

HOME

Dr. P. GANESAN

Scientist

Department of Molecular Nutrition

CSIR-Central Food Technological Research Institute (CFTRI)

Mysore – 570 020, Karnataka

E.mail: ganesanp@cftri.res.in; ganesan381980@yahoo.com

Phone (O): 0821-2514192

PROFILE

Education

MSc. with distinction (2002), Madurai Kamaraj University, Tamilnadu

PhD (2011), Kyoto University, JAPAN

Thesis: Studies on the characterization of molecular mechanisms underlying the anti-angiogenic and apoptosis-inducing potentials of marine algal carotenoids (Mentor: Prof. Takashi HIRATA)

Experience

From May 2014 to Till date, Scientist, CSIR-CFTRI, Mysore

From Jan. 2012 to May 2014 – Assistant Professor (Research), SRM Research Institute, Chennai

From Oct. 2011 to Jan. 2012 – Post-doctoral Researcher, Kyoto University, Japan

AWARDS

- Young Investigator grant from DBT – 2015-2018
- JSPS Post-doctoral Fellowship, Japan – 2014
- Young Scientist grant from DST-SERB – 2014-2017
- Merit Monbukagakusho Mext Scholarship, Japan – 2008 – 2011
- Travel grant (200 000 JPY) from Kyoto University Foundation, Japan – 2011
- Senior Research Fellowship, ICAR – 2002 -2006
- Distinction in Master degree, Madurai Kamaraj University, Madurai - 2002

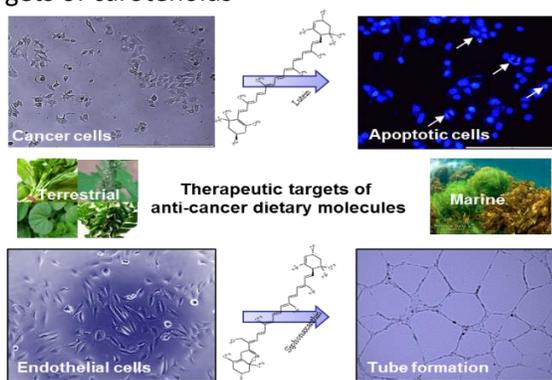
IMPORTANT PUBLICATIONS (Total No's – 28; Total citations - 941; h-index – 10)

- Niranjana R, Gayathri R, Nimish Mol Stephen, Miyashita K, Hirata T, Sugawara T, Ganesan P^S. (2015) Carotenoids modulate the hallmarks of cancer cells. *Journal of Functional Foods*. 18: 968-985
- Sugawara T, Ganesan P, Li Z, Manabe Y, Hirata T. (2014) Siphonaxanthin, a green algal carotenoids, as a novel functional compound. *Marine Drugs*. 12: 3660-3668
- Ganesan P, Matsubara K, Sugawara T, Hirata T. (2013) Marine algal carotenoids inhibit angiogenesis by down-regulating FGF-2-mediated intracellular signals in vascular endothelial cells. *Molecular and cellular Biochemistry*. 380: 1-9
- Ganesan P, Noda K, Manabe Y, Ohkubo T, Tanaka Y, Maoka T, Sugawara T, Hirata T. (2011) Siphonaxanthin, a marine carotenoid from green algae, effectively induces apoptosis in human leukemia (HL-60) cells. *BBA-General Subject*. 1810: 497-503

- Ganesan P, Matsubara K, Ohkubo T, Tanaka Y, Noda K, Sugawara T, Hirata T. (2010) Anti-angiogenic effect of siphonaxanthin from green alga, *Codium fragile*. *Phytomedicine*. 17: 1140-1144
- Prabhasankar P, Ganesan P, Bhaskar N, Hirose A, Nimishmol Stephen, Lalitha RG, Hosokawa M, Miyashita K. (2009) Edible Japanese seaweed, wakame (*Undaria pinnatifida*) as an ingredient in pasta: chemical, functional and structural evaluation. *Food Chemistry*. 115: 501-508
- Ganesan P, Chandini SK, Bhaskar N. (2008) Antioxidant properties of methanol extracts and its fractions obtained from selected Indian red seaweeds. *Bioresource Technology*. 99: 2717-2723
- Chandini SK, Ganesan P, Bhaskar N. (2008) *In-vitro* antioxidant activities of three selected brown seaweeds of India. *Food Chemistry*. 107: 707-713
- Jeyasekaran G, Ganesan P, Anandaraj R, Jeyashakila R, Sukumar D. (2006) Quantitative and qualitative studies on the bacteriological quality of Indian white shrimp (*Penaeus indicus*) stored in dry ice. *Food Microbiology*. 23: 526-533
- Jeyasekaran G, Ganesan P, Jeyashakila R, Maheswari K, Sukumar D. (2004) Dry ice as a novel chilling medium along with water ice for short-term preservation of fish Emperor breams, lethrinus (*Lethrinus miniatus*). *Journal of Innovative Food Science and Emerging Technologies*. 5: 485-493
- Jeyasekaran G, Ganesan P, Maheswari K, Jeyashakila R, Sukumar D. (2004) Effect of delayed icing on the microbiological quality of tropical fish, barracudas (*Sphyraena barracuda*). *Journal of Food Science*. 69: 197-200

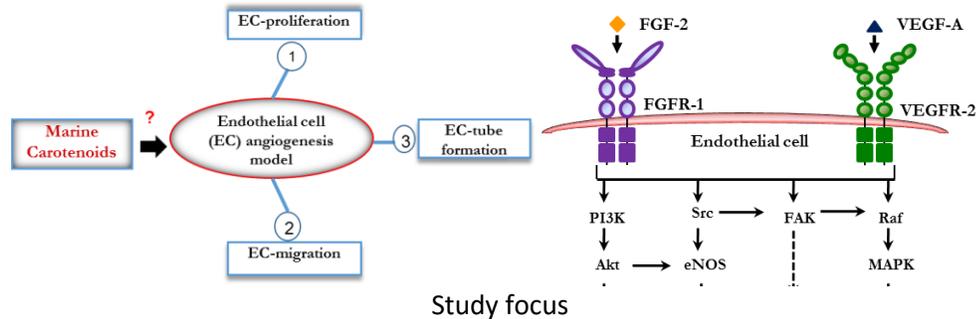
CURRENT AREA OF RESEARCH

A. Anti-cancer therapeutic targets of carotenoids



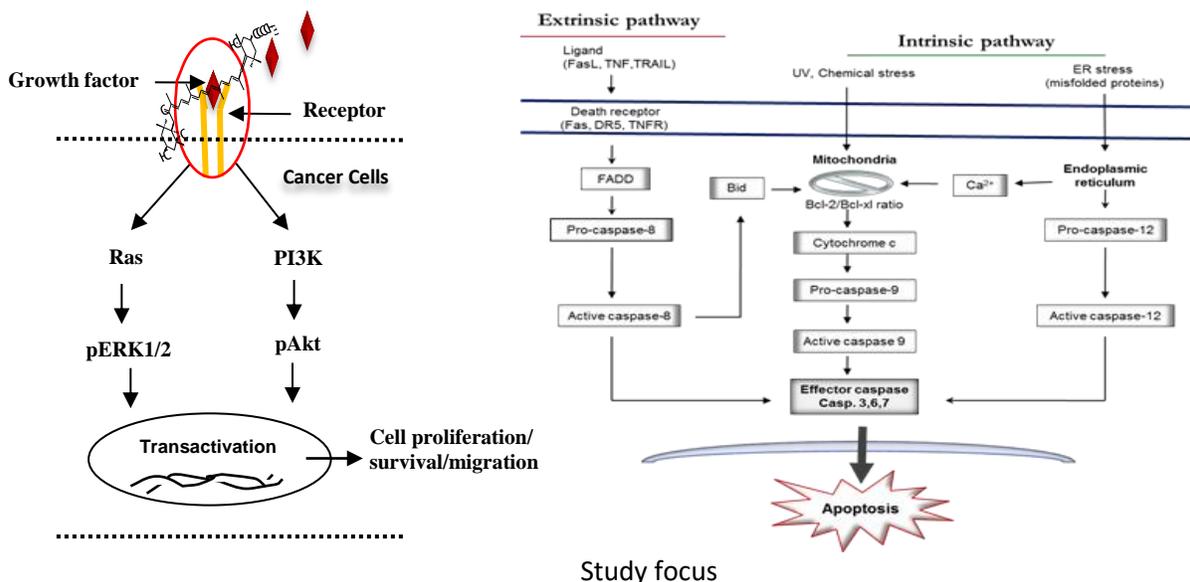
1. Targeting angiogenic signaling pathways (Endothelial cells as model)
 Angiogenesis (formation of new blood vessel) is the growth and remodeling process of the primitive network of blood vessel into a complex network. However, angiogenesis is activated under many pathological conditions especially tumor growth and metastasis. Thus, inhibition of angiogenesis would be a promising approach in the prevention of cancer and other pro-angiogenic diseases. Bioactive marine molecules have recently received considerable attention for their nutraceutical characteristics. Carotenoids from marine sources are structurally different from those found in terrestrial sources. However, scientific evidence on the bio-functional

properties of marine carotenoids is still very limited, and thus it is important to characterize the novel bio-functional activities of carotenoids from marine origin. Here, we aimed to evaluate the anti-angiogenic potential of carotenoids from marine resources and to characterize their possible molecular mechanisms.



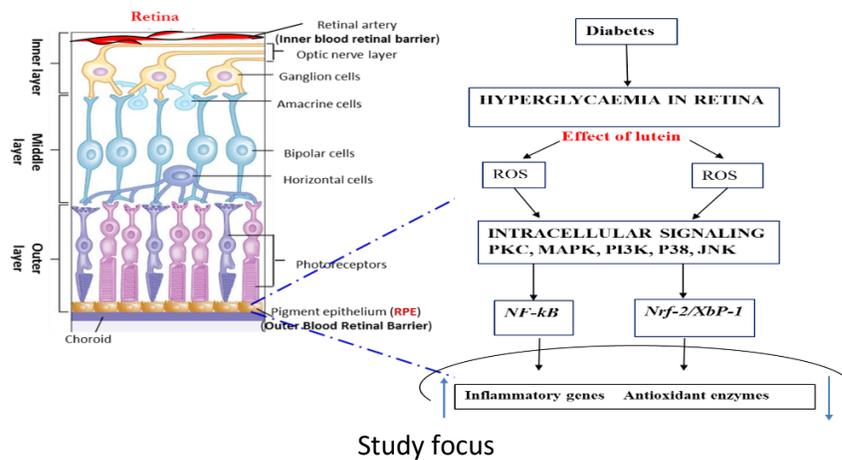
2. Targeting cell death and survival signaling pathways (in cancer cells- MCF-7, MDA-MB-231 and HepG2)

Besides having anti-oxidant property, phytonutrients can also modulate multiple cellular pathways that are crucial in the pathogenesis of various diseases including cancer. The signaling pathways which are targets of phytonutrients include phosphatidylinositol-3 kinase (PI3K), protein kinase B (Akt/PKB), protein kinase C (PKC) and mitogen-activated protein kinase (MAPK). Inhibitory or stimulatory actions on these pathways by carotenoids greatly affect cellular functions by altering the phosphorylation state of target molecules and by modulating gene expression. Mitogen-activated protein kinases (MAPKs) are members of distinct signaling cascades in the cell, and serve as focal points in response to a variety of extracellular stimuli. This signaling pathway has been implicated in cellular responses including inflammation, cell cycle, cell death, development, cell differentiation, senescence, and tumorigenesis. Since dysregulated cell cycle and resistance to apoptosis are the two major early-stage hallmarks of cancer cells, we are interested to elucidate the inhibitory role of carotenoids and other dietary active molecules on the growth of different cancer cells in molecular level.



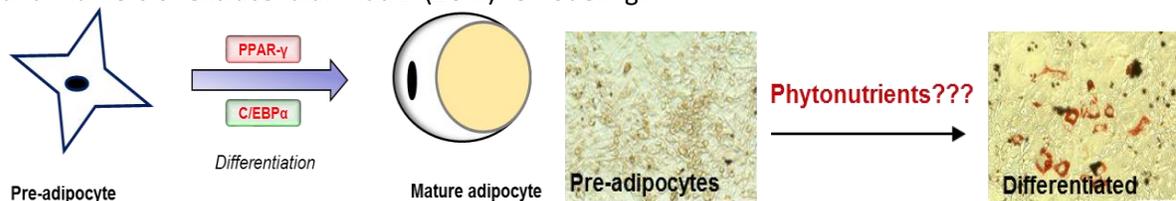
B. Combat diabetic retinopathy through phytonutrients (targeting retinal pigment epithelial (ARPE-19) cells)

One of our focuses is on diabetic retinopathy (DR), a sight-threatening complication of diabetes, is one of the major causes of blindness between the age group 20 and 70 years. Under diabetic condition, retinal cells including retinal pigment cells (RPE) experience increased oxidative stress due to sustained hyperglycemia which disrupt normal cellular metabolism leading to the development of retinopathy. Since the functional co-ordination between RPE, the outer blood retinal barrier and neighboring other retinal cells are essential for the integrity of the retina, any cellular and metabolic changes in RPE cause retinal dysfunction which leads to loss of visual function. Therefore, studies to identify small molecules that regulate glucose-induced oxidative stress and associated cell death in RPE would be an important approach to protect retina from damage. With this perspective, we here in this study proposed to characterize the regulatory mechanism underlying the glucose-induced cell death and redox markers by carotenoids in RPE cells.



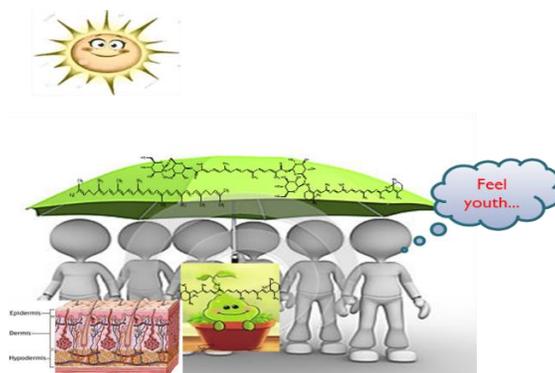
C. Modulatory effect of dietary molecules on adipocyte differentiation (3T3-L1 cells as model)

In this project, our aim is to bio-prospect phytonutrients that regulate the adipocyte differentiation by targeting the adipocyte differentiation markers. The high intensity of obesity and the lack of safe therapeutic agents have fueled an increase in anti-obesity drug related research. Obesity is an abnormal condition in which excessive fat is accumulated in adipose tissue. It has emerged as one of the biggest public-health concern today as it is a major risk factor for developing type II diabetes, cardiovascular disease, hypertension and certain types of cancer. In accordance with increasing prevalence of obesity, the number of type II diabetes cases is expected to increase by 150 % in India. Though adipose tissue serves as an endocrine organ that secretes many important signaling molecules, excess adipose tissue predisposes to several metabolic complications. Since adipocyte differentiation is an important adaptive response to excess nutrition and influences the metabolic outcome of obesity, this study would target the major regulators of adipogenesis, adipocyte expansion markers and markers of extracellular matrix (ECM) remodeling.



D. Protective effect of phytomolecules on skin damage (using human dermal fibroblast (NHDF) cells as study model)

We also interested to study the molecular aspects on the protective effect of dietary molecules against UVA-induced damage in dermal fibroblast cells. Generally, the human skin is continuously affected by environmental factors, and notably by UV radiation throughout our lifetime. Solar UV exposure is the major causative factor for about 80 % of visible signs of premature aging in the skin including irregular pigmentation, roughness, coarse wrinkles and laxity. This is mainly because of multiple cellular damage caused by reactive oxygen species (ROS) especially 1O_2 , $\cdot OH$ and H_2O_2 upon UV exposure (180-400 nm). Among UV rays, UVA (320-400 nm) penetrate more deeply in the dermis layer of the skin where it increases the production of ROS which in turn activate a wide range of transcription factors in skin cells resulting in inflammation, photoaging, and various skin disorders. Considering this perspective, nutritional means of protecting skin from UV-induced damage has recently been examined by several studies. However, the molecular mechanistic base approaches underlying those effects are very limited. With this background, our aim is to evaluate the molecular mechanisms on the protective effect of dietary phyto-antioxidants against UVA-induced damage in human dermal fibroblast cells, and further in animal models.



PEOPLE

1. Dr. P. GANESAN
Scientist & Group Leader
ganesanp@cftri.res.in
2. Arpitha, H.S.
UGC-JRF (From Feb. 2015...)
Arpitha.rf0681@cftri.res.in
3. Sowmya Shree, G.
RGNF-JRF (From Apr. 2016...)
sowmyashree.gopal@gmail.com
4. Yogendra Prasad, K.
Project (DST)-JRF (From Dec. 2014...)
prasadayogii@gmail.com

5. Deepika, U.R.
Project (DBT) – JRF (From Mar. 2016...)
deepurudresh@gmail.com
6. Priya Mondal
Project Assistant Level-II (From July 2016)

FEW CONFERENCE COMMUNICATIONS

- Sowmya Shree G, Arpitha HS, Yogendra Prasad K, Pratyusa C, Ganesan P^S. Isolation and characterization of β -carotene from *Chenopodium album* and its anti-cancer molecular mechanism in human breast cancer (MCF-7) cells. In: Abstract of the *International Conference on Stem Cells and Cancer* (ICSCC-2015) held at Pune during 02-05nd Oct. 2015 (**Received Best Poster Award**)
- Yogendra Prasad K, Arpitha HS, Sowmya Shree G, Pratyusa C, Ganesan P^S. Lutein isolated from *Spinacia oleracea* inhibits cell proliferation and induces apoptosis in human breast cancer (MCF-7) cells. In: Abstract of the *International Conference on Stem Cells and Cancer* (ICSCC-2015) held at Pune during 02-05nd Oct. 2015.
- Ganesan P^S, Nimish Mol Stephen, Niranjana R, Gayathri R, Sugawara T, Hirata T. Marine algal carotenoids exhibit anti-proliferative and apoptosis-inducing effects in colon (DLD-1) cancer cells. In: Abstract of the *International Conference on Stem Cells and Cancer* (ICSCC-2013) held at Mumbai during 19-22nd Sep. 2013
- Ganesan P, Matsubara K, Ohkubo T, Tanaka Y, Sugawara T, Hirata T. Evaluation on the anti-angiogenic activity of marine algal carotenoids. In: Abstract of the IFT 11 *Annual Meeting and Food Expo* – to be held on 11-14th June 2011 at **New Orleans, USA**.
- Ganesan P, Matsubara K, Ohkubo T, Tanaka Y, Sugawara T, Hirata T. Evaluation on the anti-angiogenic activity of marine algal carotenoids: Finding the molecular mechanism. In: *Abstract of the Annual Meeting of JOCS-2010* held at **Hakodate, Japan** on 15-17th Sep. 2010
- Ganesan P, Matsubara K, Ohkubo T, Tanaka Y, Sugawara T, Hirata T. Evaluation on the anti-angiogenic activity of marine carotenoids. In: *Abstract of the Annual Meeting of JSBBA-2010* held at **Tokyo, Japan** on 27-30th Mar. 2010
- Ganesan P, Matsubara K, Ohkubo T, Tanaka Y, Noda K, Sugawara T, Hirata T. Bio-functional properties of siphonaxanthin isolated from green alga, *Codium fragile*. In: *Abstract of the International Symposium on Seafood Processing Technology and Safety Control System* held at **Qingdao, China** on 31st Oct-2nd Nov, 2009
- Ganesan P, Prabhasankar P, Bhaskar N, Miyashita K. Antioxidative characteristics of pasta as influenced by incorporation of wakame (*Undaria pinnatifida*) as an ingredient. In: *Abstract of the 5th World Fisheries Congress* held at **Yokohama, Japan** on 20-25th Oct. 2008.

OPPORTUNITY

Motivated Master's candidates with valid fellowship can send their resume with research experience (if any) to ganesanp@cftri.res.in