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Plant and Animal Cell Systems in Cancer Biology

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ABSTRACT

Cancer biology is a broad area of study, and a lot of emphasis has been placed on drug design. The development of functional drug compounds relies on the outcome of cell responsive studies that involve animal cells, the cancer, as well as, compounds from plants. The variability in the response of cancer to plant compounds is important in order to understand the mechanisms involved in cancer metastasis and progression in animal hosts. This theme will form the basis of this contribution.

KEYWORDS: *Tea, Fruits, Cocoa, Polyphenols, Caffeic acid, Tumeric, Naturally-derived compounds, G2 / M.*

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Plants have been used for centuries to treat cancer, and their effect on animal cells differs depending on the method used to prepare them. This means that heating and cooling of the extracts made from plants can either cause cancer cells to grow or die in animal systems. In all life forms, the general hereditary information, that's retained in the nucleus, controls mitosis and meiotic divisions (Singh and Reddy, 2012). However, plant extracts, sometimes referred to as fractions - as indicated by Singh (2016) - has the ability to dictate what happens within the cytoplasm. Therefore, in order to mitigate the entry of the compound into the cell, a highly regulated sequence of events is required, and this involves the movement of the spindle fibres in somatic cells (Singh, 2016). Plants are essential for all life forms, not because of their ability to provide natural resources, but more importantly to sustain the economy and the food chain. Animal cell systems require a fairly adequate amount of nutrients to retain the robustness of animal activities (Singh, 2014). This simply implies that once cells have depleted of nutrients, their unhealthy nature is able to contribute toward the spread of cancer (Singh, 2020). In plants, chlorosis, a process that results in depigmentation of the plant, is a type of plant cancer which is a result of abnormally operational chloroplasts. In animal systems, the capability to rescue healthy respiring cells become very difficult, depending on how far the cancer has developed (Singh, 201). Currently, the plant belonging to traditional therapies in China, Japan, India, Africa, Pakistan, Sri Lanka and Thailand are used in in vitro cancer studies, particularly to evaluate their efficacy against cancer cell responses (Singh, 2014). Iron and calcium is required to maintain the integrity and shape of animal cells, however, it has been found to also increase the proliferation of adenocarcinoma (Wu et al., 1999). This relates to

cancer cell using ordinary nutients to grow inside animal's lungs, since the iron in the blood supplies the blood capilaries of the alveolus in animals (Wu et al. 1999). The basic structure of an animal cell tells us that the sphingomyelin, which is found in the outer-leaflet of mammalian cells, contribute toward signal transduction events, viz. apoptosis and autophagy, and this, in turn may contribute toward different cellular responses to plant compounds. This statement is backed up by the fact that sphingomyelin has a dual role as a stimulant and inhibitor of cell cycle events, because the secretory role of phospho sphingomyelin has been found to secret chemokines, immune protectors, serotonin and other therapeutic compounds (Singh, 2012). Singh (2014) has suggested that a pivitol factor required assessing the proliferation of cancer cells in favourable environments, have always been a way to prevent missing out any details. These details are aspects that affect both animal and plant cell systems and are not just limited to ceramide, reactive oxygen species, secondary metabolites and cellular responses. This implies that although a concerted and concrete emphasis is placed on arresting cancer cell growth, a lot of effort is placed on natural products, as they are able to prevent the multiplication of mutational cells - cancer - and can essentially contribute toward the healthy progression of animal life (Singh, 2017). In nature, taxol, camptothecin and doxorubicin, are the naturally-derived compounds that are used to prevent the cells from entering into G2 phase of mitosis (Hoaren and DaSilva, 1992). These compounds interfere with the polymerase enzymes at the replication folk, and thereby prevent uncontrolled proliferation of the cancer cells. It is because of this major feature that the G2 / M is a major checkpoint in cell cycle control. Furthermore, since G2 / M prevent cells from entering mitosis, it is said that G2 / M conseration is not a beneficual strategy for drug development (Murray, 1993). This is because although fission of healthy eukaryote cells is possible, the cancer would further compromise animal health. It has been found that Bid, Bax and Caspases contribute immensely toward apoptotic cell death, whereas Survivin and Arora B kinase don't inhibit cell death, but rather is pivitol in mitotic catastrophy events. Survivin, Arora B kinase, Mad and Bab are said to aid spindle formation, and as a result promotes the development of cancers in animals (Singh, 2014). A remarkable deduction, however, is that mitotic catastrophy has the ability to enhance fully functional apoptosis, or to resemnle the features of apoptosis (Singh, 2012). Some of these features are the ruffling of the plasma membrane, nuclear fragmentation, cytoplasmic blebbing, chromosome degradation, spindle fibres misalignment, amongst others (Singh, 2014). Plant polyphenols, curcumin and the extracts of Bulbine natalensis are found to induce fluctuation cellular responses, while plant toxins induce proliferative responses in colon, laryngeal and breast cancer cells. This feature of cancer cells is due to them containing resistant genes to specific compounds present in the toxins (Lee et al., 2004). The animal system is sustained by the phases of cell division, viz. Interphase, anaphase, metaphase, prophase and telophase. Whether a plant compound is prepared from the vegal source or not, like with Braccharis drucunculifolia, the compound administed affects the rate of cell multiplication, because of the stimulatory and inhibitory substances like caffeic acid and cinnamic acid (Fukuda et al., 2006). With the same plant, Baffalo and coworkers (2010) reported that the propolis extracts were highly effective in inhibiting cancer growth with a much lesser amount in comparison to the fraction from the vegetal source. In mice, the polyphenols in tea show lung cancer inhibition, whereas it enhances cancer cell proliferation. This means that drug development has considered inconsistencies prevalent in cell viability studies. In a study conducted by Calvert and coworkers (2005), the relationship of concentration independence and time dependence of cancer cells to plant compounds was evident. According to Singh and Reddy (2012), the HEp-2 cell line presents difficulties in analysing selective toxicity from the feature of these cells being robust but resistant. This attribute is ascribed to HEp-2 being unable to undergo autocrine apoptosis upon growth medium chemical depletion (Singh, 2014). Reactive oxygen species, however, hinders cancer cell proliferation, by interfering with cytoskeletal proteins (Singh, 2017). Thus, drugs that target myosin are essential to inhibit cancer cell growth

in mammalian systems (Singh, 2014). Plant polyphenols, as mentioned, affects apoptosis in the intestine, kidney and liver. Some examples are the curcumin obtained from tumeric, curry ans mustard, as well as, the procyandin obtained from apple, cranberry, grape, peach, pear, plums, as well as cider, cocoa and wine (Gu et al., 2003). In some animal cell systems, methylation, glucuronidation and sulfonation occur in order to utilise the polyphenolic, because cellular respiration with type 1 metabolism gets problematic. In some plant extracts, the reactive oxygen species scavengers, protect cancer cells by maintaining a high Bcl-2/Bax protein ratio, while increasing PARP (Poly -(ADP-ribose)-Polymerase expression and reducing DNA fragmentation (Singh, 2014). It can be concluded that the interplay of the genes involved in apoptotuc/autophagy with Survivin are of great therapeutic importance, particularly because of the presence of these scavengers in plant material, as well as, the dual role of Survivin (Singh, 2020; Singh, 2018).

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