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Index

Altered level of miR-100 expression impacted on cellular drug resistance in oral squamous cell carcinoma

Dr. Ruma Dey Ghosh

Abstract:

Cancer is a group of diseases characterized by uncontrolled cell division leading to the growth of abnormal tissue, which may be due to exposure to carcinogens, radiation, chemicals, infectious agents or inherited. Every year 10 million people are diagnosed with cancer and more than 6 million dies. Recently, it has been found that miRNAs might be an ideal candidate for using as biomarker for OSCC prognostication due to their stable expression in tissues and other body fluids like peripheral blood. In the present study, we have tried to understand the miRNA mediated regulatory mechanism in OSCC-prognostication. To achieve our goal, in the present investigation, we have used cisplatin-resistant (SCC25/R, SCC084/R and SCC131/R) cell lines and their parental cell lines (SCC25, SCC084 and SCC131). Here, the effect of has-miR-100 has been carried out mainly in the context of development of cisplatin resistance. Our studies revealed that miR-100 is significantly down-regulated in cisplatin resistant cell line (SCC25/R) compared to the parental cell line (SCC25). qRT-PCR results have sown that ABCB1 (gene for P-glycoprotein), BIRC5 (gene for surviving), and CTNNB1 (gene for β-catenin) expression were significantly increase in SCC25/R cells. The present study identified expression signature associated with miRNA mediated regulatory pathways which are responsible for differential patient-outcome in OSCC.

Exploring the excited state intramolecular proton transfer behavior of some carbazone derivatives: A theoretical screening study towards application as an active pharmaceutical ingredient

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Abstract

The term "Drug" being a complex one, comprises multiple components of specific requisite. The biologically active component of a targeted drug is termed as active pharmaceutical ingredient (API). Along with API, chemicals known as excipients also for an important part of the drug. Therefore, apart from actual drug, numerous chemicals form the overall composition, which needs to be biocompatible. Intrinsic studies on the compatibility of such API enable the finalization of this mixture of components which is scientifically termed as *formulation.* The authors of this research intend to study some selective carbazone derivatives which exhibits excited state intramolecular proton transfer property. The detailed mechanism of such process has been studied using density functional theory. Proton transfer takes place when the acidic or basic part of a molecule becomes stronger in the excited state which leads to the formation of a tautomer. The present approach involves DFT to study the geometric optimization of the targeted API systems which includes the computation of intramolecular bond distance of O-H during the transition state between the tautomeric forms.1,2 This is followed by screening of such system (s) for applicability as API through interaction of biomolecules. The selection of biomolecules viz proteins, metal ligand complex etc is based on the fundamental literature survey.**3** This study enables an initial screening for the interaction of carbazone derivatives with targeted biomolecules.

An overview of microRNA mediated regulation of TAM and EMT pathway in progression of breast cancer

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The most commonly diagnosed female malignancy with a major contribution to global cancer-related mortality is breast cancer. Development and progression of the metastatic stage of breast cancer and associated high mortality rate reported to be attributed to multitude of factors like epithelialto mesenchymal transition (EMT) of cancer cells, resultant enhanced migratory and invasive capacity together with elevated stemness of cells and CTC generation. The breast tumor microenvironment (TME) has elevated inflammation contributed by infiltrated immune cells, growth factors and cytokines among which tumor associated macrophages (TAM) accounts for more than 50% of the tumor mass. TAM is associated with the M2 phenotype due to its cytokine-mediated polarization by IL-4, IL-10, IL-13, TGF-β1, etc. in the hypoxic and necrotic areas of breast cancer TME. There the TAMs act as major TME remodelling mediator that promotes tumor progression and immune suppression by secretion of growth factors, pro-angiogenic factors, immunosuppressive factors and proteases and also by triggering the process of EMT where a downregulation of epithelial markers is accompanied by overexpression of mesenchymal markers. TAMs communicate with immune cells and tumor cells to induce EMT and tumor angiogenesis via JAK2/STAT3/miR-506-3p/FoxQ1 axis or by TGF-β and NFκB. Moreover, IL-6-mediated STAT3 upregulation inhibits E-cadherin and enhances Vimentin expression to advance the EMT. Therefore, TAM targeting has emerged as an attractive strategy for solid tumor therapeutic intervention.

In recent years, tumor-derived microRNAs with long half-life and significantly variable expression pattern in several diseases have been implicated as potential biomarkers for early diagnosis of cancer. They are salient in their contribution to tumor cell-stroma crosstalk through molecular reprogramming of effector functions of stromal components like TAM. Several reports implicated dysregulation of a plethora of microRNAs in cancer with protumoral and/or anti-tumoral activities that are engaged in macrophage polarization and subsequently inhibiting/ promoting initiation and progression of tumors. Therefore, both loss-of-function and gain-of-function approaches for the microRNAs can be used as therapeutic alternatives. Various regulatory factors of EMT are targeted by a group of microRNAs (miR-200 family, miR-141, miR-221). During tumor metastasis from breast tissue to secondary sites, expression of some microRNAs (miR-98, miR-27) are reported to be deregulated by the inflammatory cytokines secreted by TAMs which in turn promote EMT pathway and hence, the process of metastasis.
Thus, in breast cancer microRNAs can be a prime mediator of tumor progression and invasion through regulation of TAM activity and EMT pathway. Therefore, understanding the regulation of microRNA mediated macrophage and EMT pathobiology may have therapeutic options of immense prognostic value for breast cancer.

Terahertz Hyperthermia Technique for the Treatment of Hepatocellular Carcinoma: A Phantom Study

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Abstract

Thermal Abalation or Hyperthermia is an emerging treatment option for carcinoma. Hyperthermia refers to heat treatment to destroy cancer affected cells by increasing the temperature beyond 40^0C. This makes cancer affected cells more sensitive to EM radiation and furthermore improve the effect of cytostatic drugs. This treatment can be local/regional/whole body depending on the size and location of the tumor. In recent years researches have been carried out on Microwave Abalation/Hyperthermia study in connection to breast carcinoma. Hepatic carcinoma is now a matter of concern for Oncologists owing to its severe mortality rate. The authors in this paper have studied the effect of THz Hyperthermia/Abalation on selective destruction of cancer affected Hepatic cells in a minimal invasive way.

In this proposed Terahertz Hyper-thermic Oncology, tumors are exposed to localized heat by inserting a thin terahertz antenna into the cancerous tissues and the RF energy heats up the tumor under test, kills the cancer cells by producing a coagulated region. For doing the experiment a terahertz pulsed system is developed using Silicon material system. The power, frequency, time of exposure are predetermined through several experiments and considering the safety protocol. Special emphasis has been given in providing therapeutic benefit in a minimal invasive way, eliminating side-effects as much as possible. In this paper the authors have developed Phantom model with the properties of hepatic tissues/cells to mimic the real time appearance of cancer affected liver organ. The hepatocellular model has been developed using Comsol Multiphysics Simulator. In the study the tumor is presented as 3mm diameter sphere. The EM wave propagation in a coaxial cable is characterized by transverse electromagnetic (TEM) field. Bio-heat equations describing the time dependent heat transfer problem along with modified Maxwell's equations for hepatocellular carcinoma problem are studied subject to appropriate boundary conditions. Steady-state temperature distribution in the liver tissue for input power of 5W and 10W at 300GHz are studied. It is observed that the temperature is highest near the antenna and decreases with distance closer to the outer boundary of the Phantom. At a distant point from the antenna within the liver organ, blood manages to keep the tissue at normal body temperature. In addition to these the authors have studied the effect on surrounding cell damage under 2s, 5s and 10s of exposure times. It is revealed that 5s exposure time is the optimum as per as lowest surrounding cell damage and highest therapeutic efficacy are concerned.

To the best of author's knowledge this is the first study on terahertz hyperthermia technique in connection to hepatic carcinoma treatment. The observations will find immense applications in Oncoradiology/Radiotherapy.

Vitiated Synthesis of MASPIN in Breast Cancer by Insulin Engendered Diminution of Progesterone Receptor Number in Neutrophils:

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Key words: Breast-cancer, progesterone receptor, insulin, maspin, nitric oxide, neutrophils.

Purpose: The binding of either progesterone or insulin to their specific receptors on neutrophils has been reported to stimulate nitric oxide (NO) induced maspin synthesis in these cells. Experiments were carried out to determine the role of progesterone receptor interaction in the nitric oxide induced maspin synthesis in neutrophils that was preincubated with insulin.
Methods: progesterone receptor positive (PR+), progesterone receptor negative (PR–) neutrophils were isolated from the blood cancer subjects. Maspin was determined by enzyme linked immunosorbent assay after *in vitro* translation of maspin mRNA. NO was determined by methemoglobin method.

Results: Immunohistochemical studies of progesterone receptor (PR) demonstrated the presence of progesterone receptor in the normal peripheral neutrophils and less in number in PR+ breast cancer neutrophils. In contrast, PR– breast cancer neutrophils lacked the progesterone receptor, suggesting pathophysiological defects in the synthesis of PR protein in peripheral PR– neutrophils.
It was also found that as a result of incubation of neutrophils with insulin the binding affinity for progesterone to its receptor in normal neutrophils remained essentially unchanged which demonstrated Kd = 47.619 nM compared to Kd of the binding of progesterone is 46.08 nM in the normal neutrophils that were not pretreated with insulin. The progesterone receptors which were $11.5 \times 10_{10}$/cell in the untreated cells was found to be decreased to $8.2 \times 10_{10}$/cell ($p<0.005$, $n=6$) after the same cell were treated with 200μU of insulin.
The reduction of PR number on normal neutrophils due to the pretreatment with insulin resulted in the decreased NO induced maspin synthesis from 2.329 ± 0.012 nM to 1.410 ± 0.002 nM. Decreased PR number in PR+ breast cancer neutrophils due to disease condition and pretreatment with insulin reduced the maspin synthesis from 1.138 ± 0.024 nM to 0.555 ± 0.003 nM compared to normal control.
Conclusion: These results suggested that insulin down regulated maspin synthesis in normal and in breast cancer neutrophils by decreasing the progesterone receptor number in both cases

Comparison of Three Dimensional Conformal Radiotherapy and Intensity Modulated Radiotherapy in Cervix Cancer

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Abstract

To investigate the Dose Comparison of Three Dimensional Conformal Radiotherapy (3DCRT) and Intensity Modulated Radiotherapy (IMRT) underwent Computed Tomography (CT) simulation along with adequate immobilization and positioning devices. Planning Target Volume (PTV) and Organs at Risk (OARs) were delineated slice by slice for all patients. 3DCRT treatment plans were created by photon beam of 15 MV energy using 4-field box technique and Multi Leaf Collimator (MLC) fitted to the Planning Target Volume (PTV). IMRT plans were created by photon beam of 6 MV energy with equally distributed 7 directions gantry angel. We intend to deliver total 50 Gy in 25 fractions for all patients. Dose for the risk organs and planning target were recorded from the Dose Volume Histogram (DVH).

Artificial Intelligence tool for Cancer Detection

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Abstract

There has been rapid growth in the use of AI/D eep Learning and computer vision in medical diagnosis. Convolutional Neural Network based Deep Learning models are being used in etection of abnormalities in chest X-Rays, diabetic retinopathy, etc. This powerful technique could also be applied for the fast, automated detection of lung nodules and identification of cancer cells. IPR has developed multiple AI models for identification of abnormalities in chest X-Rays and identification of myco-bacilli. These developed AI tools involve CNN based models with huge number of layers. The AI tool functions and achieves the objectives with high specificity/accuracy. One of the AI model trained on 2200 individual single/multiple bacilli images has a mean average precision and average recall for a medium size area in the range of 0.88 and 0.92 respectively, on the test dataset Details of the technique will be reported in this paper.

Plasma for Cancer treatment and early detection

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Abstract

Plasma is the 4th state of matter and it is used in a variety of applications ranging from surface modification, coatings, waste material disposal, production of nano-particles, early detection of cancer, and medicine.

Nowadays, a recently developed plasma source known as an atmospheric pressure plasma jet (APPJ) is developed which can be used as a therapeutic for various biomedical applications such as blood coagulation, wound healing, dental applications, dermatology, and the recent one is cancer treatment. This device is developed indigenously and tested for various types of cancer cell lines to see its efficacy and selectivity against them.

In this work, we present the preliminary studies conducted with APPJ for gingivobuccal Squamous Cell Carcinoma (Tata Memorial Center, Mumbai), Breast Adenocarcinoma Cells (Tata Memorial Center, Mumbai), Lung cancer (A549 cell lines-Bhabha Atomic Research Center, Mumbai), and low-grade glioma (All India Institute for Medical Sciences, AIIMS, New Delhi). We have found cell viability of around 20 to 30 % after the treatment along with the increase in the ROS levels after the treatment. This study shows that this new technology may lead to being one of the adjunct technology along with the existing technologies.

Along with this, we have developed a process to make highly ordered arrays of metal nanoparticles which are active Surface Enhance Raman scattering (SERS) substrates. These SERS substrates can be used to detect various molecules at a very low concentration level. With the help of Tata Memorial Centre (TMC), Mumbai attempts were made to detect MCF7 breast cancer cells and drugs used in chemotherapy. Using nanoparticles Chromatin and Histones extracted from breast cancer cells were detected which are normally undetectable with simple Raman measurement. Research is being done to detect traces of cancer having few cancerous cells. We shall also be presenting some results of early detection of cancer.

Cancer 2022, March 6th - 7th, 2022, Hotel ITC Sonar, Kolkata, India).
List of invited Speakers/ Session Chairs/Experts

	Keynote Speaker **Dr. Saumen Das** MD, DM(oncology) DNB,MRCP,ESMO Netaji Subhas Chandra Bose Cancer Hospital Garia, Kolkata, West Bengal, India.
	Invited Speaker: **Dr.Dinesh Bhatia** Ph.D, North East Health University
	Invited Speaker: **Prof. Dr. Pranjal Phukan,** MD MD, Associate Professor & Head, Radiodiagnosis, North Eastern Indira Gandhi Regional Institute of Health & Medical Sciences, Shilong, India
	Keynote Speaker **Prof. Dr. M D Ray** MS, FRCS, PhD, Professor, Surgical Oncology, AIIMS – Delhi, India
	Invited Speaker: **Dr. Ruma Dey Ghosh** Cancer Research Scientist Netaji Subhas Chandra Bose Cancer Hospital. Garia, Kolkata, West Bengal, India.
	**Dr. Moumita Mukherjee**, M.Tech, Ph.D Dean(R & D), Adamas University Barasat, Kolkata, West Bengal, India. Ex. Sr. Scientist of DRDO Centre of Excellence (under Ministry of Defence, Govt. of India). Email: mm.adamasuniv@gmail.com
	**Prof. Dulal Acharjee,** M.Sc, M.Tech Chairman, Cancer 2022 and Director, Applied Computer Technology, Kolkata Website: http://actsoft.org, Email: dulal@actsoft.org, dulalacharjee@gmail.com and President, International Association of Science, Technology and Management Editor of the journal of Microsystem Technologies, SCI indexed, Springer-Nature.

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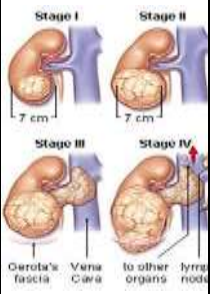

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