Correlation between the ingestion of sesame oil and a decrease in mental stress and decreased cortisol levels in humans

Christiana Standler

Mentor: Dr. Gold

BIOL 494

09 April 2014
Abstract:

Recent studies have demonstrated the effects of sesame oil in stress reduction in rodents, which suggests possible benefits to humans. Seven participants each ingested sesame oil for three weeks and a placebo for an additional three weeks. A test anxiety questionnaire was administered, and salivary cortisol levels were measured, after participants completed a major exam following each treatment period. There was statistically significant reduced emotional stress associated with sesame oil, but increased physiological stress as indicated by salivary cortisol levels.

**Keywords**: sesame oil, 3,4-methylenedioxyphenol, stress, cortisol

Introduction

Sesame seeds (*Sesamum indicum*), and the oil from these seeds, are commonly used as a food ingredient and for medicinal purposes (Kuo-Ching et al. 2009). Research into the medicinal properties of sesame oil has focused on sesamol (3,4-methylenedioxyphenol), which is derived from a lignin, sesamolin, during the roasting and bleaching process of sesame oil manufacture (Kuo-Ching et al. 2009, Kumar et al. 2010).

Stress is a problem exhibited by most organisms and, without treatment, can cause depression or other stress-related illnesses (Kumar et al. 2010). Humans with depression exhibit increased levels of cytokines and oxidative stress (Kumar et al. 2010). Sesamol inhibits cytokine production and oxidative stress which may decrease the physiological effects of stress in humans (Kumar et al. 2010). Studies performed on stress-induced mice demonstrated that sesamol produced effects similar that found in antidepressant medication (Kumar et al. 2010). Cortisol
levels in saliva have been used as a stress indicator, with higher salivary cortisol levels indicating higher emotional and physiological stress (Burke, et. al 2005). Research relating the ingestion of sesame oil to a decrease in emotional stress coupled with saliva analysis aimed at detecting the presence of cortisol has not previously been performed on humans. The purpose of this research project was to determine if the ingestion of sesame oil would affect emotional stress or indicators of a physiological stress response in humans during a high-stress situation.

**Materials and methods**

This study was approved by the BYU-H Institutional Review Board; each participant provided informed consent. Sixteen current students at Brigham Young University-Hawaii (BYU-H), ages 18 to 30, both male and female, who were enrolled in the same class at BYU-H, participated in this experiment.

Sandwich filling was prepared by mixing 350 mL of either canola oil or sesame oil with 700 mL chocolate hazelnut spread; 15 mL of the mixture was spread onto two slices of bread to prepare each sandwich. On 20 February 2013, individuals in one group were each provided seven sandwiches containing sesame oil and the other group was provided sandwiches containing canola oil; each group was instructed to consume one sandwich per day for seven days. The participants were not informed as to which type of sandwich they had received. Fresh sandwiches were provided each week for a total of three weeks.

After three weeks of daily consumption of the provided sandwiches, individuals from both groups completed a majors exam and within one hour of completing their exam the participants provided a saliva sample and completed a brief questionnaire to measure test anxiety (Nist and Diehl 1990). Saliva samples were stored at -20°C.
Following the first three weeks the groups were reversed with those who originally received sandwiches containing sesame oil now provided sandwiches containing vegetable oil, and *vice versa*. After three weeks of consumption each individual completed another majors exam. Again, each participant provided a saliva sample and completed the test anxiety questionnaire within one hour of completion. Saliva samples were stored at -20°C.

Saliva samples were analyzed using the Salivary Cortisol Enzyme Immunoassay Kit (Salimetrics, State College, PA). The amount of cortisol present in each individual’s saliva was compared to their own previous saliva sample using a dependent t-test. The responses from the questionnaires completed after the individuals’ first exam were compared to the responses from the questionnaires completed after the individuals’ second exam using a dependent t-test.

**Results**

Participants had a mean questionnaire score of 20.42 after three weeks ingesting sesame oil and a mean score of 23.14 after three weeks ingesting the placebo, with higher values indicating higher test anxiety (Figure 1). A dependent t-test was performed on the participants’ questionnaire scores, and the p-value was determined to be 0.020 (Table 1), which indicates statistical significance at the 0.05 confidence interval.

A dependent t-test was performed on the participants’ salivary cortisol levels and the p-value of the sesame versus placebo trials was determined to be 0.042, which was statistically significant at the 0.05 confidence interval (Table 2). However, the means of the placebo trial cortisol scores were lower than that of the sesame oil (Figure 2).
Figure 1. Test anxiety scores after ingestion of sesame and placebo trials. The y-axis represents the anxiety test score.

<table>
<thead>
<tr>
<th>Variable</th>
<th>T-test for Dependent Samples (Survey Data)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marked differences are significant at p &lt; 0.05000</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>sesame</td>
<td>20.42857</td>
</tr>
<tr>
<td>placebo</td>
<td>23.14286</td>
</tr>
</tbody>
</table>

Table 1. The results of the dependent t-test for the participants’ test anxiety scores after their sesame oil versus placebo trials.
Figure 2. Salivary cortisol levels of the individuals during their sesame and placebo trials. The y-axis represents the amount of salivary cortisol (μg/dL) in the participants’ saliva.

<table>
<thead>
<tr>
<th>Variable</th>
<th>T-test for Dependent Samples (Salivary Cortisol- B/Bo)</th>
<th>Marked differences are significant at p &lt; 0.05000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std.Dv.</td>
</tr>
<tr>
<td>sesame</td>
<td>0.408214</td>
<td>0.165013</td>
</tr>
<tr>
<td>placebo</td>
<td>0.268886</td>
<td>0.105393</td>
</tr>
</tbody>
</table>

Table 2. The results of the dependent t-test statistic for the cortisol levels of the participants’ sesame oil and placebo trials.
Discussion

Students reported significantly lower test anxiety scores after three weeks of ingesting sesame oil versus the placebo suggesting that daily ingestion of sesame oil could reduce anxiety. However, salivary cortisol levels were significantly higher in the individuals consuming sesame oil, which suggests that ingestion of sesame oil increases cortisol levels indicating increased levels of physiological stress.

The conflicting results observed in this study may have been the result of a type II error in that salivary cortisol may have been the wrong variable to measure a physiological stress reduction in the participants. More correct measures to assess physiological stress might have included blood pressure or cortisol levels in the blood. Another issue, which could have affected the results of my study, was the dosage of the sesame oil. The participants only consumed approximately 5 mL of sesame oil, or the placebo a day. In any future studies, a higher dosage of sesame oil should be considered. Previous studies relating sesame oil to stress reduction were performed on rats or mice. While rodents are physiologically similar to humans, they are in no way identical. It is possible that sesame oil is a stress reducer in rodents, but that this trend does not carry over to humans. Dietary stress reducers are, in some cases, a positive alternative to medication. More research is needed to determine if sesame oil is an emotional or physiological stress reducer.

Acknowledgments

I would like to sincerely thank my mentor Dr. Roger Shane Gold for his guidance and collaboration. I would like to acknowledge Dr. Daniel Gubler and Dr. Ronald Miller for valuable
discussion relating to this study. I would also like to acknowledge the participants of this study for their time along with the Biology Department at BYU-H for their resources and support.

Works Cited


