



Carotenoid News

Vol. 17, No. 2
August 2007

FROM THE EDITOR

"Ask questions and question answers" (Socrates)

The Delphic Oracle proclaimed Socrates the wisest man in the world and his words are still the best advice for scientists, including carotenoid researchers. We certainly ask a lot of questions and try to answer them – according to Dr Wataru Miki over two thousands articles on carotenoids were published in 2006! Our humble newsletter could not include citations on such a scale, but we made a valiant effort (thanks to Dr Harold Furr). By attending the stimulating meetings, like Gordon Research Conference, CARIG Conference and International Carotenoid Symposium, you have the best opportunity to question answers in formal and informal discussions following critical presentations of the most interesting issues in our field of research. We invite you to read the conference reports in this newsletter and plan to attend the future meetings.

Maria S. Sapuntzakis, Chicago, IL

News from the CARIG Steering Committee

The annual meeting of the CARIG Steering Committee was held during EB '07 in Washington, DC. The Steering Committee unanimously voted to accept the invitation to become a Research Interest Section (RIS) of the American Society for Nutrition (ASN). Previously CARIG became a formal affiliate of the International Carotenoid Society (ICS). By becoming a joint affiliate with ASN and ICS, CARIG will benefit from the administrative support provided by both organizations. These important developments were facilitated by the dedicated leadership of Wendy White, the Steering Committee Chair for the past three years. We are excited about the increased participation of our international colleagues resulting from last year's formal affiliation with ICS. The Committee thanked Julie Mares for her outstanding work as Chair of this year's CARIG Conference (see report below), and Harold Furr for organizing another wonderful CARIG/VARIG social with poster competition. (Although he is stepping down from the Committee, Harold promised to continue the literature review, which is a traditional highlight of this newsletter.) John Landrum was recognized for his successful fundraising campaign and was elected incoming Chair of the Steering Committee. We welcome newly elected member Klaus Kraemer. The current membership of the CARIG Steering Committee includes:

John Landrum (Chair) – Florida International University

Maria Stacewicz-Sapuntzakis (Newsletter Editor and member *ex officio*) – University of Illinois, Chicago

Mario Ferruzzi (Treasurer, Fundraising) – Purdue University

Elizabeth Johnson (Chair, CARIG Conference 2008) – Jean Mayer USDA Human Nutrition Research Center on Aging, Tufts University

Mark Failla – Ohio State University

Klaus Kraemer – Task Force Sight and Life

Julie Mares – University of Wisconsin, Madison

Lewis Rubin – Cleveland Clinic

Sherry Tanumihardjo – University of Wisconsin, Madison

Wendy White (Past Chair) – Iowa State University

The next issue of Carotenoid News will include the agenda for the CARIG Conference at EB 2008 in San Diego, CA. Meanwhile, the abstracts should be sent to the ASN Minisymposium entitled "Vitamin A, Carotenoids and Retinoids". The abstract deadline is November 7, 2007 (www.eb2008.org).

CARIG Travel Awards

CARIG will award one or more \$500 travel grants based on a poster competition to be held in conjunction with the CARIG/VARIG social at Experimental Biology 2008. Graduate students and postdoctoral trainees are eligible. Posters must address carotenoid and/or vitamin A research. For those assigned an oral presentation rather than a poster at EB'08, printed copies of the slides may be used for the CARIG/VARIG poster competition. The time and location of the CARIG/VARIG Social will be announced in the February 2008 issue of Carotenoid News. No advance registration is required to participate in the poster competition. Contact: John T. Landrum, Professor of Chemistry and Associate Dean of the University Graduate School, Florida International University, Miami, FL 33199, tel: 305-348-2455, E-mail: landrumj@fiu.edu

The 6th Gordon Research Conference on Carotenoids

Attendance was near capacity for the 6th Gordon Research Conference on Carotenoids held between January 7 and 12 of 2007 in Ventura, California. John Landrum (Florida International University, Miami, FL) served as Chair and Susan Mayne (Yale University, New Haven, CT) as Vice-Chair. The conference was well supported by industrial donors and with a grant from the NCI, in addition to the Gordon Research Foundation. This enabled us to provide support to many of our speakers as well as a number of student participants. The field of carotenoids continues to open new avenues for research and the speakers ably presented how new strategies are being implemented to identify and explain the extensive list of actions and functions that carotenoids exhibit in natural systems. The poster sessions were very active and we were able to select four young investigators for special recognition from among the posters presented. Gesa Albert (University of Wurzburg, Germany), Erin Marasco (University of Minnesota), Phoi Tran (UC Berkeley, CA), and Marina Khanin (Ben-Gurion University, Israel) provided short presentations of their posters and each received \$100 cash awards from the International Carotenoid Society. At the business meeting the decision was made to hold the 7th GRC Conference on Carotenoids at the Ventura site in January of 2010. We also elected Dr. Eleanor Wurtzel (Lehman College, CUNY, NY) and Dr. Xiang-Dong Wang (Tufts University and the USDA JMNRC, Boston, MA) as co-Vice-Chairs for the next meeting. The Whale Watch and excursion to the Getty Museum provided our attendees with an opportunity to see the finest displays of both nature and art.

John Landrum (Miami, FL)

Susan Mayne (New Haven, CT)

2007 CARIG Conference Report

Our 2007 CARIG Conference at the Experimental Biology meeting in Washington, DC on April 28 brought us several stimulating lectures, thanks to the generous sponsorship of **Cognis Corporation, Craft Technologies, DSM Nutritional Products Inc, General Mills, Kemin Health, Sight and Life and Wyeth Consumer Healthcare.**

Professor **Johannes von Lintig** from Albert-Ludwig University of Freiburg, Germany gave the James Olsen Memorial Lecture: *The Biochemical and Molecular Basis of Carotenoid Metabolism*. This apt tribute to Jim Olsen (extension of his work with carotenoid oxygenases) provided a fascinating look at historic and recent developments in the identification of carotenoid oxygenases in Dr. von Lintig's lab and their effects across many species. We are not only left with a concrete overview of the science that lead to these insights, but also a vivid imagination for many more biological mechanisms of carotenoid action than previously recognized. (The lecture has been published in Sight and Life Magazine, 2/2007).

Next, Professor **Keith West** from Johns Hopkins School of Hygiene and Public Health presented a talk on *Carotenoids and Maternal Health in South Asia*, in which he described recent results of two large carotenoid and vitamin A supplementation trials on maternal and child health that he has played a key role in. Among his many insights were results of his studies which lead us to consider possible health benefits of non-provitamin A carotenoids. Professor **William Connor** of Oregon Health Science University described the *Transport of Lutein and Zeaxanthin into the Tissues and Their Role in the Prevention of Vascular Disease*. His work with the Wisconsin Hypoalpha Wild-Type Mutant Chicken suggests possible mechanisms for tissue distribution and the varied response to the ingestion of carotenoids that has been observed over many years by different investigators. Professor **Frederick Khachik** of the University of Maryland presented his data that describe the effects of *Chronic Supplementation of Lutein and Zeaxanthin in the Female Rhesus Macaque*. This presentation helped us to appreciate the challenging aspects of this work and scientific issues we are faced with in evaluating these data. These will be useful as we look forward to understanding the safety of lutein and zeaxanthin, whose benefits are currently being tested in clinical trials.

Julie Mares (Madison, WI)

UPCOMING EVENTS

October 9 -13, 2007

2nd International Symposium on Human Health Effects of Fruits and Vegetables, Houston, TX. Contact: **website:** <http://favhealth2007.tamu.edu>, **e-mail:** FAV2007@ag.tamu.edu, **tel:** 979-862-4521.

November 1 -2, 2007

Food, Nutrition, Physical Activity and the Prevention of Cancer: A Global Perspective, Washington, DC. Contact: **e-mail:** research@aicr.org, **website:** www.aicr.org, **tel:** 1-800-843-8114.

April 5 - 9, 2008

Experimental Biology 2008, San Diego, CA. Contact: EB2008, FASEB Office of Scientific Meetings & Conferences, 9650 Rockville Pike, Bethesda MD 20814-3998, **website:** www.eb2008.org, **tel:** 301-634-7010, **e-mail:** eb@faseb.org

June 9-11, 2008

11th International Society for Horticultural Science Symposium on the Processing Tomato, Toronto, Ontario, Canada. Contact: WPTC Congress and ISHS Symposium, 435 Consortium Court, London, ON, Canada N6E 2S8, **tel:** 519-681-1875, **fax:** 519-685-5719, **e-mail:** 2008worldcongress@opvg.org

June 22-27, 2008

15th International Symposium on Carotenoids, Okinawa, Japan. Contact: Symposium Secretariat, **e-mail:** hassy@sci.osaka-cu.ac.jp, **website:** www.carotenoidsociety.org

RECENT / FORTHCOMING PUBLICATIONS

SIGHT AND LIFE Magazine 1 & 2/2007, PO Box 2116, 4002 Basel, Switzerland, **e-mail:** klaus.kraemer@sightandlife.org, **website:** www.sightandlife.org, **tel:** 41-61-688-7494, **fax:** 41-61-688-1910. See especially:

Yeum K-J, Aldini G, Russell RM. Antioxidant nutrients and oxidative DNA damage in humans (1/2007).

von Lintig J. The colorful world of carotenoid (vitamin A) metabolism (2/2007).

Handbook of Vitamins. 4th Edition. Ed: Zempleni J, Rucker RB, & Suttie JW, McCormick DB, Boca Raton FL: CRC Press; (2007). See especially:

Ross AC, Harrison EH. Vitamin A: Nutritional aspects of retinoids and carotenoids, pp. 1-39.

Fonseca de Moura F, Burri BJ, Clifford AJ. Accelerator mass spectrometry in the study of vitamins and mineral metabolism in humans, pp. 545-557.

Food Colorants: Chemical and Functional Properties. Ed: Carmen Socaciu. CRC Press. Publication date: 9/26/2007

Alphabetical Listing of Recent Publications

Prepared by Dr. Harold Furr, Institute of Nutrition, Mahidol University, Thailand, and Department of Nutritional Sciences, University of Wisconsin, Madison. More extensive list may be found at www.carotenoidsociety.org.

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TECHNICAL NOTE

Novel Lycopene Encapsulation Method

Microcapsules are tiny particles that contain an active agent or core material surrounded by a shell or coating, and are now increasingly being used in food ingredient preparation. The new research, published in the journal of Food Chemistry, looks at the potential of a supercritical fluid extraction (SFE) process for stabilizing all-trans-lycopene from tomato encapsulated using α , β , and γ -cyclodextrins (CD). The researchers report an optimized procedure using ratios of CD/lycopene of 1/0.0026, 1/0.005 and 1/0.05. The supercritical fluid extraction process produced all-trans-lycopene with a purity of around 90-95%. The best complexation yield (93.8%) was obtained using the ratio of CD/lycopene of 1/0.0026, and β -CD was found to be most favorable to stabilize lycopene. Complexation with β -CD remained stable for more than six months. The extraction, fractionation and encapsulation are accomplished in just one step, which shortens substantially the overall procedure (3h vs. 20h corresponding to the conventional method). The use of supercritical fluids in food ingredients is highly recommended, as it avoids the employment of large amounts of organic solvents.

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NEWS AND VIEWS

Allure of Carotenoids

This latest research has found for the first time that stickleback males eating more carotenoids lived longer - and that females found these long-lived males particularly attractive. The work compared the fate of fish that all received the same basic diet but had different amounts of carotenoid supplement. Male sticklebacks need carotenoids to produce the red throat patch that they develop in the breeding season and display to females. Males provided with fewer carotenoids still tried to produce a bright red throat patch, but could only do so by diverting carotenoids away from their role as antioxidants; so by trying to look as good as possible, these males aged faster. In sticklebacks, the female lays her eggs in a male's nest and then

leaves, and it is the male alone who cares for the eggs and young. "It seems that females can tell if males haven't eaten many carotenoids, even if they do look quite red, and probably found these males less attractive because they were more likely to die before they had finished looking after the young," said Dr Pike (*Proc. R. Soc. B*, 2007, 274:1591-96). "The positive effects of a carotenoid-rich diet are likely to apply to many other animal species as well - but whether eating carrots makes humans longer-lived and more handsome remains to be seen!"

www.nerc.ac.uk 5/18/2007

Zeaxanthin and Lycopene Linked to Better Mental Performance in the Elderly

Increased intake of lycopene and zeaxanthin may improve the mental performance of the elderly, according to a new study from France (*J Gerontol. Med Sci.* 62A:308-16, 2007). Low levels of these carotenoids were linked to the lowest levels of cognitive function amongst 589 healthy people in a highly educated, community-dwelling elderly population. Blood samples for the participants (average age 73.5 y) were taken for assessment of carotenoid levels. Cognitive function was measured using a battery of tests, including the Mini-Mental State Examination (MMSE), Trail Making Test Part B (TMTB), Digit Symbol Substitution (DSS), Finger Tapping Test (FTT), and Word Fluency Test (WFT). Significant associations were reported between zeaxanthin and all cognitive tests except the MMSE, while low levels of lycopene were associated with poor performance on the TMTB and the DSS. No statistically significant association was observed between the other carotenoids and cognitive performance.

www.nutraingredients-usa.com 7/26/2007

Carotenoids for Eye Health

Supplementation with meso-zeaxanthin may offer protection against age-related macular degeneration (AMD). Previous studies have reported a link between AMD and lutein and zeaxanthin, found in leafy green vegetables, corn, egg yolks, squash, broccoli and peas. The carotenoids are proposed to reduce the risk of AMD by absorbing blue light that could damage the macula, by preventing free radicals from damaging eye cells and by strengthening eye cell membranes. Meso-zeaxanthin is produced in macula by conversion from lutein. The new study was conducted by researchers from Florida International University and University of Cambridge (*Nutrition & Metabolism*, 2007) Supplementation of 10 subjects with gelcaps providing 20 mg/day of predominantly meso-zeaxanthin, with smaller amounts of lutein and zeaxanthin, increased macular pigment optical density after 120 days of supplementation. Nine other subjects received gelcaps containing placebo. Macular pigment optical density (MPOD) increased as a result of carotenoid supplementation by an average rate of 0.59 milli-absorbance unit/day in the 10 supplemented subjects. The placebo group experienced reductions with an average decrease rate of 0.17 milliabsorbance units/day. The study shows that a supplement containing the macular carotenoids, lutein, zeaxanthin and meso-zeaxanthin, but principally meso-zeaxanthin, are effective at raising MPOD in the majority of subjects. Increased MPOD may be an effective means of protecting the aging population from AMD.

www.nutraingredients-usa.com 7/6/2007

Carotenoids Are More Bioaccessible from Fruit than from Green Vegetables

The new study (*Nutrition Research* 27:258-64, 2007) compared the in vitro bioaccessibility of carotenoids from a range of fruits and vegetables, including orange, kiwi, red grapefruit, and honeydew melon, and spinach, broccoli, red pepper, and sweet

potato. The researchers used an in vitro digestion procedure to elucidate the bioaccessibility, defined as the amount of the ingested compound available in the gastrointestinal tract for absorption, of β -carotene, lycopene, lutein, zeaxanthin, and β -cryptoxanthin. The transfer of carotenoids to the micelles was greater from fruits than from vegetables. Xanthophyll carotenoids (lutein, zeaxanthin, and β -cryptoxanthin) had high bioaccessibilities from fruits, ranging from 50 to 100%. Bioaccessibility from dark green vegetables, like spinach and broccoli, was significantly lower (19 - 38%).

www.nutraingredients-usa.com 5/22/2007

Internet Addresses for Carotenoid Researchers

1. USDA Nutrient Database for Standard Reference (SR17) is a major source of food composition data for epidemiologists and nutritionists. Carotenoid Food Database contains best available estimates of carotenoid content in foods:
www.nal.usda.gov/fnic/foodcomp/Data/car98/car98.html

2. Agricultural Research Service (ARS) prepared searchable database to view 60-nutrient profile (including carotenoids) for more than 13,000 foods: www.ars.usda.gov/foodsearch

3. International Carotenoid Society (ICS) Webpage: www.carotenoidsociety.org.

4. LIPID BANK for Web. Carotenoid Section of Lipid Database developed by Research Institute, International Medical Center of Japan, <http://lipidbank.jp>. Also available on ICS webpage: www.carotenoidsociety.org through Articles button.

Published twice a year, in February and August by **CAROTENOID RESEARCH INTERACTIVE GROUP (CARIG)**

Chairperson: John Landrum (Miami, FL)
Treasurer: Mario Ferruzzi (West Lafayette, IN)
Editor: Maria S. Sapuntzakis (Chicago, IL)
Address: Human Nutrition, M/C 517
University of Illinois at Chicago
1919 West Taylor St. Chicago, IL 60612
312-413-0319
Fax: 312-413-0319
E-mail: msapuntz@uic.edu
Subscription: \$10 per year (checks payable to CARIG)
Website: www.carotenoidsociety.org



CaroteNature



Worldwide Distribution of Carotenoids

About CaroteNature

CaroteNature offers **carotenoids** of high purity, as **analytical standards** or in larger quantities for analytical purposes. We also offer services such as **analysis of carotenoids in plant and other extracts, custom synthesis or isolation, and consultancy** in the field of carotenoids. We are cooperating with a number of laboratories of high reputation in the various fields of carotenoid research to ensure the high quality of our products and services.

What is special about CaroteNature?

This young company is operated by leading carotenoid chemists, each with more than 30 years experience in carotenoid isolation, synthesis and analysis, with advice from other leading scientists in the carotenoid field, and help from laboratories with a long tradition in carotenoid chemistry and biochemistry. Therefore, CaroteNature is uniquely able to produce and supply a wide range of carotenoids and services of high quality and with a high level of quality control.

Product quality

The carotenoids are prepared either by extraction from natural sources or by chemical synthesis. Samples are supplied in sealed ampoules, under nitrogen, to ensure stability. Whenever possible, they are supplied in crystalline form. All compounds are fully characterized and, on request, analytical data (HPLC, UV/Vis spectra) are provided with the samples.

Book series "Carotenoids"

We are pleased to announce that CaroteNature has been appointed sole distributor of the reprinted Volumes 1A, 1B, 2 and 3 of the "Carotenoids" book series.

Contact: www.carotenature.com

CaroteNature GmbH

Im Budler 8
CH-4419 Lupsingen
Switzerland

E-mail: info@carotenature.com

Phone/Fax: +41 61 913 96 60 or
+41 31 351 18 74