LAY SUMMARY

TITLE: Pubertal high fat diet: effects on mammary cancer development

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A high fat diet has been implicated as a risk factor for breast cancer. A well established risk factor is the early onset of puberty and there are many findings that puberty presents a life period of increased susceptibility to the later development of breast cancer in adulthood. There is speculation over how a high fat diet might promote breast cancer risk. Among these are altered glucose metabolism, altered steroid hormone levels, and altered inflammatory and immune processes.

Our paper shows that a high fat diet initiated at puberty dramatically accelerates the development of breast cancer in mice that have been treated with a cancer causing agent, DMBA. The mice that we used in these experiments are of a type that does not become fat on a high fat diet, so the culprit seems to be the fat itself rather than weight gain.

We found that the mice that are fed a high fat diet show changes within the mammary gland in the peri-pubertal period and in young adulthood, before breast cancer actually arises. These changes include increased numbers of precancerous lesions, enhanced growth of normal cells, elevated levels of growth factors and factors associated with immunosuppression, increased blood supply, and greater numbers of “M2 macrophages”, a type of white blood cell that can promote the growth of tumors. These changes are likely responsible for the enhancement of breast cancer in the mice. Further, the tumors, which appear so quickly in the mice fed a high fat diet, show a pattern of gene expression that differs from the cancers that arise later in the lives of the mice. This is very significant because, even though the cancer causing agent randomly produces cancer causing mutations, this unique gene expression pattern shows the overarching and potent influence of a high fat diet in the breast.

This work addresses the challenge of understanding how the breast becomes susceptible to cancer during puberty, and the specific effects of a high fat diet in increasing susceptibility. Importantly, since many more people eat a high fat diet than become overweight, these studies have important implications for breast cancer prevention in a broad segment of the population. While the results of this study will not have immediate clinical application, the results of this study suggest that the avoidance of a high fat diet may be beneficial in lowering breast cancer risk, while clearly having no deleterious consequences.