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Cinnamon in Anti-Cancer Armamentarium: A molecular approach

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Radiotherapy is a mainstay treatment for many types of cancer, although it is still a large challenge to enhance radiation damage to tumor tissues and reduce side effects to healthy tissues. Radiosensitizers are promising agents that enhance injury to tumor tissue by accelerating DNA damage and producing free radicals. In this regard various phyto-components are being tested to be used in modulating radiation induced stress in the tumor cells. The polyphenolic compounds from plant sources are known to act as antioxidants in protecting cells from oxidative stress and can also exhibit prooxidant activity, which contributes to therapeutic functions attributed to flavonoids. This biphasic behavior of these compounds depends on concentration and free-radical source. Recent attention has been focused on employing such natural substances in combination therapy wherein administration of two or more substances with other treatment modalities like radiation or chemotherapy are being used to sensitize the cancer cells toward treatment. Further, such combinations may reinforce the drug effective concentration, intensify the combined effect of both administered therapeutics, exert cytotoxic effects specifically on tumor cells or may also reduce the development of resistance of the cancer cells by targeting multiple signaling pathways. In this perspective, our group initiated a program to probe into the efficacy of some selected active components of cinnamon, a frequently used spice in Asian countries, as a positive modulator of radiation induced damaging effects on tumour cells. Cinnamon as a whole and /or its active components exhibited significant antineoplastic activity in different types of cancer. Presently we are working to elicit the molecular mechanisms of action of cinnamon and its components on oncogenic regulators and related pathways. The anti-carcinogenic potential of cinnamon varies with the type of cancer and also depends on the administered active compound individually or in combination with some chemical or even extract of whole cinnamon. Presently, the in-vitro experimental program reflected ethyl cinnamate (EC) to exert potent radio sensitizing effects on radioresistant hepatocellular carcinoma cells (HepG2). A combination of EC and gamma-radiation showed increased ROS generation and mitochondrial membrane depolarization. Similar effects have been observed in phosphatidylserine externalization studies, where this combination showed potent apoptotic effects in hepatocellular carcinoma cells. These outstanding properties of this spice necessitate its incorporation in pharmaceuticals and/ nutraceuticals to explore possibilities of formulation of novel drug for treatment and prevention strategy of cancer.

Biography

Anindita Chakraborty, a Gold Medalist from University of Calcutta and an awardee of prestigious national scholarships and fellowships has completed her PhD from Jadavpur University, India. She is the Scientist–in-Charge of Stress Biology Division of Kolkata Centre of UGC-DAE Consortium for Scientific Research and has been working on cellular stress and molecular mechanisms of stress response. Her focus is to probe into effects of different stress factors on cellular dynamics with special reference to oxidative stress and cell signalling cascades. Her research unravels the link between failure to maintain homeostasis, cellular aberration and organismal pathologies, through study of signal transduction, cell cycle regulation, apoptosis, mitochondrial and/or nuclear DNA damage and genomic instability. She is also working on non-target effects of ionizing radiation highlighting cell signalling molecules and pathways involved in radiation induced bystander effects, aiming towards selective sensitization of tumour cells. Her contribution in the field of Trace element Sciences through studying role of trace elements in metabolomics to probe into elemental homeostasis and interaction of macro/micro elements with biological functions also deserves mention. She visited Australia, South America, China and several countries of Europe as invited speaker in International Conferences and delivered more than 20 seminar lectures and National and international conferences. She has over 120 publications with 1,166 Citations and has been serving as a reviewer for many reputed Journals.

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