Nutrigenomics: The New Science of Genes, Nutrition, and Health

Symposium in collaboration with the Center for Excellence for Nutritional Genomics, University of California at Davis.
Endorsed by NuGO (the European Nutrigenomics Organisation); UIC Laboratory of Nutrigenomic Medicine, Chicago.
Sponsored by the Scientific Advisory Group, National Coffee Association.

Contact: Amy Briskin 212 794-6644
abriskin@aol.com
MJ Wyatt 212 661-9610
mjwyatt@erols.com

FOR IMMEDIATE RELEASE

"Moderate coffee consumption may be associated with a reduction in the risk of certain diseases," food scientist says.

New York, NY – The good news about coffee and health keeps getting better, according to a food science expert who spoke at a symposium here. According to James Coughlin Ph.D., toxicologist and consultant in food safety, "The preponderance of scientific evidence suggests that moderate coffee consumption – that is three to five cups a day – may be associated with a reduction in the risk of certain diseases."

The symposium, *Nutrigenomics: The New Science of Genes, Nutrition, and Health,* was held here to introduce science writers to nutrigenomics, the new study of how foods affect our genes and how individual genetic differences affect the way we respond to nutrients in foods.

Dr. Coughlin told the group that habitual consumption of five or more cups of coffee a day has been associated with improved glucose regulation and a marked lower risk of acquiring type 2 diabetes. That means that there is a 35% to 75% lower risk of developing the disease as shown in studies in the United States, Japan and Europe. Even drinking three to four cups of coffee a day will lower an individual's diabetes risk. The protection afforded by coffee exists whether one drinks caffeine-containing or decaffeinated coffees; this positive effect may be the result of coffee's natural polyphenolic antioxidants, magnesium and lignans.

Liver disease is also affected positively by drinking coffee. The toxicologist said, "Coffee consumption has been associated with a clinically significant reduced risk of liver cancer and cirrhosis." He said there are data that suggest the reduced risk of alcohol cirrhosis could be associated with the phenolics and related substances in coffee.

The scientist told the science writers that coffee might play a role in cancer protection, also due to its naturally occurring polyphenolic antioxidants as well as heat-produced antioxidants. He said that there are studies from a number of countries that have shown that coffee is the major single source of dietary antioxidants – far more than tea, wine, chocolate, and individual fruits and vegetables. Furthermore, some coffee components can induce the expression of carcinogen-detoxifying enzymes, he noted.

Coffee seems to reduce the risk of Parkinson's disease, according to epidemiological studies. Dr. Coughlin said, "Some research in neuropharmacology suggests that only one cup of coffee a day – that amounts to 80 to 140 mg of caffeine – can halve the risk of getting Parkinson's disease. This might be because caffeine's adenosine-blocking power may be one mechanism through which the brain cells in Parkinson's disease are protected or conserved."

Dr. Coughlin told the attendees, "Numerous other studies have shown that drinking coffee increases your mental alertness, cognitive functions, physical stamina and wakefulness. It has also been shown to reduce the risk of Alzheimer's disease, gallstones, kidney stones, depression and suicide.

"There is a long established history of the safe use of coffee, and the newest detailed studies and re-examinations of old issues have been quite reassuring," Dr. Coughlin noted. "Coffee and caffeine should already be recognized for their positive health benefits and potential functional food attributes. You can forget about coffee being bad for you, it's actually good for you."

***

"Coffee is the number one antioxidant molecule in the American diet," expert on polyphenols tells science writers

New York, NY – "The leading causes of death in four out of 10 cases in the United States are diet related," said Joe A. Vinson, Ph.D. "It's well known that an increased consumption of fruits and beverages leads to a decreased risk of chronic disease such as heart disease, stroke, diabetes and cancer."

Dr. Vinson is Professor in the Department of Chemistry at the University of Scranton in Pennsylvania. He spoke at a symposium, *Nutrigenomics: The New Science of Genes, Nutrition, and Health*. The educational event was held here to introduce science writers to nutrigenomics, the new study of how foods affect our genes and how individual genetic differences affect the way we respond to nutrients in foods.

The chemist said that chronic diseases cost our society over $200 billion per year in medical costs and lost productivity. He explained, "These diseases have a pathology that is initiated by free radicals. Recent epidemiology has shown that polyphenols consumed in foods may be the major agents responsible for their health benefits – not the antioxidant vitamins C and E as we'd all originally assumed. Unfortunately, measuring individual phenolic compounds is a difficult if not impossible task, due to the very large number – it's 8000 and growing – of these compounds in plants. And that's just one of the obstacles we encounter.

"We accepted the challenge," Dr. Vinson said. "Our research group used market samples of common fruits, vegetables, spices, nuts, grains, oils and beverages to determine the total amount of phenols in foods and beverages using an analysis that measures the extract's antioxidant activity. We also measured the quality of antioxidants in foods and beverages by means of an in vitro 'heart disease in a test tube' model."

Dr. Vinson told the group that foods and beverages are better antioxidants than are antioxidant vitamins. He noted, "With the polyphenol content data and the USDA database of per capita food consumption, the contribution of each type of food to the average estimated intake of phenolic antioxidants was calculated for 2003. Total per capita phenolic antioxidants in the United States diet was 2.2 g. Polyphenols are the major antioxidants in foods and beverages, with the vitamins primarily being minor contributors. The beverage group produced the largest percentage of the total per capita intake of phenolic antioxidants – totaling 49%.

"Coffee was the largest single contributor on a daily basis for the average American, contributing 31% of the total daily antioxidants. Coffee is high in phenolic acids and chlorogenic acid, and is the number one antioxidant molecule in the American diet," the professor explained.

"But do high polyphenol foods and beverages act as antioxidants in the body? " he asked. "Coffee given to humans increases plasma antioxidant capacity, and the polyphenol metabolites act as antioxidants at the level of low density lipoprotein (LDL), decreasing its oxidizability, a possible benefit for slowing down the atherosclerosis process and lowering the risk of heart disease. Recent studies have shown that milk drunk in coffee does not inhibit the absorption of polyphenols in a cell and animal experiment, although recent research suggests that milk in tea interferes with biological effect and presumably antioxidant absorption. Other high polyphenol foods such as tea, chocolate and red wine have the same effects on plasma antioxidant capacity and LDL oxidation."

Dr. Vinson said that polyphenols, including those in coffee, can also affect oxidative stress by acting both directly as antioxidants and indirectly by affecting cell signaling and gene expression. He concluded, "Polyphenols have antioxidant, anti-inflammatory, antiproliferative, anti-angiogenic, antithrombic and vasorelaxive properties, which can affect disease and its pathology."

***

People who avoid eating some vegetables and fruits may have no choice:

Such food preferences are genetically determined, says expert.

New York, NY. February 13, 2006 – So you say you can't bear broccoli? You'd rather not grapple with a grapefruit at breakfast? Do people think it's silly that you don't like cilantro? Well, it's not. It's all in your genes, according to Dr. Ahmed El-Sohemy, who studies genetic determinants of food preferences.

Dr. El-Sohemy spoke at symposium, *Nutrigenomics: The New Science of Genes, Nutrition, and Health*. The educational event was held here to introduce science writers to nutrigenomics, the new study of how foods affect our genes and how individual genetic differences affect the way we respond to nutrients in foods.

"As a result of the Human Genome Project we know that certain genes exist in different forms, and that the various forms might explain why some people report the bitter taste of a particular food such as grapefruit as intense, mild, or not bitter at all. These genes code for receptors on the surface of the tongue and are responsible for detecting bitter compounds," Dr. El-Sohemy told the group. The scientist is Assistant Professor and Canada Research Chair in Nutrigenomics in the Department of Nutritional Sciences at the University of Toronto. He is also Theme Leader of Functional Foods & Nutriceuticals for the Advanced Foods and Materials Network Center of Excellence, which is funding this aspect of his research.

It is one of Dr. El-Sohemy's many interests to determine why some people don't like grapefruit or vegetables such as broccoli, Brussels sprouts, radicchio and cilantro. He explained, "What we found is that a taste receptor coded by one of the TAS2R genes, which exists essentially in two different forms -- one called T, the other G -- is strongly related to grapefruit preference. If you have a T at a particular position in this gene you don't mind grapefruit. But if you have the G version, you're most likely to perceive grapefruit as bitter and not like it at all. There are over two dozen genes which code for taste receptors that detect bitterness alone. There are also genes that code for olfactory receptors, responsible for the sense of smell. Some people are more sensitive to the smell of certain foods, and that clearly affects their desire to consume those foods since flavor is affected by smell as well as taste."

However, this research isn't just about who likes what food. The approach that scientists such as Dr. El-Sohemy are taking is to ascertain whether those individuals who like certain foods have particular genetic differences. This information will help them better understand the link between the consumption of certain foods and various health outcomes.

According to the Canadian researcher, "When we find associations in studies that show that those who like broccoli have a lower incidence of colon cancer, for example, we need to ask ourselves whether there are any specific genetic differences between those who like broccoli and those who do not. Then we have to make sure that any association between the food and disease is not because of this genetic difference."

Many bitter tasting foods also contain antioxidants and various phytochemicals, which may play a role in the prevention of certain chronic diseases. Over the years, the

individuals who were able to thrive and flourish were those who weren't sensitive to the bitterness of those foods. For such people broccoli and Brussels sprouts, for example, were rich sources of nutrients. For individuals who don't like such foods, an additional problem is what they eat instead, since they may eat fewer nutrient-dense foods, which have been associated with an increased risk of a variety of chronic diseases.

***

Polyphenols, enriched in grapes, berries, and coffee: scientists are learning just how beneficial these food chemicals can be

New York, NY – How can we learn about preventing Alzheimer's disease and other dementias? Helen Kim, Ph.D. is working on the answer by using new technologies to study the actions of polyphenols in the brain. Complex chemicals related to estrogens, polyphenols are different in that they're also excellent antioxidants. Antioxidants are the chemicals that give flowers, fruits, and vegetables their color and protect them against oxidation from the sun. These same antioxidant activities are among the reasons why grapes, berries, coffee and other foods are so good for us.

Dr. Kim is Associate Professor at the University of Alabama at Birmingham, Department of Pharmacology and Toxicology, and Co-Director of the UAB Comprehensive Cancer Center Proteomics/Mass Spectrometry Shared Facility. She spoke at a symposium, *Nutrigenomics: The New Science of Genes, Nutrition, and Health*. The educational event was held here to introduce science writers to nutrigenomics, the new study of how foods affect our genes and how individual genetic differences affect the way we respond to nutrients in foods.

"We are interested in how dietary elements can help us understand aging-related processes in the brain that lead to dementias such as Alzheimer's disease," Dr. Kim told the group. "I believe that we can learn about chronic diseases such as cancer and cognitive impairment by supplementing the experimental diet with chemicals such as polyphenols that we think will attenuate or delay onset of a disease. Once we introduce the potentially protective dietary element, we then analyze the proteins in the affected organs -- brain, breast, prostate -- compared to the controls, to determine what the protein differences are and what they mean."

Dr. Kim's group works with over-the-counter dietary supplements, which she explains, "are important to understand with regard to several issues. Their ready availability means that the consumer can buy and take them without knowing which, if any, brands and doses are beneficial and effective." These issues, and the potential for synergistic actions of these supplements with prescription drugs, were the basis of the NIH mandate nearly a decade ago that set up a handful of Botanicals Centers across the country, whose purpose is to understand the molecular basis of action of different classes of dietary supplements, and to determine effective doses, potential toxicities, and other important clinical issues.

The researcher told the science writers, "As part of the NIH-funded Purdue/UAB Botanicals Center for Age-Related Diseases, we decided to study grape seed extract for potential neuroprotective properties. It is enriched in proanthocyanidins, complex polyphenols that can exert antioxidant activity once they are ingested. We used 2D gel proteomics -- a technology that separates proteins based on molecular parameters intrinsic to each protein -- to identify brain proteins in vivo that were changed in response to grape seed extract. The majority of the proteins identified with this approach had already been implicated in earlier studies in Alzheimer's disease and in transgenic models of dementia. Of importance was that a protein that was less abundant in response to grape seed was more abundant in Alzheimer's disease (AD) brain, suggesting that grape seed protected against changes that lead to AD.

To what extent do these findings demonstrate that polyphenol-rich foods are beneficial for health? According to the Alabama scientist, behavioral studies have shown that grape seed extract enhanced learning and memory-formation, consistent with the proteomic results. Additional studies in her lab also showed that grape seed extract had chemopreventive activity in an in vivo model of chemically-induced breast cancer, again consistent with its health-sustaining properties.

Dr. Kim told the group, "The proteomic findings suggest that in

addition to directly protecting proteins from oxidation, polyphenols may have health-protective actions by affecting gene expression of groups of proteins."

She concluded, "Such multiple effects have also been suggested as part of the chemopreventive activity for caffeic acid, the dominant chemical in coffee. All these results indicate that risk for serious disease *can* be influenced by environmental factors, including diet, and that certain classes of food chemicals like the polyphenols may be very important in sustaining health, if not preventing disease."

***

The way we respond to specific nutrients in certain foods can actually change the messages in our DNA, according to a new field of science.

New York, NY. February 13, 2007 -- "Nutrigenomics is about the interaction of foods we eat leading to key changes in the way DNA is used -- how each of us responds to specific nutrients," Dr. Stephen Barnes told a group of science writers here.

Dr. Barnes is Director of the UAB Center for Nutrient-Gene Interaction and Associate Director of Purdue-UAB Botanicals Centers for Age-Related Disease at the University of Alabama at Birmingham. He spoke here at a symposium, *Nutrigenomics: The New Science of Genes, Nutrition, and Health*. Its purpose was to introduce this new scientific discipline, which utilizes what we now know about the genome to enhance nutrition.

"Take a photograph of a moment in a soccer or any other game," the scientist suggested. "Suppose you have to determine from that photograph what happens next. The possible answers may seem completely random except for one or two. A wise person, a knowledgeable fan or a good coach, may have seen that play in a game 10 years prior and would recognize that photographed pattern and be able to predict the play. Well, nutrigenomics is like this because there are many variations. The genetic code appears to be static, but the code can get changed due to signals coming from the foods we eat - this can be good (we live longer) or bad (the risk of disease is higher). Nutrigenomics is about recognizing the patterns of how genes are used and changed by the foods we eat."

The researcher told the journalists, "In any given population, different groups respond to diet differently. There is presumably an optimal diet for each group. We're

really like an animal or plant; there is no rational reason why we should be in all the parts of the world. Animals grow and survive where there is food and water; they don't normally go to other places. Our diverse ancestors grew around a particular food source. Some were richer than others, some were plant based, some had a lot of animals and you could survive just by eating those animals. So, I think that in the times before we started moving around the world, diet-sensitive genes were optimized for each particular location. When we moved from that location, that is when we ran into trouble. It may be that early life diet exposures have an imprint on gene expression in ways that alter cancer risk over time. That is what we hope to find out."

Genes may have specific roles at different times in our lives, starting with growth in the womb when "we're growing like fury," the speaker said. For example, in studying breast cancer colleagues of Dr. Barnes at UAB observed that events in mid-puberty seem to be "absolutely crucial" in determining risk. And by studying identical twins who grew up in different environments, other researchers were able to find out what differences the twins experienced at specific stages in their lives. They determined that, on average, two girls in a set of twins could be as much as one year apart in their onsets of puberty – despite having identical genes. So something in their diets or environments had an impact on the way in which the genes that promote puberty are switched on.

Dr. Barnes noted that the twin who began puberty second had a fivefold lower risk of breast cancer – despite having the same genes as her sister – suggesting that habits, athletics, foods, and other environmental factors we are exposed to "are quite big players in breast cancer risk, for a cancer that is not going to occur for another 30 to 40 years. In breast cancer you really have to look at what's going on in the formative years of ages 12 to 20, when the breast is going through rapid development and certain genes are expressed. This is when the external influences like the diet can effect real change. This is how diet alters the course of genetic development. I believe that this field, nutrigenomics, will determine the health of nations."

***

Would you like a nutritional plan that's tailored to your genes?

That's not as far-fetched as it seems, says renowned scientist.

New York, NY – Can the new science of nutrigenomics provide an understanding for the way common nutrition affects health, by altering the expression and/or structure of an individual's genetic makeup? Ask Jim Kaput Ph.D., a leading figure in nutritional genomics, which says that we all respond to foods according to our individual DNA patterns.

Dr. Kaput is Senior Scientist and Science Coordinator, NCMHD Center of Excellence in Nutritional Genomics (CENG), University of California at Davis, Director of the Laboratory of Nutrigenomic Medicine at the University of Illinois Chicago, and Scientific Advisor to NuGO (the European Nutrigenomics Organisation). He spoke at a symposium, *Nutrigenomics: The New Science of Genes, Nutrition, and Health*. The educational event was held here to introduce science writers to nutrigenomics, the new study of how foods affect our genes and how individual genetic differences affect the way we respond to nutrients in foods.

According to Dr. Kaput, "The conceptual basis for this new branch of genomic research can best be summarized by what I call the Five Tenets of Nutrigenomics:

1. Improper diets are risk factors for diseases
2. Dietary chemicals alter gene expression and/or genome structure
3. Influence of diet on health depends upon an individual's genetic makeup
4. Genes regulated by diet play a role in chronic diseases
5. "Individualized nutrition" – diets based upon genotype, nutritional requirements and status - prevents and mitigates chronic disease."

The scientist told the science writers, "Applying the concepts of nutrigenomics to individuals is challenging because of the diversity of genetic makeup and individual responses to the complexity of foods. The latest research in genetics has demonstrated that gene–gene interactions, called epistasis, alter SNP (single nucleotide polymorphism) associations with chronic disease outcomes and may alter responses to food.

"While this field is being applied first to health care for the diagnoses and treatments of chronic diseases, and to personal nutrition for maintaining health and preventing chronic diseases," Dr. Kaput said, "we foresee that the application of nutrigenomics to the consumer food market will be occurring over the next five to 10 years. The applications may appear to segment the consumer market, but the products that will be developed will be of high value; they will be capable of delivering the right nutrients to the right person at each stage of the life cycle."

The scientist assured the attendees that the potential increased cost of such products will likely be offset by reduced costs for health care for the individual and for society. The common factors in these different applications are genetic testing to assess needs and the matching of genetic makeup to foods or food supplements.

Dr. Kaput said that although the promise of nutritional genomics, "has been well accepted by many scientists and business people, converting the science to medical and food products for consumers remains a significant challenge. While individual genes and their variants have been linked to specific foods or nutrients, an individual dietary chemical may interact with many other gene products in the course of absorption, transport, and metabolism. Gene–gene and gene–environment interactions that alter biological processes may change gene variant–nutrient associations differently among persons of different ancestral backgrounds."

We still don't know how much of a nutrient is needed for a biological effect in an individual, Dr. Kaput said, since many nutrigenomic and nutrigenetic experiments aren't

testing doses yet. However, answers will be forthcoming, since researchers around the world have initiated an international Nutrigenomics Society that will enable collaborations among various research groups in the near future.

***