



N°7, FEBRUARY 2018

NEWSLETTER



EUROCAROTEN

EUROPEAN NETWORK TO ADVANCE CAROTENOID RESEARCH
AND APPLICATIONS IN AGRO-FOOD AND HEALTH

WELCOME

We are pleased to welcome you to the seventh issue of the EUROCAROTEN Newsletter.

In this issue read about success of IBERCAROT – the Ibero-American network for the study of carotenoids as functional foods ingredients, germ of EUROCAROTEN.

Training school “Bioavailability of Carotenoids” will be held in March, and at page 3 you can find information about the program. At the same page, you can find information about BON conference that will be held in July in Cambridge, United Kingdom.

You may check the News from the Action rubric to find finished STSMs during last period, followed by their “STSM experience report” at pages 4 and 5. Also, in this issue, we would like to introduce Anneli Ritala, a principal scientist at TT Technical Research Centre of Finland Ltd, and leader of WG4 within EUROCAROTEN.

Zeaxanthin is this issue “Carotenoid of the month”; please check page 7 to learn more about its properties and biotechnological potential.

You can find more information about EUROCAROTEN COST Action on COST website

http://www.cost.eu/COST_Actions/ca/CA15136 and on our website www.eurocaroten.eu.

*Yours sincerely,
Ludmiła Bogacz-Radomska
Mohammed Iddir
Kristina Kljak*



Subscription to the newsletter e-mailing is available via the EUROCAROTEN website (www.eurocaroten.eu). For further information, please contact us via our e-mail info@eurocaroten.eu. You can also send us your comments and proposals.

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EUROCAROTEN training school Bioavailability of Carotenoids

11th to 13th July

Brain and Ocular Nutrition (BON) Conference 2018

23rd to 25th October

4th WG and 5th MC meetings and Workshop on carotenoids in foods, nutrition and health

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“Due to my interest in secondary metabolites, I find the biosynthetic pathway elucidation and metabolic engineering options very interesting.”

CAROTENOIDS IN OUR DAILY LIFE

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Carotenoid of the Month: Zeaxanthin

“Zeaxanthin is an important carotenoid in eye health due to its function as blue light filter and its antioxidant activity.”

Biotechnological zeaxanthin

“Through microbial production it may be possible to obtain zeaxanthin and other carotenoids that could compete with chemical synthesis in regard to both their properties and price.”

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NEWS FROM THE ACTION & FINISHED STSMs

Carotenoides en agroalimentación y salud

Antonio J. Meléndez-Martínez
Coordinador



PROGRAMA
IBEROAMERICANO

CYTED

CIENCIA Y TECNOLOGÍA PARA EL DESARROLLO

IBERCAROT

CONTRIBUTION FROM THE NETWORK

Success of IBERCAROT network, germ of EUROCAROTEN

The Ibero-American network for the study of carotenoids as functional foods ingredients (IBERCAROT), germ of EUROCAROTEN, has been selected by the Ibero-American Programme for Science, Technology and Development (CYTED, <http://www.cytel.org/>) as one of the outstanding networks of the programme for its achievements in cooperation for the development.

IBERCAROT is coordinated by Dr. Antonio J. Meléndez Martínez, Chair of EUROCAROTEN. Dr. Meléndez has been invited to present the activities and achievements of IBERCAROT to representatives of the national organisms of science and technology of the Ibero-American countries during the general assembly of CYTED, held in Varadero (Cuba) on 26-28 November 2017. Over four years, this network has facilitated the capacity building among participants, the training of young researchers, the establishment of long-lasting collaborations and catalysed the obtaining of funding for research and development.

IBERCAROT has just published a comprehensive book in Spanish about the importance of carotenoids in agro-food and health. It can be downloaded using following link: <https://idus.us.es/xmlui/handle/11441/68953>.

FINISHED STSMs

CAROTENOID METABOLITES (DETERMINATION AND PROFILING) OF MEDICINAL AND AROMATIC PLANTS AND HERBS, USING ADVANCED CHROMATOGRAPHIC TOOLS AND EXPRESSION ANALYSIS OF KEY GENES

Grant Holder

Dr. Eirini Sarrou,
Hellenic Agricultural Organisation-DEMETER, Greece

Period

21st August – 22nd October 2017

Host Institution

Fondazione Edmund Mach, Istituto Agrario di San Michele all'Adige - IASMA, Italy

STUDY OF THE ABSORPTION MECHANISM OF THE CAROTENOIDS PHYTOENE AND PHYTOFLUENE

Grant Holder

Paula Mapelli Brahm,
Universidad de Sevilla, Spain

Period

3rd September – 3rd November 2017

Host Institution

Joint Research Unit INSERM 1062/ INRA 1260/
University Aix-Marseille, France

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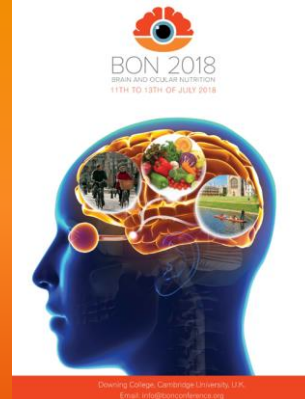
FUTURE EVENTS

SAVE THE DATE

4th WG and 5th MC MEETINGS

WORKSHOP ON CAROTENOIDS IN FOODS, NUTRITION AND HEALTH

23rd – 25th October 2018
Valencia | Spain



EUROCAROTEN TRAINING SCHOOL: **BIOAVAILABILITY OF CAROTENOIDS**

19th – 23rd March 2018

School of Medicine, Newcastle University, United Kingdom

Organizers

- Dr. Georg Lietz (Newcastle University, United Kingdom)
- Dr. Antonio J. Meléndez-Martínez (Universidad de Sevilla, Spain)

EUROCAROTEN together with the Human Nutrition Research Centre at Newcastle University have put together a training school with **focus on carotenoid bioavailability and related measurement of potential contributing factors to high inter-individual variations.**

During the five-day training school, applicants will participate **in both theoretical and practical aspects of the workshop.** The topics of talks will include dietary sources of carotenoids, basics of metabolomics and proteomics and their applications, factors influencing carotenoid bioaccessibility, bioavailability models, assessing carotenoid bioefficacy and WinSAAM compartmental modelling. The practical part of the training school will include determination of carotenoid bioavailability in cell models followed by HPLC analysis, chylomicron separation from blood samples and stable isotope preparation, and DNA extraction and qPCR analysis.

Beside the organizers, trainers are EUROCAROTEN **experts in the field of carotenoid bioavailability** (Dr Torsten Bohn, Dr Emmanuelle Reboul); and invited experts in the field of **metabolomics** (Dr Warwick Dunn, Dr Rachel Kopec); **proteomics** (Dr Achim Treumann); **genetics and epigenetics** (Dr Charles Desmarchelier, Dr Gordon Strathdee, Prof John Mathers); **intervention studies** (Dr Anthony Oxley, Mr Adam

Clark); and **compartmental modelling** (Prof Mike Green, Ms Jennifer Ford).

Full programme of training school is available at <https://www.eurocaroten.eu/sites/default/files/Programme-Accommodation.pdf>.

BRAIN AND OCULAR NUTRITION (BON) CONFERENCE 2018

11th – 13th July 2018

Downing College, Cambridge University, United Kingdom

A conference dedicated to the **role of nutrition (including carotenoids) and lifestyle for the eye and brain** where nutritional scientists disseminate research findings and discuss ideas relating to the role of nutrition for human health and wellbeing. The programme for the 2018 conference includes **speakers EUROCAROTEN participants: Dr Torsten Bohn, Prof John Nolan, Dr Antonio Meléndez Martínez and Dr Georg Lietz.** You can find more information about the conference at <http://bonconference.org/>.

Conference Fees are £350 for Student Delegates and £425 for Academic Delegate Fees. Downing College offers accommodation throughout the conference. This can be booked at the same time as the registration fee (see the above link for more details).

Please register your interest in attending the conference by clicking on the following link http://bonconference.org/contact_us/bon_membership.

Please know that registering your interest does not commit you to attending, but **membership will ensure that you are kept up to date on all conference related activities** as we now prepare for our soon approaching 2018 conference.

FINISHED STSMs

EXPERIENCE REPORT



COST is supported by
the EU Framework Programme
Horizon 2020.



EIRINI SARROU

CAROTENOID METABOLITES (DETERMINATION AND PROFILING) OF MEDICINAL AND AROMATIC PLANTS AND HERBS, USING ADVANCED CHROMATOGRAPHIC TOOLS AND EXPRESSION ANALYSIS OF KEY GENES

Affiliation Hellenic Agricultural Organization DEMETER, Institute of Plant Breeding and Genetic Resources, Department of Medicinal and Aromatic Plants, Thesslonki, Greece

Position Junior Researcher

Host Institution Edmund Mach Foundation (FEM-IASMA), San Michele all'Adige, Department of Food Quality and Nutrition, Italy

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The overall goal of my study was to **identify the carotenoid profile of a range of different medicinal and aromatic plant species** in two experimental cases: 1) in a postharvest approach evaluating the effect of different drying conditions of plant raw material and 2) an ongoing iodine biofortification experiment on Sea Fennel cultivated in a closed hydroponic system, in order to describe and highlight their nutritional value. Independently, key genes of carotenoid pathway involved in the formation of identified metabolites were considered to be cloned by homology-based RT-PCR and gene specific primers for transcription analysis using real time PCR.

The scientific environment of the Institute helped me to join easily the interdisciplinary research group of "Biotechnology of Natural Products" to perform my work, and to quickly gain control of my experiments on state-of-the-art metabolomics techniques. Through analytical difficulties I faced (for which I am finally happy) it is more than clear that I demonstrated my technical skills and the ability to design and execute my experiments providing a very effective contribution to the performance of the group and my topic.

I had the chance not only to **use well established analytical methods** previously developed in Departments laboratory, but also to **set up successfully a valuable described shorter analytical method** for green leafy tissue samples combined to bioinformatic analysis with "Alsace" software from R package. As second part of my training program, a preliminary real time PCR approach was performed to establish a method for expression analysis of carotenoid specific pathway genes in different tissues testing the transferability of primers for housekeeping genes from other Lamiaceae species.

I am very thankful for all these to Dr. Stefan Martens and Dr. Luisa Palmieri that introduced me the laboratory work on analytical methods and transcription analysis in most efficient way, and Dr. Samantha Riccadona who is supporting up to date the bioinformatic processing of all this huge batch of raw data from my experiments. Through this collaboration with the Department I had the chance to keep **the support of the Metabolomics platform to successfully apply as a co-worker** for two Greek national projects, which they got funded, and one Italian scholarship (ongoing evaluation).

Finally I am thankful to EUROCAROTEN committee providing this **great chance to widen my scientific horizons**, improve my expertise and financially support all this efforts. I would like to thank personally Prof. Lourdes Gomez for her valuable assistance during all stages of my STSM application. Last but not least, I would like to take the opportunity to thank Dr. Urska Vrhovsek for her valuable advises in analytical methods and my supervisor Dr. Stefan Martens for his contribution and full scientific and financial support to my STSM workplan.



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FINISHED STSMs

EXPERIENCE REPORT



COST is supported by
the EU Framework Programme
Horizon 2020.



PAULA MAPELLI BRAHM

STUDY OF THE ABSORPTION MECHANISM OF THE CAROTENOIDS PHYTOENE AND PHYTOFLUENE

Affiliation Universidad de Sevilla, Spain

Position PhD student

Host Institution Dr. Patrick Borel, Joint Research Unit INSERM 1062/ INRA 1260/ University Aix-Marseille, France

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From the left to the right: P. M. Brahm, P. Borel, M. Nowicki (Technician), E. Reboul (Senior Researcher), M. Margier (PhD student), C. Halimi (Technician) and C. Desmarchelier (Post-doc)

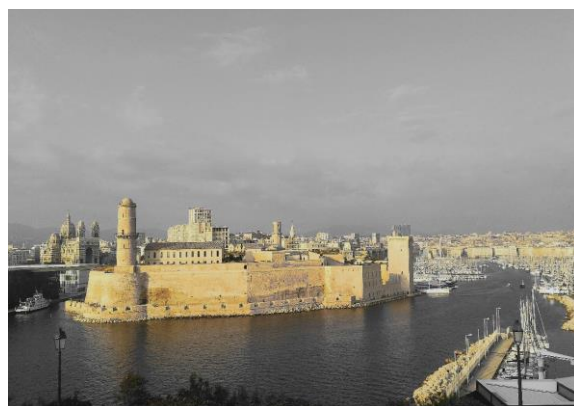
The four-month stay at the Joint Research Unit INSERM 1062/ INRA 1260/ University Aix-Marseille with the research group of Dr. Patrick Borel has been very enriching, both professionally and personally. From the beginning to the end, **the team has helped me in the laboratory and outside of it, making this stay an unforgettable experience.** The work environment was very inspiring and I went to the laboratory every morning with great enthusiasm to get new results. All the people of this group (see picture) did not hesitate to share their knowledge and were always willing to answer questions or give good advice. Thankfully to this, during my STSM, I have had the opportunity to learn about the metabolism of two understudied carotenoids, **phytoene and phytofluene**. I improved my **research skills by learning new techniques and using instruments not available at my home laboratory.** I hope to publish one or two articles with novel results in a research topic little explored in the carotenoid field. This stay also allowed me to team up, meet, and **learn from colleagues at different stages of their careers.** In addition, they made me feel like part of the group, I attended the group meetings and I was invited to give a talk.

I was very lucky, I have had research staying in an excellent group of the scientific field, and the **city where this group is located is wonderful.** On weekends, I went swimming in the creeks and turquoise-water beaches and enjoyed walks through the beautiful Vieux Port and the rest of the city, full of enchanting places. I also visited the beautiful surrounding villages, everything with unbeatable weather!

For all this, I would like first of all to thank the team of Dr.

Patrick Borel and special thanks to him for giving me this opportunity. I would also like to emphasize that this stay has been possible due to the scholarship received by COST Action CA15136 EUROCARTEN as I did not have sufficient funding to attend it otherwise. Thus, all of this has been possible thanks to work of the STSM Coordinator, the STSM Committee, the Chair and the Grant Holder of the Action, and to all these people that make possible the STSM experiences. Thanks.

I would like to take this opportunity to encourage the rest of the PhD students in the network to undertake short research stays abroad. It is a perfect way to advance in the Thesis and at the same time have a great experience.



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EUROCAROTEN INTERVIEW

TALKING WITH:

Anneli Ritala

Affiliation	VTT Technical Research Centre of Finland Ltd
Position	Principal Scientist
Country	Finland
Area of Interest	Plant molecular farming covering both secondary metabolites and recombinant proteins; Cellular agriculture e.g. concept of using plant cells as food; Malting and brewing



Please tell us a bit about your lab and what you work on?

VTT Technical Research Centre of Finland Ltd (www.vttresearch.com) is the leading multi-technological applied research organisation in Northern Europe. VTT Ltd provides high-end technology solutions and innovation services both to private and public sectors. We are supporting our national and international clients' growth with top-level research and science-based results. VTT is a state-owned non-profit limited liability company and operates under the mandate of the Ministry of Employment and the Economy. In 2016, VTT's net turnover and other operating income was 269 Me, with personnel of 2414. I am working as a Principal Scientist in area of Industrial Biology and Food Solutions and specifically in Plant Biotechnology team as a vice team leader. My major research projects are dealing with recombinant protein production in plant cell cultures and in concepts related to use of plant cell cultures as food. VTT is a partner in the EIT Food consortium (www.eitfood.eu) and I am coordinating those activities at VTT. I am a IPMA C-level certified Project Manager and I am coordinating projects related to sustainability of malting and brewing processes. I am also a part time research coordinator at the Brewing Laboratory Ltd.

Which area of carotenoids research do you find most interesting?

Due to my interest in secondary metabolites, I find the biosynthetic pathway elucidation and metabolic engineering options very interesting. Then of course all the health promoting properties and research related to that are very valuable and I follow those with great interest.

As a STSM hosting lab, what type of collaborative projects would you envision?

We could very well host visitors interested in establishing plant cell cultures of their plant species of interest. In addition, we have lot of experience in cryopreservation of plant cells and our piloting facilities are up to 1200 litre scale.

In your eyes, how can the EUROCAROTEN COST Action contribute to carotenoid research?

It is a great network to look for collaboration partners and really get up-to-date of all the on-going activities. I can very well see our EUROCAROTEN Cost Action to flourish into new EU proposals and projects as well as to one-to-one partnerships and other collaborations. We at VTT are very happy of this opportunity to be part of this great community and enthusiastically look for future joint efforts.

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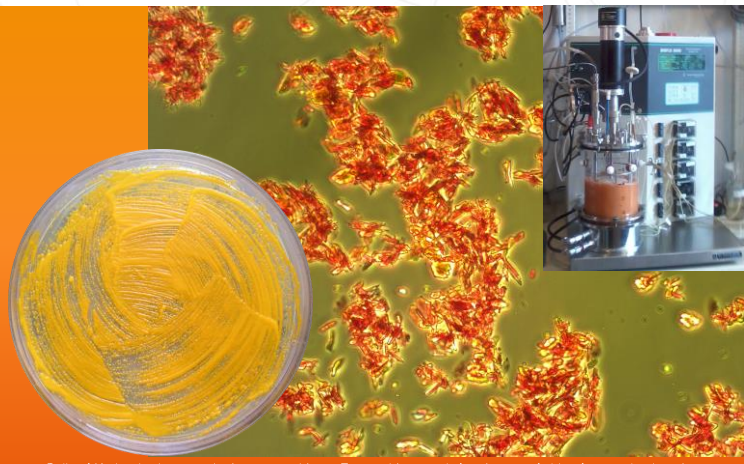
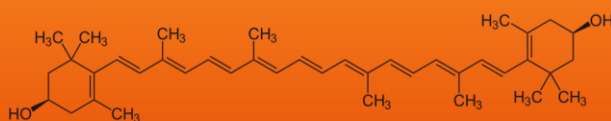
CAROTENOIDS IN OUR DAILY LIFE

CAROTENOID OF THE MONTH

Name: Zeaxanthin

Chemical Formula: $C_{40}H_{56}O_2$

Molecular Weight: 568.88 g/mol



Cells of *X. dendrorhous* producing zeaxanthin Zeaxanthin crystals forming out of chloroform under the microscope

ZEAXANTHIN

From a biosynthetically point of view zeaxanthin is derived from β -carotene by the introduction of two hydroxyl groups on C3 and C3'. The trivial name of the carotenoid (3R,3'R)- β , β -carotene-3,3'-diol is derived from the botanical name of the source this carotenoid was first isolated - *Zea mays* L. (yellow corn).

Besides yellow corn, further food sources rich in zeaxanthin are orange pepper, orange juice, egg yolk or goji berries. Microbial sources for zeaxanthin production are *Flavobacterium* sp.

Zeaxanthin is an important carotenoid in eye health due to its function as blue light filter and its antioxidant activity. Among all carotenoids found in human plasma, zeaxanthin and its structural isomer lutein selectively pass the blood retina barrier and accumulate in the macula in 500-fold higher concentrations than in other body tissues. Therefore, zeaxanthin and lutein are often termed as 'macular pigments'. Epidemiological studies strongly suggested a potential role of lutein and zeaxanthin in the treatment and prevention of certain eye diseases such as age-related macular degeneration, retinitis pigmentosa, and cataract.

Text by Judith Hempel

PhD student at University of Hohenheim, Germany

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BIOTECHNOLOGICAL ZEAXANTHIN

Through microbial production, that is the cultivation of microorganisms such as bacteria, fungi or algae, it may be possible to obtain zeaxanthin and other carotenoids that could compete with chemical synthesis in regard to both their properties and price. In comparison to plant-derived carotenoids extracted from food crops, the production of microbial carotenoids in a bioreactor is advantageous, since it does not result in barren vegetation, requires little water supply and allows the utilization of herbal waste as the carbon source, factors which all meet the principles of a sustainable production process.

Moreover, by genetic modification of carotenoid metabolism the potential of microbial production can be even increased. This involves the induction of random mutations by chemical mutagenesis and targeted genomic manipulation of carotenoid biosynthesis genes. Therefore, current research aims to establish and enhance zeaxanthin biosynthesis in common biotechnological hosts by metabolic engineering techniques. By this means, strains of the bacteria *Escherichia coli* and the fungus *Xanthophyllomyces dendrorhous* has been developed to serve as a biotechnological platform.

Text by Ludmiła Bogacz-Radomska (Institute of Chemistry and Food Technology at Wrocław University of Economics, Poland) & Hendrik Pollmann (Goethe University Frankfurt, Germany)

E-mails: ludmila.bogacz-radomska@ue.wroc.pl and pollmann@stud.uni-frankfurt.de

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THINK TANK INFORMATION

APPLICATION AND SELECTION OF THE 3RD GRANT PERIOD TT REPRESENTATIVES

The opportunity for early stage researchers and PhD students, to develop their **leadership skills** and **start creating their own contacts network** has come!

Each grant period, two new Think Tank Representatives are chosen to assure a fair opportunity for ECIs to take on leadership roles within the EUROCAROTEN network.

WHO CAN APPLY?

All ECIs and PhD students, working with participating members of the EUROCAROTEN COST Action, are welcome to apply to take part in the Think Tank Group.

HOW TO APPLY?

We will be delighted to receive **your CV and brief text explaining motivations** in our email: think.thank@eurocaroten.eu. The call is open until **April 1st 2018**.

SELECTION PROCESS

This year we will be selecting **one ECI** and **one PhD student**, from our list of candidates. The selection process will take into **account geographical and gender balance** issues.

The applications will be evaluated by the current Think Tank Committee Members and by the Chair and Vice-Chair of the Action, Dr. Antonio J. Meléndez-Martínez and Prof. Carmen Socaciu.

For more information please visit www.eurocaroten.eu and www.facebook.com/eurocaroten.

Brain and Ocular Nutrition (BON) Conference 2018



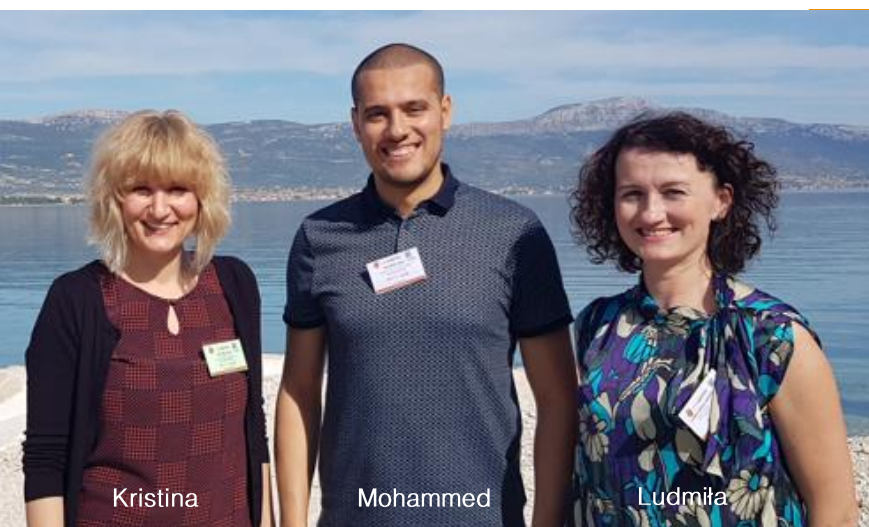
2018 BON Conference includes a new element which **invites graduate students and postdocs** to join the **BON Early Investigator Society (BON EIS)**. The aim of this society is to support scientists at the early stages of their research careers as organizers believe there is an amazing opportunity to establish a society within the areas of **brain, ocular and nutrition research for the early investigator**.

Who can become an EIS member?

Any researcher who is a postgraduate student or has five years or less postdoctoral experience.

Please click on the following link to join the BON EIS (<https://eisbonconference.org/membership/>).

As a starting point, organizers are very pleased to announce that, the **Early Investigator of the Year "The George Britton Award"** – £2,500 scholarship will be **award at this year's conference**. More information can be found at <https://eisbonconference.org/>.



OF EARLY CAREER INVESTIGATORS AND
OTHER YOUNG RESEARCHERS

Representatives for 2nd grant period:

- * Mohammed Iddir
mohammed.iddir@lih.lu
- * Ludmiła Bogacz-Radomska
Ludmiła.bogacz-radomska@ue.wroc.pl

ECI spokesperson:

- * Kristina Kljak
kkkljak@agr.hr

WORKING GROUP NEWS

Leaders of WG3, Torsten Bohn, and WG4, Anneli Ritala, gave us insight in progress done so far, as discussed during WGs meetings in Trogir.

The major aim of **WG3** meeting was to continue discussing ongoing activities in. These predominantly included the **2 reviews – one on carotenoid intake and tissue concentrations, the other on carotenoid pathways important for chronic diseases**. While the first review is about to be finalized soon, the second required some restructuring. Furthermore, aspects regarding the **ongoing creation of a carotenoid database** by Brigitte-Winkelhofer-Roob was discussed, as well as the design and strategy of the **carotenoid questionnaire**, which aims to assess the knowledge of carotenoids in the more educated and the general population. Finally, an important outcome of the meeting included the decision to organize a **„Food and Health” workshop on carotenoid during the next WC meeting in Valencia, Spain** (autumn 2018).

WG leader: Torsten Bohn (Torsten.bohn@lih.lu)

WG vice-leader: Joanna Dulińska-Litewka (joanna.dulinska-litewka@uj.edu.pl)

The progress of **WG4** Transfer, dissemination and exploitation is very well on track. The dedicated **EUROCAROTEN web is working perfectly** and for example all meeting materials are available either on public or protected area. People were reminded to provide material like publication links, news and info of carotenoid related events for Webmasters and Think Tank to be place in our web and disseminated via the **social media tools: Facebook and Twitter**. People were also encouraged to post on EUROCAROTEN Facebook wall. We have published **five issues of Newsletter and four Scientific Newsletters** and this will continue on regular basis.

WG leader: Anneli Ritala (Anneli.Ritala@vtt.fi)

WG vice-leader: George Manganaris (george.manganaris@cut.ac.cy)

ACKNOWLEDGEMENTS

We would like to thank everyone who has so kindly contributed with the content present in this newsletter:

Antonio J. Meléndez Martínez and Cristina L. M. Silva for their guidance and supervision during the development of the EUROCAROTEN Newsletter.

Eirini Sarrou and Paula Mapelli Brahm who have kindly given their testimonies.

Anneli Ritala for her contribution to our EUROCAROTEN Interview.

Judith Hempel, Hendrik Pollmann and Ludmiła Bogacz-Radomska for their contribution to the Carotenoid of the Month rubric.

Torsten Bohn and Anneli Ritala in WG News.

This newsletter is part of dissemination strategy of COST Action EUROCAROTEN, supported by COST (European Cooperation in Science and Technology).

COST (European Cooperation in Science and Technology) is a pan-European intergovernmental framework. Its mission is to enable break-through scientific and technological developments leading to new concepts and products and thereby contribute to strengthening Europe's research and innovation capacities. www.cost.eu

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