P.O. Box 144345 Austin, TX 78714-4345 ▪ 512.926.4900 ▪ Fax: 512.926.2345 ▪ www.herbalgram.org

HerbClip™

FILE: ▪Tea (*Camellia sinensis*)
▪Colon Cancer

HC 020254-283

Date: June 30, 2005

RE: Evaluation of the Anti-cancer Effects of Tea Extracts in Colon Cancer

Hibasami H, Jin ZX, Yoshioka K, Ina K, Ohnishi K. Human colon cancer cells undergo apoptosis by theaflavin digallate, epigallocatechin gallate, and oolong tea polyphenol extract. *Journal of Herbs, Spices & Medicinal Plants.* 2003;10(4):29–37.

Tea (*Camellia sinensis*), one of the most popular drinks globally, has emerged as a plant with the potential to prevent and treat some cancers. The green tea polyphenol epigalocatechin-3-gallate (EGCG) has received the most attention; however, black tea theaflavin digallate (TFDG) and oolong tea polyphenol extract (OTPE) may also have anti-cancer properties. Previous studies have shown that tea and its extracts inhibit carcinogenesis in animal models of skin, lungs, oral cavity, esophagus, stomach, liver, pancreas, small intestine, colon, and prostate cancers.[1] The current study evaluated the anti-cancer effects of EGCG, TFDG, and OTPE on an experimental human colon cancer cell line (COLO 205) in vitro and the safety of these chemicals on human lymphocytes ex vivo.

Oolong tea extracts, as 85% OTPE (Institute for Biomedical Research, Suntory Ltd., Osaka, Japan), TFDG, and EGCG (both supplied by Kurita Industrial Company, Tokyo, Japan) were studied for their ability to inhibit growth of COLO 205 cells and induce apoptosis (programmed cell death). Cancer cells escape this step in their life cycle and divide uncontrollably. COLO 205 cells were incubated for 3 days in 0.5 mM, 1.0 mM, and 1.5 mM EGCG, in the same concentrations of TFDG, and in 0.38 mg/ml, 075 mg/ml, and 1.50 mg/ml OTPE in separate Petri dishes. To determine growth inhibition, dead COLO 205 cells were then stained with Tryptan blue dye and counted using a hemocytometer (Iwaki Glass, Japan). Apoptosis of COLO 205 cells was determine by microscopic screening for "apoptotic bodies."

Electrophoresis of COLO 205 DNA was used to determine DNA fragmentation. [Electrophoresis is a standard laboratory technique whereby DNA fragments are processed and placed in an agar gel, a polysaccharide extracted from seaweed (usually *Gelidium* spp. or *Gracilaria* spp.).] An electrical current is run through the agar plate, and the DNA fragments migrate through the gel matrix. Smaller fragments travel a greater distance than larger

fragments. The fragments are then stained, visualized as bands of light, and compared against a control containing known fragment sizes.

All 3 tea extracts inhibited COLO 205 in a dose-dependent manner. TFDG inhibited COLO 205 cells by 63.5 ± 2.1%, 85,8 ± 3.5%, and 100.0 ± 4.2% at concentrations of 0.5mM, 1.0mM, and 1.5mM, respectively. EGCG inhibited cell growth by 93.4 ± 3.1%, 99.8 ± 3.0%, and 100.0 ± 4.6% at the same concentrations at TFDG, respectively. OTPE inhibited cell growth by 26.4 ± 1.5%, 89.5 ± 3.7%, and 98.2 ± 4.4%, respectively. Apoptotic bodies and DNA fragmentation increased over time and in a dose-dependent manner. After 3 days of treatment, all 3 tea extracts produced apoptotic bodies and DNA fragmentation in COLO 205 cells. EGCG was more effective at promoting apoptosis than TFDG. EGCG-induced apoptosis increased from 0.5mM to 1.0mM, whereas TFDG-induced apoptosis increased from 1.0mM to 1.5mM. OTPE-induced apoptosis increased as the concentration of OTPE increased from 0.75 to 1.50 mg/ml. No morphological changes were detected in human lymphocytes treated with EGCG, TFDG, and OTPE, indicating no appreciable toxicity at these concentrations.

This study demonstrates that green tea, black tea, and oolong tea extracts have anti-cancer effects on experimental human colon cancer cells. Animal models have already shown tea's potential to treat some forms of cancer; however, until prospective, human trials are conducted the efficacy and safety of tea extracts to treat cancer remain theoretical.

—John Neustadt, ND

References

[1]Lambert JD, Hong J, Yang G-y, Liao J, Yang CS. Inhibition of carcinogenesis by polyphenols: evidence from laboratory investigations. *Am J Clin Nutr.* January 1, 2005 2005;81(1):284S-291.

Enclosure: Referenced article reprinted with permission from Haworth Press.