[Margaret Yoo won the Director's Award for the 2010 HTCC Student Research Conference with the following abstract.]

Presenter: Margaret Yoo, Irvine Valley College
Mentor: Professor Robbi Nester

Title: Phase III: The Removal of Fuel Oxygenates from Water – Saving the Future from Yesterday, 427 words

Tap water is delivered to homes, schools, and businesses and is the most readily available source of water for human consumption; consequently, our groundwater system provides the greatest opportunity for the harmful spread of pollutants, including methyl tertiary butyl ether (MTBE), diisopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), and tertiary amyl methyl ether (TAME). These fuel oxygenates, added to gasoline as a response to the Clean Air Act Amendments of 1990 for the cleaner burning of gasoline, were manufactured at the rate of over 200,000 barrels produced per day in 1999, without consideration of the effects of seepage into the groundwater system (**US EPA**). **Acute neurotoxic effects**, along with cancer and tumors at multiple organ sites were found in almost every rat and mouse exposed to these **fuel oxygenates** (**Bond et al.**). As a result, the use of these fuel oxygenates was banned in 2004.

The 2004 ban was not a sufficient remedy**. In September 2006, Hartford County Maryland reported levels of MTBE at 101 ppb in the elementary school drinking water supplies (Aqua).** The maximum contamination level of MTBE is 13 ppb, and children, who are exposed to seven times more water compared to their body size than adults, were exposed to dangerously high levels of MTBE two years after the use of MTBE was banned. **The number of U.S. drinking water systems reporting MTBE contamination increased six-fold between 1996 and 2002. In 2002, California was reported to have the most severe contamination, with systems serving more than 30 million people reporting MTBE contamination (California).** To protect ourselves and our children, I have researched an inexpensive and effective method for the removal of MTBE, DIPE, ETBE, and TAME.

After researching the removal of nitrate and ethylene dibromide/dibromochloropropane using adsorbents, **I developed an experiment to determine a method to remove fuel oxygenates from contaminated waters. Water samples representing three different matrices of water – groundwater, tap water, and surface water – were spiked with 10 ppb of the MTBE, DIPE, ETBE, and TAME stock solution to simulate acute contamination of water sources. The samples were then filtered using five different adsorbents with distinctively varying physical characteristics.** It was determined that divinylbenzene polymer, a synthetic adsorbent, and coconut carbon, a natural carbon, were able to remove all of the fuel oxygenates consistently, regardless of the varying background of organic content. **This experiment uncovered a potable, cost-effective, efficient method that can help save our future from yesterday. For me, personally, it was the discovery of a life-long passion for research because of the life-saving potential of such discoveries.**

Effective two-part title; informative main title and catchy subtitle

Opening hook to intrigue reader and state problem

Precise scientific language; relevance of problem demonstrated

In-text citation provided to show source of data

Logical paragraph breaks

Brief instances of key evidence, with citations

Research methodology explained

Outcome and relevance of project explained

Works Cited and Consulted

American Public Health Association. "Ultraviolet Spectrophotometric Screening Method." 16th Edition: American Public Health Association 1985: 392-393.

Aqua MD. Gasoline Additive (MTBE) Found in Elementary School Drinking Water Supplies. 12 September 2006. 14 February 2008 <http://www.aquamd.com/water_health/mtbe_school.cfm>.

Belpoggi, Fiorella, et al. Results of Long-Term Carcinogenicity Bioassays on Tert-Amyl-Methyl-Ether (TAME) and Di-Isopropyl-Ether (DIPE) in Rats. 2002. 29 February 2008 <http://www.annalsnyas.org/cgi/content/abstract/982/1/70?ck=nck>.

Bond, James A., et al. Neurotoxicological Evaluation of Ethyl Tertiary-Butyl Ether Following

Subchronic (90-day) Inhalation in the Fischer 344 Rat. 5 January 1999. 29 February 2008 <http://www3.interscience.wiley.com/cgi-bin/abstract/25000054/ABSTRACT?CRETRY=1&SRETRY=0>.

Brown, Jame L., et al. A Tool for Selecting an adsorbent for Thermal Desorption Application. 31 January 2007 <http://www.sigmaaldrich.com/Graphics/Supelco/objects/11400/11342.pdf>.

Bureau of Toxic Substance Assessment, New York State Department of Health. Fact Sheet for Gasoline Oxygenates in Drinking Water. December 2006. 14 February 2008 <http://www.heatlh.state.ny.us/environmental/water/drinking/oxygenates_in_drinking_water>.

California Energy Commission. Energy Commission MTBE Study: Study of Alternatives to Methyl Tertiary-Butyl Ether, an Oxygenate in California Reformulate Gasoline. 2002. 14 February 2008 <http://www.energy.ca/gov/mtbe/>.

Center for Groundwater Research (CGR). Gasoline Oxygenates (MTBE). 21 March 2000. 2008 14 February <http://cgr.ese.ogi.edu/mtbe/>.

Cheng, Robert, Ph.D., P.E. Personal Interview Margaret Yoo. November 2005.

Clesceri, Lenore S. and Others. Standard Methods for the Examination of Water and Wastewater 20th Edition . Baltimore: United Book Press, Inc., 1998.

Creek, Daniel, et al. Treatment Technologies for Removal of Methyl Tertiary Butly Ether (MTBE) from Drinking Water: Air Stripping, Advanced Oxidation Processes, Granlar Activated Carbon, Synthetic Resin Sorbents. Second Edition Exectutive Summary. Fountain Valley: Center for Groundwater Restoration and Protection, National Water Research Institute, 2000.

Dischinger, Joseph B. The Water Front: Top Issues in Water Quality in 2005. 2005. 14 February 2008 <http://www.fwlaw.com/water2005.html>.

Energy Information Administration. MTBE, Oxygenates, and Motor Gasoline. 6 March 2000. 14 February 2008 <http://www.eia.doe.gov/emeu/steo/pub/special/mtbe.html>.

Environmental Working Group. MTBE in Drinking Water. 2007. 29 February 2008 <http://www.ewg.org/node/21314>.

Gaiam. Methods of Water Filtration and Purification. 29 December 2004 <http://www.gaiam.com/retail/gai_content/learn/gai_learnArticle Print.asp>.

International Labour Organization. Diisopropyl Ether. March 1996. 29 February 2008 <http://www.ilo.org/public/english/protection/safework/cis/products/icsc/dtasht/_icsc09/icsc0906.htm>.

Jennings, Gregory D. and E. Sneed Ronald. "Nitrate in Drinking Water". March 1996. 22 December 2003 <http://www.bae.ncsu.edu/programs/extension/publicat/qwm/ag473_4.html>.

Kennedy, James. "Scientists See Little Ozone Reduction Due to MTBE, Ethanol Use in Gasoline." Volume 30, No. 21, American Chemical Society 14 May 1999: 46-47.

Liberatore, Paul A. Automated Nitrate Analysis of Water. Australia: Varian Instrument Company, 1993.

Lowy, Joan. MTBE Liability. 9 October 2002. 14 February 2008 <http://www.ewg.org/node/15027>.

Lyon, Stephen R., Ph.D. Personal Interview Margaret Yoo. November 2005 .

Milloy, Steven J. State May Relax Rules on MTBE. 13 December 1998. 14 February 2008 <http:??www.junkscience.com/dec98/latmtbe.htm>.

Rhodes, I.A.L. and Verstuyft, A.W. Selecting Analytical Methods for the Determination of Oxygenates in Environmental Samles and Gasoline. March/April 2001. 19 February 2008 <http://www.api.org/ehs/groundwater/upload/MTBE_RhodesVerstuyft.pdf>.

The European Fuel Oxygenates Association (EFOA). MTBE Resource Guide: 1.3 MTBE and human health. 14 February 2008 <http://www.efoa.org/mtbehhealth.html>.

The Health Effects Institute. Program Summary: Research on Oxygenates Added to Gasoline. 2004. 29 February 2008 <http://www.healtheffects.org/Pubs/oxyprog.htm>.

U.S. Environmental Protection Agency. Methyl Tertiary Butyl Ether (MTBE). 13 September 2007. 29 February 2008 <http://www.epa.gov/mtbe/gas.htm>.

—. "Phase II Reformulated Gasoline: The Next Major Step Toward Cleaner Air." Air and Radiation (6406J) (1999): 1-2.

Water Education Foundation. MTBE Risks and Issues. 200. 14 February 2008 <http://www.water-ed.org/store/itemdetail.as?id=93>.

Weitz and Luxenberg. MTBE Lawsuit - Information You Need to Fight Back Against Big Oil. 2008. 14 February 2008 <http://www.weitzluz.com/mtbe/lawsuit_1062.html>.

"What You Need to Know About Your Water, and How it May Affect You." (2007).

Yoo, Lee. Personal Interview Margaret Yoo. December 2007.

Yoo, Megan. Personal Interview Margaret Yoo. January 2008.