IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
**Review Article**
March 2020 Vol.:17, Issue:4


# A Review on Medicinal Classification of Anti Neoplastic Agents

IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

**Virendra Bhouriyal[1]*, Shubham Prajapati[2]*, Susheel Deshmukh[3], Rajni Dubey[4], Neeraj Upmanyu[5]**

*[123]Student, School of Pharmacy & Research, Peoples University, MP, India*

*[4]Associate Professor, School of Pharmacy & Research, Peoples University, MP, India*

*[5]Principal, School of Pharmacy & Research, Peoples University, MP, India*

**Submission:** 22 February 2020
**Accepted:** 29 February 2020
**Published:** 30 March 2020

HUMAN JOURNALS
**www.ijppr.humanjournals.com**

**Keywords:** Cancer, abnormal tissue growth, DNA, apoptosis

**ABSTRACT**

Cancer is a group of diseases characterized by uncontrolled cell division that leads to abnormal tissue growth. The major types of cancer are carcinoma, sarcoma, melanoma, lymphoma, and leukemia. One woman dies of cervical cancer every 8 minutes in India. For every 2 women newly diagnosed with breast cancer, one woman dies of it in India. Mortality due to tobacco use in India is estimated at upwards of 3500 persons every day. Tobacco (smoked and smokeless) use accounted for 3,17,928 deaths (approx.) in men and women in 2018. Antineoplastics or anticancer drugs affect the activity of cell division i.e. are anti-proliferative. They damage the DNA and initiate apoptosis, halting the development and expansion of neoplastic cells. They also affect quickly dividing normal cells, therefore are likely to repress the bone marrow, repress growth, impair healing, cause sterility and cause hair loss. The present review therefore is an attempt to focus on classification of Antineoplastic Drugs with Structure.

## INTRODUCTION-

**Cancer** - The term "Cancer" is derived from the Greek word "Karkinos". Cancer is the name given to a group of related diseases. In all types of cancer, some of the body's cells begin to split without stopping and spread into nearby tissues. Cancer can start virtually anywhere in the human body, which is made up of trillions of cells.[1] [2]

Classification- Cancers are classified by the type of cell that the tumor cells resemble and are therefore presumed to be the origin of the tumor. These types include:

- **Carcinoma**: Cancers originated from epithelial cells. This group comprises many of the most common cancers and include almost all those in the breast, prostate, lung, pancreas and colon.

- **Sarcoma**: Cancers rising from connective tissue (i.e. bone, cartilage, fat, nerve), each of which matures from cells originating in mesenchymal cells outside the bone marrow.

- **Lymphoma and leukemia**: These two classes arise from hematopoietic (blood-forming) cells that leave the core and tend to develop in the lymph nodes and blood, respectively.

- **Germ cell tumor**: Cancers derived from pluripotent cells, most often presenting in the testicle or the ovary (seminoma and dysgerminoma respectively).

- **Blastoma**: Cancers derived from immature "precursor" cells or embryonic tissue.

**Epidemiology-** According to the National Cancer Registry Programme of the India Council of Medical Research (ICMR), more than 1300 Indians dies every day due to cancer. Between 2012 and 2014, the mortality rate due to cancer increased by approximately 6%. In 2012, there were 478,180 deaths out of 2,934,314 cases reported. In 2013 there were 465,169 deaths out of 3,016,628 cases. In 2014, there were 491,598 people died in out of 2,820,179 cases. According to the Population Cancer Registry of Indian Council of Medical Research, the incidence and mortality of cancer is highest in the north-eastern region of the country. Breast cancer is the most common and stomach cancer is the leading cause of death by cancer for the population as a whole. Breast cancer and lung cancer kill the most women and men respectively.[7]

Antineoplastic drugs are medicines used to treat cancer. Antineoplastic drugs are also called anticancer, chemotherapy, chemo, cytotoxic, or hazardous drugs.[8]

**Classification-**

1. **Cytotoxic antineoplastics.**
2. **Targeted antineoplastics**.

**1. Cytotoxic-**

**a. Nucleoside analogues.**

- Azacididine
- Capecitabine
- Carmofur
- Cladribine
- Clofarabine
- Cytarabine
- Decitabine
- Floxuridine
- Fludarabine
- Fluorouracil
- Gemcitabine
- Mercaptopurine
- Nelarabine
- Pentostatin
- Tegafur
- Tioguanine

**b. antifolats-**

- Methotrexate
- Pemetrexed
- Raltitrexed

**c. Other antimetabolites-**

- Hydroxycarbamide

**d. topoisomerase I inhibitor-**

- irinotecan
- topotecan

**e. Anthracyclines-**

- Daunorubicin
- Idarubicin
- Doxorubicin
- Mitoxantrone
- Epirubicin
- Valrubicin

**f. Podophyllotoxins-**

- Etoposide.
- Teniposide.

**g. Taxanes-**

- Cabazitaxel.
- Paclitaxel.
- Doocetaxel.

**h. Vinca alkaloids-**

- Vinblastine
- Vinflunine.
- Vincristine
- Vinorelbine.
- Vindesine.

**i. Alkylating agents-**

- Bendamustine.
- Cyclophosphamide.
- Busulfan.
- Decarbazine.
- Carmustine.
- Fotemustine.
- Chlorambucil.
- Ifosfamide.
- Chlormethine.
- Lomustine.

- Melphalan.
- Streptozocin.
- Temozolomide.

**j. Platinum compounds-**

- Carboplatin.
- Cisplatin.
- Nedaplatin.
- Oxaliplatin.

**k. Miscellaneous-**

- Altretamine.
- Bleomycin.
- Bortezomib.
- Dactinomycin.
- Estramustine.
- Ixabepilone.
- Mitomycin.
- Procarbazine

**2. Targeted antineoplastics-**

**A. Monoclonal antibodies-**

- Alemtuzumab.
- Bevacizumab.
- Cetuximab.
- Denosumab.
- Gemtuzumab ozogamicin.
- Ibritumomab tiuxetan.
- Lipilimumab.
- Nivolumab.
- Ofatumumab.
- Panitumumab.
- Pembrolizumab.
- Pertuzumab.
- Rituximab.
- Tositumomab.
- Trastuzumab.

**B. Tyrosine kinase inhibitor-**

- Afatinib.
- Aflibercept.
- Axitinib.
- Bosutinib.
- Crizotinib.
- Dasatinib.
- Erlotinib.
- Gefitinib.
- Imatinib.
- Lapatinib.
- Nilotinib.
- Pazopanib.
- Ponatinib.
- Regorafenib.
- Ruxolitinib.
- Sorafenib.
- Sunitinib.
- Vandetanib.

**C. mTORinhibitor-**

- Everolimus.
- Temsirolimus.

**D. Retinoids-**

- Alitretinoin
- Bexarotene.
- Isotretinoin.
- Tamibarotene.
- Tretinoin.

**E. Immunomodulatory agents[IMiDs]**

- Lenalidomide.
- Pomalidomide.
- Thaliedomide.

**F. Histone deacetylase inhibitors-**

- Panodinostat.
- Romidesin.

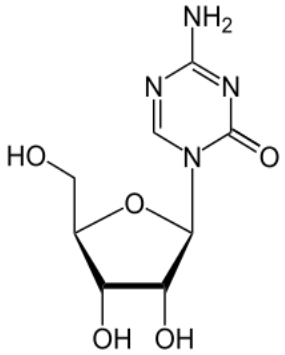
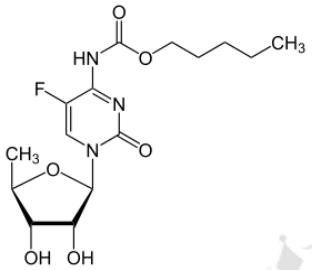
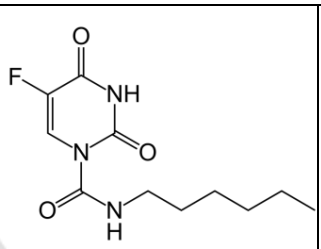
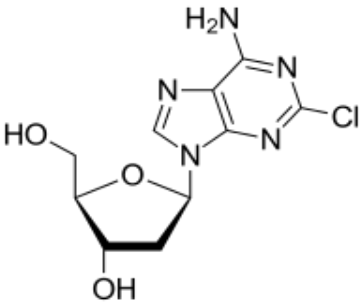
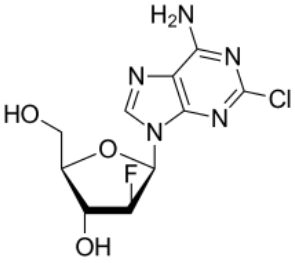
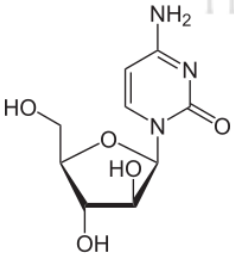
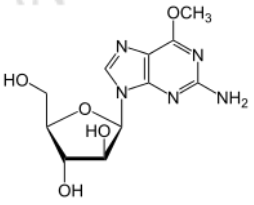
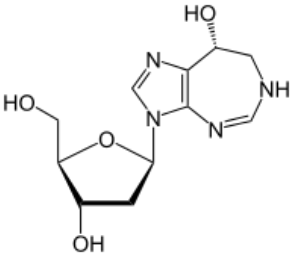
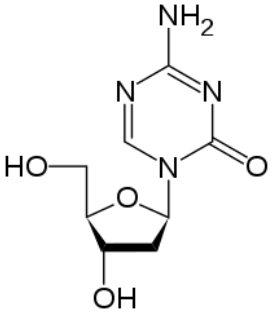
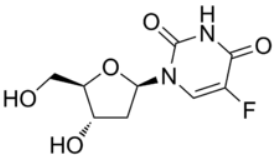
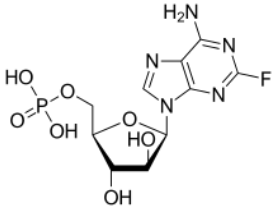
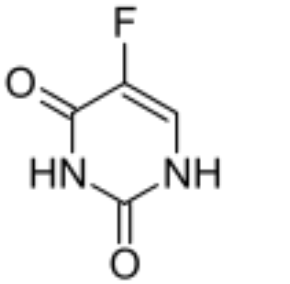
- Valproate.
- Vorinostat.

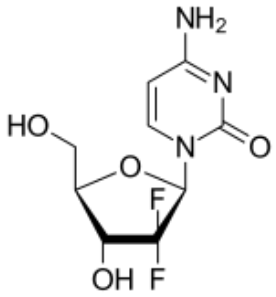
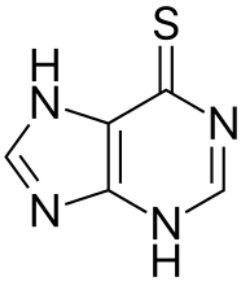
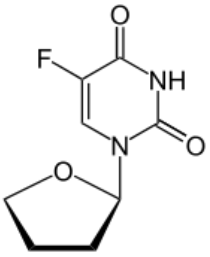
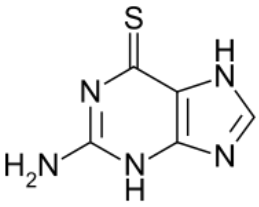
**G. Other agents-**

- Anagrelide.
- Arsenic trioxide.
- Asparaginase.
- BCG vaccine.
- Denileukin diftitox.
- Vemurafenib.

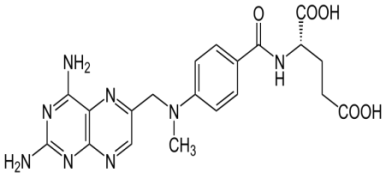
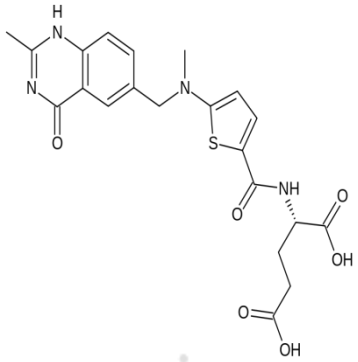
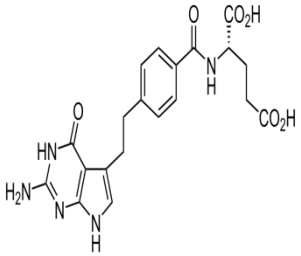
**Structures-**

**Nucleoside analogues-**

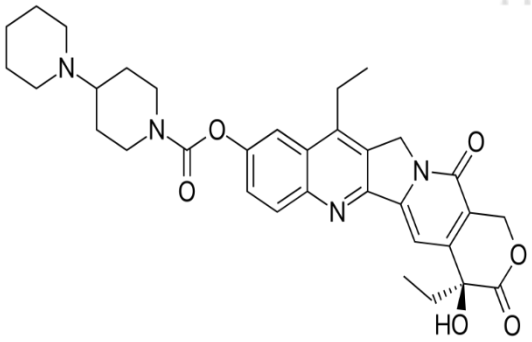
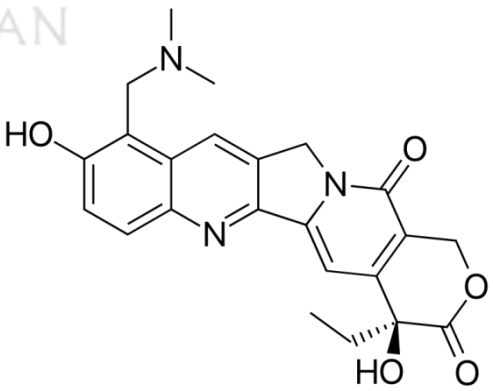
| | | | |
|---|---|---|---|
|  **Azacitidine** |  **Capecitabine** |  **Carmofur** |  **Cladribine** |
|  **Clofarabine** |  **Cytarabine** |  **Nelarabine** |  **Pentostatin** |
|  **Decitabine** |  **Floxuridine** |  **Fludarabine** |  **Fluorouracil** |

| | | | |
|---|---|---|---|
|  **Gemcitabine** |  **Mercaptopurine** |  **Tegafur** |  **Tioguanine** |

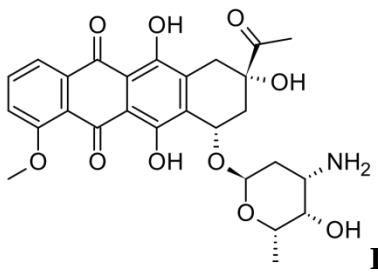
**Antifolates-**

| | | |
|---|---|---|
|  **Methotrexate** |  **Raltitrexed** |  **Pemetrexed** |

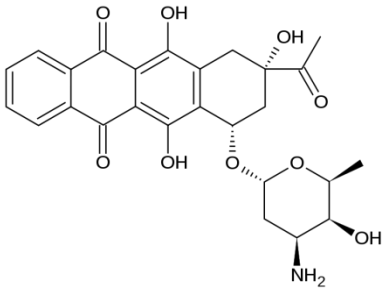
**Topoisomerase I inhibitor-**

| | |
|---|---|
|  **Irinotecan** |  **Topotecan** |

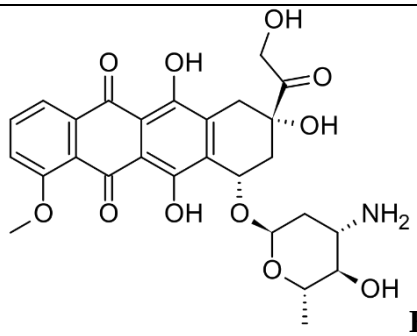
**Anthracyclines-**



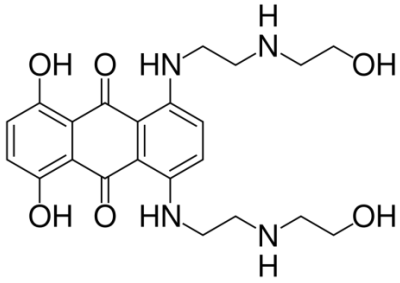
**Daunorubicin**



**Idarubicin**

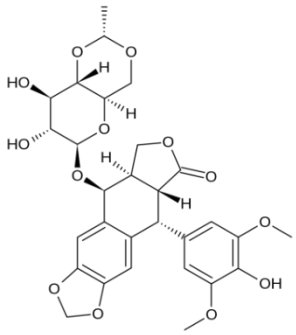


**Epirubicin**

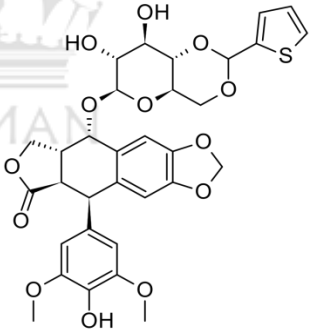


**Mitoxantrone**

**Podophyllotoxins-**

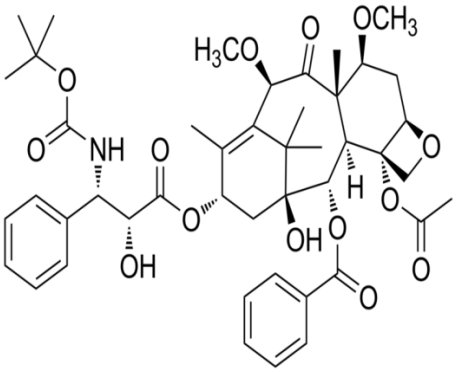


**Etopside**

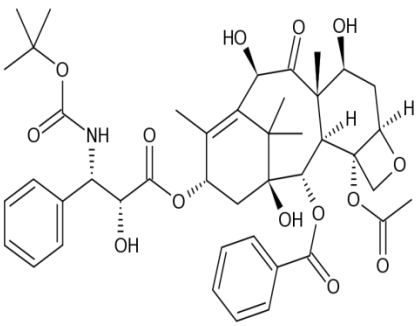


**Teniposide**

**Taxanes-**

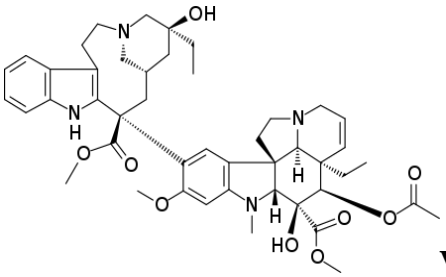


**Cabazitaxel**

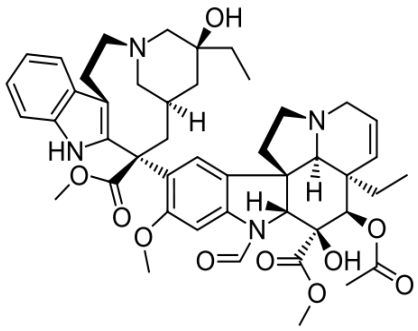


**Docotaxel**

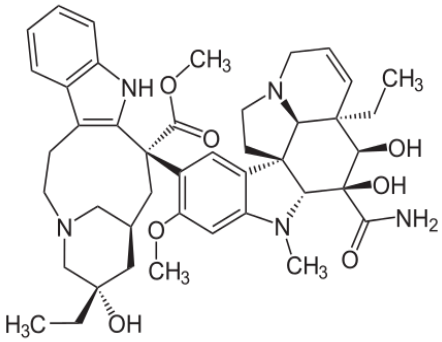
**Vinca alkaloids-**



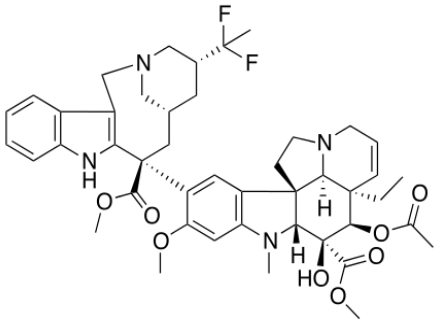
**Vinblastine**



**Vincristine**

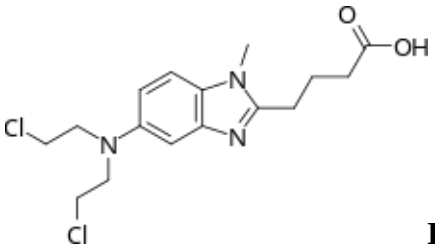


**Vindesine**

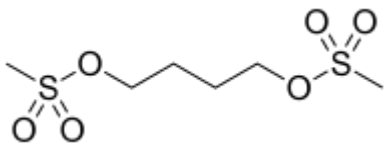


**Vinflunine**

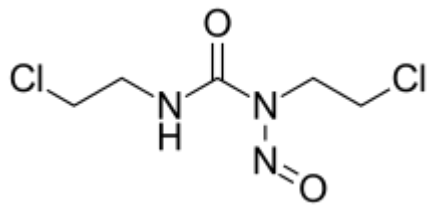
**Alkylating agents-**



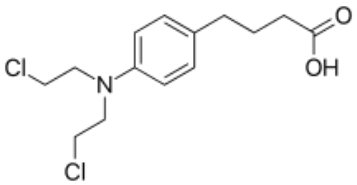
**Bendamustine**



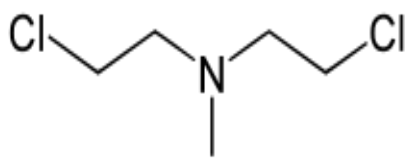
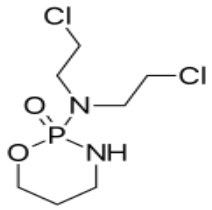
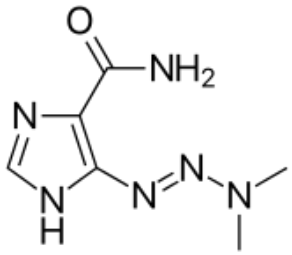
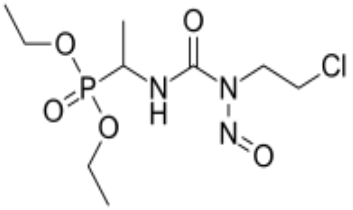
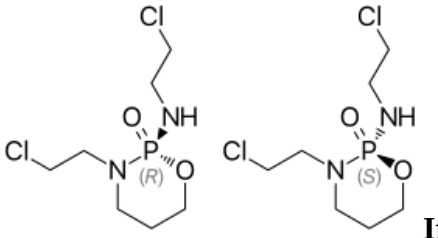
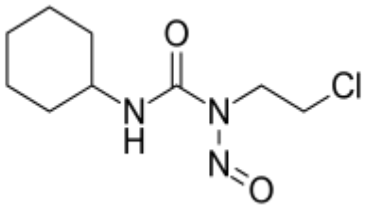
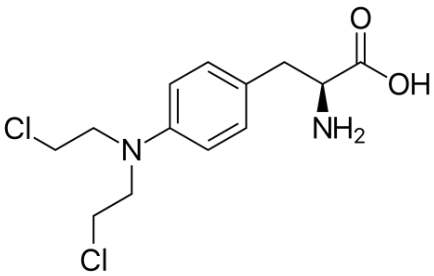
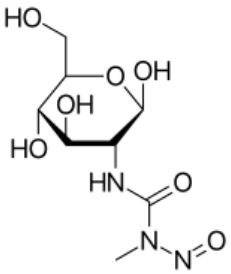
**Busulfan**



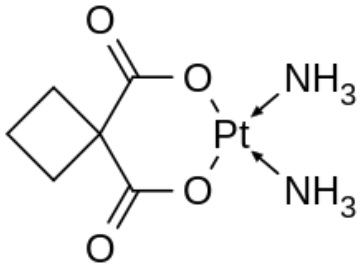
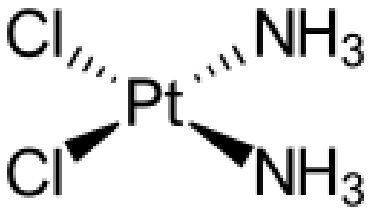
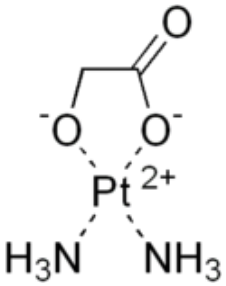
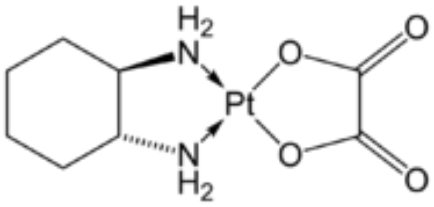
**Carmustine**



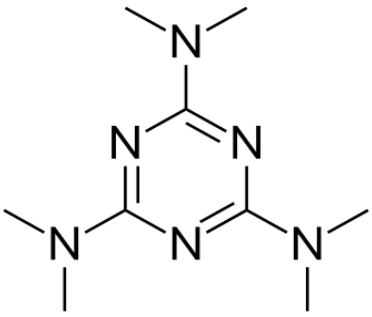
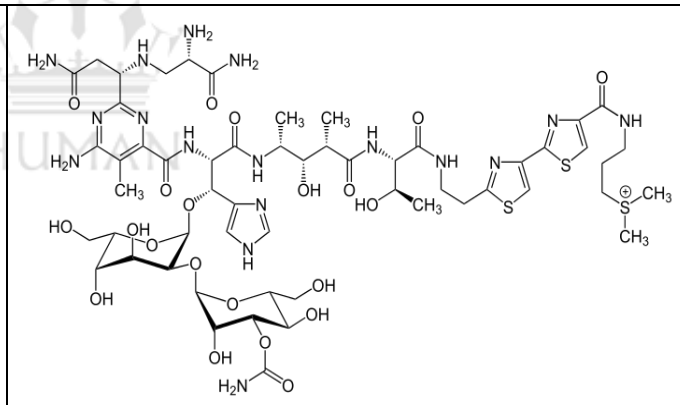
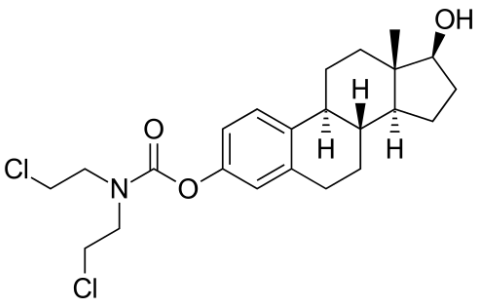
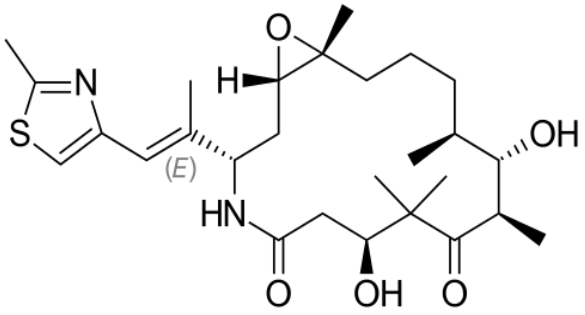
**Chlorambucil**

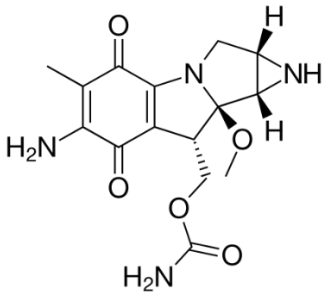
| | |
|---|---|
|  **Chlormethine** |  **Cyclophosphamide** |
|  **Decarbazine** |  **Fotemustine** |
|  **Ifosfamide** |  **Lomustine** |
|  **Melphalan** |  **Streptozocin** |

**Platinum Compounds-**

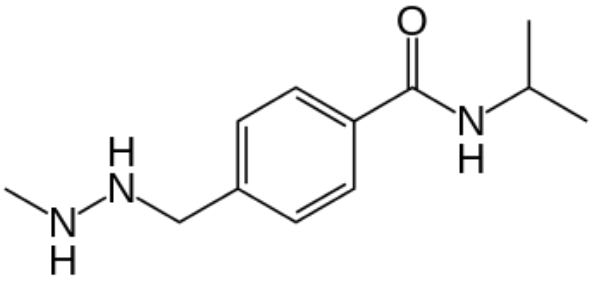
| | |
|---|---|
|  **Carboplatin** |  **Cisplatin** |
|  **Nedaplatin** |  **Oxaliplatin** |

**Miscellaneous-**

| | |
|---|---|
|  **Altretamine** |  **Bleomycin** |
|  **Estramustin** |  **Lxabepilone** |

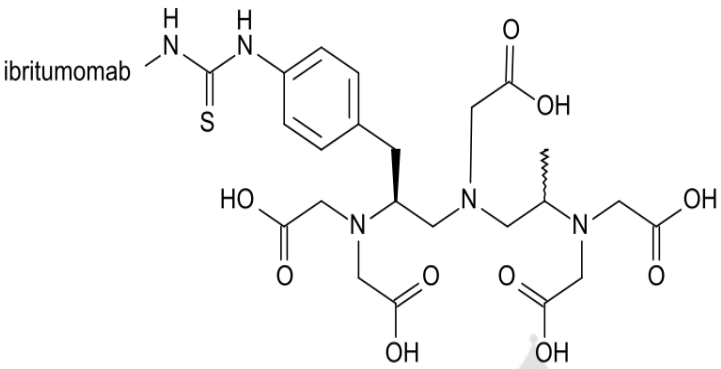


**Mitomycin**



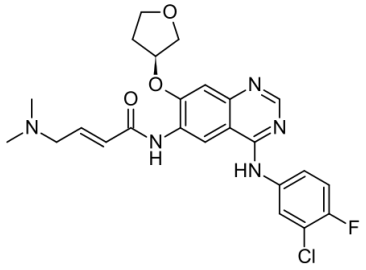
**Procarbazine**

**Monoclonal antibodies-**

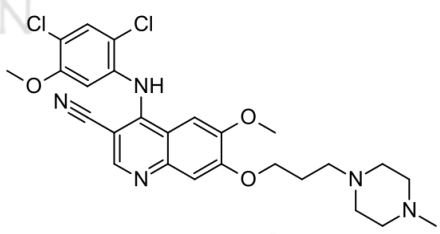



**Ibritumomab Tiuxetan**

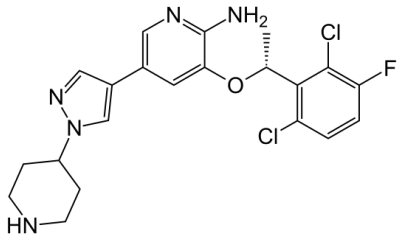
**Tyrosine Kinase Inhibitor**



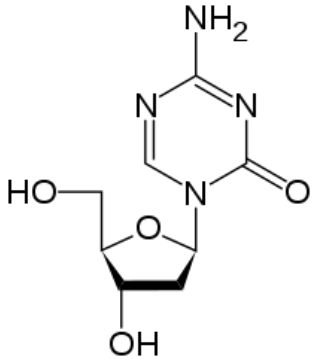
**Afatinib**



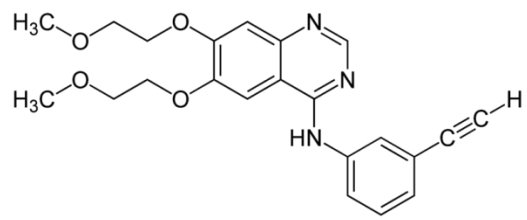
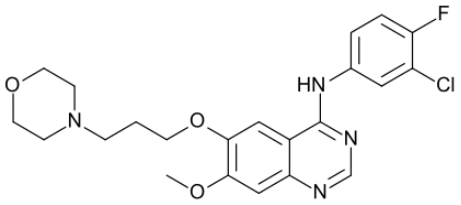
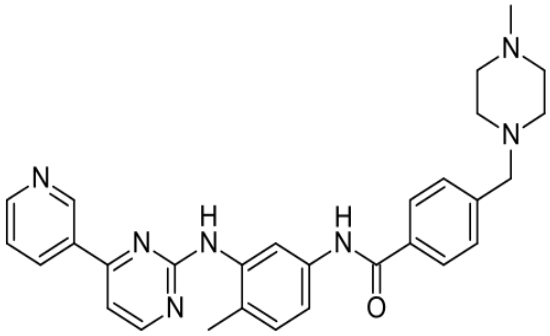
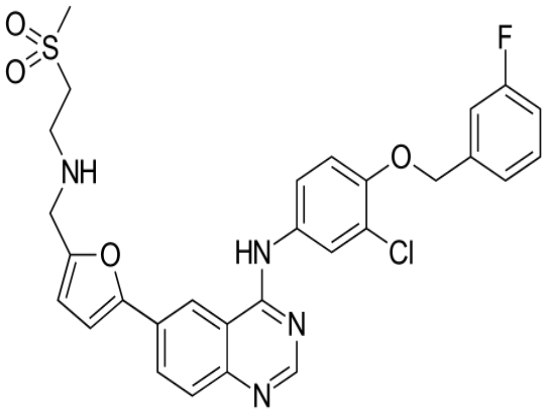
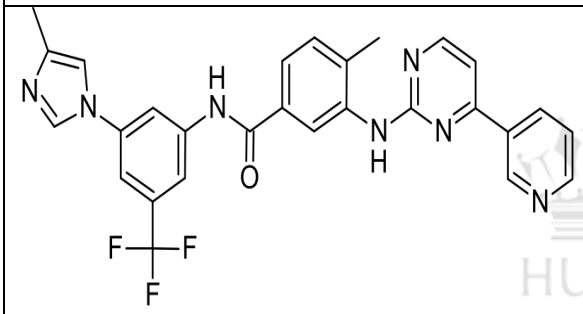
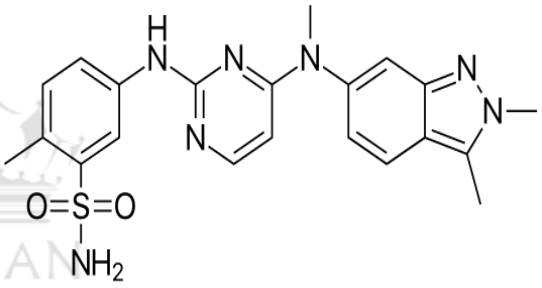
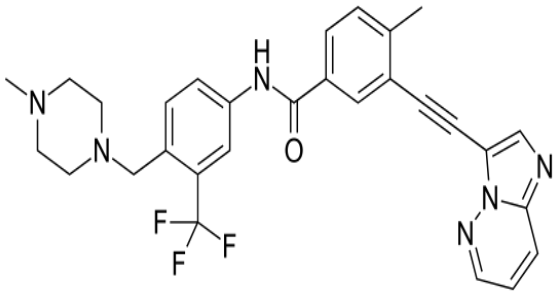
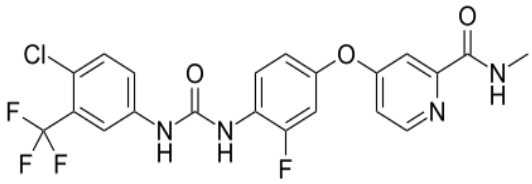
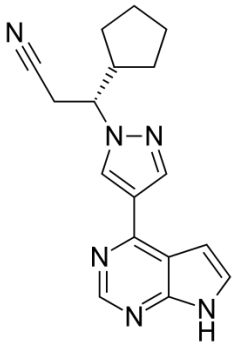
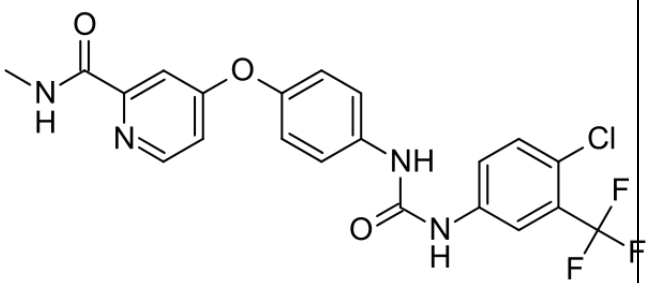
**Bosutinib**

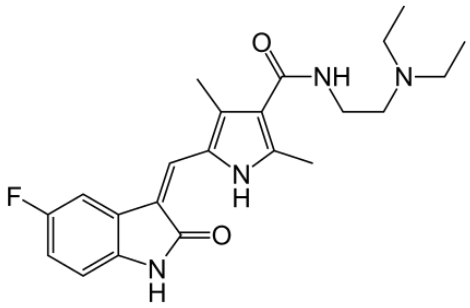


**Crizotinib**

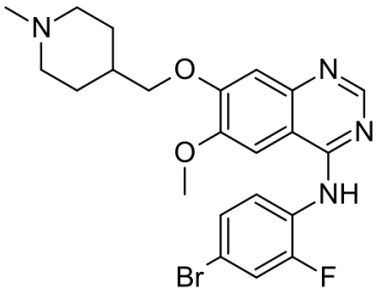


**Dasatinib**

| | |
|---|---|
|  **Erlotinib** |  **Gefitinib** |
|  **Imatinib** |  **Lapatinib** |
|  **Nilotinib** |  **Pazopanib** |
|  **Ponatinib** |  **Regorafenib** |
|  **Ruxolitinib** |  **Sorafenib** |

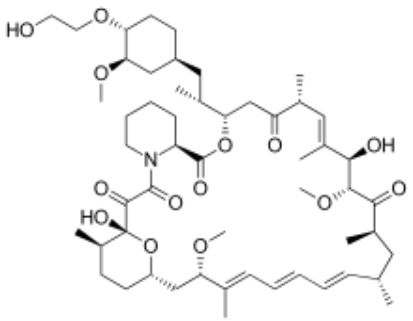


**Sunitinib**

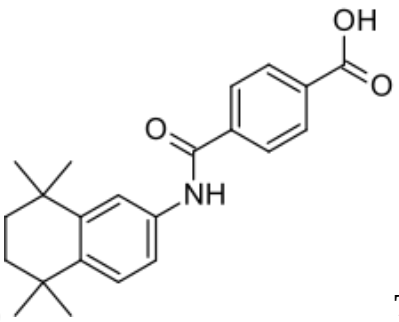


**Vandetanib**

**mTOR inhibitor-**

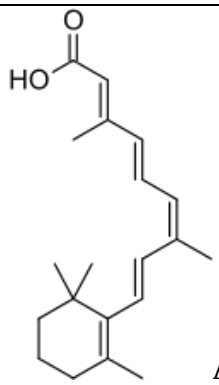


**Everolimus**

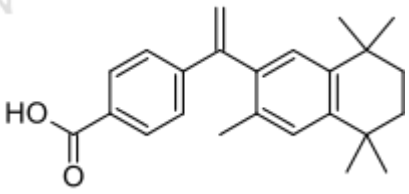


**Temsirolimus**

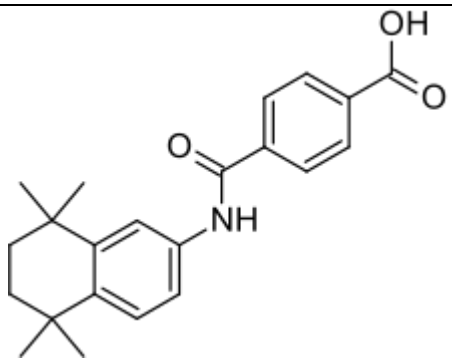
**Retinoids-**



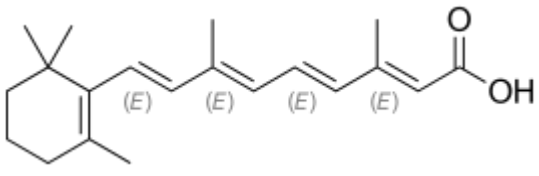
**Alitretinoin**



**Bexarotene**

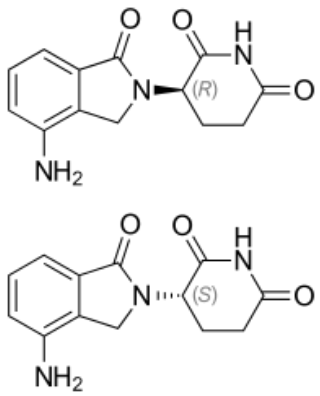
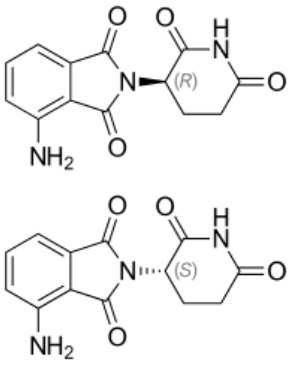


**Tamibarotene**

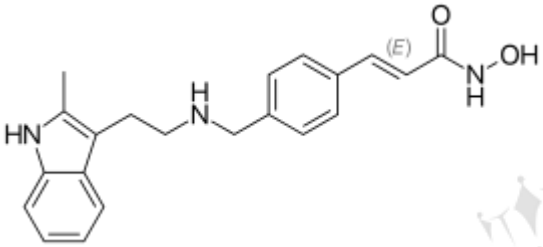
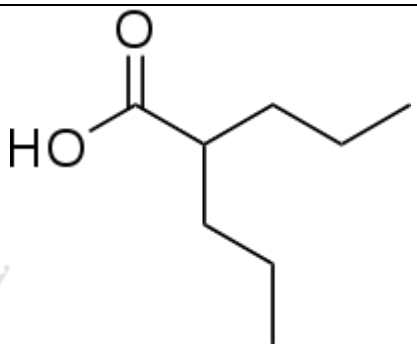
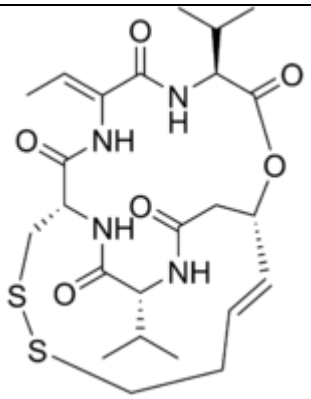
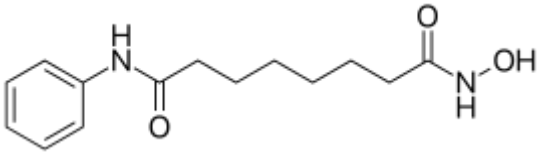


**Tretinoin**

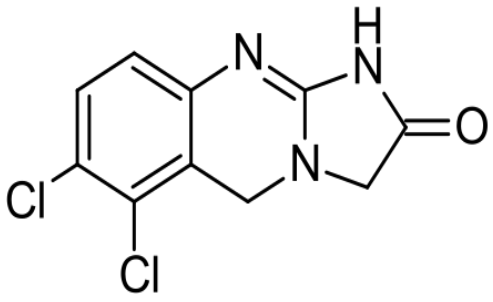
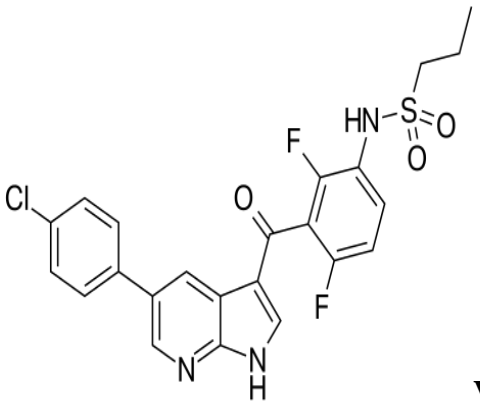
**Immunomodulatory agents-**

| | |
|---|---|
|  **Lenalidomide** |  **Pomalidomide** |

**Histone Deacetylase inhibitor-**

| | |
|---|---|
|  **Panodinostat** |  **Valproate** |
|  **Romidepsin** |  **Vorinostat** |

**Other agents-**

| | |
|---|---|
|  **Anagrelide** |  **Vemurafenib** |

## CONCLUSION:

Cancer is becoming a high profile disease in developed and developing countries. In 2007 the WHO published that in 2005, 7.6 million people died from cancer related diseases with the majority of these people living in low-income countries.[10] Chemically-derived drugs have been developed and other cancer treatments pre-exist. However, current methods such as chemotherapy have their limitations due to their toxic effects on non-targeted tissues furthering human health. Many treatment options for cancer exist. The primary ones include surgery, chemotherapy, radiation therapy, hormonal therapy, targeted therapy and palliative care. Which treatments are used depends on the type, location and grade of the cancer as well as the patient's health and preferences. The treatment intent may or may not be curative.

## REFERENCES:


1. *"Cancer"*. World Health Organization. 12 September 2018. *Retrieved 19 December 2018*
2. Rajpal S, Kumar A, Joe W. Economic burden of cancer in India: Evidence from cross-sectional nationally representative household survey, 2014. *PLoS One*. 2018;13(2):e0193320. Published 2018 Feb 26. doi:10.1371/journal.pone.0193320
3. WHO Summary report on HPV & cervical cancer statistics in India (18/03/2008)
4. Ferlay J, Soerjomataram I, Ervik M, et al. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet].
5. Lyon, France: International Agency for Research on Cancer; 2013.[3]
6. Bray F, Ren JS, Masuyer E, et al. Estimates of global cancer prevalence for 27 sites in the adult population in 2008.; 2013; Int J Cancer.; 132(5):1133-45.
7. http://www.breastcancerindia.net/bc/statistics/stat_global.html
8. Jha P, Jacob B, Gajalakshmi V, Gupta PC, Dhingra N, Kumar R, et al. A nationally representative case–control study of smoking and death in India. New England Journal of Medicine. 2008 March; 358(11):1137–1147.
9. Sinha DN, Palipudi KM, Gupta PC, Singhal S, Ramasundarahettige C, Jha P, et al. Smokeless tobacco use: a meta-analysis of risk and attributable mortality estimates for India. Indian Journal of Cancer. 2014;51(Suppl 1):S73–S77.

10. http://ncdirindia.org/NCRP/Annual_Reports.aspx
11. https://www.cdc.gov/niosh/topics/repro/antineoplastic.html
12. https://www.aimu.us/2016/10/20/cancer-symptoms-causes-diagnosis-classification-and-management/
13. World Health Organisation. The World Health Organisation's Fight Against Cancer: Strategies that prevent, cure and care. WHO Press; Geneva: 2007.[Google Scholar]