

## PROJECT SUMMARY

*In 2009, the USDA and Northern Canola Growers Association funded our study titled: Canola Oil Reduces Breast Cancer Risk: Synergistic Effect with an Anticancer Drug. A summary of the basic strategies and completed tasks are explained below:*

**Background:** Multidrug resistance in human breast cancer treatment is a major issue in treatment efforts. We investigated whether canola oil may (1) reduce growth of human breast cancer cells *in vitro* in combination with the anticancer drug, doxorubicin, and (2) increase sensitivity of doxorubicin-resistant MCF-7 (MCF-7/Dox)-induced breast cancer to treatment in nude mice.

**Methods:** Cell proliferation of MCF-7/Dox estrogen receptor positive cancer cells was measured in the presence of canola oil plus doxorubicin. *In vivo*, nude mice were assigned to control or canola oil supplemented diets and injected with doxorubicin-resistant MCF-7 cells to induce tumorigenesis. Once tumors developed, mice were assigned to the control diet, control plus doxorubicin treatment, canola oil diet, or canola oil diet plus doxorubicin treatment. Tumor growth was monitored and recorded.

**Results:** Canola oil significantly inhibited the growth of MCF-7/Dox cancer cells with doxorubicin as compared with control and doxorubicin alone. *In vivo*, canola oil reduced tumor growth as compared to the control. At the end of doxorubicin treatment, tumor growth rate was slower on the canola oil diet plus doxorubicin.

**Accomplishments:** Currently, tumor tissues collected from the mice are being analyzed for expression of genes related to development of multidrug resistance. This second phase of the project is expected to be completed in August 2011. So far, we have been able to determine that canola oil may play a role in sensitizing drug resistant human breast cancer cells to treatment. However, further studies would need to be conducted to confirm the results and also identify the mechanism through which canola oil may sensitize cancer cells to treatment.

**Impact:** Information obtained from this project may be useful in the development of canola oil-based nutraceutical products for human breast cancer treatment. Awareness of this growth inhibitory effect of canola oil on breast cancer development and growth may in turn contribute to increased demand for canola and increased economic benefits for canola growers, especially in North Dakota, the leading canola producing state in the US.

**Work Planned for Upcoming Year:** In the coming year, we plan to investigate the effect of maternal exposure to dietary canola oil supplementation on breast cancer risk of the offspring (epigenetic study).

## PUBLICATIONS AND PRESENTATIONS

### **Publications:**

#### *Refereed Journal Article*

Cho, K., Mabasa, L., Fowler, AW., Walsh, DM., and Park, CS. 2010. Canola Oil Inhibits Breast Cancer Cell Growth in Cultures and In Vivo and Acts Synergistically with Chemotherapeutic Drugs. *Lipids* 45(9):777-784.

#### *Abstracts*

Park, CS., Mabasa, L., Cho, K., and Fowler, AW. 2008. Dietary Canola Oil Reduces Susceptibility to Chemically-induced Mammary Carcinogenesis. *Mol. Biol. Cell* 19 (suppl 855-6).

Park, CS., Cho, K., Mabasa, L., and Fowler, AW. 2009. Canola Oil Inhibits Human Breast Cancer Cell Growth by Regulating Caspase-3 and P53. *FASEB J* 23:897.9.

Cho, K., Mabasa, L., Fowler, AW., and Park, CS. 2009. Effects of Canola Oil on Breast Cancer Cell Growth and Multidrug Resistance. *Mol. Biol. Cell* 20:96.

### **Presentations:**

**National** – Mabasa L: Dietary Canola Oil and Reduction of Breast Cancer Risk. 2010 US Canola Conference, Long Beach, CA.

**North Dakota** – Bae S: Dietary Canola Oil and Breast Cancer Risk. 2010 Northern Canola Growers Association, Fargo, ND.

**Minnesota** – Mabasa L: Canola Oil Reduces Breast Cancer Risk. 2010 Minnesota Canola Council Meeting, Roseau, MN.