



Preliminary Executive Summary
Examining the Health Benefits of Lycopene from Tomatoes

April 1-2, 2003
Washington, DC

Convened by the Center for Food and Nutrition Policy at Virginia Tech
Sponsored by the H.J. Heinz Company

Conference Objective: To examine the latest scientific findings on the potential health benefits of lycopene from tomatoes.

Tuesday, April 1, 2003

Breakfast Speaker: The Honorable Robert Dole, former U.S. Senator

The Honorable Robert Dole, former U.S. Senator, began the conference by relating to the audience his health and humanitarian work on the international scene. In addition, he spoke about his battle with prostate cancer. He is an advocate for prostate cancer testing and lifestyle changes that reduce the risk of cancer. He strongly reinforced the need to spread the message of nutrition to the public.

Keynote Address: Vegetable Consumption and Human Health
Speaker: Dr. Johanna Dwyer, Tufts University

Dr. Dwyer's presentation emphasized the importance of fruit and vegetable intake for ensuring nutrient adequacy as well as reducing the risk of chronic disease. Government and health organizations in the U.S. and around the world recommend increased intake of fruits and vegetables, in the range of 5-9 servings daily. In the U.S., fruit and vegetable intakes are below recommendations. A recent study examined the psychosocial factors associated with red-yellow vegetable consumption in males and females. In males, self-efficacy, morale and perceived benefits and barriers influenced intake, while in females, nutrition importance and perceived benefits and barriers were the most important factors. Dr. Dwyer then presented lycopene data. In the National Health and Nutrition Examination Study (NHANES) 2000, more than 85% of lycopene came from 10 sources, taking into account amount per serving as well as frequency of consumption. These sources were: spaghetti/pasta sauce, ketchup, salsa, tomato soup, canned tomatoes, raw tomatoes, tomato sauce, tomato paste, vegetable juice cocktail, and watermelon. The science relating the intake of tomato and tomato-based products and blood lycopene level with a lower risk of various cancers is promising.

The Center for Food and Nutrition Policy is editing the final, complete proceedings of the conference. The availability of the proceedings will be announced on the CFNP website, www.ceresnet.org.

During the question and answer period, Dr. Dwyer was asked if she was aware of any negative studies on the effects of increasing fruit and vegetable intake. While some studies are not as strong as others that relate positive benefits, she was not aware of any negative studies. Also brought forth in the discussion was the fact that while the American population has relatively high blood lycopene levels compared to other countries, chronic disease is also high. What could be occurring is a time lag; that is, the higher lycopene levels are a more recent phenomenon, and over time, there may be a more beneficial effect observed.

Session 1: The Food Science of Lycopene
Moderator: Dr. Maureen Storey, Center for Food and Nutrition Policy

Effects of Processing on Bioavailability of the Functional Components of Tomatoes

Speaker: Dr. Marisa Porrini, University of Milan, Italy

Dr. Porrini reported that the amount of lycopene in a tomato is variable, ranging from 15-56 mg/kg. Food processing must address retention, chemical changes, and bioavailability. Dr. Porrini then reviewed her studies on lycopene blood response and raw/processed tomato intake. In her 1998 study, tomato puree, oleoresin capsules (extract from tomato) and ketchup increased plasma lycopene. Plasma lycopene levels when tomato paste was fed were 3.8 times the level when raw tomatoes were given. Homogenization and heat treatment together resulted in a greater blood response. She also noted that lycopene levels in the blood increased in response to feeding in one week and then plateaued. Lycopene was found in both the plasma and lymphocytes. Tissues that take up lycopene include the skin, human milk, prostate, and human buccal mucosa cells. Her conclusions were that food processing has a positive effect on lycopene availability, with thermal processing resulting in the release of lycopene. In addition, regular intake of tomato products is necessary to maintain blood levels.

Consumption Patterns of Tomato-Based Products

Speaker: Dr. Richard Forshee, Center for Food and Nutrition Policy, Virginia Tech

Dr. Forshee shared tomato intake data from the Continuing Survey of Food Intake by Individuals (CSFII) 1994-6, 1998, for adults 18+ years. The tomato products included were: raw tomatoes, cooked tomatoes, tomato juices, tomato sauces (a broad category covering ketchup, salsa, spaghetti sauce, barbecue sauce, etc.), tomato mixtures (such as tomato and corn, tomato and okra, etc.), and tomato soups. Over 2 days of CSFII, 60% of individuals had consumed at least one of the products, but 40% reported no consumption of the products. Tomato sauces and raw tomatoes accounted for most of the consumption. The other categories showed low consumption. The average amount consumed by consumers of tomato products was: tomato juice, 153 grams; tomato soup, 182 grams; tomato sauces, 59 grams; and raw tomatoes, 34 grams. Preliminary data indicate that 1) African Americans consume less tomato-based products than other groups; and 2) Hispanics consume significantly more tomato sauces than Caucasians. Future work will include the development of more narrow categories, incorporation of lycopene concentrations, development of lifetime exposure estimates, and the development of better statistical models of factors that affect lycopene intake.

Question and Answer Period

During the question and answer period, it was clarified that the Dr. Forshee's tomato intake data did not include mixed dishes (such as pizza) and therefore the intake could have been underestimated. Also discussed was that the process of heating raw tomatoes increases the amount of *cis*-lycopene, and this isomer may be more available to the body. It was emphasized that there is individual variability in carotenoid absorption that is tied to triglyceride absorption. Therefore, the food containing lycopene must be administered with fat (oil) for absorption to occur. The level of lycopene in food that increases blood lycopene levels is 5-7 mg. Dr. Porrini also stated that it is impossible to separate the effect of vitamin C and lycopene in the tomato, since tomatoes are a good

source of vitamin C. This means that the emphasis should be on the consumption of a whole food rather than a single component, since food components work in concert.

The variability of lycopene content in tomatoes is quite high. The level varies from species to species, and there are seasonal differences. Generally, redder tomatoes are higher in lycopene. Dr. Kerr Dow from the Heinz Company mentioned that Heinz is the second largest tomato seed company in the world and the largest tomato processor in the world. Tomatoes used for processing in the Heinz products are picked red.

Luncheon Address:

The Honorable Michael Burgess, U.S. Congressman and Doctor of Obstetrics and Gynecology

Dr. Burgess highlighted some work associating lycopene with beneficial effects on women's health. He emphasized the strong link between diet and chronic disease. He stated that Congress is coming to understand the policy implications of the results from scientific studies, and that there is a need to focus on preventive care from a health and financial perspective. Prudent advice is to increase consumption of fruits and vegetables.

Session 2: Lycopene and Men's Health

Moderator: Dr. David Yeung, H. J. Heinz and Dr. Venket Rao, University of Toronto

Emerging Role of Lycopene in Male Infertility

Speaker: Dr. Narmada Gupta, All India Institute of Medicine, New Delhi, India

The pathogenesis of seminal oxidative stress is due to an imbalance of reactive oxygen species (ROS) versus antioxidants. Abnormal ROS generation, abnormal spermatozoa and seminal leukocytes cause cellular damage. The effect on semen is a lower sperm count as well as abnormal motility and morphology.

High levels of ROS are found in 25-40% of infertile men. The ROS.TAC score is an index for the assessment of oxidative stress in infertile men. ROS refers to the measurement of reactive oxygen species by chem-luminescence assay, and TAC refers to the measurement of total antioxidant capacity. Fertile men have a higher TAC. Oxidative stress has clinical significance in the following areas: idiopathic oligoasthenospermia (severely depressed sperm count), following varicocele (enlargement of the veins of the spermatic cord) surgery, in cigarette smokers, and in the preparation of sperm for artificial reproductive techniques. To reduce oxidative stress, there are sperm washing techniques, and oral vitamin E, vitamin C, glutathione, and lycopene can be administered.

Lycopene is found in the testes and seminal plasma. In 1996, it was reported that there is higher ROS and lower lycopene in immunoinfertile men. In a study by Dr. Gupta, 2000 micrograms of lycopene was administered twice daily for 3 months to men with oligoasthenospermia. Results showed an improvement in sperm concentration, motility and morphology. Low levels of ROS in semen appear to have a physiological role in the regulation of sperm function. High levels endanger sperm function and viability. A large multicenter randomized placebo-controlled clinical trial is needed.

Benefits of Tomatoes, from Crop to the Clinic

Speaker: Dr. Steven Schwartz, Ohio State University

Dr. Schwartz reviewed the study by Giovannucci et al. in which the intake of carotenoids and retinol was examined in relation to the risk of prostate cancer. Tomato sauce and tomatoes significantly decreased the risk of prostate cancer. No significant effect was observed with tomato juice. The negative result could have been due to bioavailability or to the lack of fat consumption with tomato juice.

There are many compounds in tomatoes besides lycopene. Fresh tomatoes, soup, and most processed tomato products have predominantly *trans*-lycopene and a small amount of *cis*-lycopene. In biological tissues, 60-65% of the lycopene is in the *cis* isomeric form. In the prostate, 80-85% of the lycopene is in the *cis* form. The reason and significance for the change in form is unknown.

The bioavailability of a *poly-cis* tomato, specially bred to contain *cis* isomers was compared to a tomato with *all-trans* lycopene. The tomatoes were made into pasta sauces and fed to participants. Lycopene from the *poly-cis* tomato was better absorbed than from the *all-trans* tomato.

Studies with lycopene indicate that the washout period takes 7-10 days. There is a preferential loss of *trans*-lycopene during washout. After a two-week period on a tomato sauce supplemented diet, a plateau effect on blood lycopene level was observed. Co-consumption of fat is essential for the absorption of carotenoids. Tomato product intervention studies suggest that lycopene prevents oxidative stress and increases lipid-soluble antioxidant capacity.

Dr. Schwartz then described a rat study in which three groups of rats were divided into a control group, a group receiving freeze-dried tomato powder at the level of 13 mg/kg of diet, and a group that received lycopene beadlets, a pure form of lycopene at a level of 160 mg/kg of diet. Lycopene levels in the blood were similar. Prostate cancer was induced and mortality was monitored. There was no significant difference in survival in the control vs. the lycopene beadlet group. Therefore, lycopene alone did not appear to be protective. In the tomato powder group, there was a significant increase in length of survival versus the control group and the lycopene beadlet group. This finding suggests that there are other active components in tomato products that are protective.

Possible Mechanisms of Action of Lycopene in Prostate Cells

Speaker: Dr. Phyllis Bowen, University of Illinois

Dr. Bowen hypothesized that lycopene's effect on risk reduction for late phase cancer may be greater than its role in the prevention of cancer. She listed beneficial lycopene activities: antioxidant activities, prooxidant activity, enhancement of cellular communication, interference with Insulin-like Growth Factor (IGF-1) stimulated cell cycle progression, proposed retinoid activity, and enhancement of immune function. In vitro, cell viability is decreased with lycopene concentrations greater than 3 μ M. Lycopene at this level increases cell cycle arrest. Oxidized lycopene is more active than unoxidized lycopene. Because some lycopene is oxidized in cell culture media, care must be taken in cell preparation. In studies that have not protected the media from oxidation, the effects noted may have been due to oxidized lycopene.

Dr. Bowen reported the results of her study that measured oxidative DNA damage in cancer patients. Sixty prostate cancer or high Prostate-Specific Antigen (PSA) patients were randomly assigned to two groups. One group received a placebo, and the other received three weeks of intervention in the form of tomato sauce feeding (3/4 cup to deliver 30 mg lycopene). Subjects received 82% of the intended dose of lycopene, but they also decreased lycopene intake in their regular diet. Results showed lycopene accumulation in the prostate cells, a decrease in PSA, and decreased DNA damage. In the blood, lycopene at a level of 1.25 μ M decreased leukocyte DNA damage. In the prostate, lycopene at a level of 0.84 μ M decreased prostate cancer. This led to the question of whether or not a decrease in oxidative DNA damage in cancer cells is a benefit. For prevention, a decrease is considered a positive finding, but in cancer cells, it may be negative. Dr.

Bowen also questioned whether or not the cancer cells of patients treated with tomato sauce are dying faster. She found that in prostate cancer, there is greater DNA damage in cancer cells than in normal cells. Increased prostate lycopene was associated with decreased DNA damage as well as increased late stage apoptosis (a normal series of events in a cell that lead to its death). It is unclear if lycopene products or a parent compound is responsible for lycopene's effects.

Evidence for Reducing the Risk of Prostate Cancer—A Clinical Trial

Speaker: Dr. Omer Kucuk, Wayne State University

Dr. Kucuk listed the factors that increase prostate cancer risk: androgen, high plasma IGF-1, low plasma lycopene, high intake of animal fat, height (the taller a person is, the greater the risk), ethnicity/race, family history, and age. Prostate cancer has a long clinical history. It is dormant at first, and can take 20-40 years to appear. It is hypothesized that oxidative stress results in DNA damage. This induces mutagenesis, finally resulting in cancer. Cancer is therefore a multi-step process of initiation, promotion, and progression. Due to its long latency period, there is plenty of opportunity to intervene. The research supports that it is not a single component (lycopene), but it may be the combination of compounds in tomatoes that has the beneficial effect. In Dr. Kucuk's study, men scheduled for a radical prostatectomy underwent a biopsy and gave blood samples. They were then randomized into a "no lycopene" group or a group given 30 mg per day of "Lyc-O-Mate", a compound that contains many carotenoids in addition to lycopene such as phytoene and phytofluene, as well as tocopherols, phospholipids, etc. Although they must be confirmed, the results showed that in the group administered lycopene, significantly more tumors were confined to the prostate compared to the "no lycopene" group. Dr. Kucuk also noted that there is a synergistic effect of phytoene and lycopene. He also reported that a new study is underway comparing pure lycopene vs. tomato compounds vs. a placebo to ascertain if pure lycopene or a combination of compounds has an effect.

Question and Answer Period

It is unknown what dose of lycopene is appropriate because dosing studies have not been completed. Rather than supplements, the better recommendation is to eat plenty of fruits and vegetables. In a single dose study, it was found that regardless of dose, absorption was 6 mg when lycopene was administered as tomato paste with olive oil. This indicates that there are diminishing effects with higher doses. Conversion of the *trans* to the *cis* isomer occurs after absorption. What is fed is what is absorbed, meaning that the conversion does not take place at the gut level. Researchers are unsure if the conversion takes place at the tissue or liver level. The conversion is most likely not due to an enzyme system, and may be as simple as chemical isomerization once lycopene is in the body. This seems to be supported by the fact that while lycopene is stable in the tomato, once removed from it, lycopene becomes susceptible to reactions.

Wednesday, April 2, 2003

Breakfast Speaker: Beth Johnson, USDA

Beth Johnson, Senior Advisor on Food and Nutrition Issues, United States Department of Agriculture (USDA), started the second day by describing current activities at USDA. The “Healthier U.S. Initiative” launched by President Bush has four parts: regular exercise, preventive tests/screening, nutritious diet, and avoidance of risky behaviors. In USDA, the initiative applies to Extension, Food Assistance, and Basic and Applied Research. Another activity is a renewed commitment to “5 A Day.” There is currently a four-state pilot project to provide fresh and dried fruits and vegetables to students in schools free of charge. In the research arm of USDA, the phytonutrients lab is addressing lycopene. Foods in USDA’s database will include the lycopene content for the first time. Release is slated for summer, 2003. In 2005, the revised Dietary Guidelines are due, followed by a revised Food Guide Pyramid. There is a strong commitment by President Bush and Secretary Veneman to work with academia and the private sector on its initiatives.

Session 3: Lycopene and Women’s Health

Moderator: Richard A. Forshee, Ph.D., Center for Food and Nutrition Policy

The Role of Lycopene and Other Tomato Carotenoids in Breast and Endometrial Cancers

Speaker: Dr. Joseph Levy, Ben-Gurion University, Be’er-Sheva, Israel

Health issues of postmenopausal women include hot flashes, osteoporosis, cardiovascular disease, and urogenital atrophy. Currently, only 20% of postmenopausal women are taking hormone replacement therapy (HRT). The Women’s Health Initiative Study was stopped after 5.2 years by the safety monitoring board because women on HRT showed an increase in breast cancer and a substantial increase in coronary heart disease. The benefits of HRT in this study were a decrease in hip fractures and fewer colon cancers. Dr. Levy is studying whether lycopene and tomato carotenoids protect mammary and endometrial cells from the deleterious effects of estrogens. Lycopene inhibits estradiol stimulation of hormone-dependent malignant cells. The mechanism by which it works is in the cell cycle. Estrogen, androgen and IGF-1 regulate cell division. Antiestrogens and lycopene inhibit a key protein in cell cycle regulation, Cyclin D, that is over-expressed in cancer cells. Also, various carotenoids inhibit estradiol-induced estrogenic receptor activity in cancer cells. Dr. Levy stated that it is important to note that no one carotenoid is the magic bullet. No single active ingredient is a cure or will prevent cancer. The beneficial effects of diet are related to a concerted action of several constituents. While single carotenoids and single phytonutrients show a small beneficial effect; when they are combined, they show a synergistic effect. Including tomato phytonutrients in HRT may decrease the risk of breast cancer and augment bone formation.

Lycopene, Tomatoes, and Bone Health

Speaker: Dr. Leticia Rao, St. Michael’s Hospital, University of Toronto

Osteoporosis, or low bone mass, is called the “silent disease” because the symptoms are not noticed until the disease is advanced. Osteoporosis is an imbalance of the bone formation and bone resorption process. Bone mass increases up to age 25-35 years. After 35 years of age, bone loss

normally occurs due to aging. In osteoporosis, there is a sharp decrease in bone mass. Because bone mass increases over a number of years, there is ample time to intervene. Higher bone mass results in a greater chance of maintaining bone.

Various drugs are used to prevent and treat osteoporosis, including bisphosphonates, Selective Estrogen Receptor Modulators (SERMs) such as raloxifene, estrogen, calcitonin, parathyroid hormone (PTH), and calcium and vitamin D. In addition, many drugs are under study including vitamin D analogs, phytoestrogens, statins, more potent SERMs, and more potent bisphosphonates.

Oxidative stress is associated with the aging process as well as with many diseases, such as cardiovascular diseases, osteoporosis, cancer, including prostate cancer, and diabetes mellitus. Reactive oxygen species (oxidative stress) affects bone cells by decreasing osteoblast (bone forming) function and increasing osteoclast (bone resorbing) activity. Dr. Rao hypothesizes that lycopene inhibits ROS. She is studying the effect of lycopene on bone cells in the laboratory. Osteoclasts fuse to grow larger. Lycopene-treated osteoclasts are inhibited from fusing into multinucleated cells. In addition, lycopene decreases resorption pits. Lycopene also stimulates the proliferation of osteoblasts.

Dr. Rao also has a clinical study underway that will test the effects of lycopene on bone turnover markers. She stated that postmenopausal women with high oxidative stress parameters and low antioxidant status will have high bone turnover markers (proteins that spill into the urine when bone resorption occurs). One hundred women who are at least one year postmenopausal will be recruited. Four groups will be studied: one group will be given regular tomato juice containing 15 mg lycopene per serving, another will be given lycopene-rich tomato juice, containing 35 mg per serving, a third group will be given lycopene capsules containing 15 mg, and a fourth group will be given a placebo. The intervention will span three months. Blood and urine samples will be taken before and after the intervention.

Question and Answer Period

Prostate cancer victims have problems with their bones. In addition to its antioxidant properties, lycopene may also have anti-mitotic action. Lycopene affects many fast-dividing cancer cells.

Session 4: Emerging Health Benefits of Lycopene **Moderator: Sandy Miller, Center for Food and Nutrition Policy**

Distribution, Metabolism, and the Role of Carotenoids in Disease Prevention **Speaker: Dr. Frederick Khachik, JIFSAN**

Approximately 700 carotenoids have been isolated from plants and animals, and only 50-60% of these are in the U.S. diet. Carotenoids are found in green and yellow-orange and red fruits and vegetables. The most abundant carotenoid in tomatoes is lycopene. Other carotenoids in tomatoes include gamma carotene, zeta-carotene, phytofluene, phytoene, neurosporene, and lutein. Future clinical studies should consider the combination of carotenoids.

Dr. Khachik reviewed the metabolism of lycopene. In the body, lycopene is oxidized to two metabolites, and these metabolites have more chemopreventive action than the lycopene itself. The

oxidative metabolites have been found in human serum, milk, organs (liver, lung, breast, prostate, colon) and skin. This has led Dr. Khachik to believe that there is “good” oxidation and “bad” oxidation. In addition, the combination of carotenoids is more effective in the prevention of cancer than single carotenoids.

Lycopene’s cancer chemopreventive mechanism involves anti-inflammatory properties and protection against oxidative damage, as well as enhancement of the expression of gap proteins (gap proteins are involved in the communication among cells; cancer cells cannot communicate with themselves or other cells). Inflammation is associated with tumor production. Lycopene and lutein inhibit induced skin inflammation. This may be linked to their antioxidant activity.

In addition to cancer prevention, carotenoids may also prevent some eye diseases. Age-related macular degeneration is the leading cause of blindness in adults over 40 years of age. Twenty-five percent of 65 year-olds have clinical evidence of the disease that has no cure and is progressive. Carotenoids are present in the eye and eye structures. The ciliary body maintains pressure in the eye, and is responsible for the expansion and contraction of the lens. Substantial lycopene is present in the ciliary body and may act as an antioxidant. In the iris and lens, the carotenoids probably filter out phototoxic short-wave visible light and may play a role in the prevention of cataracts.

Lycopene as an Antioxidant in Lung Function

Speaker: Dr. Brooks Hyberston, University of Colorado

Lungs are continuously exposed to the external environment, coming into contact with particulates, smoke and pathogens. As a result, the lungs have an extensive pulmonary defense system including mucociliary clearance, proteins, enzymes, and antioxidants. Lung antioxidant systems are both enzymatic (superoxide dismutase) and nonenzymatic (vitamin C, vitamin E, etc.). Lycopene has been found in lung tissue, and carotenoids appear to play a role in its defense systems. A high dietary intake of lycopene, reflected by increases in the lung tissue, is correlated with lower lung cancer risk and higher lung function. Cystic fibrosis patients were found to have depressed plasma lycopene levels.

Dr. Hyberston then discussed his work on acute respiratory distress syndrome (ARDS). This syndrome follows other diseases and usually affects patients who are admitted to the intensive care unit for another reason. There is no clear treatment at this time, and it claims 30-50% of victims. Dr. Hyberston has worked with aerosol-administered vitamin E in rats and observed reduced lung injury and inflammation. Controlling cellular vitamin E uptake and release is alpha-tocopherol transfer protein. He hopes to prove that this is upregulated by tocopherol and is responsible for the decrease in inflammation.

Lycopene, Skin Cancer and UV Exposure

Speaker: Dr. Yoav Sharoni, Ben-Gurion University, Be’er-Sheva, Israel

Photooxidative stress, especially ultraviolet (UV) light affects the eyes and the skin. UV light results in the formation of singlet oxygen (ROS) and peroxy radicals that damage DNA, lipids and proteins. Antioxidants can prevent this damage. In the eye, photooxidative stress results in cataracts and age-related macular degeneration. In the skin, sunburn, skin aging, photosensitivity disorders, and skin cancer can result.

Sunscreen provides exogenous photoprotection for the skin. People tend to use sunscreen only on vacation, yet sunlight exposure occurs more often. In fact, only 1/3 of sunlight exposure occurs while on vacation.

Of all the carotenoids, lycopene is the most effective quencher of singlet oxygen. Skin lycopene is destroyed preferentially over beta-carotene with UV exposure, evidence that it is a primary defense. Dr. Sharoni described a study in which nine volunteers with skin type II (burns easily, tans minimally) were given 40 grams of tomato paste with olive oil per day providing 16 mg lycopene for a period of 10 weeks. Serum and skin levels of carotenoids and erythema formation (sunburn reaction) were measured. Results showed that at week 10, erythema formation was 40% lower in the treatment group. This was a preliminary, small study that needs to be replicated. In another study, the sun-protective effects of lycopene versus tomato products were tested to investigate if the photoprotective effects were a result of lycopene or other compounds in tomatoes. Results demonstrated a 25% protection when synthetic lycopene was administered for 12 weeks, a better effect when Lyc-O-Mate capsules were given, and an even better effect (50% protection) when a Lyc-o-Mate drink was administered. This lends support to the synergistic effect of phytonutrients in tomatoes. Phytoene and phytofluene in addition to lycopene were present in the drink and Lyc-O-Mate capsules vs. the pure lycopene capsules. One explanation for the better protection in the products that contained phytoene and phytofluene has to do with the absorption spectra of these two compounds. Phytoene and phytofluene reduce exposure to UVB and UVA light.

Tomato-derived products therefore provide endogenous protection against UV-induced sunburn. Phytoene, phytofluene, and lycopene are the bioactive components that act synergistically to provide protection.

Question and Answer Period

No transfer proteins for lycopene have been identified in the lung. Low carotenoids may influence diseases of the eye. Phytoene and phytofluene may be more important than lycopene in the prevention of skin cancer. The future NHANES databank will have phytoene and phytofluene information.

**Luncheon Address: Food: It's a Gold Mine. Wealth for your Health.
Speaker: Tieraona Low Dog, MD**

Dr. Low Dog stated that the view of health is changing. Instead of simply the absence of sickness, it is moving towards optimization. She emphasized the importance of obtaining nutrients from foods and then reviewed the phytonutrients and current state of the evidence in foods such as garlic, green tea, soy, fruits and vegetables. Dr. Low Dog shared stories of her own patients' commitment to a healthier lifestyle by adding daily exercise and eating a healthier diet.

Panel Discussion:

**Communicating Emerging Health Benefits to Health Professionals and to the Public
Moderator: Sue Borra, International Food Information Council and past President of American Dietetic Association**

Speaker: Larry Lindner, Executive Editor, Tufts Newsletter

Mr. Lindner noted the increase in marketing of specific foods for specific health benefits, and provided examples of promotional pieces for food products he had recently received. In his view, food prescriptions are not helpful. Unfortunately, food prescriptions play well in the press. As a result, more specific foods for specific reasons are sold, but health is not improved. People do not choose foods for phytonutrients, but for pleasure and taste. Dietary patterns are better to emphasize instead of specific foods, and they provide more helpful information to consumers.

Speaker: Dr. Maria Simbra, KDKA-TV

Dr. Simbra stated that viewers want personally relevant health news. People do not attend to media messages right away; it takes about two years for a message to “sink in.” To be newsworthy, a story must have impact, timeliness, and currency. These three prime attributes are followed by prominence, proximity (location should be relevant to viewers), presence of conflict (in the data or scientific opinion), bizarre elements, and having “the scoop”, or being the first in the media to provide the information. Medical reports can take the form of a voice-over, a voice over followed by a sound bite, or as a package. The components for a report include information, B-roll (pictures used to edit a report), and sound bites. Time constraints and distance restrictions must be kept in mind. Stories that occur beyond one to two hours from home result in a loss of local value. Medical news faces barriers that other types of news do not. Many journalists are not skilled in science and medicine and may be hesitant to cover it. Also, medical news competes with all the other news of the day. To get the message out, scientists must know the messenger (local TV personality), provide new angles, give good feedback to the reporter, develop three important points about the item of interest and get at least one point in each question the reporter asks.

Speaker: Leslie Bonci, MPH, RD, American Dietetic Association Spokesperson

Points to keep in mind when communicating nutrition messages include recognizing that the message must be concrete—the information is bringing science to the dinner table; consumers must have a “buy in”; and how and what is said is important. When it comes to nutrition, consumer hooks are taste, convenience, accessibility, ease of use, and affordability. Speakers

should communicate simple changes in diet, give the consumer a sense of control, and focus on something to add to or substitute in the diet (positive) rather than on something that must be avoided (negative). To effectively communicate lycopene information, speakers must explain in plain language what lycopene is, where it is found, what it does in the body, and ways to use products that contain lycopene. A simple message might be: Lycopene is a natural plant compound found in tomatoes and tomato products. Lycopene is more available to the body from processed tomato products. Lycopene-containing products are inexpensive, readily available, shelf-stable, and versatile.

Speaker: Sara Parks, PhD, RD, Pennsylvania State University
“Rebuilding the Consumer ‘Ant Hill’ Through Effective Communications”

Consumers are dissatisfied with interactions with health care professionals. Consumers want reinforcement of the personal values of trust, respect, honesty and integrity. They also want to simplify their lives to decrease stress.

Key components of a new model of communications include providing options, not plans, speaking of what is possible versus expecting perfection, and encouraging involvement rather than obedience. A communication environment must be developed where consumers assume leadership responsibility for their own health care. Scientists must be the source for standards of good information.

Concluding Remarks:
Kerr Dow, PhD, H.J. Heinz Company

Dr. Dow stated that over the past two years, enormous progress has been made in tomato research. Food companies convert raw components into products that are safe, tasty, and nutritious. Selecting for high color, ripe tomatoes to process, using heat processing and homogenization all improve the lycopene content and availability from the products. Dr. Dow reinforced that the presentations at this conference clearly demonstrated that tomato product consumption could have a positive effect on women and men’s health. He acknowledged that there are still many questions that require additional study. Dr. Dow emphasized that there is no magic bullet, but a family of nutrients in tomatoes that are of benefit. The conference clearly reinforced the need to increase fruit and vegetable consumption. The work of scientists helps people to take control of their life and health. This event highlighted good science that must be effectively communicated to consumers.

Concluding Remarks:
Maureen Storey, Center for Food and Nutrition Policy

Dr. Maureen Storey closed the conference by noting that this is one of the most exciting eras in nutrition science. At the turn of the 20th century, scientists discovered essential vitamins and minerals in certain foods that prevented deficiency diseases. Now—at the turn of the 21st century—other novel nutrients, such as lycopene are being examined for health benefits that are linked to chronic diseases. She remarked that communicating the health benefits to consumers and health professionals must be done responsibly by everyone including the media, industry, academia, and government.