ANTINUTRIENT APPROACH TOWARDS TREATMENT OF CANCER

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ABSTRACT

Cancer is an alarming disease in the present day since there is no remedy for the same. All can be be done is to seek for prevention and arrest of the illness. Antinutrients are known to act as preventive of the disease. The objective of the investigation done here is to examine how the dietary antinutrient could help in their goal.A vegetarian diet proposed earlier indicates that it can successfully prevent cancer if taken regularly.Antinutrients have been estimated from the diet concerned by evaluating their presence in each element of the diet and the result is obtained by adding them up. The total amount of anticancer antinutrient is found to be approximately equal to the daily intake amount. So the diet can be thought to be an anticancer one and it can prevent cancer.The medicinal dose of some of the antinutrients are found to be much higher than the daily intake amount which suggests that when someone is affected with cancer , the proposed diet is of no use .
In this case medicinal dose has to be applied to inhibit the disease.

Keywords
Cancer, Dietary antinutrients, Daily intake, Medicinal dose, Inhibit

Introduction

Antinutrients(1) are exactly the opposite of nutrients. Thus, while the nutrients help in the development of health and body the antinutrients inhibit them.

The antinutrient compounds reduce the absorption of the essential nutrients in our body thereby decreasing the nutritious of the food apparently, injurying our health.

But a careful investigation suggests that antinutrients can be beneficial for our health. Antinutrients in foods are usually found in seeds, gram, beans and legumes which have both adverse effects(2) and health benefits. Let us now be acquainted with the antinutrients which play important roles in reducing the risk of cancer in human system.

Some of them are:

1. Fiber: Prior to nineteenth century people believed that Fiber is harmful for human being so that was removed from the food in which it is present , but now it is known very well that fiber is essential for smooth bowel movement. Fiber also inhibits the absorption of Carbohydrates in our body which helps in reducing the glucose levels in blood thus benefiting the diabetic patients. It also inhibits the growth of cancer.

2. Tannins: Tannins are found in tea , potato,tomato, pumkin, brinjal, some fruits like banana , mango etc. Current research found that tannins have the power to reduce the risk of certain cancers and they can also boost the immune system.

3. Lectins: Antinutrient in foods are responsible for deleterious effects related to the absorption of nutrients and micronutrients, however some antinutrients like lectins exert beneficial health effects. Mostly found in whole grains, lectins can be toxic if taken raw but when cooked and processed properly, they have medicinal value . Thus lectins can combat tumour growth and cancer.

4. Lignans: Lignans are commonly obtained from nuts , seeds and grams. They have antioxidant properties which may benefit our health by reducing the risk of cancer and heart disease.

5. Phylates: Mainly found in seeds, grains , beans and legumes , this antinutrient reduces the absorption of calcium , magnesium and zinc.

   However, study shows that phylates can reduce the risk of kidney stones and lower the blood sugar and cholesterol levels.

   Also known as Inositol Hexaphosphates (IP6), phylates is all pervading in the plant kingdom. IP6 and its lower phosphoxylated forms (IP6-5) are contained in most mammalian cells, which are important in anti cancer behavior.

6. Alkaloids: They play major role as anti cancer agents. Used in combination with other cancer chemotherapeutic drugs alkaloids find place for the treatment of variety of cancers , including leukemia, advanced testicular cancer etc.

7. Saponins: Saponins are steroidal which is distinguished by the soap-forming nature. Different saponins have been characterized and purified . They are gaining attention in cancer chemotherapy.

8. Protease Inhibitors: Protease Inhibitors(PIS)[3] are compounds that act on proteases to block their activities which eventually play a keyrole in cancer therapies.
   Protease inhibitors act as medications to treat viral infections.
   They are mostly used as antiviral element to manage HIV/AIDS. They can also be used to treat Hepatitis C and COVID-19.

9. Glucosinolates[4]: Glucosinolates , the sulfur containing compounds are available in Spinach, Broccoli, Drumstick leaves, Radish and Papaya. They are broken down into metabolics which help protect our cell from free radical damage.
   Through various mechanism and routes, the above nutrient not only provide us protection against cancer but are able to kill the cancerous cells also.
   In addition to the anti cancer activities it is found to have anti-inflammatory , antidiabetic and lipid lowering properties[5].

2) Mechanism and Function

Having presented an introduction of some of the antrinutrients for treatment and inhibition of cancer , it would now be interesting to discuss their mechanism and function in details.

1. Scientific studies reveal that higher fiber consumption lower the risk of cancer, especially colorectal and breast cancer .
   This is related with fact that higher consumption of fiber results in smooth bowel movement giving rise to empty bowel thus lowering the risk of any disease especially cancer.

2. Tannic acid or tannin [6] is a natural polyphenol present in plant which is known to possess anticancer, anti-inflammatory and antioxidant properties.
   Since tannic acid has many hydroxyl groups as functional groups, it can regulate the oncogenic signals by directly binding to the biological macromolecules.
   Over than this, Tannin was found to be potent- chemosensitizer overcoming multi drug resistance.
   Eventually, in specific physicochemical features were found useful for generation of drug loaded nanoparticles.

3. The potential anticancer drug derived from natural sources like microorganism, plant and animal are available.

Lectins[7], a group of highly diverse protein of nonimmune origin with carbohydrate binding abilities, have been found in the kingdom of life.
These proteins can react with free and cellsurface oligoschearides and could differentially bind cancer cells . Since malignant transformation is lightly associated with altered cellsurface glycans. Thus lectin could represent a valuable tool for diagnosis of cancer and

be developed as anti-cancer therapeutics..

Actually, plant lectins have found application as cancer biomakers for identifying the malignant tumor cells for diagnosis and prognosis of cancer. Plant lectins contribute to inducing cell death through autophagy and apoptosis , indicating their potential implications in cancer inhibitory mechanism.

4. Plant Lignan [8] is an important group of polyphenols , which significantly induce cancer cell death and suppress cancer cell proliferation with minimal toxicity against non-transformed cells. Various epidemiological studies proved that intake of lignin is linked with lower risk several cancers. Thus lignan compounds have the potential to inhibit carcinogenesis , tumor growth, metastasis, by targeting various signaling molecules and path ways. Evidence indicates that honokiol and magnotol are natural lignans which possess anticancer activities against various types of human cancer.

   Lignans have great importance due to their biological activity.

5. Phytates[9] show their miraculous anticancer achievements for strong anticancer activity, anti-inflammatory, boost immune enhancing activities and assist in detoxification.

   They prevent cancer cells from developing new blood cells while suppress their existing blood supply. Phytates inhibit all cancer cell lines like leukemia cell , colon cancer cells, estrogen receptor breast cancer cells , cervical cancer , liver cancer etc.

6. Alkaloids[10] are naturally occurring organic bases containing nitrogen which are derived from plant sources. They contain one or more nitrogen atoms which which usually have a marked physiological action on man and other animals.

   Alkaloids play major role as anticancer agents by inhibiting the enzyme topoisomerase which is involved in DNA replication, inducing apoptosis and expression of P53 gene.

   Alkaloids are used in combination with other cancer chemotherapeutic drugs for treatment of a variety of cancers including leukemia, advanced testicular cancer, breast and lung cancer.

7. Saponins[11] are steroidal or triterpenoid glycoside which is distinguished by their soap-forming nature. Various saponins have been characterized and purified which are gaining attention in cancer chemotherapy.

   The compound possess high structural diversity , which is linked to the anticancer activities. Several studies have reported the role

of saponins in cancer therapy and the mechanism of action, including cell-cycle arrest , antioxidant activity, cellular invasion, inhibition, induction of apoptosis, and autophagy.

Recent studies have explored the options like combination therapy and drug delivery system to ensure increased efficacy and decreased toxicity in saponin. Saponin as an anticancer agent is applicable by using

various mechanism. This include the poorly studied pathways such as those involved in ferroptosin and necroptosis.

8. Protease[12] and protease inhibitors are recognized as important factors in the physiopathology of human diseases. Their role in cancer treatment has dramatically changed for about a decade. There is evidence linking protease to tumor invasion and metastasis. The genuine mechanism, used by tumor cells to optimize the use of proteases in pericellular matrix is well known.``
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9. Glucosinolates[13]: It is evident from various studies that Glucosinolates are valuable for improving health and provide protection from serious diseases like colorectal cancer , prostate cancer, breast cancer and myocardial infection. Glucosinolates are sulphur and nitrogen containing compounds found in many plants and vegetables which are derived from amino acid and glucose. In human guts they are converted into isothiocyanates by hydrolysis. Glucosinolates break down products, isothiocyanates

and indole products have been found to induce apoptosis slowing tumor growth by blocking the phase-1 enzyme , by altering estrogen metabolism and by blocking the cell cycle. They also play anti-inflammatory role by blocking the release of histamine., which leads to the inflammation formation.

After preliminary introduction and mechanism of action of the antinutrients let us now concentrate on the role of the antinutrients in the treatment and inhibition of cancer.

Medicinal approach for treatment of cancer is well known but an alternative thought of treatment could be interesting where food items fight to reduce the risk of cancer and its inhibition. It is a natural biological action through proper choice of food containing all the nine antinutrients. Thus dieticians have major role to fight against cancer.

In this context, an investigation in the sufficiency of the above antinutrients in a vegetarian diet[14] could be worthy of mention.

In this article , the amount of essential antinutrients obtainable from a daily diet[12*] has been evaluated.

## Materials and Methods

Since the diet proposed involves variety of food that contains legumes, vegetables, cereal, dairy products and fruits estimation of the amount of the above antinutrients from each element of the diet has been calculated and added them up to get the net result .

The result so obtained has been compared with daily intake amount necessary as precautionary measure against cancer.
Also presented here the medical doses which are essential for treatment when one is affected with the diseases.

Results and Discussion

In the present investigation, estimation of the amount of antinutrients present in every item of the daily diet has been made separately. They are then added up to get the daily intake of the above antinutrients from the proposed diet.
The daily intake of the antinutrients necessary as safeguards for cancer diseases[13, 14 , 15]* have been found out.

The medicinal doses (IC50) of the relevant antinutrients have been studied and and incorporated in the investigation. The results have been shown in Tables 1 and 2.
Table-1 contains the minimum amount of antinutrients obtainable from the proposed diet, the minimum of the antinutrients necessary as daily intake for precautionary measure against cancer and the minimum medicinal doses(IC50)when one is affected with cancer.
Table-2 gives the maximum amount of the above respectively.

Table-1 . Minimum amount of antinutrients.

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Relevant Antinutrients | Obtained from proposed diet in mgm/day | Daily intake in mgm | Medicinal dose (IC50) in mgm/day |
| Fiber | 1164 | 2500 | .052 |
| Tannins | 389.2 | 1500 | 14.21 |
| Lectins | 983 | 0 | 5.25 |
| Lignans | 10.35 | .15 | 21.37 |
| Phytates(Phytic acid) | 1324 | 250 | 25.75 |
| Alkaloids | 231 | 9 | 20.87 |
| Saponins | 1149.7 | 200 | 8.12 |
| Protease inhibitors | 1914 | 100 | 13 |
| Glucosinolates | 112 | 14.2 | 1.53 |

Table-2 . Maximum amount of antinutrients

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Relevant Antinutrients | Obtained from proposed diet in mgm/day | Daily intake in mgm | Medicinal dose (IC50) mgm per day |
| Fiber | 1818 | 3800 | .072 |
| Tannins | 1426.19 | 2500 | 14.21 |
| Lectins | 988 | 200 | 5.25 |
| Lignans | 10.46 | 1.6 | 34.02 |
| Phytates(phytic acid) | 1960 | 800 | 39.01 |
| Alkaloids | 311 | 420 | 44.72 |
| Saponins | 1197.2 | 200 | 8.12 |
| Protease Inhibitors | 2049.5 | 100 | 13 |
| Glucosianolates | 252 | 14.8 | 1.53 |

Table-3 . Medicinal dose in cancer

| 1 | 2 |
|---|---|
| Relevant antinutrients | Dose for cancer |
| Fiber | 3000 mg[18] |
| Tannin | ---- |
| Lectin | ---- |
| Lignans | <708 mg for ovarial cancer[19] |
| Phytates | 6000 mg for breast cancer |
| Alkaloids | ----- |
| Saponins | 2000-4000 mg |
| Protease Inhibitors | ----- |
| Glucosinolates | 58000 mg for colorectal cancer |

From Table 1,2 and 3 it is clear that the medicinal dose for the antinutrients (Fiber, Lignans, Phytates, Saponins and Glucosinolates) are much higher than the daily intake amount as well as the amount obtainable from the diet , which means that when somebody is affected with any cancer problem, he can't be cured with diet only. Some medicine is also necessary.

## Conclusion

Cancer is a leading problem of the day and the number of cancer patients are increasing alarmingly day by day. So, scientists and doctors are engaged to investigate the ways for prevention and remedy of the disease. To get remedy , it may prove fatal due to side complications.

Prevention and arrest of the disease could be wise to search for.

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