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Annual Fasting; the Early Calories Restriction for Cancer Prevention

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ABSTRACT

Essentially, people's diet and nutritional status has been changed substantially worldwide and several lines of evidence suggest that these changes are to the detriment of their health. Additionally, it has been well documented that unhealthy diet especially the fast foods, untraditional foods or bad-eating-habits influence the human gut microbiome. The gut microbiota shapes immune responses during human life and affects his/her metabolomic profiles. Furthermore, many studies highlight the molecular pathways that mediate host and symbiont interactions that regulate proper immune function and prevention of cancer in the body. Intriguingly, if cancer forms in a human body due to the weakness of immune system in detriment of microbiome, the removal of cancer stem cells can be carried out through early Calories Restriction with Annual Fasting (AF) before tumor development or progress. Besides, fasting can balance the gut microbiome for enhancement of immune system against cancer formation.

Introduction

World Health Organization (WHO) has recently released a report in which it has been announced that cancer is the second leading cause of mortality in most countries and it will turn in to the first and foremost killer around the world. Accordingly, many researches and experiments have been directed towards the control and prevention of the cancer. An important discovery of recent studies in cancer patients' life style has shown that environmental factors affect cancer initiation, promotion and progression and suggested that many malignancies are preventable (Longo and Fontana 2010). Epidemiological studies been shown that excessive adiposity, decreased physical activity, and unhealthy diets are key players in the prognosis of many cancers (Longo and Fontana 2010).

Nevertheless divergent causes of cancer have been identified such as microbial and viral infections (Carrillo-Infante *et al.* 2007, Karin *et al.* 2006), chemicals (Patel and Butte 2010), alcohol consumption and smoking (Boffetta and Hashibe 2006, Sasco *et al.* 2004), fatty food and red meat consumption (Schulz *et al.* 2008, Zur 2012), stress (Sood *et al.* 2006) and hundreds of other reasons. On the contrary, the consumption of vegetables and fruits is highly recommended due to their anticancer properties which can be ascribed to their high amount of antioxidants and flavonoids (Lotito and Frei 2006, Steinmetz and Potter 1996). The other effective strategy in cancer prevention is Calorie Restriction (CR). CR has been shown to be the broadly potent dietary regimen for suppressing the carcinogenesis process and cancer prevention.

Here, we discuss on the profound importance of healthy food habits on maintenance of normal microbial flora and boosting of immune system in order to eliminate cancer cells. Moreover, it is postulated that our body applies several approaches particularly anorexia to inhibit cancer cells' growth. Accordingly, this commentary can provide an insight in prevention of cancer through CR and Annual Fasting (AF). It weighs the evidence of caloric restriction in cancer control and focuses on microbiome affecting the enhancement of immune system and emphasizes AF as cancer controller.

Caloric restriction in cancer prevention

Calorie restriction (CR) is the most effective strategy for increasing lifespan in a variety of animals even microorganisms (Stephen *et al.* 2003). The effect of CR on human in cancer prevention is critical, as in modern lifestyle, the obesity which is an important risk factor for

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cancers, is alarmingly increasing in the world (Basen *et al*. 2011). There are many studies demonstrating that CR has anti-cancer properties. In 1909, Moreschi reported that CR inhibits the growth of tumors transplanted into mice (Calorie *et al*. 2010). A meta-analysis summarized the evidence of effect of calorie restriction on spontaneous mammary tumors in mice. The energy-restricted animals developed 55% fewer mammary tumors than did those in the control groups (Dirx *et al*. 2003). The study with inconsistent findings regarding the effect of CR on breast cancer (BC) risk in humans enduring war-related extreme situations indicated that CR reduced the risk of BC (Vin-Raviv *et al*. 2012). The other study, reported the effect of Intermittent Fasting (IF) on inhibition of prostate cancer tumor growth in a mouse model (Thomas *et al*. 2010). Molecular pathways that mediate the anti-cancer effects of CR were weighed in monkeys and rodents with more detail in the literature (Walter *et al*. 2010). A clinical trial of 10 cases of patients with various types of cancer, who have voluntarily fasted prior to and following chemotherapy demonstrated that fasting is a safe status and can reduce chemotherapy-associated side effects (Safdie *et al*. 2009). Though, there has never been a sufficiently clinical trial of CR in humans, we can study the religious fasting in cancer prevention.

Relationship of diet and the gut microbiome to cancer risk

From human genome project onwards, scientists found out the vital role of microbiome in human health that was then called human metagenome (Turnbaugh *et al*. 2007). Human genome is stable during his/her life, but microbiome changes and can influence the human metabolome. Diet shifts the gut microbial community and affects human metabolome (Turnbaugh *et al*. 2009). In modern life style, the increase of consumption of pasteurized foods, fast foods and not the use of homemade and traditional rich foods have affected human gut microbiome. Evidence that the intestinal microbiota is fundamentally linked with human health, especially cancer risk, is emerging. The consumption of probiotics bacteria, prebiotics and synbiotics substances are recognized modifiers of types of microbes and have been reported to reduce colon cancer risk (Davis and Milner 2009).

Many studies have summarized how gut microbiota is able to train the host's immune system (Kau *et al*. 2011). The gut microbiota and the host immune system join forces in order to protect the body against disease. If the causes of cancer initiation, progression and development be studied precisely, it can be recognized that they significantly afflict the microbial flora (Brinkman *et al*. 2011, McGarr *et al*. 2005). Many studies have demonstrated the anticancer effects of probiotic microbes and also their impacts on the enhancement of immune system (Ma *et al*. 2010, Rafter 2004) and the effect of fruit and vegetable consumption on reinforcing microbial flora (Li *et al*. 2009). On the other hand, increasing intake of antibiotics removes useful intestinal bacteria and debilitates immune system. It is, therefore, plausible that there is an inextricable connection between microbial flora and function of body's immune system and it can be firmly claimed that any changes in human normal flora can lead to the immune system debilitation and cancer development.

Hypothesis; early calorie restriction with annual fasting

Anorexia syndrome is highly prevalent among cancer patients and as body defense mechanism against cancer tumor cells, it is so more in the need of calorie than the other healthy cells. The host body shows some defensive activities such as anorexia, muscular weakness, problems in protein synthesis, not control of glucose levels and some other abnormalities in body metabolism in order to inhibit the growth of tumor and cancer cells through reducing the calorie distribution and CR required for excessive growth of cancer cells (Longo and Fontana 2010). Therefore, it could be concluded that anorexia is the defensive state of body to control cancer cells' growth. It is apparently to be largely mediated by depletion in plasma concentrations of growth factors (Sonntag *et al*. 1999), inflammatory cytokines (Matsuzaki *et al*. 2001) and free radical-induce damage to DNA (Sohal *et al*. 1994). Simultaneous with cancer cell growth, angiogenesis occurs in the cancer tissue; therefore body would not be able to reduce the distribution of calorie to the tumor cells.

Remarkably, cancer stem cells are constantly produced in the body; however the enhancement of immune system and also fasting can eradicate them in the body and inhibit their growth. In order to confront with cancer, its sprouts can be ruined with a strict reduction in eating and drinking and through the fasting before the body system confront with it by anorexia, because when calorie production reduces, body tries to rescue the necessary cells, so unnecessary cells die. The present hypothesis intensifies the effect of healthy nutrition on the balance of microbial flora, bolstering immune system and eradication of cancer stem cells. Significantly, even in the presence of immune system, cancer stem cells are produced in the body every year. So it is noteworthy that regular Early Calorie Restriction (ECR), fasting can extirpate cancer cells before angiogenesis occurrence because after metastasis and angiogenesis cancer cells conquer the body and apply all energies and mechanisms to prolife rate extensively. Although some defensive activities such as anorexia and its harmful concomitants can combat growth of cancer cells, it seems that fasting is the more effective way to prevent cancer occurrence.

Competing interests

Authors declared no competing interests.

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