

# CANCER CHEMOPREVENTION; A HOPE FULL STRATEGY FOR LIFE

Jibin.V. Mathew

Lecturer, Rama Nursing College, Pilkhua, Hapur, Uttar Pradesh

## Abstract

Chemoprevention is one of the advanced technique to prevent Cancer. In the present scenario, many researches are going on research regarding this. The success of several recent clinical trials in preventing cancer in high-risk populations suggests that chemoprevention is a rational and appealing strategy. This article highlights on cancer and its phases of Chemo preventive measure.

**Keyword:** Cancer, Chemoprevention, Preventive measures.

## Introduction

Cancer is one of the most leading diseases in the world that leads to death. Cancer started from the era of Hippocrates. Today researchers are trying their best to eradicate this dangerous disease. But still questions are remaining. What causes cancer? How we can prevent it? How can we cure cancer with minimum side effects?

This article, shares some ideas regarding new preventive strategy that is chemoprevention. Before that it's better to go through a brief discussion regarding standard cancer prevention strategies.

## Standard cancer prevention strategies

### Development

The cancer prevention programs developed by three main organizations. These are:

1. The National Cancer Institute
2. American cancer society
3. Oncology nursing society

1. The National Cancer Institute (NCI)

NCI is directed by the USA to conduct National Cancer Prevention Research efforts. Surveillance, epidemiology and end result programme (SEER programme) are

components of NCI which aims for cancer prevention.

### 2. American Cancer Society

This organization is dedicated to eliminating cancer through research findings, professional and public education

### 3. Oncology Nursing Society

It supports cancer prevention and early detection through a variety of publication, professional education and training programme.

## Frame work of cancer prevention.

The frame work of cancer prevention is formulated on the basis of two fundamental concepts that is multistep carcinogenesis and field carcinogenesis; provides structural frame work for a variety of innovative ideas and approaches in cancer prevention.

## Cancer prevention model

The cancer prevention model can be symbolized by a triangle(Fig.1)

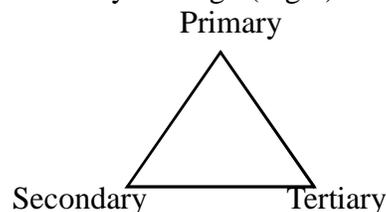


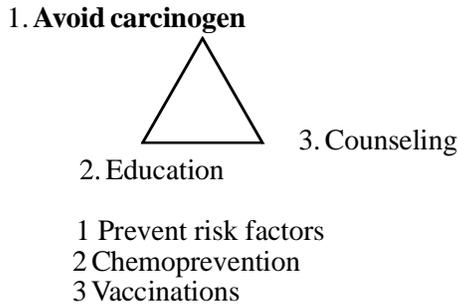
Fig.1: Cancer prevention model

However this article focuses on primary prevention strategy.

**Primary prevention**

The most desirable approach to eliminating cancer is through primary prevention. Primary prevention is to avoid carcinogen. Effective educational programme regarding healthy life style and counseling provides a good hope.

**Primary prevention**



**Chemoprevention**

What is chemoprevention? How we can utilize this? By hearing the name chemo one may set confused with chemo drug. But in fact it is absolutely different from chemo drugs because the action of chemo drug is to kill the cells by interfering cell cycle.

Chemoprevention is the systematic use of natural, synthetic chemicals or biologic substance that inhibits the development of invasive carcinoma by blocking DNA damage or arresting or reversing progression of preneoplastic cells that have already sustained such damage.(Fig.2)

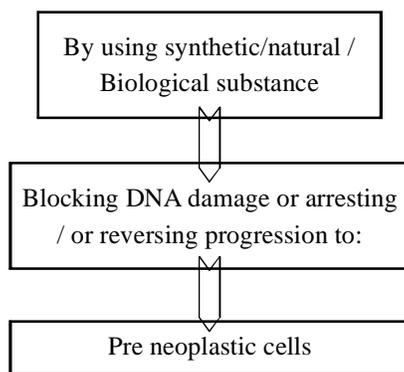


Fig.2: flow chart showing steps of chemo prevention.

Cancer chemoprevention is the use of natural, synthetic (made in a laboratory), or biologic (from a living source) substances to reverse, suppress, or prevent the development of cancer.

It is typically used by people who have a higher risk of developing cancer, including those with a previous cancer, an inherited cancer syndrome, or a family history of cancer.

**Chemoprevention is divided into three groups:**

1. **Primary prevention-** The strategies seek to prevent malignancies (cancers) in a healthy population. The individuals may have a history that puts them at higher risk, such as, a history of smoking or particular genetic mutations predisposing them to cancer development.

2. **Secondary prevention-** It involves patients who have known premalignant (pre-cancerous) lesions; by utilizing medications or vitamins in an attempt to prevent the progression of these lesions into cancers.

3. **Tertiary prevention-**It focuses on the prevention of new cancers in patients cured of an initial cancer or individuals who have been treated for premalignant lesions. Clinical trials of chemopreventions are based on the idea that interruption of the biological processes involved in carcinogenesis (the process of normal cells transforming into cancer cells) will inhibit this process and in turn, reduce cancer incidence.

**Agents use in chemoprevention:**

It can be natural, biological or synthetic compounds, dietary constituents, such as micronutrients, and vitamins or pharmacological agents such as NSAIDS and antiestrogens.

Although there is no absolute grouping, generally these compounds are grouped as two; Antimutagenes and Antiproliferatives.

**Antimutagenes**

These agents are carcinogen blocking agents that prevents activation of carcinogen, enhancing detoxification system or stop carcinogen before they reach their target sites.

Eg: Calcium, DHEA, NSAIDS, tea, polyphenoles

Tamoxifen (Nolvadex), an estrogen blocker that reduces the risk of developing breast cancer, and raloxifene (Evista), which lowers the risk of

developing breast cancer in women who have been through menopause.

Finasteride (Propecia, Proscar) and similar drugs that lower prostate cancer risk by reducing the amount of dihydrotestosterone (a male hormone) produced by the body.

Aspirin and other non-steroidal anti-inflammatory drugs (NSAIDs) to lower the risk of many types of cancer in people with an average risk of cancer

For example, in animal model (Experiments in the animals) calcium has been shown to inhibit hyper proliferation and subsequent malignancy in the colon by binding to excess bile and free fatty acids. So it is expected that advanced calcium therapies can reduce risk of colon cancer in high risk patients.

### **Antiproliferatives**

These agents typically act to block or retard the promotion and progression phase of carcinogenic process.

Eg: Retinoids, NSAIDS, Soy isoflavones, calcium, vitamin D, Folic acid etc.

For example, Retinoids are the most well studied chemo preventive agents. They act by inducing apoptosis and terminal maturation or differentiation of cells. NSAIDS inhibits enzymes that can enhance the development and progression of cancers.

### **Risks and benefits of chemoprevention**

As with any drug or medication, these drugs also have risks. Lowering the risk of cancer is often a benefit, whereas unwanted side effects are a risk. So a person should discuss with his doctor about the risk of developing cancer, preferences for taking a medication and current health status.

For instance, a person with a higher risk of developing cancer may be willing to accept specific side effects, if the tradeoff is a lower risk of cancer. However, a healthy person may not want to take a medication that gives them side effects when they are not already sick. Everyone's preferences are different.

### **Chemoprevention in clinical trials**

All drugs or other substances that have shown evidence of lowering cancer risk are tested in clinical trials. Clinical trials are research studies in people. A chemoprevention study tests a new chemo preventive agent to learn whether it is safe, effective, and actually delays or prevents cancer.

Often, substances that seem to prevent cancer in the laboratory setting don't prevent cancer when tested on people. In some situations, chemoprevention have shown to cause harms, some of which were serious or even life-threatening. For example, beta carotene, a substance found in carrots, squash, and similar vegetables, was thought to help to prevent cancer. When tested in clinical trials, though, it raised the risk of lung cancer in people who smoked.

### **Phases of chemoprevention clinical trials**

#### **Phase I**

Agents are introduced into a limited number of cancer free but high risk of human subjects.

#### **Phase Ia:**

A trial is conducted with small single dose study to determine dose response

#### **Phase Ib:**

The sequential, short term dose escalation trial will conduct in this phase. The maximum tolerated dose and minimum effective dose are determined at this stage.

#### **Phase II**

Evaluation of intermediate end points will conduct in this phase. Intermediate end points consist of biochemical, genetic, molecular, cellular and histological indicators that can be used to estimate possible neoplasm progression and predict future cancer incidence.

#### **Phase III**

Large scale, randomized placebo controlled studies for specific indications.

#### **Phase IV**

Post marketing study.

Although chemoprevention may delay cancer, it is possible that a person could still be diagnosed with cancer in the future. In this respect, chemoprevention for cancer may be similar to drugs used to prevent heart disease or stroke, such as statins or antihypertensive drugs, which are not 100% protective.

## **Conclusion**

Only large clinical trials conducted for many years can demonstrate whether a compound will reduce the risk of cancer. Once a given chemo preventive agent is shown to be effective, patients and their care providers will need to have an individualized discussion of the risks and benefit. Anyway new findings of chemoprevention strategy are giving a hopeful future to fight with cancer.

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