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Gordon

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[54] **CANCER TREATMENT METHOD**

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Related U.S. Application Data

[63] Continuation of Ser. No. 457,715, Jan. 13, 1983, abandoned, which is a continuation of Ser. No. 96,413, Nov. 21, 1979, abandoned.

[51] **Int. Cl.**[4] **A61N 1/42**

[52] **U.S. Cl.** **128/1.3;** 128/422; 604/20

[58] **Field of Search** ..... 128/1 R, 1.1, 1.3, 1.5, 128/422, 736, 804; 604/20, 21; 424/1.1, 9, 85, 147; 514/824, 889

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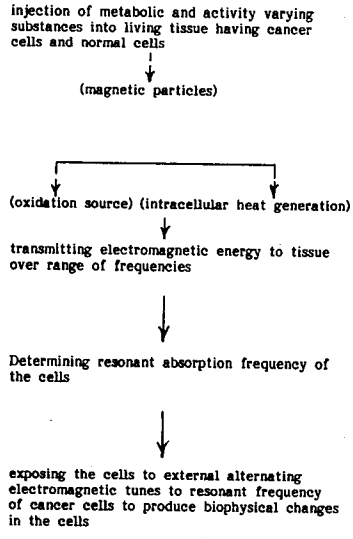
[57] **ABSTRACT**

A process for the treatment of cancer by the application of external electromagnetic energy capable of achieving biophysical alterations in the intracellular structure of cancer cells in living tissue, including stimulation of intracellular production of interferon. The process accomplishes these biophysical alterations by tuning an external electromagnetic energy to the resonant energy absorption frequencies of the intracellular structure of the selected cells and then exposing the subject to this tuned electromagnetic energy field. Alternatively, the field can be tuned to the frequency which has been calculated to be closest to the resonant frequency of the cancer cells and furthest from the resonant frequency of the normal cells. The process may be further enhanced by the intracellular absorption of selected materials designed to alter the magnetic susceptibility and therefore the resonant energy absorption frequency of the intracellular structure.

17 Claims, 1 Drawing Figure



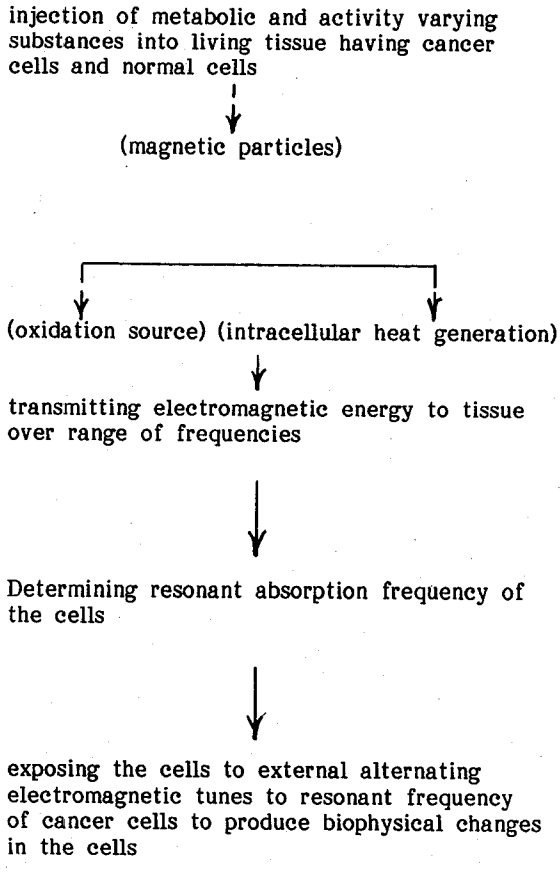

injection of metabolic and activity varying substances into living tissue having cancer cells and normal cells
(magnetic particles)
(oxidation source) (intracellular heat generation)
transmitting electromagnetic energy to tissue over range of frequencies
Determining resonant absorption frequency of the cells
exposing the cells to external alternating electromagnetic tunes to resonant frequency of cancer cells to produce biophysical changes in the cells

Fig. 1

CANCER TREATMENT METHOD

This is a continuation of co-pending application Ser. No. 457,715, filed on Jan. 13, 1983, now abandoned, which is a continuation of application Ser. No. 096,413, filed on Nov. 21, 1979, now abandoned.

INTRODUCTION

This invention relates generally to a process for the treatment of cancer in living tissues and is an extension of the technology described in U.S. Pat. No. 4,106,488 issued Aug. 15, 1978; and U.S. Pat. No. 4,136,683 issued Jan. 30, 1979. More particularly, the present invention relates to method for achieving biophysical alterations in the intracellular structure of cells. These biophysical alterations include thermal changes, stimulation of the intracellular production of interferon, stimulation of the intracellular production of prostaglandins, and the treatment of cancer by intracellularly killing the cancer cells without injuring the normal cells.

BACKGROUND OF THE INVENTION

There are presently a number of methods and techniques for the treatment of cancer, among which may be included: radiation therapy, chemotherapy, immunotherapy, and surgery. The common characteristic for all of these techniques as well as any other presently known technique is that they are extracellular in scope; that is, the cancer cell is attacked and attempted to be killed through application of the killing force or medium outside of the cell; the only known exception being, U.S. Pat. No. 4,106,488, Cancer Treatment Method, Robert Thomas Gordon, issued Aug. 15, 1978, of which this invention is an extension of the technology therein described.

The extracellular approach is found to be less effective because of the difficulties of penetrating the outer membrane of the cancer cell that is composed of two protein layers with a lipid layer in between. Of even greater significance is that in order to overcome the protection afforded the cell by the cell membrane in any extracellular techniques, the attack on the cancer cells must be of such intensity that considerable damage is caused to the normal cells resulting in severe side effects upon the subject. These side effects have been found to limit considerably the effectiveness and usefulness of these extracellular treatments.

A safe and effective cancer treatment has been the goal of investigators for a substantial period of time. Such a technique to be successful in the destruction of the cancer cells must be selective in effect upon the cancer cells and produce no irreversible damage to the normal cells. In sum, cancer treatment must selectively differentiate cancer cells from normal cells and must selectively weaken or kill the cancer cells without affecting the normal cells.

It has been known that there are certain physical differences that exist between cancer cells and normal cells. One primary physical difference that exists is the temperature differential characteristics between the cancer cells and the normal cells. Cancer cells, because of their higher rates of metabolism, have higher resting temperatures compared to normal cells. In the living cell, the normal temperature of the cancer cell is known to be 37.5° Centigrade, while that of the normal cell is 37° Centigrade. Another physical characteristic that differentiates the cancer cells from the normal cells is

that cancer cells die at lower temperatures than do normal cells. The temperature at which a normal cell will be killed and thereby irreversibly will be unable to perform normal cell functions is a temperature of 46.5° Centigrade, on the average. The cancer cell, in contrast, will be killed at the lower temperature of 45.5° Centigrade. The temperature elevation increment necessary to cause death in the cancer cell is determined to be at least approximately 8.0° Centigrade, while the normal cell can withstand a temperature increase of at least 9.5° Centigrade.

It is known, therefore, that with a given precisely controlled increment of heat, the cancer cells can be selectively destroyed without injury to the normal cells. On the basis of this known differential in temperature characteristics, a number of extracellular attempts have been made to treat cancer by heating the cancer cells in the body. This concept of treatment is referred to as hyperthermia. To achieve these higher temperatures in the cancer cells, researchers have attempted a number of methods including inducing high fevers, utilizing hot baths, diathermy, applying hot wax, and even the implantation of various heating devices in the area of the cancer.

Presently, none of the various known approaches to treat cancer have been truly effective and all have the common characteristic of approaching the problem by treating the cancer cell extracellularly; the only known exception being, U.S. Pat. No. 4,106,488, Cancer Treatment Method, Dr. Robert Thomas Gordon, issued Aug. 15, 1978. The outer membrane of the cancer cell being composed of lipids and proteins, is a poor thermal conductor, thus making it difficult for the application of heat by external means to penetrate into the interior of the cell where the intracellular temperature must be raised to effect the death of the cell. If, through the extracellular approaches of the prior hyperthermia techniques, the temperatures were raised sufficiently to effect an adequate intracellular temperature to kill the cancer cells, many of the normal cells adjacent the application of heat would be destroyed as well.

It has been known that the nuclei of cancer cells and the nuclei of normal cells possess some differences. The alterations which occur in a cell to produce malignancy either take place in, or are transmitted to, the nucleus. This is evident by the fact that the cells produced by tumor cell multiplication possess the same characteristics as the original tumor cell.

A large amount of work has been done "in vitro" concerning the magnetic resonant frequencies of cancer tissues as compared to those of normal tissues. Differences have been attributed to differences in the amount of water present in the cancer cells and the way in which the water molecules are ordered. A key to this process lies in the nuclear differences, including energy changes characteristic of structural and conformational changes in the deoxyribonucleic acid and the histones of the nucleus, including their relationship, resulting in differential resonant frequencies for the cancer cells from the normal cells.

A further key to this process is the additional changes in intracellular biophysical characteristics which occur in this process. Included in these changes is the intracellular production of interferon and/or prostaglandins. The production of interferon in the past has been shown to be triggered by foreign agents or materials which alter the internal biophysical characteristics of the cell

by increases in the intracellular temperature or energy levels.

Due to the unstable characteristics of interferon and prostaglandins, even if interferon and prostaglandins were to be synthesized and subsequently injected intravascularly into a subject, the effectiveness of the synthesized interferon and/or prostaglandins would be limited due to the loss of time between injection into the subject and the time when the synthesized interferon and/or prostaglandins would reach the cellular level where their effectiveness is required. Interferon and prostaglandins are most effective when their production is stimulated intracellularly so that their peak effectiveness and potential are utilized, where required, intracellularly.

OBJECT OF THE INVENTION

It is therefore the purpose and principal object of the present invention to selectively destroy cancer cells by achieving biophysical alterations in the intracellular structure of the cancer cells while producing no significant effects upon the normal cells. The biophysical alterations include thermal changes, the stimulation of the intracellular production of interferon and/or the stimulation of the intracellular production of prostaglandins. In addition, the present invention provides a technology for the detection of cancer cells wherever they exist in the body.

SUMMARY OF THE INVENTION

A treatment of cancer by the application of external electromagnetic energy capable of achieving biophysical alterations in the intracellular structure of cancer cells in living tissue. These biophysical alterations include thermal changes, the stimulation of intracellular production of interferon and the stimulation of intracellular production of prostaglandins. The process comprises accomplishing these biophysical alterations by tuning the external electromagnetic energy to the resonant energy absorption frequencies of the intracellular structure of the selected cells. Alternatively, the field can be tuned to the frequency which has been calculated to be closest to the resonant frequency of the cancer cells and furtherest from the resonant frequency of the normal cells. The process may be further enhanced by the intracellular absorption of selected materials designed to alter the magnetic susceptibility and therefore the resonant energy absorption frequency of the intracellular structure. The biophysical differences between diseased cells and normal cells make possible the selective absorption of materials thereby enhancing the differences in magnetic susceptibilities between diseased cells and normal cells resulting in an increased capability of selective energy absorption by diseased cells. This technology has diagnostic applications in the detection of cancer cells in combination with the use of differential resonant frequencies, magnetic resonance and electron spin resonance techniques. The process will have application in the treatment of a wide range of diseases at the cellular level, particularly, in the field of cancer where this mode of affecting the thermal characteristics and of stimulating the intracellular production of interferon and/or prostaglandins in the diseased cells will be effective in the selective destruction of cancer cells without injuring the normal cells and tissue.

DESCRIPTION OF THE INVENTION

The present invention achieves a precise increment of heat rise within the cancer cell and within the cytoplasm. The thermal barrier that characteristically exists as the outer membrane or cell wall of the cell is now utilized as a means of retaining the heat produced within the cell, rather than, as in the past, preventing any heat build-up within the cell. On the basis of the cell resting temperatures and the temperature necessary to produce cell death, the increment that the cell temperature must be raised to cause the cell death is critical. For the normal cell, the temperature rise is 9.5° Centigrade, while in the cancer cell the temperature rise is approximately 8.0° Centigrade. Thus, any temperature rise in the cancer cell or in the normal cell that is at least 8.0° Centigrade and not more than 9.5° Centigrade above the normal cell temperature results in the selective destruction of the cancer cell without any harmful effects to the normal cell.

In accordance with the present invention, there are found to be a number of approaches that can successfully achieve the end result of an intracellular heat rise and an intracellular destruction of the cancer cell.

In its simplest and broadest aspect, the invention contemplates the use of the differential resonant frequencies of cancer cells and normal cells to allow significant energy absorption into the cancer cells at their specific resonant frequency while allowing very little energy absorption into the normal cells. The nuclei of the cancer cells (the DNA, histones, etc.) besides often being different in content, usually differ in conformation and binding from the nuclei of normal cells (the DNA, histones, etc.). These differences contribute to the variance in the resonant frequencies between the structures in cancer cells and in normal cells. This difference between the cancer cells and the normal cells being nuclear in origin, is transmitted to the daughter cancer cells formed by cell division and explains the daughter cells' propensity towards malignancy.

A tuning fork will resonate, absorbing energy, from sound produced by another tuning fork of the same pitch (frequency) twenty or thirty feet away. If a variety of structures were placed within the effective range of a high frequency electromagnetic field, those structures having the same resonant frequency as the electromagnetic field will absorb energy from the field. Therefore, by placing the subject within the effective range of the high frequency electromagnetic field and by tuning the frequency of this field to the specific resonant frequency of the cancer cells, the cancer cells will then absorb energy from this electromagnetic field resulting in the raising of their intracellular temperature and the affecting of their biophysical properties so as to selectively destroy the cancer cells without affecting the normal cells.

Computerized axial tomography techniques are combined with an electromagnetic field generator and detection receiver sensing techniques to obtain three-dimensional data on specific point resonant energy absorption at a range of frequencies. The resonant frequency of the cancer cells being different from that of the normal cells will serve to identify the location of the cancer cells.

One possible configuration would embody the subject being placed within a large helical coil and the entire coil energized by a high frequency generator so that the entire subject would be within the effective