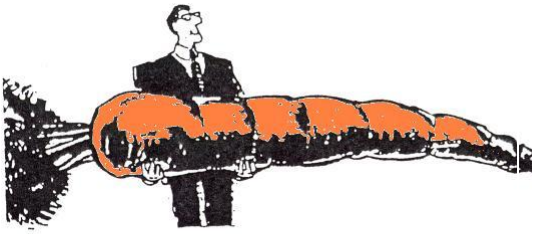

Carotenoid News

Vol. 22, No. 1
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FROM THE EDITOR

"New opinions are always suspected, and usually opposed, without any other reason but because they are not already common." ~John Locke (1632-1704)

This acute insight of the famous English philosopher, published in his *Essay Concerning Human Understanding* (1690) found recent support in a psychological study (*JS Mueller et al., Psych Sci 2012; 23:13-17*). Apparently most subjects have an unconscious negative attitude toward creativity, because it involves an element of uncertainty. People profess to love creativity but are very skeptical about new ideas, both in science and technology. Many innovators suffered ridicule and contempt from their colleagues. We all know that it is often very difficult to obtain funding to investigate truly novel ideas, especially for young researchers without proven record of grants and publications. Scientific institutions and public policy decision makers should spend more effort and resources on recognition and appreciation of creative projects instead of perfunctory "promotion of creativity". CARIG RIS meetings at Experimental Biology are always conducted in spirit of free exchange of creative ideas, and we invite all carotenoid researchers to participate in this year meeting on April 20 (see the preliminary program below).

Maria S. Sapuntzakis (Chicago)

CARIG Travel Awards

CARIG will award at least two monetary prizes, based on a poster competition to be held in conjunction with the CARIG/VARIG Social at Experimental Biology 2012. 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'12, printed copies of your slides with a print copy of your abstract and a small banner may be used for the CARIG/VARIG poster competition. No advance registration is required to participate in the poster competition. Contact: Mario Ferruzzi, **e-mail**: mferruzz@purdue.edu; tel: (765) 494-0625.

UPCOMING EVENTS

March 22-24, 2012
15th International Meeting on Fat Soluble Vitamins, Kalabaka, Greece.
Website: www.vitamins2012.com
E-mail: info@vitamins2012.com

April 20, 2012
CARIG Annual Conference, San Diego, CA. Contact**:** Dr. Mario Ferruzzi, CARIG RIS Chair, **e-mail**: mferruzz@purdue.edu, **tel**: 765-494-0625 [preliminary program below].

April 21 - 25, 2012
Experimental Biology 2012, San Diego, CA. Contact: EB2012, FASEB Office of Scientific Meetings & Conferences, 950 Rockville Pike, Bethesda, MD 20814-3998, **website**: www.experimentalbiology.org, **e-mail**: eb@faseb.org

2012 CARIG Annual Conference
Friday, April 20, 2012, 1:00 - 5:00 pm
San Diego Hilton Bayfront Hotel

Theme: Xanthophylls: Dietary Sources and Impact through the Life Cycle

Co-Chairs: Elizabeth Johnson (Tufts University) and Lewis Rubin (University of South Florida)

1:00-1:45 pm. James Olson Memorial Lecture: *Xanthophylls as provitamin A carotenoids.* Sherry Tanumihardjo (University of Wisconsin)

1:45-2:15 *Xanthophylls and eye development.* B. Randy Hammond (University of Georgia)

2:15-2:45 *Xanthophylls concentrations in infant brain.* Rohini Vishwanathan (Tufts University)

2:45-3:00 Break

3:00-3:30 *Breeding for enhanced carotenoid profile.* Torbert Rochford (Purdue University)

3:30-4:00 *Dietary sources of lutein and zeaxanthin-Updates on USDA food composition database.* Joanne Holden (USDA-ARS)

VARIG/CARIG Social and Poster Competition
Friday, April 20, 2012, 6:30 - 8:30 pm
San Diego Hilton Bayfront Hotel
Indigo Ballroom B

The trainees (undergraduate, graduate, postdocs) are especially encouraged to set up posters. Poster boards, pins and light refreshments will be provided. Poster awards will be presented. The CARIG business meeting will be convened (open to all CARIG members) immediately after the awards presentations. All CARIG members are urged to attend.

Experimental Biology 2012 - ASN Annual Meeting Highlights
Saturday, April 21, 2012
San Diego Convention Center, Room 32B

8:00am - 10:00am
Minisymposium: *Carotenoids and Health*. Chairs: Lewis Rubin and Jessica Campbell

10:30am - 12:30pm
Minisymposium: *Carotenoids: Bioavailability and Metabolism.* Chairs: Sherry Tanumihardjo and Xiaoming Gong

3:00pm - 5:00pm
Minisymposium: *Carotenoids: Eye and Brain Health.* Chairs: Elizabeth Johnson and Zeina Jouni

Sunday, April 22, 2012, 8:30 - 5:00 pm
Posters: *Carotenoids and Health*

RECENT / FORTHCOMING PUBLICATIONS

SIGHT AND LIFE Magazine 25 (3) 2011. PO Box 2116, 4002 Basel, Switzerland, **tel:** 41-61-815-8756, **website:** www.sightandlife.org
e-mail: klaus.kraemer@sightandlife.org
See especially: G. Britton. **Highlights of the 16th International Symposium on Carotenoids. Krakow, 17 July 2011**, pages 72-75.

Carotenoid biosynthesis in Arabidopsis: A colorful pathway. MA Ruiz-Sola, M Rodriguez-Conception. A summary of knowledge about genes and enzymes of carotenoid biosynthetic pathway. www.bioone.org/doi/full/10.1199/tab.0158

Maize provitamin A carotenoids, current resources, and future metabolic engineering challenges. ET Wurtzel, A Cuttriss, R Vallabhaneni, *Frontiers in Plant Science 2012, vol 3, Article 29* http://www.frontiersin.org

Alphabetical Listing of Recent Publications may be found at www.carotenoidsociety.org under **Articles.** Prepared by Dr. Harold Furr, Department of Nutritional Sciences, University of Wisconsin, Madison.

TECHNICAL NOTE

FDA permits higher dosage of astaxanthin

Astaxanthin has been used in feed industry to improve the color of farmed salmon. Recently, it became popular in the dietary supplements market, and it is being promoted as a functional food ingredient following several GRAS affirmations. Cyanotech Corp. was allowed to increase the daily dose of its BioAstin brand astaxanthin from 7.8 to 12 mg in September 2011. Now AstaREAL brand (Fuji Health Science) has received a similar permission. The company will show a water-soluble astaxanthin preparation for foods and beverages, as well as a 6 mg astaxanthin softgel in bulk at ExpoWest in Anaheim, CA, in March 2012**.** Algatechnologies Ltd. also produces 2% water-soluble AstaPure brand aimed at functional foods and cosmetics. However, European Food Safety Authority (EFSA) has rejected all claims for astaxanthin benefits.

Nutraingredients-usa.com (2/27/2012)

NEWS AND VIEWS

Astaxanthin shows benefits against colitis

Japanese scientists tested different doses of astaxanthin on the development of colitis and colon cancer in mice (*Yasui et al, Chemico-Biological Interactions 193:79-87, 2011*). The animals were exposed to sodium dextran sulphate to induce the inflammation of the colon. Their diet contained 50, 100, or 200 ppm astaxanthin (Sigma-Aldrich). Feeding the highest amount of astaxanthin (200 ppm) significantly inhibited the development of colitis and colitis-related colon carcinogenesis, through the suppression of inflammatory cytokines (NF-kappaB), and of cell proliferation.

Nutraingredients-usa.com (9/15/2011)

GM yeasts add β-carotene to bread

A group of undergraduate students from Johns Hopkins University (Baltimore, MD) produced modified yeast (VitaYeast), by inserting DNA plasmid ring, programmed to produce β-carotene, into a

common yeast genome. Using VitaYeast, they baked bread that looked and smelled “very tempting”. However, they could not taste it because the genetically engineered (GM) ingredient has not yet received approval from regulators (it requires safety testing). The students hope that the enhanced starter could be shared among malnourished people and the resulting β-carotene-enriched bread could avert vitamin A deficiency. The project has been entered in the International Genetically Engineered Machine (iGEM) competition.

Nutraingredients-usa.com (10/28/2011)

Modulation of lycopene isomers in human plasma by lycopene isomer profile in the meal

Dietary lycopene consists mostly of the (all-*E*) isomer. Upon absorption, (all-*E*) lycopene undergoes isomerization into various (*Z*) isomers. Because these isomers offer potentially better health benefits than the (all-*E*) isomer, the aim of the present study was to investigate if the profile of lycopene isomers in intestinal lipoproteins is affected by the profile of lycopene isomers in the meal and by the tomato preparation. Six postprandial, crossover tests were performed in 27 healthy young men, consuming 25 mg lycopene, and the blood was collected for 6 hr after the meal. Three tests provided about 70% of lycopene as (*Z*) isomers, either mainly as 5-(*Z*) or 13-(*Z*), or as a mixture of 9-(*Z*) and 13-(*Z*) lycopene, while three other tests provided lycopene mainly as the (all-*E*) isomer. Consumption of the 5-(*Z*) lycopene-rich meal led to a high (60%) proportion of this isomer in TAG-rich lipoproteins (TRL), indicating a good absorption and/or a low intestinal conversion of this isomer. By contrast, consumption of meals rich in 9-(*Z*) and 13-(*Z*) lycopene isomers resulted in a low level of these isomers but high amounts of the 5-(*Z*) and (all-*E*) isomers in TRL. This indicates that the 9-(*Z*) and 13-(*Z*) isomers were less absorbed or were converted into 5-(*Z*) and (all-*E*) isomers. Dietary (*Z*) lycopene isomers were, therefore, differently isomerized and released in TRL during their intestinal absorption in men. Consuming the three meals rich in (all-*E*) lycopene resulted in similar proportions of lycopene isomers in TRL: 60% (all-*E*), 20% 5-(*Z*), 9% 13-(*Z*), 2% 9-(*Z*) and 9% unidentified (*Z*) isomers. These results show that the tomato preparation has no impact on the lycopene isomerization occurring during absorption in humans.

Richelle et al. Br J Nutr
doi:10.1017/S0007114511004569

Zeaxanthin and/or lutein supplementation and visual function in patients with early AMD

The purpose of this study was to evaluate whether dietary supplementation with zeaxanthin (Zx) raises macular pigment optical density (MPOD) and has unique visual benefits for patients with early age-related macular degeneration (AMD). This was a one year, prospective, randomized controlled clinical trial of 60 patients (75 $\pm$ 10 y old, 57 men) with mild-to-moderate AMD randomly assigned to one of three dietary supplement groups: 8 mg Zx (n = 25), 8 mg Zx plus 9 mg lutein (L) (n = 25), or 9 mg L (n = 10). Estimated foveal heterochromic flicker photometry, 1° MPOD, low- and high-contrast visual acuity, foveal shape discrimination, 10° yellow kinetic visual fields (KVF), glare recovery, contrast sensitivity function (CSF), and 6° blue cone color thresholds were obtained serially at 4, 8, and 12 months. MPOD increased in each of the 3 groups from 0.33 to 0.51 density units at 12 months, (P = 0.03), but there were no between-group differences (P = 0.47). In the Zx group, detailed high-contrast visual acuity improved by 1.5 lines, shape discrimination sharpened from 0.97 to 0.57 (P = 0.06, 1-tail), and a larger percentage of Zx patients experienced clearing of their KVF central scotomas (P = 0.057). The L group was superior in terms of low-contrast visual acuity, CSF, and glare recovery, whereas Zx showed a trend toward significance. In older male patients with AMD, Zx-induced foveal MPOD elevation mirrored that of L and provided complementary distinct visual benefits by improving foveal cone-based visual parameters, whereas L enhanced those parameters associated with gross detailed rod-based vision, with considerable overlap between the two carotenoids. The Zx + L group was not superior in terms of raising MPOD, presumably because of duodenal, hepatic-lipoprotein or retinal carotenoid competition. These results make biological sense based on retinal distribution and Zx foveal predominance.

Richer et al. Optometry - J Am Opt Assn 2011, 82: 667-80

Lutein and zeaxanthin intake and the risk of age-related macular degeneration

Lutein and zeaxanthin are thought to decrease the incidence of age-related macular degeneration (AMD); however, findings have been inconsistent. We conducted a systematic literature review and meta-analysis to evaluate the relationship between dietary intake of lutein and zeaxanthin and AMD risk. Relevant studies were identified by searching five databases up to April 2010. The search yielded six longitudinal cohort studies. The pooled relative risk (RR) for early AMD, comparing the highest with the lowest category of lutein and zeaxanthin intake, was 0.96 (95% CI 0.78, 1.17). Dietary intake of these carotenoids was significantly related with a reduction in risk of late AMD (RR 0.74; 95% CI 0.57, 0.97); and a statistically significant inverse association was

observed between lutein and zeaxanthin intake and neovascular AMD risk (RR 0.68; 95% CI 0.51, 0.92). The results were essentially consistent among subgroups stratified by participant characteristics. The findings of the present meta-analysis indicate that dietary lutein + zeaxanthin is not significantly associated with a reduced risk of early AMD, whereas an increase in the intake of these carotenoids may be protective against late AMD. However, additional studies are needed to confirm these relationships.

Ma et al. Br J Nutr 2012; 107, 350-9

Ladybug's color is related to its toxicity

New research shows that darker ladybugs are more poisonous than their paler peers. This variation is directly linked to diet in early life. In this study, the researchers reared seven-spot ladybugs (*Coccinella septempunctata*) on either a low or high aphid diet (*Blount et al. Functional Ecology 2012, doi: 10.1111/j.1365-2435.2012.01961.x)*. They measured several effects of varying diet in the maturing ladybugs: body coloration which acts as a warning signal, levels of toxic defensive chemicals, and the relationship between signals and defenses. Ladybugs that were fed a high aphid diet had greater pigmentation, resulting in darker elytra (wing cases), than less well-fed ladybugs. The pigmentation in elytra was due to higher levels of carotenoids, obtained from the aphid diet. They also had higher levels of precoccinelline, one of the defensive chemicals which make them toxic to predators. The study suggests that better-fed ladybugs can afford to invest more into producing both warning signals and toxic chemicals, and are therefore less likely to be eaten by predators (birds). It should be mentioned that ladybugs prefer to eat red aphids, which are rich in torulene. Green aphids contain mainly α-,β-,γ-carotene. All these carotenoids were identified previously in the wing cases of ladybug beetles (*Britton et al. Nature 266:49-50, 1977*).

Internet Addresses for Carotenoid Researchers

1. USDA Nutrient Database for Standard Reference (SR23) 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/car_tbl.pdf and www.nal. usda. gov/fnic/ foodcomp/Data/car98/zea_tbl.pdf
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) **Website**: 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.

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American Scientist, March - April 2012

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