work hand in hand in aerobic exercise. Increasing fat intake can to some extent help reduce fatigue in moderate, extensive exercise and help spare glycogen. However, there is a limit. Increasing dietary fat amounts cannot only cause health effects like that of cancers, obesity, heart disease, etc, but excessive fat oxidation can overpower glycogen breakdown and not allow for optimal performance in exercise. On the other hand, deficiencies in fats can also cause negative effects. We have learned that fats aid in insulation, hormones, transferring of fat molecules throughout the blood and most importantly, with athletes, it helps stabilize energy output throughout intensive exercise and helps with normal fat oxidation. For endurance athletes especially those involved in activities that range from low to moderate intensity should consume a diet filled with a good amount of fats.
References


