



International Journal of Medical and All Body Health Research



International Journal of Medical and all body Health Research

ISSN: 2582-8940

Received: 25-03-2021; Accepted: 10-04-2021

www.allmedicaljournal.com

Volume 2; Issue 2; April-June 2021; Page No. 01-05

Cancer: An overview

Suresh C Dangi ¹, Sourabh D Jain ², Arun K Gupta ³

¹⁻³ Chameli Devi Institute of Pharmacy, Indore Madhya Pradesh, India

Corresponding Author: Suresh C Dangi

Abstract

Cancer is a severe problem that can affect any part of the body. It is a multifactorial disease due to a combined effect of hereditary and outside factors acting concurrently and consecutively. Unluckily, it is a variety disease at the tissue level and this variety is a major challenge for its specific diagnosis, followed by efficacy of treatment. Tumors may be classified as benign or malignant. Benign tumors are not cancer and do not spread to other parts of the body. A malignant tumor can metastasize and spread to nearby parts of the body and eventually to sites far away from the original tumor. Chemotherapy is a major therapeutic approach for the treatment of different types of cancer. Since anticancer or antineoplastic drugs are neither specific nor targeted to the

cancer cells, improved delivery of anticancer drugs to tumor tissues in humans appears to be a rational and attainable challenge. Previously, the chemical carcinogen or group of carcinogens which has received the most attention has been tobacco smoke and deservedly so. Although, there is also fact that industrial and manufacturing exposures to chemicals, agricultural exposures to pesticides, indoor and outdoor air pollution and chemical infectivity of water can form cancer-causing factors present in our living and working atmosphere. The present review focused on types of cancer, causing agents, anticancer agents and long-lasting efficacy in cancer therapy.

Keywords: Cancer, Antineoplastics, Carcinogens, Chemotherapy, Leukaemia

1. Introduction

1.1 Cancer

Cancer is an assembly of illnesses characterized by abandoned growing and multiplication of unusual cells that invade and metastasize to additional parts of the body. Tumor is a main cause of Humanity and morbidity in human beings ^[1]. Cancer cells modifies from common cells in which the DNA (deoxyribonucleic acid) inside the cell nucleus has become injured or mutated ^[1-2] DNA is the "blueprint" contained in each cell that transports instructions for the cell's function, development, and decrease and protein synthesis. When this DNA becomes injured, the cell usually either repairs the injury or dies ^[3]. However, in tumor cells, the DNA which is damaged is not mended and cell does not die. These malignance cells generates many novel abnormal cells which has abnormal DNA in it (Fig. 1) ^[4].

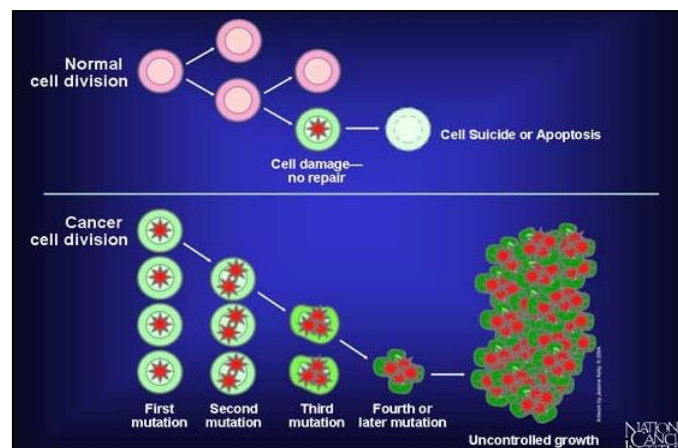


Fig 1: Loss of normal growth control of cells ⁴

DNA injury may be inherited or it may happen naturally at any opinion in a person's life. DNA injury can be affected via exposure to certain poisons such as those present in rollup smoke. There are however many issues that are liable for cancer^{2-5(a, b, c)}. This is mainly because of steady increase in life probability and rising urbanization as well as aggregate adoption of cancer-associated lifestyle picks like smoking, daily life activities and westernized food. Obviously, as per the evaluations given via Glob can 2012^[6] accounts for 14.1 million novel cases and 8.2 million expiries in 2012, then is projected for a nonstoprise, with an valued 22.2 million novel malignance cases and about 13.2 million deaths worldwide every year by 2030^[7]. Carcinogenesis is a multistep method that initiates with cellular conversion of usual cells into tumor cells, growths to hyper proliferation and culminates in the achievement of antigenic properties, invasive potential, and establishment of metastatic lesions. Over the past fifty years, there has been fabulous growth in the considerate of the molecular biology and growth of anticancer therapies.

1.2 Classification of cancer according to site of origin

Cancers may be classified according to site of origin and also their tissue or histological kinds. As per major site of origin; malignances may be characterized as prostate cancer, breast tumor, lung tumor, liver cancer renal cell carcinoma (kidney cancer), brain cancer, oral tumor etc. Based on tissue kinds tumors may be categorized into six major groups^[8]:

1.2.1 Carcinoma

This kind of malignance creates from the epithelial layer of cells that form the liner of outer shares of the body or the inner linings of organs inside the body. Malignancies, Carcinomas, of epithelial tissue, explanation for 80 to 90 % of all tumor suitcases since epithelial tissues are most plentifully originate in the body from existence extant in the skin to the layer and coating of body part and inner passages, such as the gastrointestinal area. Carcinomas typically affect body part or glands talented of excretion as well as breast, bladder, lungs, colon and prostate. Carcinomas are of dual kinds – adenocarcinoma and squamous cell carcinoma. These are speedily spreading tumors^[8].

1.2.2 Sarcoma

These tumors originate in connective and helpful tissues as well as muscles, bones, cartilage and fat. Bone tumor is one of the sarcomas called osteosarcoma. It affects the young most generally. Sarcomas appear like the tissue in which they develop. Other examples include leiomyoma sarcoma

(smooth muscles), condor sarcoma (of the cartilage), rhabdomyo sarcoma (skeletal muscles), mesothelioma (membranous liner of body cavities), Fibro sarcoma (fibrous tissue) or Mesothelium sarcoma etc^[8].

1.2.3 Myeloma

These generate in the plasma cells of bone marrow. Plasma cells are proficient of generating various antibodies in response to infections. Myeloma is a kind of blood cancer^[8].

1.2.4 Leukaemia

This is a cluster of tumors that are gathered within blood tumors. These tumors affect the bone marrow which is the site for blood cell manufacture. When tumorous, the bone marrow begins to produce undue immature white blood cells that flop to execute their usual actions and the patient is often prone to contamination^[8].

1.2.5 Lymphoma

These are tumors of the lymphatic system. Disparate the leukemia's, which affect the blood and are named "liquid tumors", lymphomas are "solid tumors". These may affect lymph nodules at precise sites similar stomach, brain, intestines etc. These lymphomas are referred to as additional nodal lymphomas. Lymphomas may be of dual kinds – Hodgkin's lymphoma and Non-Hodgkin's lymphomas. In Hodgkin lymphoma there is representative presence of Reed-Sternberg cells in the tissue samples which are not present in Non-Hodgkin lymphoma^[8, 9].

1.2.6 Mixed types

These have dual or extra constituents of the tumor. Some of the examples comprise miscellaneous mesodermal cancer, carcinoma sarcoma, adenoma squamous carcinoma and terato carcinoma. Blast to mothers is further type that involves emergent tissues^[8].

1.3 Classification of cancer on the basis of grade of tumor

Tumors can be classified according to grade of tumor. The anomaly of the cells with admiration to surrounding normal tissues determines the rating of the tumor. Increasing anomaly increases the grade; from 1–4. These are large grade cancers. Grade 1 fine differentiated cells by minor abnormality, Grade 2 cells are abstemiously differentiated and marginally more abnormal, Grade 3 cells are poorly discriminated and very irregular, Grade 4 cells are undeveloped and primitive and undifferentiated^[8].

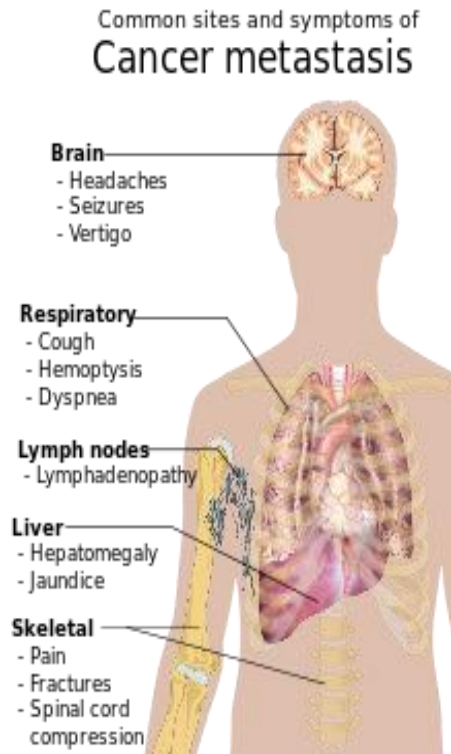


Fig 2: Common sites and indications of cancer ⁸

2. Cancer-causing agents

Some chemicals and ecological poisons are accountable for vicissitudes in usual cellular DNA. Lengthy revelation to asbestos filaments is related with mesothelioma. Tobacco is likewise connected to other tumors such as lung, larynx, head, neck, stomach, bladder, kidney, esophagus and pancreas as it contains added recognized carcinogens, counting nitrosamines and polycyclic aromatic hydrocarbons. Radiations unpaid to radon gas and protracted exposure to infrared emission from the sun can lead to melanoma and other skin malignancies. Some tumors can be activated by contaminations with pathogens. Notable between these include liver tumors due to Hepatitis B and C pollutions; cervical tumor due to contagions with Human Papilloma virus (HPV); Epstein Barr virus causing Burkett's lymphoma and gastric or stomach tumor due to Helicobacter pylori contamination. Certain hormonal changes also lead to tumor such as estrogen promotes uterine tumor. Impaired invulnerability counting HIV contamination leads to some cancers including Kaposi's sarcoma, non-Hodgkin's lymphoma, and HPV-associated malignancies such as anal tumor and cervical cancer ^[9, 10].

3. Currently available anticancer drugs

Antitumor agents are the medicines which are used in to managing of malignant illness (i.e.). Antitumor agents are also identified as cytotoxic agents .Cancer is a very problematic disease to treat. This has been because of deficiency of reliable analytic tests for the early detection and not having the compounds which will treatment any anticancer agents. Anticancer agents are the drugs which are used in to management of malignant illness (i.e. Cancer). Anticancer medicines used in the usage of malignant illness when surgery or radiotherapy is not conceivable or has verified unsuccessful. They are furthermore working as adjunct to surgery or radiotherapy they are used as the

primary treatment as in leukemia. Chemotherapy usually involves amalgamation of medicines having different targets or mechanisms of action. Anticancer medicines used in the treatment of malignant illness when surgery radiotherapy is not likely or has verified unsuccessful. They are also employed as adjunct to surgery or radiotherapy. They are used as the preliminary cure as in leukemia. Chemotherapy usually involves combination of medicines having altered targets or mechanisms of action. Traditional anticancer medicines are usually cytotoxic (toxic to the cell) and the more modern drugs are selective in their action. Anticancer drugs mainly categorized as followings (Fig. 3) ^[11]:

a) Alkylating agents

1. Mustard drugs: Mechloethamine, Chlrambucil, Cyclophosphamide, Melphalan.
2. Aziridnes: Thiotepa.
3. Alkyl sulphones: Busulphan.
4. Nitrosoureas: Lomustin, Carmustin, Procarbazine.

b) Antimetabolites

1. Purine antagonist: 6-Mercaptopurine.
2. Folic acid antagonist: Methotrexate.
3. Pyrimidine antagonist: 5-Flurouracil.

c) Plant products

1. Vinka alkaloids: Vincristine, Vinblastin.
2. Taxanes: Paclitaxel, Docetaxel.

d) Antibiotc: Dactinomycin, Daunorubicin, Doxorubicin, Mitomycin.

e) Radioisotopes: Radioiodine I131I31, Radiphosphorus p3232.

f) Other cytotoxic drugs: Hydroxyurea, cisplatin

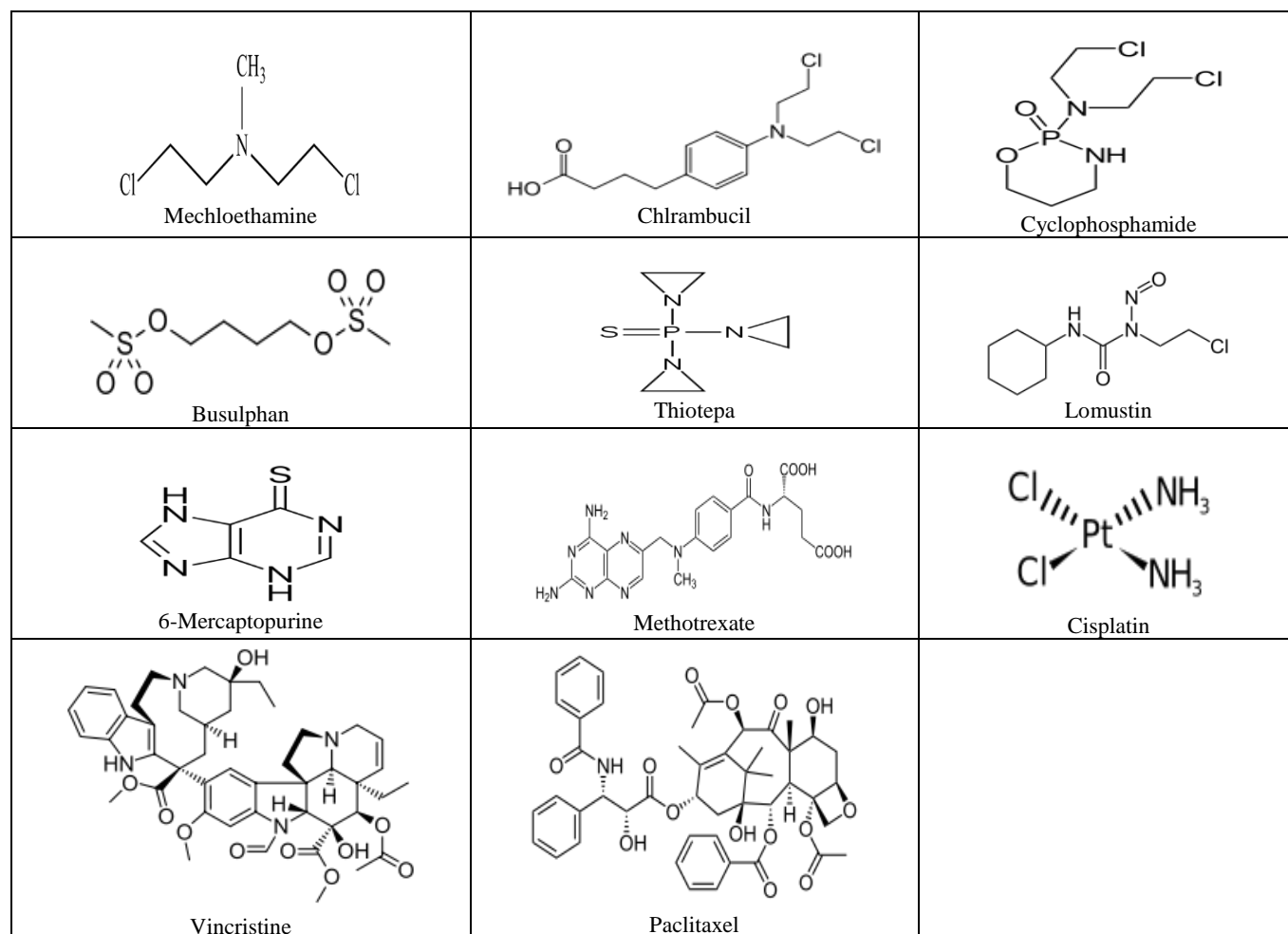


Fig 3: Structure of few anticancer drugs¹¹

4. Treatment strategy for cancer

Cancer can be treated by the following means

1. Surgery: Surgery is a medicinal specialty that uses operational manual and contributory methods on a patient to reconnoiter or treat a pathological disorder such as an illness or damage, to help recover bodily function or arrival or to renovation undesirable ruptured areas. Robotic radical prostatectomy for prostate tumor (3-D) opinion of the surgical field, at a greatly increased magnification, up to 15 eras bigger than the human eye.
2. Radiation therapy: Radioactivity therapy uses high-energy radiation to therapist cancers and slay cancer cells. Like X-rays, gamma radiations, and charged particles are kinds of radioactivity used for tumor treatment.
3. Immunotherapy: Tumor immunotherapy is the usage of the immune system to luxury tumor. Immunotherapies can be classified as lively, inactive or hybrid.
4. Hormonal therapy: Hormone rehabilitation or hormonal therapy is the usage of hormones in medicinal treatment. Treatment by hormone antagonists may likewise be referred to as hormonal cure or antihormone therapy.
5. Antibiotic: Antibiotics, likewise named antibacterials, are a kind of antimicrobial medication used in the cure and preclusion of bacterial contaminations. They may either kill or impede the growing of bacteria.
6. Chemotherapy: Chemotherapy is a type of tumor treatment that usages one or further antitumor medicines as segment of a standardized chemotherapy regimen. Chemotherapy may be given by a remedial intent, or it

may goal to extend life or to decrease symptoms. Chemotherapy is the tenure applied for an extensive array of biochemical substances i.e. drugs that are engaged in the treating the tumor. These drugs may act by many mechanisms like nosy with the replication of DNA. Inhibiting the creation of important molecules which are needed for DNA formation and inhibiting the mitotic spindle.^{12 (a, b, c, d)}

5. Conclusion

This review has summarized different types of cancer and its treatment. Their unique attributes have allowed clinicians to offer them as new treatments or as adjuncts to existing treatments to improve therapeutic effectiveness. The aim of this review was to present antineoplastic or anticancer drugs which may reduce side effects from systemic cancer treatment. This is necessary because chemotherapy often exhibits relatively low tumor specificity and high toxicity. Ultimately, we evoke that personalized combination strategies according to pathways that will be one of the main challenges and most promising strategies for cancer treatment in the future.

6. References

1. Ahmedin J, Siegel R, Ward E, Hao Y, Xu J, Murray T, *et al.* Cancer Statistics, CA: A Cancer J Clin. 2008; 58:71-96.
2. Sinha R, El-Bayoumy K. Apoptosis is a critical cellular event in cancer chemoprevention and chemotherapy by selenium compounds. *Current Cancer Drug Targets.*

- 2004; 4:13-28.
3. Cozzi P, Mongelli N, Suarato A. Recent anticancer cytotoxic agents. *Current Med. Chem. Anti-Cancer Agents*. 2004; 4:93-121.
 4. Anand P, Kunnumakkara AB, Sundaram C, Harikumar KB, Tharakan ST, Lai OS, *et al.* Cancer is a preventable disease that requires major lifestyle changes. *Pharm. Res.* 2008; 25(9):2097-116.
 5. National Cancer Institute/National Institutes of Health/Department of Health and Human Services. NIH, 2006.
 6. Deisboeck TS, Stamatakos GS. *Multiscale Cancer Modeling*, Chapman & Hall/CRC Press, Boca Raton, Fla, USA. Scientifica, 2011, 15.
 7. Kwabi-Addo B, Lindstrom TL. *Cancer Causes and Controversies*, Praeger, Barbara, Calif, USA, 2011.
 8. Weinberg RA. *The Biology of Cancer*, Garland Science, New York, NY, USA, 2007.
 9. Ferlay AJ, Steliarova-Foucher AE, Lortet-Tieulent AJ, Rosso BS, Coebergh CD JWW, Comber EH, *et al.* A Cancer incidence and mortality patterns in Europe: Estimates for 40 countries. *European Journal of Cancer*. 2013; 49:1374-1403.
 10. Bray F, Torre LA, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global cancer statistics, *CA Cancer J Clin*. 2015; 65(2):87-108.
 11. Kushi LH, Doyle C, Cullough MCM, *et al.* American Cancer Society Guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin*. 2012; 62(1):30-67.
 12. Rustagi T, Dasanu CA. Risk Factors for Gallbladder Cancer and Cholangio carcinoma: Similarities, Differences and Updates. *Journal of Gastrointestinal Cancer*. 2012; 43(2):137-147.
 13. Report on Carcinogens, Eleventh Edition. U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, 2011.
 14. Ashutoshkar. *Medicinal chemistry, new age international (p) ltd.* Publishers first edition, 1993, 672.
 15. Sudhakar A. History of cancer, ancient and modern treatment methods. *Journal of Cancer Science & Therapy*. 2009; 01(02):1-5.
 16. Mieog JSD, Vender Hage JA, Vande Velde CJH. Neoadjuvant chemotherapy for operable breast cancer. *British Journal of Surgery*. 2007; 94(10):1189-1200.
 17. Jafri SH, Mills G. Neo adjuvant chemotherapy in lung cancer. *Therapy*. 2011; 8(1):23-31.
 18. Takimoto CH, Calvo E. Principles of Oncologic Pharmacotherapy. In Pazdur R, Wagman LD, Camphausen KA, Hoskins WJ. *Cancer Management: A Multidisciplinary Approach* 11th Ed, 2008.
 19. Mohammed HA, Ba LA, Bhurkhloz T, Schumann E, Diesel B, Zapp J, *et al.* Facile synthesis of chrysin – derivatives with promising activities as aromatase inhibitors. *Nat prod commun*. 2011; 6:31-34.
 20. Karthikeyan S, Srinivasan R, Wani SA, Manoharan S. Chemo preventive potential of chrysin in 7, 12-dimethylbenz (a) anthracene-induced hamster buccal pouch carcinogenesis. *Int. J Nutr. Pharmacol. Neurol. Dis.* 2013; 3:46-53.
 21. Plaza Merichel, Pozzo Tania, Liu Jiayin, Ara Kazi, Zubaida Gulshan, Turner Charlotta, Karlsson Eva Nordberg. Substituent Effects on *in Vitro* Antioxidizing

Properties, Stability, and Solubility in Flavonoids. *J Agric. Food Chem.* 2014; 62(15):3321-3333.