

June 2015

Effects of an Anti-Neoplastic High in Omega-3 Fatty Acids

Kevin M. Schrader

Southern Illinois University Carbondale, kschrader@siu.edu

Follow this and additional works at: http://opensiuc.lib.siu.edu/uhp_theses

None of this would have been possible without the help of Dale "Buck" Hales, PhD and Karen Hales, PhD.

Recommended Citation

Schrader, Kevin M., "Effects of an Anti-Neoplastic High in Omega-3 Fatty Acids" (2015). *Honors Theses*. Paper 400.

This Dissertation/Thesis is brought to you for free and open access by the University Honors Program at OpenSIUC. It has been accepted for inclusion in Honors Theses by an authorized administrator of OpenSIUC. For more information, please contact opensiuc@lib.siu.edu.

Effects of an Anti-Neoplastic Diet High in Omega-3 Fatty Acids

Kevin Schrader

A thesis submitted to the University Honors Program in partial fulfillment of the
requirements for the Honors Degree

Southern Illinois University

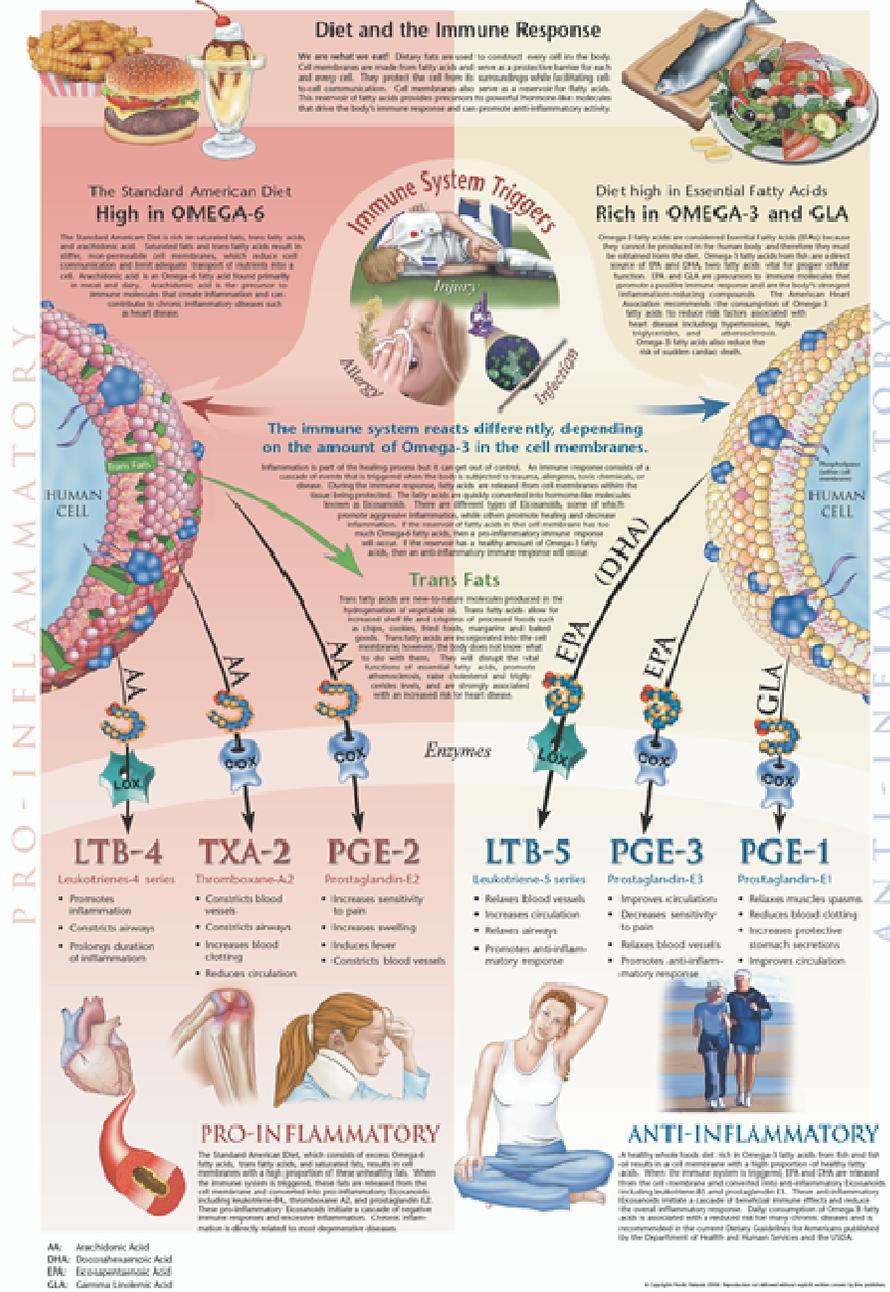
May 29, 2015

Introduction

From my first year at SIU, I have worked as an ovarian cancer researcher for the Chair of Physiology, Dr. Dale "Buck" Hales. In our lab, we focus on preventative methods of regulating cancer severity. Much of this is done through dietary intervention that regulates and maintains a high level of omega-3 fatty acids. The purpose of this thesis was to take a college student with a college student diet, and see what a short term diet high in omega-3's could do. The student selected for the study was myself. For this reason, I would like to address that the style of this paper will be observational with personal excerpts to give the most detail in regards to the quantitative and qualitative data.

In our lab, we use the laying hen as our animal model because it is unique in its natural occurrence of ovarian cancer, as opposed to induced incidence. Many of the diets given utilize fish oil, flax seed, and flax derivatives because they are high in omega-3 fatty acids, and have a smaller amount of omega-6's. This is important because ovarian cancer has a higher incidence rate with a pro-inflammatory microenvironment. omega-3's are anti-inflammatory and by being present can reduce initiation of neoplasia in the epithelial layer of the ovary and oviduct. At this point, the reader may be confused as to why the author, a male, is concerned with ovarian cancer mitigation with anti-inflammatories. The point in changing the diet and observing myself is for the overall health effects that an anti-inflammatory environment may present, most noticeably on the cardiovascular health of men. It is also reported to have anti-cancer effects and antioxidant actions.

OMEGA-3 SUPPORTS HEALTHY IMMUNE RESPONSE



To elaborate more on the formation of tumors in the ovary, I must first explain that ovulation is an inflammatory process. The deposition of the egg into the fallopian tube leaves the ovary with a wound in its epithelial layer. This wound could be compared to a sunburn in that repetitive sunburns (damage to the epithelial layer) can lead to cancer formation because of the

repetitive damage from ultraviolet rays (pro-inflammatory microenvironment). Much of the pro-inflammatory conditions are controlled by prostaglandins which create oxidative stress, inflammation, angiogenesis, and anti-apoptotic conditions that are known to positively influence cancer's formation. With ovulation occurring once a month in females, and almost daily in the laying hen, the ovary is constantly in a state of repair, and it is during this repair that the initiation of neoplasia occurs in the epithelial layer. This is why keeping anti-inflammatory mediators like omega-3's are ideal in an everyday diet.

There are three categories of fatty acids: saturated, monounsaturated, and polyunsaturated. Saturation of fatty acids is determined on whether or not carbon atoms in the chain have a single or double bond linking them. A double bond between two adjacent carbon atoms yields one less hydrogen on the chain. For the polyunsaturated, or having multiple double bonds, they are further divided into two categories: omega-3 and omega-6. These two categories are named the essential fatty acids due to the body lacking the ability to manufacture them. They can only come from your diet and the omega-3 fatty acid family is alpha-linolenic acid, eicosapentaenoic acid, and docosahexaenoic acid. The omega-6 family consists of linoleic acid, gamma-linolenic acid, and arachidonic acid. Both families are converted into eicosanoids, and have opposite and profound influences on health. A majority of chronic diseases are caused by eicosanoids from omega-6's and the balance of the two essential fatty acids can lead to a much lower risk of inflammatory, autoimmune, and other diseases.

To achieve a diet that qualifies as high in omega-3's, I used a Mediterranean style approach to eating. The diet eliminated heavily processed foods, alcoholic drinks besides red wine, and anything from a fast-food restaurant. Now, as you can imagine, this eliminates the three major college food groups. Instead of those things, the diet focused on plenty of fish,

vegetables, fruits, and whole grains with an extra dosing of fish oil daily. With our modern diet, the ratio of omega-4 to omega-3 is approximately 15 to 1. A well-balanced diet to encourage anti-inflammatory benefits sits around 4 to 1 as an appropriate ratio. By eliminating vegetable oils, processed foods, and a majority of grains, the ratio can be balanced closer to what is ideal for the human body. The next section will give details into how the diet was performed, the data collected, and analysis for error.

Methods

The duration of the study was a month and a half, beginning on February 2nd and continuing until March 16th. The first two weeks were to establish a metabolic and physical baseline while maintaining my normal diet. On February 2nd, I began tracking the following markers:

- Weight
- Body Fat Percentage (%BF)
- Body Muscle Percentage (%BM)
- Body Mass Index (BMI)
- Water Consumption
- Food Consumption
- Exercise Journal
- Mood and Sleep Journal
- Blood Glucose
- Blood Pressure (BP)
- Pulse

Most of these readings were taken immediately upon waking up to keep from influencing factors. Some variations in the data shown can be attributed to these factors or a change in the time of recording each day. For this reason averages were used for a majority of the data by taking another reading in the evening before bed.

A VonHaus BMI scale was used for recording weight, %BF, %BM, and BMI. Due to the unreliability of most household BMI readers, these markers were collected twice daily, if possible, to compensate. An Omron blood pressure monitor was used to collect BP and pulse while a ReliOn Ultima Blood Glucose Monitor was used for measuring glucose levels in the morning and evening, ideally 4 hours or more after a meal.

To monitor the effects of the diet on exercising, I had to balance my normal schedule of rugby, lifting, and cardio-intensive activity with a system of measuring progress physically. This involved tracking multiple lifts to ensure that any muscle loss or addition would not go unnoticed. When I began the diet, I incorporated black beans, kale, berries, mushrooms, quinoa, and salmon heavily. To add to the already omega-3 packed diet, I took two capsules of fish oil daily with a meal. Any days that may have skewed results due to readings at odd times, eating late the previous night, or from staying up all night were disregarded and compensated for by averaging the data. Each day I consumed more than 100 fl.oz. of water to keep a normalized level for ease of comparison.

Results

From February 16th to March 16th, I dropped from approximately 241lbs to 222lbs for a total loss of 19lbs. It was week two of the diet where the weight loss began to accelerate even though throughout the month and a half study the caloric intake was kept similar. This was the most major result that we predicted and visualized. Glucose levels remained steady throughout the entire study and were only changed noticeably with readings the morning after a meal late in the evening. Blood pressure, %BF, and %BM were all hard to measure on certain occasions so the results, upon being averaged, showed less change than expected. Blood pressure was not changed greatly and was also affected by medication taken early on in the diet so these results were not analyzed heavily. The body fat percentage and the body muscle percentage were decreased and increased by 2% respectively. Before the study, I had predicted a loss in muscle due to the lean meats being consumed along with a change in overall diet. This was not the case, and although weight loss was noticed, overall muscle tone and strength increased at a higher rate than normal. As the diet progressed, I noticed that joint soreness was eliminated, sweating decreased, and energy levels increased when exercising.

An unexpected result for such a short term diet was a reduction in my pulse from 73.2 to 66.2 on average. That is a 7 bpm decrease which was surprising for a resting heart rate. The lower heart rate, increased energy, and increased muscle tone leads me to believe that a healthy diet is beneficial for overall health. Maybe my mom was right when it came to eating my spinach... For my daily diet, the estimated fiber, carbohydrates, and protein were all increased while the estimated levels of fat and sodium decreased. Calorically, I tried to consume around 5000 calories throughout the study but struggled with the new diet to hit this goal. This required my times of eating to shift to a 4 meal structure with multiple snacks of fruits and vegetables.

Each of the main meals were also scaled back, so the new schedule of feeding may have had some impact on overall weight since this form of eating is metabolically more active.

Conclusion

Throughout the course of the study there was a noticeable increase in overall energy and attention that was retained even after the strict diet was ended. With a slight return to some of the poor dietary habits I have always had, the benefits from the month of clean eating still continued. With a diet emphasizing omega-3 rich food, I managed to lose 19 lbs, gain 2% overall muscle, lose 2% overall fat, and decrease heart rate 7 beats per minute. This is without a change in the vigor of exercises and goes to show that dietary change can be extraordinarily effective in the maintenance of health.

Resources

Resources used directly are the following:

- *The Omega Diet* by Artemis Simopoulos, M.D., and Jo Robinson

-This book goes through diets that focus on reducing the risk of heart disease and cancer while also enhancing mood and learning ability. Great reference for diet tips and recipes.