Investigation of Cancer Types Using Synchrotron Technology for Proton Beam Therapy: An Experimental Biospectroscopic Comparative Study

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Abstract. In the current study, we have experimentally and comparatively investigated and compared malignant human common cancers' cells, tissues and tumors such as Bladder Cancer, Breast Cancer, Colorectal Cancer, Endometrial Cancer, Kidney Cancer, Leukemia, Liver, Lung Cancer, Melanoma, Non–Hodgkin Lymphoma, Pancreatic Cancer, Prostate Cancer, Thyroid Cancer and Non–Melanoma Skin Cancer using synchrotron technology for proton beam therapy before and after irradiating of synchrotron radiation process using some modern biospectroscopic techniques and methods. It is clear that malignant human cancer cells, tissues and tumors have gradually transformed to benign human cancer cells, tissues and tumors under synchrotron radiation with the passage of time using synchrotron technology for proton beam therapy.

Key words: Cancer, Synchrotron Technology, Proton Beam Therapy

Introduction

Synchrotron technology for proton beam therapy have recently come to the fore front of photochemical research due to their attractive electronic, chemical, biological, pharmaceutical, clinical, medical and medicinal properties (Heidari 2015; Heidari 2016; Heidari 2017). Since their discovery, synchrotron radiations have attracted great attention which is of practical importance in a variety of fields such as catalysis, hydrogen storage, electrical and thermal conductivity, field emission and human cancers' prevention, diagnosis and treatment (Heidari 2016; Heidari 2017). Also, synchrotron radiations have been introduced as photo/electro Nano catalysts and recent studies demonstrated that their photo/electro–active sites are edge plane–like sites/defects which can occur at the ends of the human cancer cells, tissues and tumors or along the proton beam therapy where human cancer cells, tissues and tumors compartments terminate and can promote the proton transfer reaction of a wide range of biologically and environmentally significant species (Heidari 2016; Heidari 2017).

Using synchrotron technology has been studied for several years. But nowadays, many methods and techniques proposed to adapt using synchrotron radiations to the cancer chemistry attitude. One such method is supporting proton beam on a solid phase (human cancer cells, tissues and tumors) which cause reduction of cancer waste and enhancement of the catalytic efficiency. Therefore, various synchrotron technologies are reported in human cancer prevention, diagnosis and treatment procedures. We chose one of them, proton beam therapy, which is a relatively newly discovered Nano catalyst.

In this work, we have used this Nano catalyst for investigation of Bladder Cancer, Breast Cancer, Colorectal Cancer, Endometrial Cancer, Kidney Cancer, Leukemia, Liver, Lung Cancer, Melanoma, Non–Hodgkin Lymphoma, Pancreatic Cancer, Prostate Cancer, Thyroid Cancer and Non–Melanoma Skin Cancer using synchrotron technology for proton beam therapy as an experimental biospectroscopic technique. According to the cancer chemistry literatures, synchrotron radiations have several chemical, pharmaceutical, biological, clinical, medical and medicinal applications (Heidari 2015; Heidari 2016; Heidari 2017). It is therefore desirable to find improved and more efficient reaction conditions especially in line with cancer chemistry protocol. Through this background, we wish to report a high–yield, cancer chemistry compatible procedure for the prevention, diagnosis and treatment of Bladder Cancer, Breast Cancer, Colorectal Cancer, Endometrial Cancer, Kidney Cancer, Leukemia,

Liver, Lung Cancer, Melanoma, Non–Hodgkin Lymphoma, Pancreatic Cancer, Prostate Cancer, Thyroid Cancer and Non–Melanoma Skin Cancer using synchrotron technology for proton beam therapy in solvent–free conditions. That is, we did not employ any solvent in the reaction, which is one of the main guidelines of the cancer chemistry attitude.

Materials, Research Method and Experimental Techniques

The application of synchrotron radiation in chemical transformation is of great practical importance, both in laboratory and industrial scale applications; however, the development of new synchrotron radiation processes is still in the focus of recent researches. Synchrotron radiation results in the formation and collapse of micro scale human cancer cells, tissues and tumors and generating local high temperature, the human cancer cells, tissues and tumors are thought to work as the reaction field and to promote the reaction.

Comparable with traditional methods and techniques, this method is more convenient and can be easily controlled. Synchrotron radiation has been used in heterogeneous chemistry for several years. Immobilization of Nano catalysts on insoluble organic and inorganic supports appears to be a good way to render them practicable and improve their stability and show other advantages with respect to recovery and reuse. However, the activity of heterogeneous Nano catalysts is often less than that of soluble ones, whereas under synchrotron radiation higher activity and stability of the supported Nano catalysts has been observed, so that their activity is comparable to homogeneous catalytic systems.

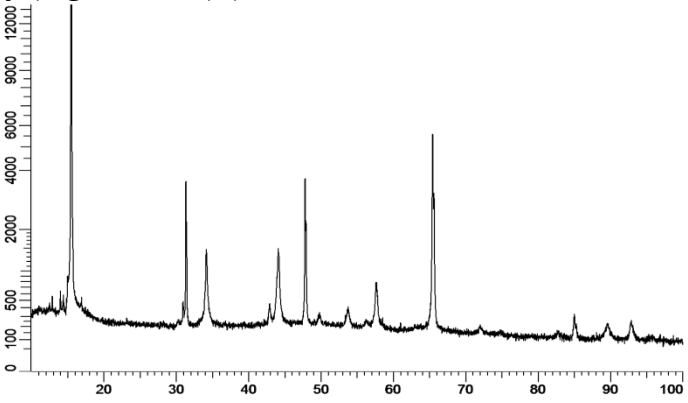
However, one the most attractive fields for oncologists is working on preparing Nano catalysts which are more eco–friendly. Through this attempt, one of the proposed solutions is using polymer–supported Nano catalysts. Many kinds of these Nano catalysts have been used widely in research and in process cancer chemistry due to their easy recovery and high efficiency but their use is getting restricted because of easy damage of the different treatment methods and techniques such as radiation therapy, surgery, chemotherapy, targeted therapy and so on (Heidari 2015; Heidari 2016; Heidari 2017). To overcome this problem, some researches changed the expensive synchrotron radiation to synchrocyclotron radiation having a covalently anchored organic and clinical spacer. In this way, we can support harmful waste on human cancer cells, tissues and tumors to gain anti–cancer Nano catalysts. Therefore, we chose a newly discovered synchrocyclotronic–based anti–cancer Nano catalyst as a good example of this category.

Substituted synchrocyclotron radiations are an important class of anti–cancer beams which also exhibit a wide spectrum of biological, chemical, pharmaceutical, clinical, medical and medicinal activities. According to this background, we have managed to find an eco–friendly procedure for the preparation of substituted synchrocyclotron radiations. We have used a typical synthetic method in conjunction with the above Nano catalyst and we have found that synchrocyclotron radiations can be made in high yields under proton beam therapy conditions by our modern and novel comprehensive method and technique.

Results and Discussion

In the current study, we have experimentally and comparatively investigated and compared malignant human common cancers' cells, tissues and tumors such as Bladder Cancer, Breast Cancer, Colorectal Cancer, Endometrial Cancer, Kidney Cancer, Leukemia, Liver, Lung Cancer, Melanoma, Non–Hodgkin Lymphoma, Pancreatic Cancer, Prostate Cancer, Thyroid Cancer and Non–Melanoma Skin Cancer using synchrotron technology for proton beam therapy before and after irradiating of synchrotron radiation process using some modern biospectroscopic techniques and methods. It is clear that malignant human cancer cells, tissues and tumors have gradually transformed to benign human cancer cells, tissues and

tumors under synchrotron radiation with the passage of time using synchrotron technology for proton beam therapy (Figures 1–14) (Heidari 2015; Heidari 2016; Heidari 2017).



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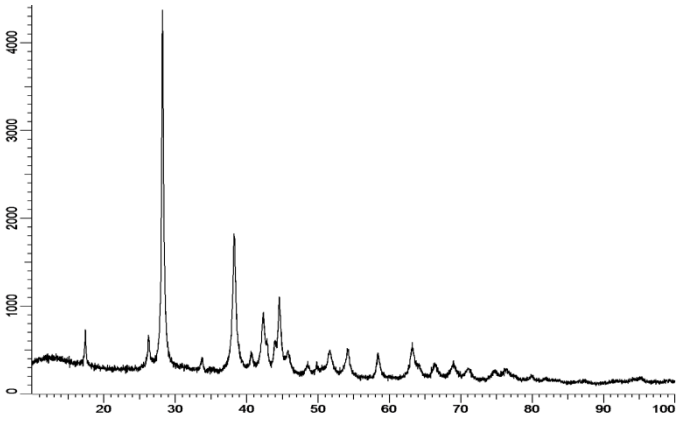

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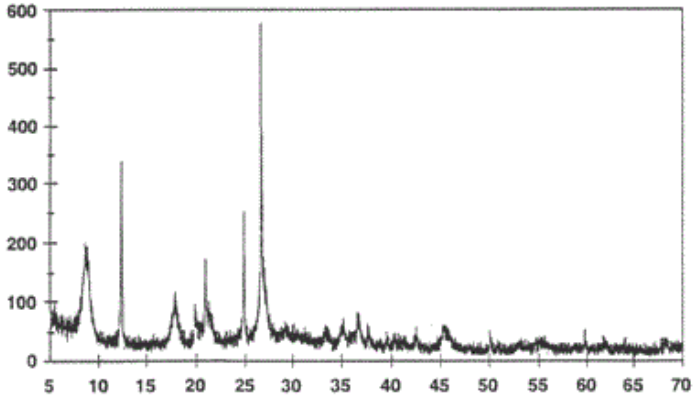
Figure (1): Biospectroscopy analysis of malignant Bladder Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Bladder Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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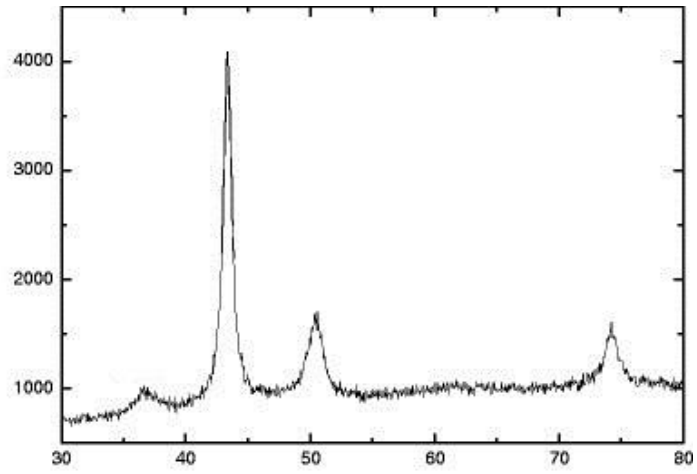

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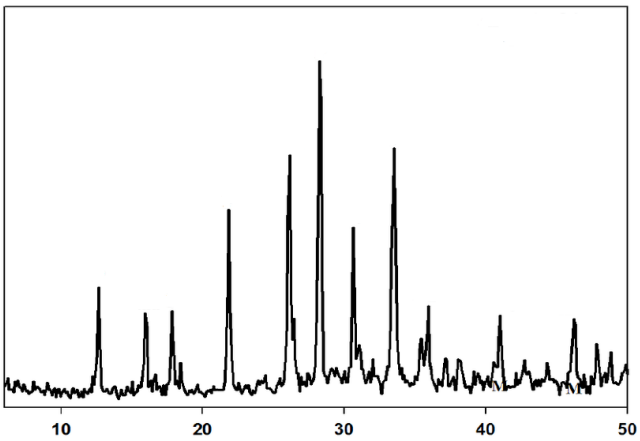
Figure (2): Biospectroscopy analysis of malignant Breast Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Breast Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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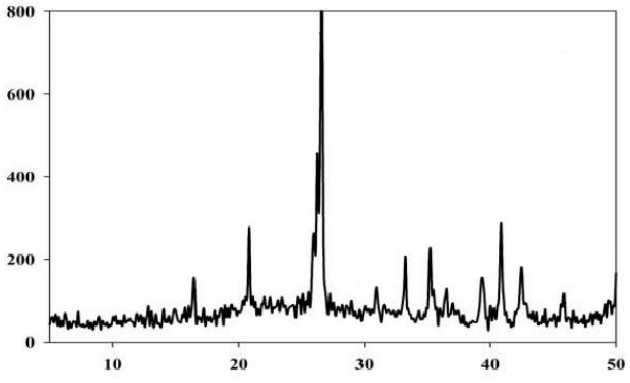

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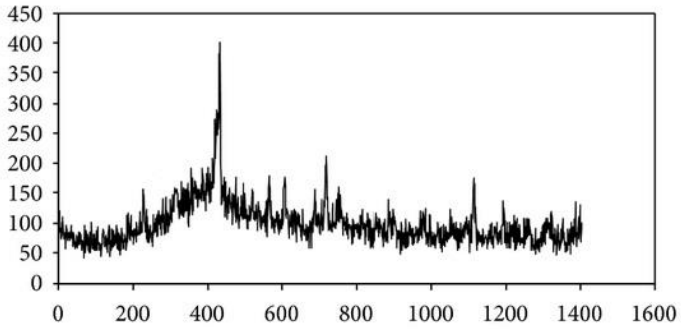
Figure (3): Biospectroscopy analysis of malignant Colorectal Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Colorectal Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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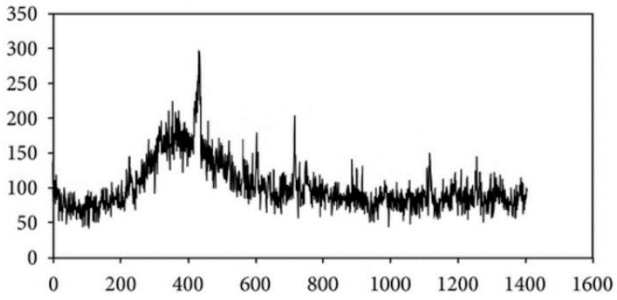

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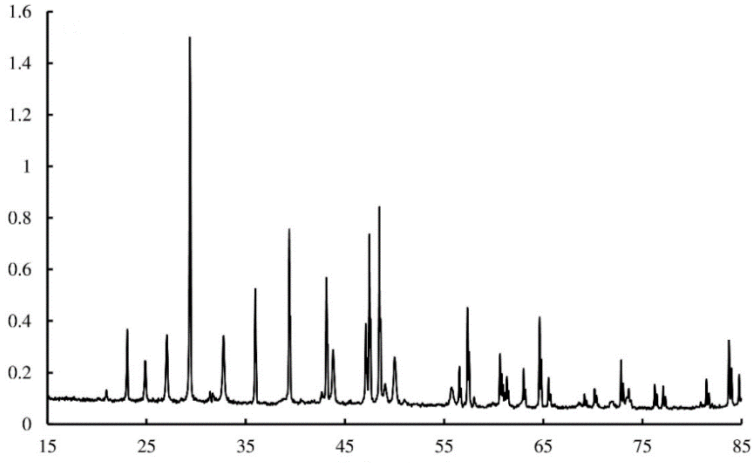
Figure (4): Biospectroscopy analysis of malignant Endometrial Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Endometrial Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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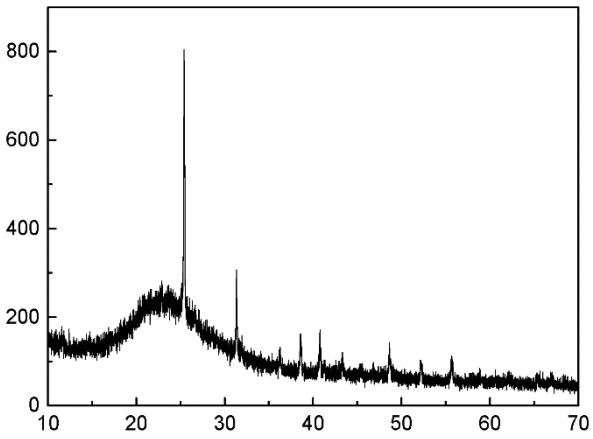

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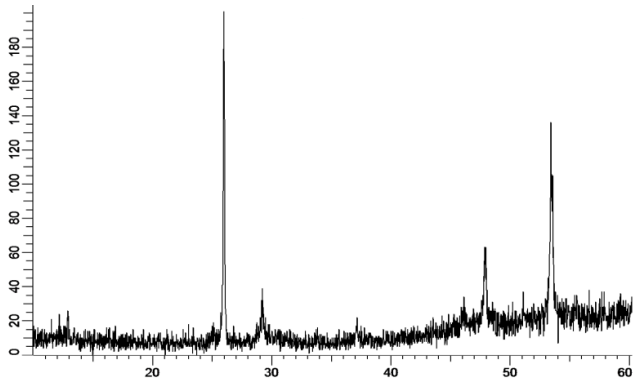
Figure (5): Biospectroscopy analysis of malignant Kidney Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Kidney Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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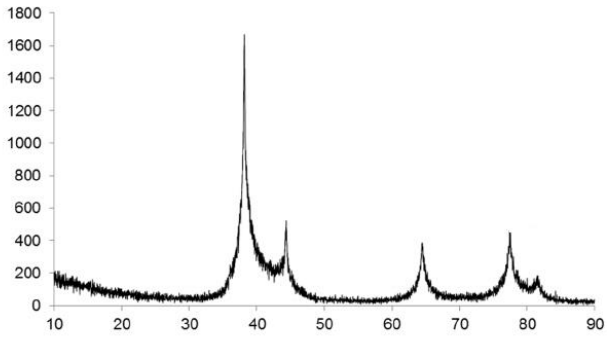

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Figure (6): Biospectroscopy analysis of malignant Leukemia cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Leukemia cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).

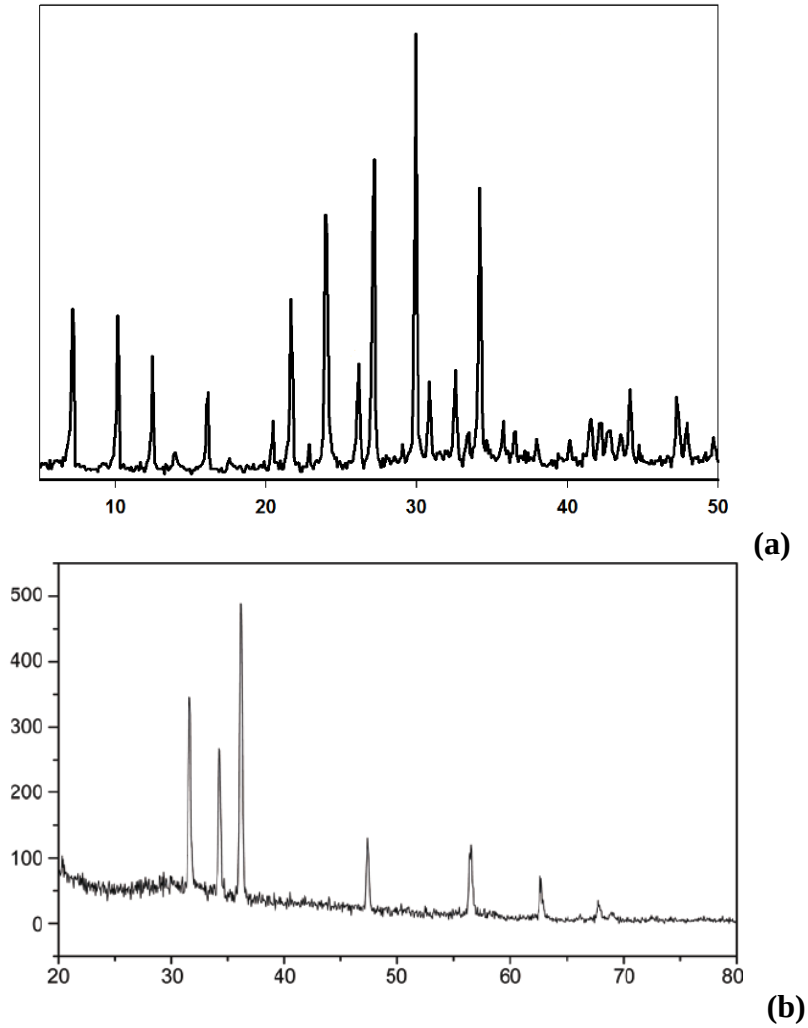
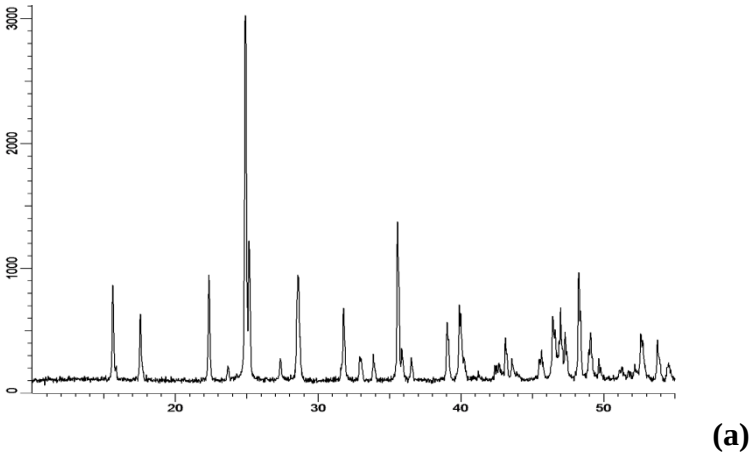


Figure (7): Biospectroscopy analysis of malignant Liver cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Liver cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



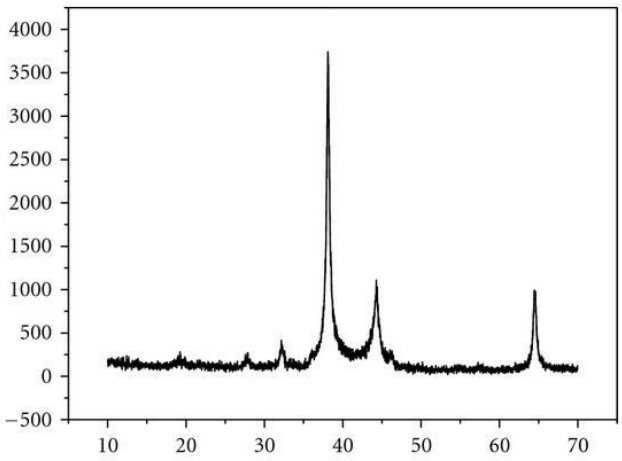


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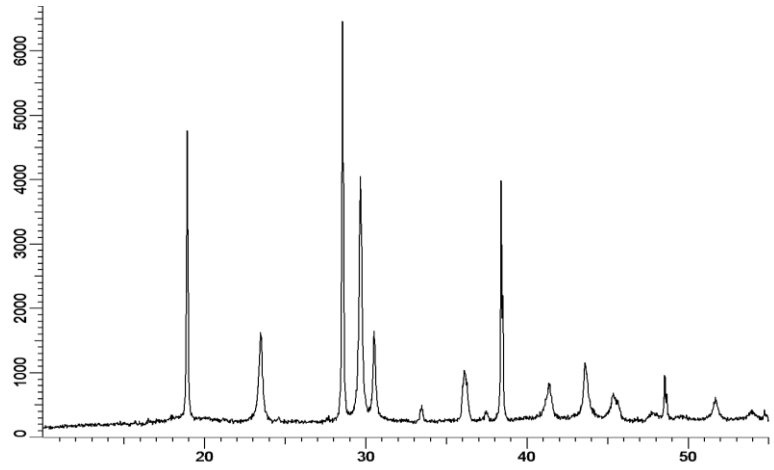
Figure (8): Biospectroscopy analysis of malignant Lung Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Lung Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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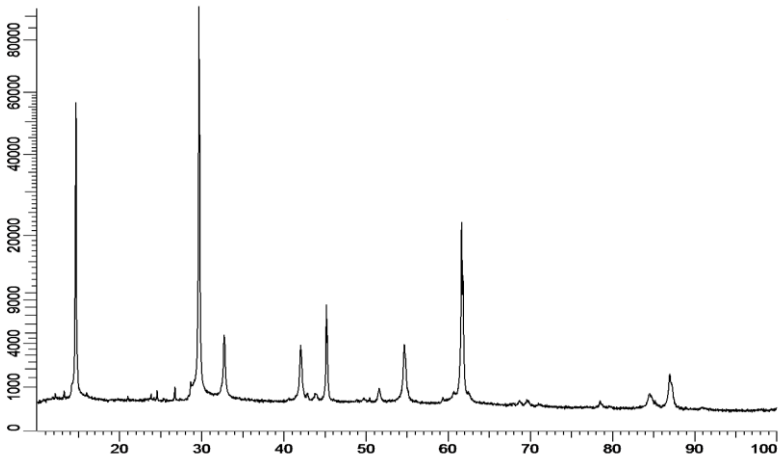

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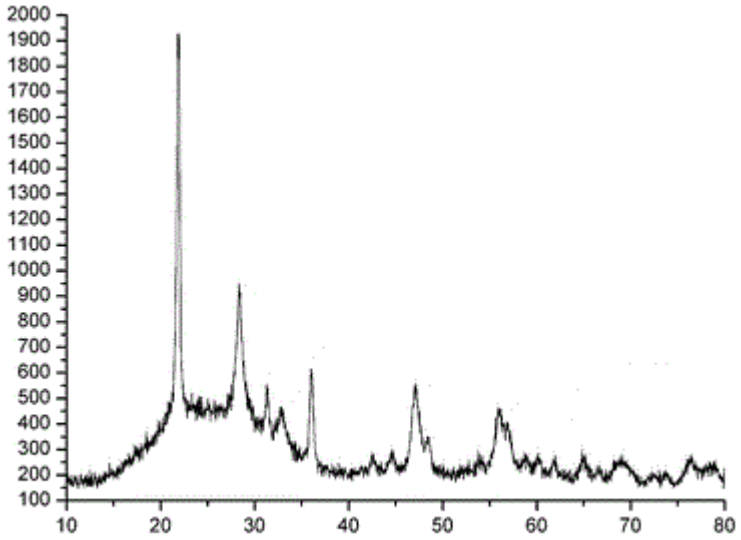
Figure (9): Biospectroscopy analysis of malignant Melanoma cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of

synchrotron radiation in transformation process to benign Melanoma cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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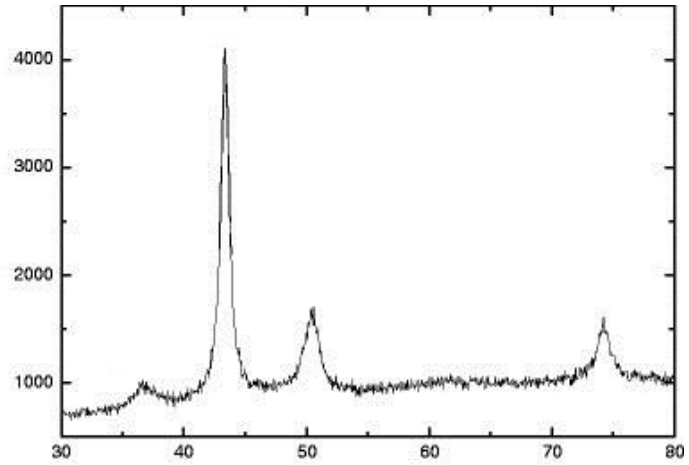

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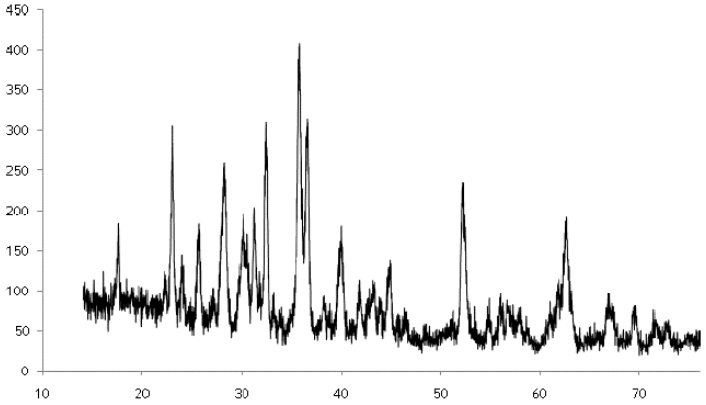
Figure (10): Biospectroscopy analysis of malignant Non–Hodgkin Lymphoma cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Non–Hodgkin Lymphoma cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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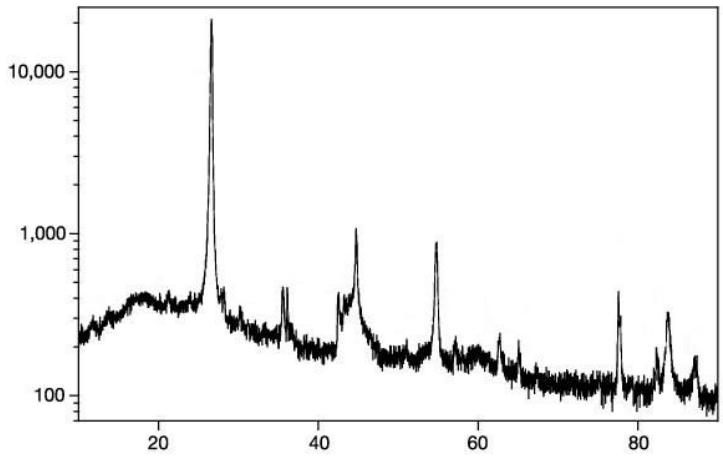

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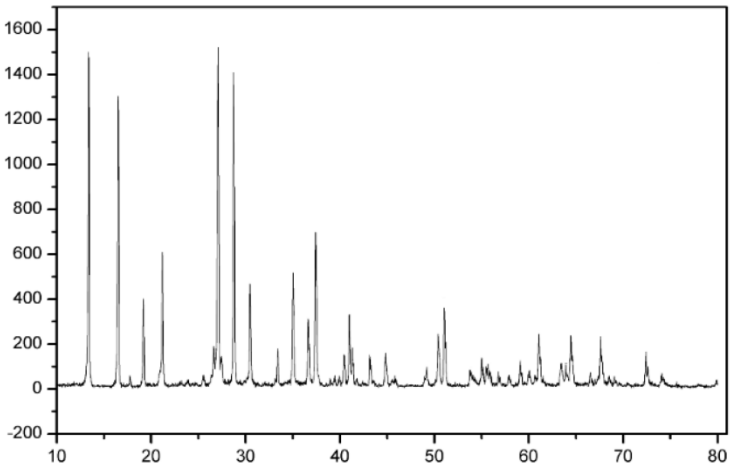
Figure (11): Biospectroscopy analysis of malignant Pancreatic Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Pancreatic Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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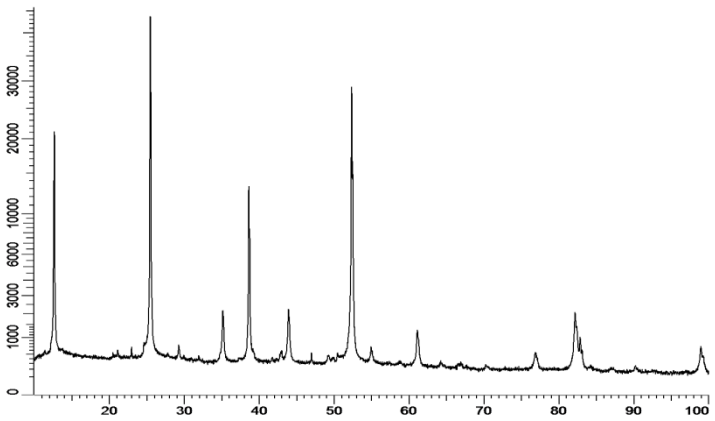

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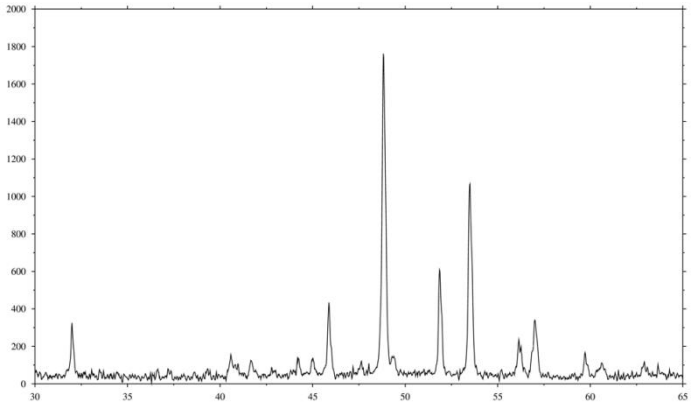
Figure (12): Biospectroscopy analysis of malignant Prostate Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of

synchrotron radiation in transformation process to benign Prostate Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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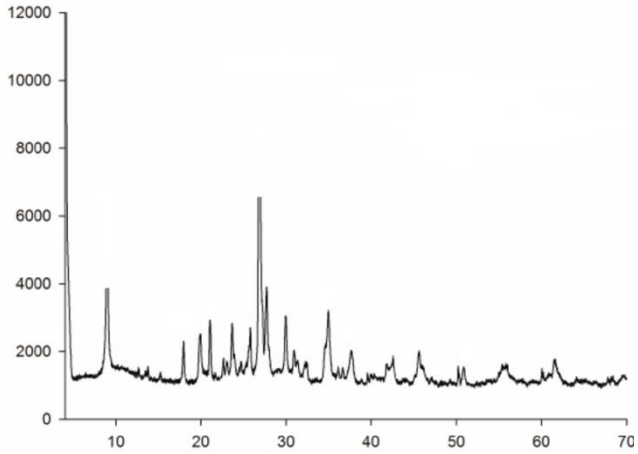

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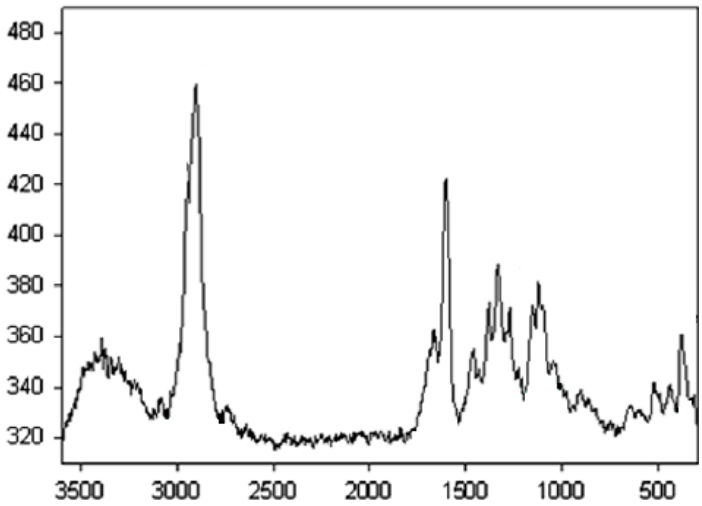
Figure (13): Biospectroscopy analysis of malignant Thyroid Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Thyroid Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).



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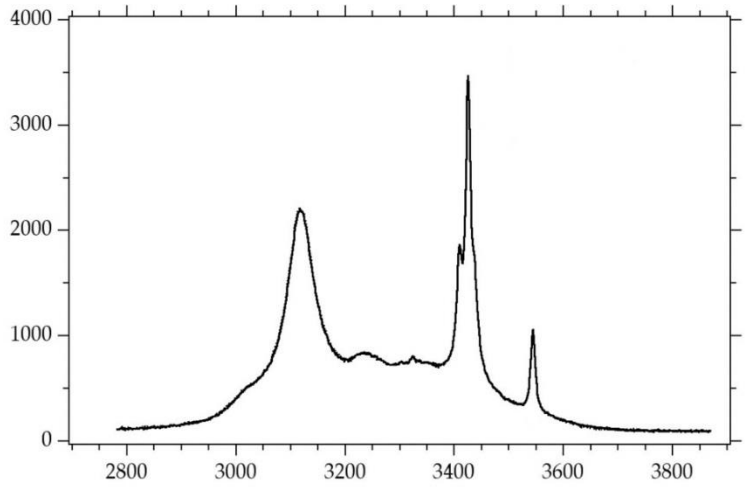

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Figure (14): Biospectroscopy analysis of malignant and Non–Melanoma Skin Cancer cells, tissues and tumors using synchrotron technology for proton beam therapy (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign Non–Melanoma Skin Cancer cells, tissues and tumors with the passage of time (Heidari 2015; Heidari 2016; Heidari 2017).

Conclusion

It can be concluded that malignant human cancer cells, tissues and tumors have gradually and clearly transformed to benign human cancer cells, tissues and tomurs under synchrotron radiation with the passage of time using synchrotron technology for proton beam therapy. It should be noted that in all of the figures y–axis shows intensity and also x–axis shows energy (keV). In addition, malignant human cancer cells, tissues and tomurs were exposed under white synchrotron radiation for 30 days. Furthermore, there is a shift of the spectrum in all of spectra after irradiating of synchrotron radiation that it is because of the malignant human cancer cells, tissues and tomurs shrink post white synchrotron irradiation with the passage of time using synchrotron technology for proton beam therapy.

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