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Grant title: Dietary considerations effecting lung metastatic therapeutic responsiveness and co-morbidities

Several studies have demonstrated a strong link between obesity and a greater risk of developing breast cancer. It is estimated that 3 out of 10 breast cancers may have been prevented if the women were not overweight, indicating the important role obesity in the etiology of breast cancer. Obesity is also a predictor of poor response to chemotherapy, which is the first line of therapy for women with triple negative breast cancer (TNBC). In patients who received neoadjuvant anthracycline-based chemotherapy, a higher BMI was associated with worse pathological complete response, implicating obesity in the development of chemotherapy resistance. Over 2.1 billion people worldwide are considered overweight or obese. Obesity is a major public health concern and considered an epidemic in the (USA, as over 60% of women are overweight or obese a body mass index of over 30). Moreover, some studies have reported a three-fold higher breast cancer mortality rate in obese women at diagnoses suggesting obesity promotes metastasis and/or reduces therapeutic effectiveness.

What our study shows:

- High fat diets (such as a Western diet) increased primary breast tumor growth.
- Supplementing a Western diet with fish oil (n-3 polyunsaturated fatty acids) reduced primary breast tumor growth.
- Western diet consumption increased breast cancer lung metastatic colonization and lesion growth.
- Western diet consumption decreased chemotherapy efficacy in treating breast cancer lung metastases.
- Mediterranean diet consumption resulted in increased doxorubicin responsiveness when compared with Western diet or Western diet + fish oil consumption for the treatment of lung metastases.
- Consumption of a Mediterranean diet or a Western diet + fish oil prevented chemotherapy-mediated increase in cardiac weight, suggesting diet can modulate off target toxicities.

Future Outcomes/Impact:

We are currently submitting grant applications to investigate whether diet and exercise can be used as a tool to treat cardiac damage after the completion of chemotherapy in breast cancer patients. We are using the data obtained from this METAvisor grant as preliminary data in support of these new applications to show that diet directly modifies the risk of chemotherapy-induced cardiotoxicities.