

A CRITICAL REVIEW ON CANCER WSR TO AYURVEDA

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ABSTRACT

Life on earth has been modernized with new avenues of modern science and technology. Along with the comfort, the modern world has gifted mankind a lot of worries and tension and in consequence a number of life style related disorders, such as Cancer, AIDS, Parkinson's disease, Alzheimer's disease, Auto-immune disorders, SLE, Diabetes, Hypertension, Cardiac diseases etc. Among all these, Cancer needs a serious concern because of its increasing incidence with high mortality and morbidity rate. In Ayurveda, some conditions are mentioned which are similar to cancerous growths, types, signs, symptoms and treatments. This paper critically examines the Ayurvedic concept of cancer, its pathogenesis in terms of the theory of *Tridosha*, *Sapta Dhatus* (body tissues) and the work done on anti-cancer properties of some of the herbs.

Keywords: Cancer, Ayurveda, *Arbuda*, Medicinal plants

INTRODUCTION

Cancer is the second leading cause of death behind Heart disease in USA. 10 million new cases of Cancer are diagnosed each year and 7.9 million deaths occur from Cancer each year worldwide, which is 13% of the total death (In the year 2007). In 2012, there were an estimated 14.1 million new cases of cancer in the world: 7.4 million (53%) in the males and 6.7 million (47%) in females, giving a male: female ratio of 10:9.¹As the modern civilization keeps on advancing, the prevalence of Cancer is also rising at a same speed. Cancer is as old as human civilization. Description regarding Cancer (*Arbuda*) is also found in the most ancient treatises of Ayurveda i.e. *Charak Samhita* and *Sushruta Samhita*. *Charaka* and *Sushruta samhitas*, two well-known Ayur-

vedic classics, describe cancer as inflammatory or non-inflammatory swelling and mention them either as *Granthi* (minor neoplasm) or *Arbuda* (major neoplasm).^{2,3} Even Egyptian mummies also show evidences of cancer. However, incidences of Cancer have been increased by 20 times in the last 100 years. In this regard, it is estimated that there would be 15 million new cases of Cancer and 10 million deaths out of Cancer by 2020 AD. The most commonly diagnosed cancers worldwide were those of the lung (1.8 million, 13.0% of the total), breast (1.7 million, 11.9%), and colo-rectum (1.4 million, 9.7%). The most common causes of cancer death were cancers of the lung (1.6 million, 19.4% of the total), liver (0.8 million, 9.1%), and stomach (0.7 million, 8.8%).⁴ Billions of

dollars have been spent since 1950 AD on research, but nothing has been gained. If people have been helped or saved from cancer, an equal number have been fatally damaged by the treatment itself. Depending on the stage of cancer, treatment modalities most commonly used are surgery, radiotherapy and chemotherapy. However, the disadvantage of radiotherapy and chemotherapy are the development of therapy-related temporary and permanent adverse effects ranging from hair loss to lung or nerve damage. Also dry mouth, mouth sores, difficulty or pain in swallowing, nausea, vomiting, diarrhea, constipation, fatigue, bleeding and loss of appetite etc. are inevitable. Maximum of FDA approved anti-cancer drugs are themselves toxic, immunosuppressive and carcinogenic. Therefore, Ayurvedic medicines can be beneficial as a supplementary to modern medicine, even can be given alone for a complete cure.^{5,6}

Cancer is a hyper proliferative disorder that involves transformation, deregulate of apoptosis, proliferation, invasion, angiogenesis, and metastasis. In simple words, it is the uncontrolled abnormal growth of a body cell or group of cells. Cancer may be regarded as a group of diseases characterized by abnormal growth of cells, ability to invade adjacent tissues and even distant organs and the eventual death of the affected patient if the tumor has progressed beyond the stage when it can be successfully removed.⁷ It is a disease of disturbed life style, change in food habits, and environmental pollution are among the chief causes of Cancer. Ayurveda, being the science and way of Life, has the potential to prevent and cure the Cancer. Ayurveda can provide an important contribution to the successful treatment of cancer. This is due to

the fact that Ayurveda can determine subtle disturbances in a very early stage of this disease. Even before it manifests itself, Ayurveda can already establish disturbances in the balance of mind and body. Both in this first stage, as in the following stages, Ayurveda can help a patient to recover and prevent serious chronic diseases. In all the stages, even when a chronic disease like cancer has been diagnosed, Ayurveda can provide extensive knowledge of herbs and treatment strategies. During chemotherapy and/or radiotherapy Ayurveda can help as well to reduce the side-effects of the treatment and assist the body in its recovery process. The therapeutic approach of Ayurveda has been divided into four categories as *Prakriti sthapani chikitsa* (health maintenance), *Roga nashani chikitsa* (disease cure), *Rasayana chikitsa* (restoration of normal function) and *Naishthiki chikitsa* (spiritual approach).⁸

Distribution of Cancer incidence in India⁹:

The total cancer cases are likely to go up from 979,786 cases in the year 2010 to 1,148,757 cases in the year 2020. The tobacco-related cancers for males are estimated to go up from 190,244 in the year 2010 to 225,241 in the year 2020. Similarly, the female cases will go up from 75,289 in year 2010 to 93,563 in the year 2020. For the year 2010, the number of cancer cases related to digestive system, for both males and females, are estimated to be 107,030 and 86,606 respectively. For, head and neck cancers, the estimates are 122,643 and 53,148 cases, respectively. And for the lymphoid and hematopoietic system (LHS), for the year 2010, are 62,648 for males and 41,591 for females. Gynecological-related cancers are estimated to go up from 153,850

in 2010 to 182,602 in 2020. Among males and females, cancer of breast alone is expected to cross the figure of 100,000 by the year 2020.

Cancer Head & Neck	-	35 to 40 %
Cancer Cervix & Uterus	-	25 to 30 %
Cancer Breast	-	6 to 8 %
Cancer Oesophagus	-	8 to 10 %
Cancer Lungs	-	8 to 10 %
Bone Tumor	-	1.5 to 2 %
Paediatric Cancer	-	4 to 6 %
Miscellaneous (Bladder, Rectum, Testes etc.)	-	4 to 6 %

Other statistics that need a mention are:

Delhi – 13 % of Gall bladder cancer (highest in the world)

Barsi – highest rural based cancer (390/1 million)

Mumbai, Bhopal, Bangalore, Chennai - 1200 to 1500 cases per 1 million.

The most significant risk factor for cancer over all is age; two-thirds of all cases were in people over age 65 as immunity decreases in old age.

Causative factors¹⁰:

1. Physical – itching, irritation, repeated trauma
2. Chemical – chronic irritation, toxins
3. Environmental pollutants – pollution, overcrowding, improper sanitation
4. Radiation – leukemia, melanoma (5-10%)
5. Genetic factors (5-10%)
6. Default in food and life style (20-25%)
7. Stress and Depression (10-15%)
8. Lack of Physical activity
9. Human papilloma virus, Hepatitis-B – the invader theory (1-5%)
10. AIDS induced cancer
11. Smoked food, Asbestos, Arsenic, Tar, Chimney's smoke

12. Smoking – Lungs, cervix, bladder, mouth, GIT cancers (15-20%)

13. Chewing tobacco – Oral and GIT cancer (15-20%)

➤ **Chewing tobacco** is the greatest factor causing cancer in India. More than 50% of the cancer cases in India are due to smoking and chewing tobacco. Tobacco smoking is the main known cause of human cancer-related death worldwide. Smoking most commonly causes lung cancer.¹¹

➤ Studies of cancer risk in brewery workers and in **alcoholic patients** have provided important evidence on the carcinogenic role of alcohol. A causal association is also established in the case of breast cancer and is probable for colon and rectal cancer.^{12,13}

➤ In a broad sense, “**environmental factors**” are implicated in the causation of the majority of human cancers. In respect of many such environmental factors, such as active smoking, alcohol intake, sun exposure and dietary make-up, individuals exercise a degree of control over their level of exposure. However in the present context, “environmental pollution” refers to a specific subset of cancer-causing environmental factors; namely, contaminants of air, water and soil. The carcinogenic pollutants for which most information is available include asbestos (referring here to non-occupational exposure), toxic agents in urban air, indoor air pollutants and chlorination by-products and other contaminants of drinking water. Various determinations suggest that environmental pollution accounts for 1-4% of the total

burden of cancer in developed countries.^{14,15}

- Exposure to **ionizing radiation** is unavoidable. Humans are exposed both to X-rays and γ -rays from natural sources (including cosmic radiation and radioactivity present in rocks and soil) and, typically to a much lower extent, from man-made sources. On average, for a member of the general public, the greatest contribution comes from medical X-rays and the use of radiopharmaceuticals, with lower doses from fallout from weapons testing, nuclear accidents (such as Chernobyl), and accidental and routine releases from nuclear installations. Medical exposures occur both in the diagnosis (e.g. radiography) of diseases and injuries and in the treatment (e.g. radiotherapy) of cancer and of some benign diseases.¹⁶
- **“The genetic basis of cancer”** may be used to refer to an increased risk of cancer that may be inherited from generation to generation. This section is concerned with the latter phenomenon. In many instances, the genes concerned have been identified, and have also sometimes been found to play a role in sporadic cancers as well. The fact that cancer can “run in families” has been recognized for over a century. Among the earliest recorded evidence for inherited susceptibility is a description by a Parisian physician, Paul Broca, of a family with many cases of early onset breast cancer, liver cancer or other tumours. Such families have proven to be key resources in establishing the inheritance of disease from generation to generation.¹⁷

AYURVEDIC CONCEPT OF CANCER:

According to Ayurveda, imbalance of the three *doshas* (*Vata*, *Pitta*, & *Kapha*) is the root cause of all the diseases and so the case of Cancer. A lot of factors are responsible for the vitiation/mitigation of these three *doshas*, out of which important factors being faulty dietary regimen, improper diet pattern (taking food before digestion of previous food, or not taking food during hunger), disturbed sleep (awakening at night and sleeping during daytime), suppression of natural urges (stool, urine, hunger, thirst etc.), lack of exercise, and mental constraints like anxiety, tension, stress, depression, etc. Stress, anxiety and depression of the modern world make the mind more unstable which triggers the *doshik* imbalance causing incidence of cancer higher. During Vedic period **“AR-BUDA”** was considered as a serpent like demon conquered by Lord Indra (Moniar Williams). On the other hand literary meaning of *Arbuda* is a lump or mass. According to the description given by *Sushruta*¹⁸, *Arbudas* are gradually increasing mass of big size, globular in shape, fixed with deeper structure, usually do not suppurate, giving occasional pain and can occur in any part of the body. It can involve *Mamsa* and *Rakta* due to vitiation of *tridosha*.

Etiopathogenesis of Arbuda:

It is based mainly on *Doshic* theory i.e. *Vata*, *Pitta* and *Kapha*. Further by *MithyaA-hara* and *Vihara* the different humors are vitiated involving different *Dhatus* (*Mamsa*, *Meda*, *Rakta*, etc) resulting in the prescription of *Arubuda*.

Though vitiated “*Dosha*” are responsible for the development of *Arbuda*, almost all Ayurvedic texts have given maximum importance to *Kapha*. *Susruta* has mentioned that due to excess of *Kapha*, *Arbuda* does

not suppurate¹⁹, which is considered to be the most common and important factor for any growth in the body. Thus, it seems justified to postulate that excess of vitiated *Kapha* in the body might be responsible for the precipitation of cancer.

Irritation by vitiation of increased *dosha*²⁰ and trauma²¹ may precipitate or activate the formation of *Arbuda*. According to *Sushruta*, trauma is also considered to be another causative factor for the development of *Mamsarbuda*. Vagbhata has also mentioned that Large granthis are called as *Arbuda* (malignant tumours); they are of six kinds, caused by the doshas etc. Because of predominance of medas (fat) and *kapha* generally and due to deep rootedness, they do not ripen (suppurate).²² It indicates that *Mithya Ahara* and *Mithya Vihara* probably changes local or systematic bio chemical factors including the haemo-dynamics²³ leading to the origin of *Arbuda*. *Sushruta* describes three forms of metastasis:

1. **Raktarbuda:** when a tumor is surrounded by smaller tumors.
2. **Adhyarbuda:** Development of another tumor over the first tumor or when a tumor arises on a pre-existing site.
3. **Dviarbuda:** when two tumors arise at the same time.

The tumours which cause large secretion of fluid in the surrounding tissue, located in vital locations or channels (lymphatic system and blood vessel system), tenaciously attached to the surrounding tissues are difficult to cure.²⁴

Early signs of Cancer^{25,26}:

When cancer begins, it invariably produces no symptoms. Signs and symptoms only appear as the mass continues to grow or ulcerates causing local symptoms. General symp-

toms occur due to distant effects of the cancer that are not related to direct or metastatic spread. These may include:

1. Change in bowel or bladder habit: Long-term constipation, diarrhea, or a change in the size of the stool may be a sign of colon cancer.
2. Unintentional weight loss: This happens most often with cancers of the pancreas, stomach, esophagus, or lungs.
3. Fever : Hodgkin's disease, leukemia, and cancers of the liver or kidney can cause a persistent fever of unknown origin; Less often, fever may be an early sign of cancer, such as blood cancers like leukemia or lymphoma.
4. Being excessively tired
5. A sore that doesn't heal (changes to the skin)
6. Unusual bleeding from any part.
7. A thickness or Lump (Tumor)
8. Indigestion & trouble swallowing
9. Pain may be an early symptom with some cancers like bone cancers or testicular cancer. A headache that does not go away or get better with treatment may be a symptom of a brain tumor.
10. Thickening or lump in the breast or other parts of the body
11. An obvious change in shape and size of any part.

Paraneoplastic syndrome²⁷:

Paraneoplastic syndrome is a disease or symptom that is the consequence of the presence of cancer in the body but not due to the local presence of cancer cells. The most common cancers associated with paraneoplastic neurological disorders are breast, ovarian and lung cancer, but many other cancers can produce paraneoplastic symp-

toms as well. Symptoms of paraneoplastic neurological disorders may include ataxia (difficulty with walking and balance), dizziness, nystagmus (rapid uncontrolled eye movements), difficulty in swallowing, loss of muscle tone, loss of fine motor coordination, slurred speech, memory loss, vision problems, sleep disturbances, dementia, seizures, sensory loss in the limbs.

Treatment in Conventional Medicine²⁸:

The goal of Cancer treatment is to eradicate the cancer. If this is not accomplished, goal shifts to Palliation, Amelioration of symptoms and preservation of quality of life. Surgery is the most effective method of treating cancer (both for eradication and palliation). In conventional medicine, Cancer is treated with the procedures; Cut, Slash, Burn, Poison, and Shoot. 70% of the cases are treated by Radiotherapy either alone or combined with Surgery and Chemotherapy, either before or after. Drugs used to treat most Cancers are those that can block cell signaling, including growth factor signaling (e.g., epidermal growth factor); prostaglandin production (e.g., COX-2); inflammation (e.g., inflammatory cytokines : NF-B, TNF, IL-1, IL-6, chemokines); drug resistance gene products (e.g., multi-drug resistance); cell cycle proteins (e.g., cyclin D1, & cyclin E); angiogenesis (e.g., vascular endothelial growth factor); invasion (e.g., matrix metalloproteinases); antiapoptosis (e.g., bcl-2, bcl-X, XIAP, surviving, FLIP); and cellular proliferation (e.g., c-myc, AP-1, growth factors).

Ayurvedic Management of Cancer²⁹:

Ayurvedic herbs have been treating the cancer cases since antiquity. Numerous researches conducted in recent past suggested that Ayurvedic herbs and their components

mediate their effects by modulating several of the above said recently identified therapeutic targets. However, the molecular basis for the mode of action of Ayurvedic drugs in cancer can be elucidated by the following 3 aspects:

1. **Anti-angiogenesis** – It is a form of targeted therapy that uses drugs or other substances to stop tumors from developing new blood vessels. Without a blood supply, tumor can't grow. (Angiogenesis - beginning of blood vessels.)
2. **Apoptosis** – It means programmed cell death. Cancer cells induce suicidal tendency. Ayurvedic drugs trigger the process of apoptosis in cancer cells.
3. **Destroying stem cells** – Ayurvedic drugs destroy cancer stem cells and so prevent metastasis.

Even, Ayurvedic drugs work significantly in the complications arising from chemotherapy and radiotherapy. The complications of cancer treatment in which Ayurvedic drugs have been proved effective are nausea, decreased appetite, hair loss, excess salivary secretion, pleural effusion, pericardial effusion, ascites, weight loss, sexual dysfunction, anxiety, depression, fatigue, liver and kidney disorders. Ayurveda medicines improve the nutritional status and combat the complications well. Therefore, Ayurvedic medicines can be prescribed along with chemotherapy and radiotherapy for better results.

Ayurvedic Medicines for Cancer:

Ayurvedic medicines capable of pacifying all the three *doshas* are very beneficial for cancer patients. Along with them, some liver protective medicines and affected organ specific medicines should be given for better results. Keeping in view these parameters,

Ayurvedic medicines can be categorized as under:

1. **Tridoshasamak medicines:** Medicines capable of pacifying all the three *dosha* include *Triphala*, *Dasamoola*, *Guduchi* (*Tinospora cordifolia*), *Yastimadhu* (*Glycyrrhiza glabra*).

❖ *Triphala* is a traditional Ayurvedic herbal formulation, consisting of equal parts of three medicinal plants namely *Embllica officinalis*, *Terminalia chebula* and *Terminalia belerica*. *Triphala* strengthens the different tissues of the body, prevents ageing, promote health and Immunity³⁰

❖ *Dashmoola* balances *Tridosha*; when there is a high vitiation of *Vata*, *Dashmoola* can be used as a tonic to strengthen the system, exhibits anti-oxidant, anti-cancer activity, strengthens the body and enhances the production of tissue.

❖ *Guduchi* balances *Tridosha* (*Vata*, *Pitta*, *Kapha*), helps increase the effectiveness of protective white blood cells and builds up the body's own defense mechanism (immune system), thus helping to protect ourselves from infections. A study conducted on *Tinospora cordifolia* suggests that the extract of *Tinospora cordifolia* has anti-tumor potential in a two-stage skin carcinogenesis mouse model.³¹

❖ *Yashtimadhu* (*Glycyrrhiza glabra* or *Liquorice*) pacifies *Vata* and *Pitta*, aggravates *Kapha*, is most known for its soothing effect on inflamed mucous membranes of the throat, lungs, stomach and intestines. The liquorice plant contains about 8% of glycoside called glycyrrhizin which specifically reduces

the activity of two enzymes that break down prostaglandin E. Liquorice shows anti-infective and anticancer properties.³²

2. **Liver Protective:** To maintain proper metabolism and protect liver from the side effects of anti-cancer medicines, it is imperative to prescribe liver protective medicines. These include: *Bhumyamalaki* (*Phyllanthus niruri*), *Kakamachi* (*Solanum nigrum*), *Kalamegh* (*Andrographis paniculata*)

❖ *Kalamegh* (*Andrographis paniculata*): The extract and isolated diterpenes (andrographiside and neo-andrographolide) from this plant are proved to be beneficial against tumour angiogenesis by their anti-lipo peroxidative action and by enhanced carcinogen detoxification action.³³

❖ A study was carried out to evaluate the anti-tumor activity of a hydro-alcoholic extract of the whole plant of *Phyllanthus niruri* in 7-9 week old male Swiss albino mice, which showed significant reduction in tumor incidence, tumor yield, tumor burden and cumulative number of papillomas as compared to carcinogen-treated controls. Furthermore the average latent period was significantly increased in the PNE treated group.³⁴

3. **Organ Specific:** Medicines acting upon specific organs affected with cancer are to be prescribed. For example:

i. Lung Cancer: *Vasa* (*Adhatoda vasica*), *Kantakari* (*Solanum xanthocarpum*). Vasicinone showed prominent cytotoxic activity in vitro against A549 lung adenocarcinoma cancer cell line.³⁵

ii. Uterus Cancer: *Sthouneyaka* (*Taxus buccata*). *Taxus buccata* is known to con-

- tain taxane/taxol which exerts anticancer effect.³⁶
- iii. Liver Cancer: *Bhumyamalaki* (*Phyllanthus nururi*), *Kalamegh* (*Andrographis paniculata*), *Chitraka* (*Plumbago zeylanica*)
 - iv. Breast Cancer: *Matulunga* (*Citrus medica*), *Haridra* (*Curcuma longa*)
 - ❖ The flavonoids and limonoids present in Citrus plants are postulated to be the cause of their anti tumour and anti-inflammatory effects.³⁷
 - ❖ *Curcuma longa* Linn: The effect of curcumins on different stages of development of cancer was studied.³⁸
 - v. Colon cancer: *Sounth* (*Zingiber officinalis*), *Maricha* (*Piper nigrum*), *Bilwa* (*Aegle marmelos*). The anticancer effect of hydro-alcoholic extract of *Aegle marmelos* (AME) was studied in the Ehrlich ascites carcinoma bearing Swiss albino mice.³⁹
 - vi. Prostate Cancer: *Salmali* (*Bombax malabarica*), *Guggulu* (*Commiphora mukul*). The studies reveal that Guggul-Lipid, an extract of *Commiphora mukul* is a potent inhibitor of cancer cell growth. Guggul-Lipid is a multi-targeted chemo preventive and chemotherapeutic agent.⁴⁰
4. **New Tissue Proliferation:** *Punarnava* (*Boerhavia diffusa*), *Amalaki* (*Embllica officinalis*)
 - ❖ Administration of the aqueous methanol (3:7) extract of *B. diffusa* was found to be effective in reducing the metastases formation by B16F10 melanoma cells. Prophylactic administration of the extract (0.5mg/dose) inhibited the metastases formation by about 95% as compared to untreated control animals.⁴¹
 - ❖ The fruits of *Amlaki* have been reputed as a tonic to favor long life, health and young appearance. The fruits are used as an expectorant, an antidote to “mineral” poisons, particularly vermilion and sulfur.⁴² The potential anticancer effects of aqueous fruit extract of *P. emblica* was tested in several different human cancer cell lines such as A549(lung), HepG2 (liver), HeLa (cervical), MDA-MB-231 (breast), SKOV3(ovarian) and SW620 (Colorectal). *P. emblica* extract significantly inhibited the growth of several human cancer cell lines at doses of 50-100µg/ml. *P. emblica* extract inhibited invasion of MDA-MB-232 cells in vitro matri gel invasion assay at doses of 25 and 50 µg/ml.⁴³
 5. **Enhance Vigor & Vitality:** *Ashwagandha* (*Withania somnifera*), *Kapikachhu* (*Mucuna pruriens*), *Shilajatu* (*Asphaltum punjabinum*), *Tulsi* (*Ocimum Sanctum*), *Guduchi* (*Tinospora cordifolia*)
 6. **Enhance metabolism:** *Sounth*, *Kali Mirch* and *Pippali* collectively known as *Trikatu* is an age old formulation to enhance metabolism, absorption and assimilation.
 - ❖ *Mucuna pruriens* pacifies *Vata*, aggravates *Pitta* and *Kapha*, is a muscle strengthening herb and used for revitalization of the musculo-skeletal system, useful for *Vata* disorders, stimulates nervous system.
 - ❖ *Ashwagandha* (*Withania somnifera* or Indian Ginseng) reduces *Vata/Kapha* (with excess *Pitta*), supports the recovery process of overall fatigue, nervous conditions; generally rejuvenates tissues. Antitumor and radio sensitizing effects of alcoholic root extract of *W. somnifera*

and their modification by heat were studied in vivo on Sarcoma-180 grown on the dorsum of adult BALB/c mouse.⁴⁴

❖ **Tulsi** (*Ocimum sanctum* or Holy Basil) pacifies *Vata* and *Kapha*, increases *Pitta*, ignites the digestive fire, is a cardiac tonic, is useful in management of all skin diseases, is useful in respiratory discomfort and cough, has anti-inflammatory, antioxidant capabilities, reduces the effects of chronic stress, and promotes wound healing. Studies on biological models like fibro-sarcoma cell culture, papilomas in the skin of albino mice, mice having sarcoma - 180 solid tumors etc provide proof for its anticancer activity.⁴⁵ Ethanolic Extract of *Ocimum sanctum* exerted cytotoxicity against A549 cells, it increased the sub-G population and exhibited apoptotic bodies in A549 cells.⁴⁶

Role of Food, Sleep and Exercise in Management of Cancer^{47,48}:

In Ayurveda, *Ahara* (Food), *Nidra* (Sleep), and *Bramhacharya* (Celibacy) are considered as *Traya Upastambha* (tripod) of Life. To maintain a healthy life, one has to be very cautious regarding food, sleep and performing *bramhacharya*. Faulty food habit, obesity, disturbed sleep, and lack of physical activity are related to approximately 30–35% of cancer deaths. Physical inactivity is believed to contribute to cancer risk not only through its effect on body weight but also through negative effects on immune system and endocrine system. Diets that are low in vegetables, fruits and whole grains, and high in processed or red meats are linked with a number of cancers. A high-salt diet is linked to gastric cancer, aflatoxin B1, a frequent food contaminate, with liver

cancer, chewing tobacco with oral cancer, consumption of alcohol to liver cancer, red or processed meat to breast cancer, colon cancer, and pancreatic cancer.

Keeping view of above, Ayurvedic recommendations are:

1. Take fruit, vegetables and multi grain food.
2. Take Cow's ghee, cow's milk and goat/camel milk as much as possible.
3. Avoid fried, spicy, fast, junk and preserved food.
4. Avoid non-veg, particularly red meat once a week is enough, also for children in their growth period. Preferably cook fresh fish, poultry, alternative protein sources (soya, egg, dairy products) and biological red meat.
5. Vitamin D exerts a protective effect on the development of tumors. Fatty fish, eggs and vegetable oils are natural sources of vitamin D.
6. Sugar is not a problem as many people think. Sugar does not feed the tumor. It might cause some extra body weight though, or hyperactivity.
7. Avoid in-compatible food i.e. milk with sour fruits, milk with non-veg, etc.
8. Use *agnivardhak* medicines like *Trikatu* (*Sounth, marich, and pippali*) along with food to enhance metabolism.
9. *Tridoshashamaka* medicines like *Triphala, Dasamoola, Guduchi* etc. should be taken
10. Take plenty of water
11. Avoid using Tobacco, alcohol and other intoxicated substances
12. Attention should be given for proper evacuation of stool and urine.
13. Don't over eat and don't take food before digestion of previous food.

14. Create positive thought and emotion.
15. Meditation and prayer is very beneficial
Practice meditation and yoga for mental and physical relaxation to calm the mind to a clear and tranquil state, will especially help us to distinguish what is beneficial for us and what not.
16. Increase physical activity, and daily exercise; take (long) walks outside or relax in nature.
17. Listening to harmonious music is soothing, calming and healing for the mind, thoughts and nervous system.

Recent Research Advancements^{49,50,51}:

1. Prof. Srivastava Sanjaya et al. 2007, (University of Pittsburgh Cancer Institute), “Triphala triggered the Pancreatic cancer cells to die off and significantly reduced the size of the tumors without causing any toxic side effects. Triphala had also activated tumor suppressor genes, resulting in the generation of proteins that support apoptosis but didn’t negatively affect normal pancreatic cells.”
2. Singh SV et al., (University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania), Caspase dependent apoptosis induction by guggulsterone, a constituent of Ayurvedic medicinal plant *Commiphora mukul* (Guggulu) in PC-3 human prostate cancer cells is mediated by Bax and Bak.
3. Gammill et al. 2004, “Artemisinin is most effective against Leukemia and colon cancer. Intermediate activities were also seen against melanoma, breast, ovarian, prostate, CNS and renal cancer.”
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5. Mugamuri SK et al., Apoptosis induction by Curcumin (active constituent of *Curcuma longa*, Haridra) in HCT 116 colon carcinoma cells.
6. Priya S et al., Curcumin inhibits metastasis in the lungs of mice afflicted with breast cancer.
7. Senthil V et al., *Withania somnifera* (Aswagandha) lead molecule suppresses anti-apoptotic protein Bcl-2 activates Bax& cytochrome c release leading to apoptosis through mitochondrial pathway in Hela cervical cancer cells.
8. Sivakumar V et al., Induction of apoptosis by *Plumbago zeylanica* (Citraka) in DEN induced hepato-carcinoma bearing male Wistar rats through mitochondrial and caspase pathways – a chronic study.
9. Cheppail R et al., Natural Triterpenoid Cancer drug Amooranin from *Amoora rohitaka* (Rohitaka) stem bark induces apoptosis in human tumor cells.
10. Pandey D et al., Garlic (*Rasona*) helps to prevent cancer, especially of the GIT, prevents certain tumors from growing larger and reduces the size of certain tumors.
11. Jagetia GC et al., A poly-saccharide present in *Tinospora cordifolia* (Guduchi) treats throat cancer.
12. Prakash J et al., Chemo-protective activity of *W. somnifera* (Aswagandha) in experimentally induced fibro-sarcoma tumors in Swiss Albino mice.
13. Garlic, onion and zinger prevent cancer, especially of the digestive system.

CONCLUSION

There are probably more varieties of cytotoxic herbs than chemotherapeutic drugs. Hartwell researched all references to cancer herbs spanning 5000 years and 2,500,000 herbs. Of these, he determined that at least 3000 herbs possess some anti-cancer properties. This is the same figure used by the U.S. department of Agriculture. Maximum of Ayurvedic herbs described in ancient treatises possess anticancer properties. In this regard, Ayurvedic herbs require rediscovery in light of advanced modern chemistry, physics and biology for a better understanding and global acceptance. Ayurvedic treatment with its intrinsic treatment modalities like herbal remedies, dietary modifications, spiritual support and adoption of the way of life as described in Ayurvedic classics may create a new hope in the treatment and prevention of cancer and leading a life of positive health.

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