



# Carotenoid News

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AUGUST 2009

## FROM THE EDITOR

*"Necessity, who is the mother of invention..."  
(Plato, Greek philosopher, 427-347 BC)*

Forty years ago the Internet was invented because it was necessary to exchange information directly between computers, and a new era of efficient, fast and inexpensive communication began. Now our newsletter will finally follow the example of many other periodicals which are available only in electronic form, easy to read or print from your computer screen. We regret that we cannot continue to provide paper copies to our readers world-wide, but the expense of printing and mailing over 300 letters twice a year became too large for the CARIG budget. We were receiving very few voluntary contributions (\$10 per year) from our readers, and it was also increasingly difficult for the lone editor to fold the newsletters, stuff the envelopes, and affix the stamps and labels. **This is the last printed copy.** In the future you will be able to find the newsletter on the International Carotenoid Society (ICS) webpage ([www.carotenoidsociety.org](http://www.carotenoidsociety.org)), recently redesigned and very easy to navigate. The long alphabetical list of recent literature, which filled the newsletter with pages of fine script, will be available under ARTICLES. If you are a member of ICS you will be reminded by e-mail about publication of every new issue. We hope that you accept the necessity of these changes and applaud the invention that made it possible.

*Maria S. Sapuntzakis (Chicago)*

## In Memoriam

It is with great sadness that I have to inform you of the loss of Professor Dr. Hans-Dieter Martin who died on March 8, 2009 after a long fight against lung cancer; all the more sad because he was a life-long non-smoker. Professor Martin was a very distinguished carotenoid chemist with numerous ground-breaking achievements and a dear member of our carotenoid family. In the course of the past several decades, Professor Martin and his group at the Institut für Organische Chemie at the Heinrich-Heine University in Düsseldorf have made enormous contributions to the synthesis and determination of physiochemical properties of carotenoids. For a long list of accomplishments of Professor Martin and his group, see the website: [http://www.chemie.uni-duesseldorf.de/Faecher/Organische\\_Chemie/OC1/Martin](http://www.chemie.uni-duesseldorf.de/Faecher/Organische_Chemie/OC1/Martin)

At the next International Carotenoid Symposium in 2011 (Krakow, Poland) we will dedicate a series of lectures to the memories of the late Professor Hans-Dieter Martin, Professor Norman Krinsky, and Professor Trevor Goodwin to acknowledge the immense contributions of these remarkable scientists.

*Fred Khachik, ICS President*

## News from the CARIG Steering Committee

The annual meeting of the CARIG Steering Committee was held during EB 2009 in New Orleans. The new officers were elected for the next term (June 1, 2009 – May 31, 2010) and new members of the Committee were proposed. The current membership of the Committee includes:

Sherry Tanumihardjo (Chair, CARIG RIS) – University of Wisconsin - Madison  
Elizabeth Johnson (Treasurer, Past Chair) – Tufts University  
Lew Rubin (Chair Elect) – University of South Florida  
Mario Ferruzzi – Purdue University  
Klaus Kraemer – Task Force Sight and Life  
John Landrum – Florida International University  
Harold Furr (newsletter contributor, member *ex officio*) – Mahidol University, Thailand  
Maria Stacewicz-Sapuntzakis (newsletter editor, member *ex officio*)  
Jessica Campbell – General Mills (new member)  
Earl Harrison – Ohio State University (new member)  
Loredana Quadro – Rutgers University (new member)

The Committee decided to abandon paper distribution of *Carotenoid News* and limit the publication of the newsletter to the ICS website in order to reduce distribution costs. There is also a possibility that it will be distributed in the future via ASN (American Society for Nutrition) listserve, since CARIG is now a RIS of the ASN. The Committee thanked Lew Rubin and Sherry Tanumihardjo for organizing this year's CARIG EB Conference and discussed plans for the next CARIG EB2010 Conference. A preliminary program will be announced in the next issue of *Carotenoid News*. An excellent report of CARIG EB2009 Conference was prepared by Noel Solomons and may be found in *Sight and Life Magazine* 2/2009, which also published James A. Olson Memorial Perspective on Carotenoids Lecture.

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## 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 2010. 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'10, printed copies of the slides may

be used for the CARIG/VARIG poster competition. No advance registration is required to participate in the poster competition. Contact: Dr. Sherry Tanumihardjo, University of Wisconsin-Madison, 1415 Linden Drive, Madison, WI 53706, **e-mail:** [sherry@nutrisci.wisc.edu](mailto:sherry@nutrisci.wisc.edu) **fax:** 608-262-5860.

### UPCOMING EVENTS

**October 4 - 9, 2009**

**19th International Congress of Nutrition - Nutritional Security for All. Bangkok, Thailand.** Contact: **website:** [www.icn2009.com](http://www.icn2009.com)

**January 17- 22, 2010**

**7th Gordon Research Conference on Carotenoids, Ventura, CA.** Contact: **website:** [www.grc.org](http://www.grc.org) (see the announcement below).

**April 24 - 28, 2010**

**Experimental Biology 2010, Anaheim, CA.** Contact: EB2010, FASEB Office of Scientific Meetings & Conferences, 950 Rockville Pike, Bethesda, MD 20814-3998, **website:** [www.eb2010.org](http://www.eb2010.org), **e-mail:** [eb@faseb.org](mailto:eb@faseb.org) **tel:** 301-634-7010

### Gordon Research Conference

The 7th Gordon Research Conference (GRC) on Carotenoids will be held on January 17 - 22, 2010 in Ventura, California. The 2010 GRC will uphold the tradition of bringing together multidisciplinary research investigators at the forefront of carotenoid science. The conference will showcase exciting developments and updates with presentations in genomics/modeling/systems biology; biosynthesis and regulation; photosynthesis; metabolic engineering of provitamin A carotenoids; carotenoid transport and metabolism; biological actions of carotenoids and their metabolites; carotenoids and chronic disease prevention. Academic, industrial and government participants are welcome and all are strongly encouraged to present their most recent unpublished findings as posters for which ample time has been allotted. This conference is an outstanding opportunity to promote growth, development, and open communication of frontier developments in carotenoid science. The collegial atmosphere of this conference, with programmed discussion sessions as well as opportunities for informal gatherings in the afternoons and evenings, provides a forum for scientists from different disciplines to brainstorm, and promotes cross-disciplinary collaboration between carotenoid researchers world-wide. Applications are especially welcome from postdoctoral fellows and graduate students; selected posters from young investigators will be chosen for short oral presentations and conference awards during the meeting. The program website is: <http://www.grc.org/programs.aspx?year=2010&program=carotenoid>. The final program will be available in mid-September. The attendance at this Conference is limited; applications for attendance can be done through the conference website and will be reviewed beginning in September. You can apply for the conference without submitting your poster title or abstract; these can be submitted at a later date (for your most current findings to be presented). Mail your application to: Dr. Susan T. Mayne, Chronic Disease Epidemiology, Yale School of

Public Health, 60 College St., P.O. Box 208034, New Haven, CT 06520-8034, **tel:** 203-785-6274, **e-mail:** [susan.mayne@yale.edu](mailto:susan.mayne@yale.edu), **fax:** 203- 785-6980. We look forward to seeing you in Ventura!

*Susan T. Mayne, Chair  
Eleanore Wurtzel, Vice Chair  
Xiang-Dong Wang, Vice Chair*

### RECENT / FORTHCOMING PUBLICATIONS

**SIGHT AND LIFE Magazine 1/2009 and 2/2009**, PO Box 2116, 4002 Basel, Switzerland, **tel:** 41-61-815-8756, **fax:** 41-61-815-8190, **website:** [www.sightandlife.org](http://www.sightandlife.org), **e-mail:** [klaus.kraemer@sightandlife.org](mailto:klaus.kraemer@sightandlife.org). See especially:

In Memoriam. A Scientist who added color to the world of carotenoid research: Norman I. Krinsky, 1928-2008 (1/2009)

Yang JZ, and Blaner WS. Carotenoids, their retinoid and non-retinoid metabolites and the metabolic syndrome. James A. Olson Memorial Perspectives on Carotenoids Lecture 2009 (2/2009)

Solomons NW. Annual CARIG Conference meets in New Orleans (2/2009)

**Recent Achievements of Carotenoid Science and Technology.** A highlight issue of Arch. Biochem. Biophys. Vol. 483 (2), March 15, 2009.

**Distribution and Biosynthesis of Carotenoids** by S. Takaichi in *The Purple Photosynthetic Bacteria*, eds. C.N. Hunter, F. Daldal, M.C. Thurnauer and J.T. Beatty, Advances in Photosynthesis and Respiration, vol 28: 97-117, Springer, Dordrecht, The Netherlands (2009).

### 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. A more extensive list may be found at [www.carotenoidsociety.org](http://www.carotenoidsociety.org).

Anonymous. Is it true that antioxidant supplements such as  $\beta$ -carotene, vitamin A and Vitamin E can raise my risk of death? Health News 2009; 15:12.

Acosta, O., Perez, A. M., & Vaillant, F. Chemical characterization, antioxidant properties, and volatile constituents of naranjilla (*Solanum quitoense* Lam.) cultivated in Costa Rica. Arch.Latinoam.Nutr. 2009; 59: 88-94.

Akimoto, S., Yokono, M., Higuchi, M., Tomo, T., Takaichi, S., Murakami, A., & Mimuro, M. Solvent effects on excitation relaxation dynamics of a keto-carotenoid, siphonaxanthin. Photochem.Photobiol. Sci. 2008; 7: 1206-1209.

Al Duais, M., Hohbein, J., Werner, S., Bohm, V., & Jetschke, G. Contents of vitamin C, carotenoids, tocopherols, and tocotrienols in the subtropical plant species *Cyphostemma digitatum* as affected by processing. J.Agric.Food Chem. 2009; 57: 5420-5427.

Al Wadei, H. A. & Schuller, H. M. Non-genomic inhibitory signaling of  $\beta$ -carotene in squamous cell carcinoma of the lungs. Int.J.Oncol. 2009; 34: 1093-1098.

Al Wadei, H. A. & Schuller, H. M.  $\beta$ -Carotene promotes the development of NNK-induced small airway-derived lung adenocarcinoma. Eur.J.Cancer. 2009; 45: 1257-1264.

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Alonso-Alvarez, C., Perez-Rodriguez, L., Garcia, J. T., & Vinuela, J. Testosterone-mediated trade-offs in the old age: a new approach to the immunocompetence handicap and carotenoid-based sexual signalling. Proc.Biol.Sci. 2009; 276: 2093-2101.

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## TECHNICAL NOTE

### Raman Spectroscopic Analysis Could Detect Carotenoids on Mars

Since evaporitic rocks on the Martian surface could serve as potential habitats for microbial life on Mars, there is a reasonable possibility that these rocks may sustain molecular remnants as evidence for the presence of extinct or extant living organisms on Mars and that  $\beta$ -carotene could be a suitable biomarker. Raman microspectrometry was tested in the Institute of

Geochemistry, Prague, as a nondestructive method of determining the lowest detectable  $\beta$ -carotene content in experimentally prepared evaporitic matrices---gypsum, halite and epsomite. Two excitation wavelengths were compared: 514.5 nm, because of the resonance Raman enhancement in the carotenoid analysis, and 785 nm, as a more universal wavelength now much used in the detection of biomolecules terrestrially. Mixtures were measured directly as well as with a laser beam penetrating the crystals of gypsum and epsomite. The researchers obtained  $\beta$ -carotene signals at the 0.1-10 mg/kg level. The number of registered  $\beta$ -carotene Raman bands differed depending on the particular mineral matrix and the excitation wavelength. We can assume that if carotenoids were synthesized by potential Martian biota, they could have been subsequently preserved in subsurface evaporitic rocks in detectable amounts.

Vitek P. et al., *Anal. Bioanal. Chem.* 393:1967-75 (2009)

## NEWS AND VIEWS

### Lutein May Protect Eyes in Long-term Computer Use

Supplements of lutein, long-reported to have benefits for eye health, may also protect against the detrimental effects of long-term computer display light exposure. The study recruited 37 healthy subjects, 22-30 years old, with long-term computer display light exposure. The participants were randomly assigned to one of three groups for 12 weeks: the control group (placebo – maltodextrin), or two lutein groups, (6 or 12 mg of lutein per day). At the end of the test period, the researchers noted an increase in blood levels of lutein in both lutein groups, from 0.36 to 0.61  $\mu\text{M/L}$  in the low-dose group, and from 0.33 to 0.73  $\mu\text{M/L}$  in the high-dose group. There was a trend towards improved visual acuity in people in the high-dose lutein group. Both lutein groups did experience improvements in measures of contrast sensitivity, reaching statistical significance in the high-dose group. (Ma L. et al. *Br.J.Nutr.* 102:186-90, 2009). A higher intake of lutein may have beneficial effects on the visual performance.

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### Golden Rice Is an Effective Source of Vitamin A

Genetically engineered Golden Rice contains up to 35  $\mu\text{g}$   $\beta$ -carotene/g of rice. It is important to determine the vitamin A equivalency of Golden Rice  $\beta$ -carotene to project the potential effect of this biofortified grain in rice-consuming populations that commonly exhibit low vitamin A status. Golden Rice plants were grown hydroponically with heavy water (deuterium oxide) to generate deuterium-labeled [ $^2\text{H}$ ] $\beta$ -carotene in the rice grains. Golden Rice servings of 65-98 g (130-200 g of cooked rice), containing 0.99-1.53 mg  $\beta$ -carotene, were fed to 5 healthy adult volunteers (3 women and 2 men) with 10 g of butter. A reference dose of [ $^{13}\text{C}_{10}$ ]retinyl acetate (0.4-1.0 mg) in oil was given to each volunteer one week before ingestion of the Golden Rice dose. Blood samples were collected over 36 d. The mean area ( $\pm$  SD) under the curve for the total serum response to [ $^2\text{H}$ ]retinol was  $39.9 \pm 20.7 \mu\text{g} \times \text{d}$  after the Golden Rice dose. Compared with that of the [ $^{13}\text{C}_{10}$ ]retinyl acetate reference dose ( $84.7 \pm 34.6 \mu\text{gxd}$ ), Golden Rice  $\beta$ -carotene provided 0.24-0.94 mg retinol. Thus, the conversion factor of Golden Rice  $\beta$ -carotene to retinol is  $3.8 \pm 1.7$  to 1 with a

range of 1.9-6.4 to 1 by weight, or  $2.0 \pm 0.9$  to 1 with a range of 1.0-3.4 to 1 by moles. Therefore  $\beta$ -carotene derived from Golden Rice is effectively converted to vitamin A in healthy humans.

Tang G. et al. *Am.J.Clin.Nutr.* 89:1776-83 (2009)

### Site-specific Concentrations of Carotenoids in Adipose Tissue

Dietary carotenoids are related to a decreased risk of certain diseases. Serum and adipose tissue carotenoid concentrations are used as biomarkers of intake. The objectives of this study were to evaluate site-specific concentrations of carotenoids in adipose tissue and to examine relations between carotenoid concentrations in the diet, serum, and adipose tissue. Healthy adults (12 women and 13 men) participated in this cross-sectional study. Dietary carotenoid intakes over the past year were assessed with a food-frequency questionnaire. Serum and adipose tissue biopsy samples were collected from the abdomen, buttock, and inner thigh for the measurement of carotenoids by HPLC. Some adipose carotenoids were inversely related to percentage body fat, although lycopene was the only carotenoid inversely correlated with all 3 sites. Most of the carotenoids were significantly higher in the abdominal adipose tissue than in the thigh ( $P < 0.05$ ). Concentrations of  $\alpha$ -carotene,  $\beta$ -carotene, 5-cis-lycopene, and total carotenoids were significantly higher in the buttocks than in the thigh ( $P < 0.05$ ). Concentrations of  $\alpha$ -carotene, cis-lycopene, and lutein (with or without zeaxanthin) were significantly higher in the abdomen than in the buttocks ( $P < 0.05$ ). Dietary intake was significantly correlated with serum concentrations of  $\alpha$ -carotene,  $\beta$ -carotene,  $\beta$ -cryptoxanthin, and total carotenoids. Carotenoid intake was significantly correlated with adipose tissue concentrations of cis-lycopene,  $\alpha$ - and  $\beta$ -carotene,  $\beta$ -cryptoxanthin, and total carotenoids ( $P < 0.05$ ), but varied by site. Of all the adipose tissue sites evaluated, the abdomen showed the strongest correlation with long-term dietary carotenoid intakes and with serum (indicator of short-term intake) for most carotenoids. In conclusion, body fat may influence the tissue distribution of carotenoids, and abdominal adipose tissue concentrations may be a useful indicator of carotenoid status.

Chung H.Y. et al. *Am. J.Clin.Nutr.* 90:533-9 (2009)

### 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](http://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](http://www.ars.usda.gov/foodsearch)
3. International Carotenoid Society (ICS) Webpage: [www.carotenoidsociety.org](http://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](http://www.carotenoidsociety.org) through Articles button.