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OPINION

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A new growth is for a new life - A new hypothesis

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Introduction

Cancer is a unique group of diseases with certain common hallmarks. There are several hypotheses regarding cancer. This hypothesis is complementary to the existing hypotheses and theories on cancer.

Hypotheses

I consider that humans and animals develop cancer due to an error during an attempt to enhance their reproduction the basic function of a living organism [1]. Cancer is a genetically unstable growth evolved while attempting asexual reproduction by mutations promoted by the gametogenic genes (cancer testis genes) and the growth is seen, often when sexual reproduction is stopped at old age.

Supporting arguments

Growth is a sign of life and in the human body active growth occurs either to increase the size and number or for repair and healing. The growth stops as the purpose for the growth is achieved at the completion of adulthood or at the completion of wound healing. Unfortunately, the cancer growth does not stop because the purpose of growth (reproduction) is not achieved. This continuous growth (limitless replication) spreads (tissue invasion) and leads to the fatal outcome in cancer. The intention of growth is not to kill but to create.

Reproduction is the most important function of a living organism. Many organisms (octopus) die immediately after reproduction. Living organisms do everything possible to achieve reproduction. There is a strong instinct for reproduction in humans too. Several organisms have both sexual and asexual methods of reproduction. Often only one method is active and the other method may be dormant. Dormant method can get activated when the dominant method is not functioning satisfactorily. Humans get cancer often when the sexual reproduction is stopped at the old age. The dormant asexual reproduction method gets reactivated in humans at old age. But it fails to perform due to the absence of essential asexual reproduction genes in humans.

The common risk factors for cancer are old age, use of tobacco, use of alcohol, obesity etc. They are risk factors for infertility too. Human fertility rate is reducing and the semen quality is deteriorating in the developed world. Incidence of cancer are above world average in communities and countries where fertility rate is below the world average. Examples are south Korea, Singapore and Italy. It was observed that there was high risk of cancer associated with female infertility [2]. Never married adults had higher cancer incidence [3]. Humans are the only organism supressing reproduction. Often sexual reflexes are supressed to get social respect and to avoid religious out cast and punishments. (when a reflex is repeatedly supressed, the reflex may disappear) Humans use many methods to stop reproduction and to enjoy sex without reproduction. The strong association of cancer with infertility is seen in animals too. Cancers are common among the animals moving for extinction due to insufficient reproduction. Examples are Tasmania devils and Sea lions. This is because the infertility is triggering asexual reproduction process or the tumorigenesis. There is a trade-off between reproduction and cancer defence in mammals [4].

There is a strong association of cancer with reproductive organs. Reproductive organs in the human body is around 10 to 15% of the total body mass. But cancers of the reproductive organs are very common. Breast cancer is the most commonly diagnosed cancer in women and prostate cancer is the most commonly diagnosed cancer in old men. This is in spite of prophylactic removal of several reproductive organs to prevent cancer. Women get cancer more frequently if the breast is not used for breast feeding a child and prostate cancer rate increases in sterility and when ejaculation frequency is low. Only on breast feeding the body gets the feedback that the child is surviving and sexual reproduction is successful. Breast feeding reduces ovarian cancer risks too [5].

There is an association of embryo genesis with tumorigenesis. There are a lot of similarities between early embryo development and tumorigenesis, both at biological behaviour and at molecular basis [6]. Developmental biologists thought cancer a special vital phenomenon that is the product of natural selection with respect of cancer cells, although the result of this selection is unfavourable for human health and normal development. Prof. Lloyd J Old noticed that primordial programmes were reactivated in cancer. He noticed that cancers activate the gametogenic program of spermatogenesis, oogenesis and placentation. He found that different cancers have a predilection for activating only one or other of the gametogenic programs. He even named cancer a 'somatic cell pregnancy'[7]. The p53 gene regulate sexual reproduction as well as cancer. There are similarities between an invading cancer and the trophoblast.

Cancer is not just a bunch of abnormal cells. It contains normal blood vessels and nerve fibres. It was observed that cancer contains many normal cells too and thought that it was like a loosely structured organ. Just an error in cell division cannot produce normal blood vessels. Hence it is a failed attempt for either making an organ or an embryo. It should be an error in the sophisticated process for asexual reproduction.

Errors in reproduction and other biological process are common in nature. "Look around you at all the beauty, complexity and verity of life we live in a world of mistakes governed by chance" [8]. Sexual reproduction errors are common in living organisms including plants. Examples are sterility, miscarriages, molar pregnancy, several congenital anomalies of the new born etc. Molar pregnancy does not have an embryo. Products of reproductive errors need not have an embryo always.

Immune evasion is one of the hallmarks (emerging traits) of cancer [9]. During immunotherapy we train the immune system especially the T cells to attack cancer cells. The immune check point inhibiters allow the T cells to kill the cancer cells. We know that normally the immune system shall not attack the reproductive tissue. The placenta and amniotic membranes are not attacked by the immune system of the mother. Even a surrogate pregnancy is not attacked by the normal immune system. Surgeons use amniotic membrane for transplantations in burns etc to avoid immune reaction. Hence the immune evading cancer can be a reproductive tissue.

Zebra sharks are sexually reproducing fish. When they are kept in

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aquariums separated from the males they reproduce by asexual method [10]. Switching from sexual reproduction to asexual reproduction do occur in fish and other animals. Parthenogenesis is known process in the animal world. It is possible that since humans do not have all the required genes for successful parthenogenesis, the growth becomes cancer.

Cancer growth often contains cancer testis genes [11]. These are a group of proteins manufactured almost exclusively by cancers and the germ-line cells producing sperms and eggs. The function of cancer testis genes in cancer is not clearly understood. About 90 % of these genes have the distinguishing features of mRNA expression in testis & cancers and no or highly restricted mRNA expression in normal adult somatic cells. Why the gametogenic genes (cancer testis genes) are associated with cancer? These gametogenic genes are most probably promoting cancer. Hence it could be a reproductive process. Cancer cells contain telomerase enzyme seen in reproductive organs. (This prevents telomer shortening and helps for limitless multiplication of the cancer cells) Cancer growth is not influenced by growth hormone. But sex hormones can influence certain cancer growth. Association of gametogenic genes with cancer strongly suggest that cancer is a failed reproductive process.

Large-size nucleus is one of the characters of cancer cells. Reproductive cells like sperms have large nucleus. Cancer cells have free mobility. The sperm and cancer cells have free mobility. Association of these characters of cancer cells with reproductive cells is relevant.

Spontaneous regression and cure of cancer is a known phenomenon [12]. It may not be very common but it exists. There is no universally acceptable explanation for spontaneous regression and cure. Spontaneous miscarriages are common. A good number of miscarriages occur even before the woman knows about the pregnancy (chemical pregnancy). I consider spontaneous cure of cancer may be a spontaneous miscarriage of the 'somatic cell pregnancy'. The association of spontaneous cure of cancer and spontaneous miscarriage of a pregnancy is relevant. (The somatic cell pregnancy does not have a placental protection. Hence toxins and microbes from the blood can easily reach cancer- the somatic cell pregnancy. (Zika virus can destroy the cancer medulloblastoma). Viral oncolysis is a new method of treatment for cancer evolving) [13].

Old age is the major risk factor for cancer. But cancer incidence reduces in very old age. The incidence is less after the age of eighty-five. In very old age reproduction drive is less even for the asexual reproduction. (In a rose plant we use matured old branches for asexual reproduction. Neither the tender young stems nor the very old stems are used for growing a new plant by asexual reproduction.)

Ectopic pregnancy is a fatal error in the sexual reproduction process of humans. This error is often treated and destroyed successfully using the drug methotrexate [14]. Methotrexate is effective in treating certain cancers (Acute Lymphoblastic leukaemia, non-Hodgkins's lymphoma) too. Cancers are responding to the embryo toxic drugs. A new growth destroyed by embryo toxic drug is probably reproductive tissue.

One of the existing hypotheses was that cancer was due to an error while responding for the demand for repair and proliferation of a diseased organ [15]. Another hypothesis was cancer arise from the stem cells or germ cells [16]. Both hypotheses are partly correct. It is due to a demand by the body for repair of the whole body - a reproduction and creation of the whole body not one organ. Cancer arising from the germ cells (reproductive cells) is for reproduction and not for development of a killer growth disease. There is mutation in cancer but the mutation is not by accident but by intention for reproduction.

A group of scientists thought that cancer was a virus disease. Another group of scientists thought that cancer was a genetic disease. It is true that certain genes encourage the development of the cancer. The reproduction process ends up in cancer because of the deficiency in the asexual reproduction genes in humans.

Another group thought that cancer was a metabolic disease (anaerobic glycolysis - Warburg effect). The cancer cells are changing metabolism to promote growth and survival [17]. But these changes are occurring during the process of development of a 'somatic cell pregnancy' without a placenta and without foetal haemoglobin. Cancer cells are trying to grow and survive even in the hypoxia?

Another group thought that cancer was due to the accumulation of DNA mutations. It is true that DNA mutations are there in cancer. But these mutations are in an attempt to achieve another method of reproduction. (Mutations occur in bacteria while developing drug resistance).

Another view was that cancer was not a single disease but multiple diseases caused by different factors. It is true that there are a lot of difference between different types of cancers. But there are some common hallmarks of cancer in all of them. Different risk factors may be associated with different types of cancers. But the basic character is the same. Most cancers are genetically unstable [18]. This is probably because it is a new reproductive process in the developing stage.

The asexual reproduction hypothesis is complimentary to the existing cancer theories and hypotheses. I feel that we develop cancer because of a strong asexual reproduction drive in the absence of essential asexual reproduction genes in humans. (In the living organism sexual reproduction usually occurs at young age and asexual reproduction usually occurs at old age.)Cancer risk factors are basically of two types. There are risk factors interfering with sexual reproduction (stimulating asexual reproduction) and there are risk factors causing repeated tissue damages & repairs. And there are risk factors acting both the ways. Examples are undescended testis causing infertility, sharp tooth repeatedly causing mucosal damage and repair and chewing tobacco causes local tissue damage and repair as well as reduces fertility. A good number of cancers develop without any classical risk factors or triggering factors. This is probably because everybody has the genetic risk factor of the absence of essential asexual reproduction genes and a strong drive for reproduction.

The asexual reproduction hypotheses is a very simple hypothesis and easy to understand. The errors in the reproduction are very common in nature. According to Occam's razor principle a simplest answer to a problem is often correct. Hence this hypothesis is most probably correct.

Falsification criteria

If it were proved that the associations of cancer with infertility is casual, it shall be a proof against the hypotheses. If we find a reason for the presence of cancer testis gene in cancers other than the reproductive reason it shall help to disprove the hypotheses. And if we prove that the similarities of embryo genesis with cancer are accidental that shall be a proof against the asexual reproduction hypotheses.

Testable prediction

If we do germ line transfer of all asexual reproduction genes in mammals prone to cancer (mouse) and watch for any possibility of cancer in them. If they do not develop cancer and are doing asexual reproduction, it means the hypothesis is right.

Conclusion

There are a lot of circumstantial evidence to prove that cancer is an abnormal asexual reproduction process. But they may not be the conclusive proofs. In biological science we can't get a proof as we get in physics or mathematics. Each biological proof add to the probability of the hypotheses is right. I feel that there is enough proof to conclude that cancer is a failed attempt for asexual reproduction. This hypothesis is simple and attributes cancer to an event commonly occurring in living organisms – errors in reproduction. Hence the new growth is a failed attempt for a new life.

Future Possibilities

If and when a germ line transfer of the deficient asexual reproduction genes were done, we shall not only prevent cancer but also develop a new mode of reproduction for humans!

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Ethical Declaration

It was neither a hospital study nor an institutional study. It was only a new hypothesis derived from the existing data. Hence ethical committee consent is not applicable.

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