**Extended Abstract**
Volume 6-2, 2020

Journal of Oncology Translational Research

Open Access

# Radio Frequency Electromagnetic Waves Induce Cancer Cell Death

**Muhammad Bhatti*, Juan Lopez and Megan Keniry**

*The University of Texas Rio Grande Valley, USA, E-mail: muhammad.bhatti@utrgv.edu*

**Keywords:** Electromagnetic Waves; Cancer Cell; Radio Frequency

## Abstract

The primary objective of this research is to study and interpret the natural physics phenomenon of electromagnetic resonance in one end closed cavity for the eventual purpose of cancer treatment. Radio Frequency waves are released into a coaxial cavity filled with a small amount (1.6 mL) of breast cancer cells (BT549) and the reflection as well as the power input is measured to determine the absorption power into cancer cells. When the reflection of the RF waves from the uploaded sample of cancer cells is at its lowest power, the RF Frequency is noted and seen to be approximately close to the resonant frequency of that cavity. This cavity can potentially be used as a control method of testing RF frequencies on various types of cancer cells, such as the available BT549 cancer cell line obtained from the UTRGV Biology Department. 70% confluent basal breast cancer BT549 cells were grown in RPMI mammalian cell culture media with 10% fetal bovine serum (FBS) and 5% penicillin/streptomycin (P/S: from 10,000 U/mL stock solution) in 5% CO2. Samples were treated with 2 mL of 0.25% trypsin solution to detach cells from petri plates; cells were centrifuged at 100 x g for 5 minutes at room temperature to pellet. After this, cells were then re-suspended in fresh RPMI media (with 10% FBS and P/S). The cell density was 250,000 cells per mL at the time of RF treatment. The determined frequency for 1.6 mL of sample article was found to be within the range of radio frequency, but there is much room for improvement in our method, depending on the coaxial cavity design such as length and the radii of the coaxial tubes which is currently under investigation. Some initial results were obtained which showed that the electromagnetic waves induced cancer cell death as assessed by MTT cytotoxicity assays. These assays measure the reduction of MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) by mitochondrial reductases leading to the formation of purple formazan. MTT assays are commonly employed to detect decreased mitochondrial metabolic activity and cell death. The ability of RF waves to induce death in BT549 cells highlights a potential new intervention for poor prognosis basal breast cancer cells in the future.

**Introduction:** Radio frequency is a measurement which represents the oscillation rate of electromagnetic radiation spectrum, or electromagnetic radio waves, from frequencies ranging from 300 GHz to as low as 9 kHz and radiofrequency ablation for cancer is a minimally invasive procedure that uses electrical energy and heat to destroy the cancer cells. Radiofrequency ablation is sometimes used to treat cancers in the: adrenal gland, breast, bone, kidney, liver, lung, pancreas, and thyroid. Electromagnetic resonance is produced by applying steady magnetic field simultaneously and electromagnetic radiation, usually radio waves to a sample of electrons and adjusting both the strength of the magnetic field and the frequency of the radiation to produce absorption of the radiation.

While chemotherapy and other treatments that are taken by mouth or injection usually expose the whole body to cancer-fighting drugs, radiation therapy is usually a local treatment, which means it is usually aimed at and affects only the part of the body that requires treatment. Radiation treatments are planned in such a way that they damage cancer cells with as little harm as possible to nearby healthy cells. Some cancers are very sensitive to radiation. Radiation may be used by itself in these cases to make the cancer shrink or completely disappear. In some cases, chemotherapy or other anti-cancer drugs may be given first and for other cancers, radiation may be used before surgery to shrink the tumor (this is called pre-operative therapy or neoadjuvant therapy), or after surgery to help keep the cancer from coming back (known as adjuvant therapy). Radiation not only kills or slows the growth of cancer cells; it can also affect nearby healthy cells and the damage to healthy cells can cause side effects.

Cancer cells harbor diverse genetic mutational spectra and gene expression profiles that enable uncontrolled growth and survival. Breast cancer can be classified into at least five subgroups luminal A, luminal B, HER2 positive, basal and normal-like based on gene expression profiling. These subtypes of breast cancer are associated with distinctive characteristics such as cell fate and prognosis. Basal breast cancer typically lacks expression of the progesterone, estrogen and HER2 receptors and is associated with poor prognosis. Basal breast cancer is more commonly found in younger and African American patients. Oftentimes, breast cancer is treated with hormonal-based therapies or targeted therapy to HER2. However, basal breast cancer is resistant to hormonal and HER2-targeted therapies as these cancers lack the receptors necessary to elicit a response. Therefore, innovative therapies are needed to effectively treat basal breast cancer. On a cell biological level, the ultra-high frequency RF waves are thought to broadly disrupt cellular processes including metabolism, migration, mitotic spindle function and differentiation. Some studies implicate RF waves in possibly promoting cancer. Yet, if RF treatment leads to catastrophic cellular damage followed by death preferentially in cancer cells in comparison to normal cells, it may prove an efficacious therapy for difficult to treat cancers. Basal breast cancer may be particularly sensitive to RF treatment as this type of cancer commonly has extensive chromosomal abnormalities, potentially making disruptions of the mitotic spindle especially toxic. In this study, we examined the impact of ultra-high frequency RF wave treatment on basal breast cancer cell BT549 viability.

**Biography:** Professor Muhammad Bhatti received PhD. From the University of Notre Dame, IN, USA. He completed postdoctoral studies from the University of Vanderbilt. He has been serving as a professor at the University of Texas Rio Grande Valley in the department of Physics. He has published more than 50 papers in reputed journals and has been serving as an editorial board member of repute and serving as manuscript reviewer for several prestigious journals.