

A Review on Lung Cancer Causes and Treatment Using Modern Technology

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I. Introduction

1.1. Cancer

Cancer occurs because of uncontrolled growth of cells within the body, worldwide cancer is a major burden. It is hierarchic second reason for death; this is often in several countries, (American Cancer Society, 2016). At the current time radiation therapy and surgery are the most treatment of many of the approaches to cure cancer although these clinical medicines posses multiple facet effects like canal lesions, suppression of bone marrow, neurological pathology, internal organ toxicity and hair loss.

Carcinoma is the main cause of public unhealthiness all over the world is second leading death causes in the USA among other countries. In the USA the carcinoma death cases are highest every year as it is estimated by cancer society with the recent information on cancer incidence, mortality, and survival (Bray *et al.*, 2018). (In Asian country carcinoma constitutes 12.9% of all new cancer cases and nine point three of all cancer connected deaths in many men and women (2018, WHO). According to the most recent reports cancer is estimated to be over 13.1 million in 2030 worldwide (Bray *et al.*, 2018). Expensive facilities and medicines are needed for the treatment of cancer, it's a known proven fact that growing cancer cells could damage healthy cells and cause adverse effects too like automotive vehicle immune reactions, harm to heart, endocrine, liver and excretory organ, slow wound healing, hyperbolic risks of infections and coagulation problems throughout the body (Wisastra *et al.*, 2014). There are many factors such as environmental factors, smoking, and heredity that cause various types of cancer (Chen *et al.*, 2018; Norum *et al.*, 2018).

Lung cancer has become a deadly disease and remains the deadly cause of deaths in various nationalities, various methods and medication are employed to suppress and kill the cancer cells.

1.2. Lung Morphology

1.3. Structure of the lungs

They are paired organs pyramid shaped attached to trachea through propel the inferior surface composed of left bronchi. Diaphragm boxes the lungs is dome shaped and flat, the bottom contains the muscles which comprises of cavity of the body and lungs. There are many diseases that attack the lungs the leading is lung cancer which destroys the lungs hence has become a concern and treatment with less effects are in trial stages (Higano *et al.*, 2017); (Hoffman *et al.*, 2016).

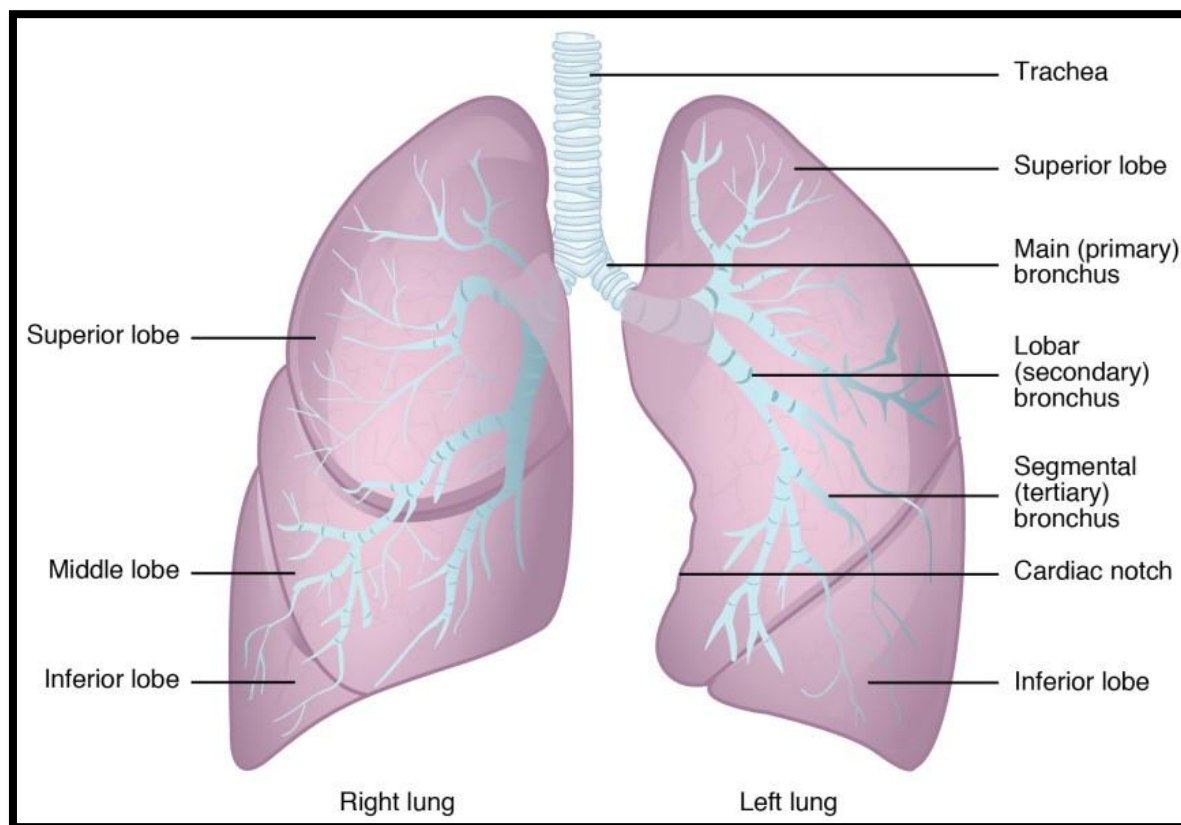


Figure. 1. The lungs (Saad *et al* 2018)

1.3.1. Cancer classification

1.3.2. Sarcoma:

It's a type of cancer that develop from connective tissue like fat muscle, cartilage, supportive tissue and and bones, this type of cancer develop from mesenchymal cells outside bone marrow.

1.3.3. Carcinoma:

These types of cancer that originate from epithelial cells, its features are cells that cover internal and external body parts like colon, breast and lung cancer.

1.3.4. Blastoma:

It's a type of tumor that originates from immature embryonic tissue, mostly found in minors than the grownups.

1.3.5. Adenomas:

These are type of tumours that starts from the thyroid adrenal gland, glandular tissues and other pituitary glands.

1.3.6. Germ tumour:

They are malignant cancer that is derived from pluripotent cells found in the ovary or testicle.

1.3.7. Leukemia and Lymphoma:

Cancer that begins from the lymph nodes and immune system tissues, the cancer that arises from bone marrow and mount up in the blood stream is call leukemia.

1.8. Lung cancer

Worldwide and us tumors of the lung are causing numerous deaths in men and women. The major factor cause of lung cancer is smoking; Lung cancer can also obtained through passive exposure to tobacco smoke (Chen *et al.*, 2015).

1.4. Types of lung cancer

1.4.1. Non-Small Cell Lung Cancer

Composed of 85% most common type of lung cancer, about 85% of lung cancers is non-small cell lung cancers and includes Squamous cell carcinoma, adenocarcinoma, and large cell carcinoma (Galon *et al.*, 2014).

1.4.2. Small Cell Lung Cancer

About 1%-15% of lung cancers are small cell lung cancers. This type of lung cancer tends to spread quickly. Small cell lung cancer (SCLC), which is sometimes called oat cell cancer.

1.4.3. Lung Carcinoid Tumor

Generally less than 5% of lung cancers are lung carcinoid tumors. They are also sometimes called lung neuroendocrine tumors. Most of these tumors grow slowly and rarely spread. There are two types of lung

carcinoid tumors (or cancerous tumors made up of neuro-endocrine cells): typical (slower) and atypical (faster and more likely to spread to other organs). The symptoms to some people include wheezing and coughing. Generally each type of lung cancer is treated differently from one another various methods are employed for the treatment, diagnosis also differentiate various cancer types so that to allow for the effective treatment.

1.4.4. Lung cancer structure

In figure 2. Shows the types of lung cancer, the causes, effects and damages caused by the cancer agents.

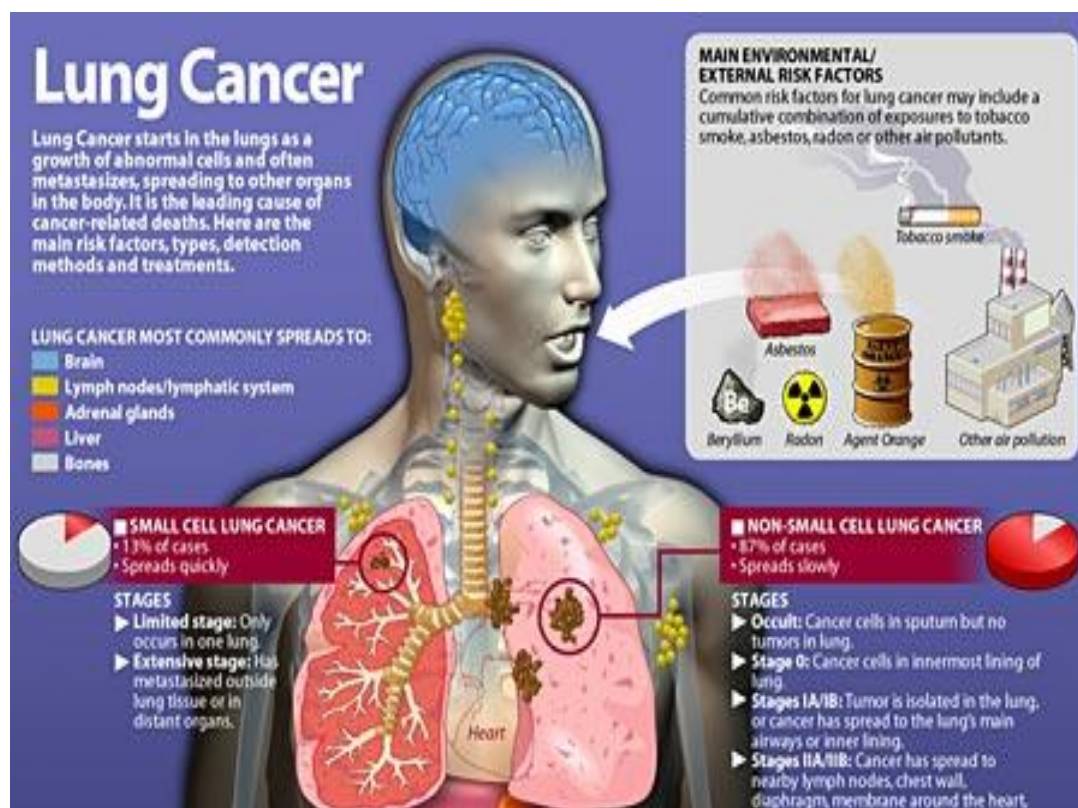


Figure. 2. Types of lung cancer and causes - <https://mtviewmirror.com>

1.4.5. Causes of lung cancer

1.4.6. Exposure to diesel exhaust

Soot and gases from exhaust from diesel exposure can lead to increase risk of cardiopulmonary and cardiovascular diseases hence development of cancer of the lung.

1.4.7. Tobacco smoking

This is the main causing of cancer of the lung as revealed by many doctors and professionals, smoking destroy and damage the cells that line in the lungs due to its high carcinogenic emotions during cigarette smoking and use of tobacco (Butler *et al.*, 2017).

1.4.8. Air pollution

Breathing polluted air like power plants industry leads to the development of lung complications and difficulty in breathing which lead to formation and cancer of the lung development.

1.4.9. Diseases of the Lungs

Disease of pulmonary obstruction which is chronic and other lung diseases like respiratory illness pulmonary disease and emphysema risk associated development of lung cancer.

1.5. Familial predisposition

Genetic susceptibility encourages cancer of the lungs development in individuals who inherit genes such as genes which interfere with DNA repair, are at higher risk of attaining cancers, which are passed from family lineage to the off springs.

1.5.1. Exposure to radon gas

A natural decay product of uranium that produces ion radiation from radon gas causes lung cancer. Due to radioactive elements that get attached to the lungs, they can emit radiation that destroys the lungs hence causing lung cancer.

1.5.2. Exposure to asbestos fibers

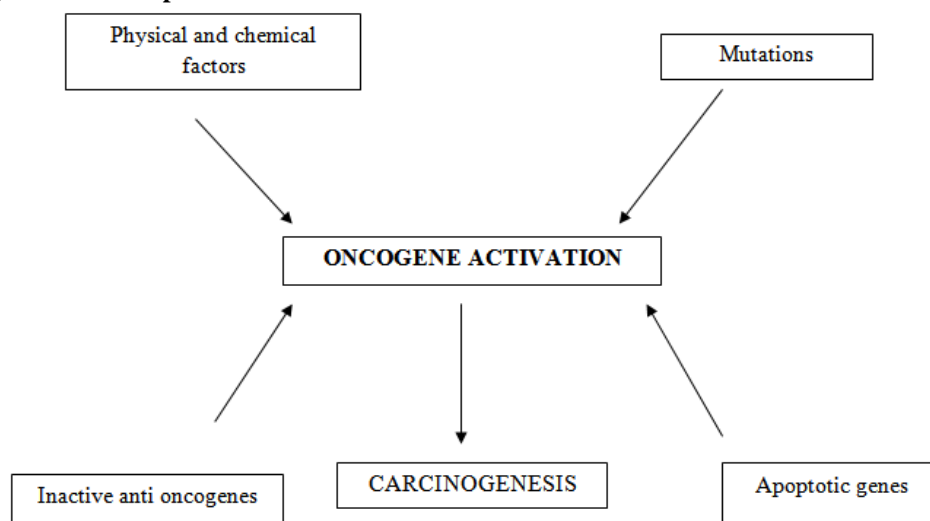
A silicate fiber from Asbestos fibers when inhaled persist in lungs for long period of time which leads to lung complications finally causes lung cancer.

1.5.3. Etiology of cancer of the lungs

1.5.4. Lung cancer mechanism

Oncoproteins encode for proteins which are versions altered like the normal ones involving multiplication and transformation of cells. Proliferation of cells which are normal and stimulate various growth factors. The cell divisions is regulated by division and transmission of signals through membrane of plasma to the cell interior, growth factors plays a key role in carcinogenesis of cells (Roman *et al.*, 2018). In cells proliferation stimulation is brought by growth factor. The growth factors binding in the receptor of protein on the membrane plasma are activated by binding cytoplasmic kinases to protein phosphorylation of intracellular messengers to stimulate cell division.

1.5.5. Lung cancer development



Cancer of the lungs is caused by growth of cells uncontrollably and cells proliferation in uncontrolled way due to different factors activating the formation of cancer carcinogenesis, apoptotic genes physical and chemical factors involves the development of cancer, and mutations can lead to oncogene activation that lead to development of lung cancer (Lee *et al.*, 2017).

1.5.6. Diagnose of lung cancer

1.5.7. Diagnostic tests and procedures for lung cancer by doctors;

Suspicious signs and symptoms of lung cancer arise from the history revelation of physical examination additionally to the concern in lung cancer development. Risk factors and symptoms like tobacco smoke, doctors could observe respiratory signs obstruction of airways or in lungs infections, skin color of light blue like cyanosis and membrane secretion because of meagre chemical element within the blood, suggests compromised operation because of chronic sickness of the respiratory organ, even, changes within tissues of the nail beds, referred to symptom, and conjointly could indicate chronic respiratory organ sickness (Hu *et al.*, 2015).

1.5.8. X- Rays;

X-rays of chest is that of the commonest 1st diagnosis alternative once any of the signs of carcinoma gift. The X-rays of chest procedures usually involves a read from the rear to chest front still and read aspect in every x-rays procedure, x-ray exposing patients in short to minimal radiation quantities. X-ray of chest could show suspiciousness defects within lung however is not able to work out incase of infected with cancer specially, nodule within lung known as hematomas is also known in x-ray of chest for mimicking carcinoma (Kato *et al.*, 2018).

1.5.9. Computerized tomography (CT) scans;

It is an additional sensitivity unlike normal X-rays of chest with detection for nodules in respiratory organs, it demonstrates and shows additional nodules. Generally endovenous medium is given before the scan to

assist delineates and positioning of the organs. Foremost obvious aspect results in reactivation adverse to endovenous medium which are given before the procedure. This could lead to itch, hives and rashes which typically disappear very fast. Extreme hypersensitivity reaction (threatening-life allergies and respiration difficulties) medium rarely. Abdomen CT scans could establish pathological process cancer within the adrenaline gland and liver, and CT scans is also used to show the presence extent of pathological process tumor within lungs (Xu *et al.*, 2017).

1.5.10. low-dose spiraling CT scan

This technique suggested with USOSTF (United States Preventive Services Task Force) annually in current and former smokers. Technically seems in extending chance in detecting small, early, additional cures of respiratory organ tumors. Three years of low dosage CT scan during the cluster reducing a chance for carcinoma death by a hundred. Using model regulations in analysis of outcome for those test in decrease of requirement in diagnostic test and gauge nodules detected once the probability is higher then the nodules are not of cancer (Smits *et al.*, 2018).

1.5.11. MRI Magnetic resonance imaging (MRI) scans

The use of magnetic radio waves is the logic under the MRI technique, and a pc to supply pictures for structures of body like CT scan; patients are put on a bed which is transferrable inserting it into the MRI scanning machine. Currently not any illustrious aspect effect of MRI scanner in absence of radiation exposure (Varricchio *et al.*, 2004; Hoffman *et al.*, 2016).

1.6. Positron emission pictorial representation (PET) scanning

PET scans will confirm whether or not a tumour tissues are growing actively also might assist to determine the kind of cell inside a specific tumour. The PET scanner, the patient receives a brief half life hot drugs, receives some quantity of radiation exposition X-ray of chest. The drugs accumulation is bound in tissue over other, counting on injected drug. Discharge of drug particle referred to positrons from tissue is absorbed upwards. Because encounter of electrons by the positrons inside body, a reaction manufacturing rays of gamma happens. Gamma rays are recorded by a scanner marks the area wherever hot drugs accumulation has taken place. For instance, combination aldohexose (a simple supply of energy within the body) with a hot substance can show wherever aldohexose is being employed, for instance, during a growing tumour. PET scanner additionally integration to CT scanner during techniques referred to PET- CT scanner. Integration PET-CT have showing to boost the accurate stage unlike PET scans separately (Socinski *et al.*, 2013).

1.6.1. Cancer of the lung treatment

1.6.2. Chemotherapy:

It is prevention growing and division in cells of cancer through administration of drugs. Radiotherapy or single chemotherapy may be administered as therapy of surgical as adjuvant; the most effective drugs of chemotherapeutics are the drugs of platinum-based in lung cancer treatment as compared to other drugs (Brueckl *et al.*, 2018). SCLC when diagnosed it is usually widespread all over the body and chemotherapy is the preferred alternative treatment (Yoon *et al.*, 2018). Outpatients are given chemotherapy as pills, or intravenous infusion for a period of months to week's drugs combinations can be administered. There are many side effects caused by chemotherapy drugs killing cells which are dividing due to blood cells damage leads to prevalence of blood clotting and infections. The other complications include; mouths sores hair loss, diarrhea, nausea, fatigue, weight loss, and vomiting. Combination of drugs and dosage for chemotherapy and side effects vary from person to person many side effects of chemotherapy have been in control due to development of medication that prevent and treat the side effects. After the completion of dosage the side effects may disappear after recovery (Chen *et al.*, 2018).

1.6.3. Therapy targeted;

Targeting molecular therapy is administrated by drug which works in patient's subsets that have got changes in genetic cancers that cause growth of tumor (Reuland *et al.*, 2018).

1.6.4. EGFR-targeted therapies;

The medication afatinib, gefitinib and erlotinib are medication that targets cancer cells specifically, hence has no harm to other normal cells generally they are macromolecule targeted like EGFR for assistance in division of cell (Ke *et al.*, 2016). This macromolecule encryption factors in NSC carcinoma is mutated by several cases, leading to mutation hence enhances of growth. In ladies EGFR factor are leading factors for mutation growth (Ferrer *et al.*, 2018).

1.6.5. Other targeted therapies;

Alternative medications that target various mutations are in use. They embody the enzyme of ALK (Anaplastic lymphoma kinase) amino acid. Ceritinib, brigatinib, alectinib and crizotinib are used in patients whose tumors have ALK factor abnormality (Song *et al.*, 2018).

1.6.6. Immunotherapy;

It is effective therapy for advanced respiratory organ cancer patients. This type of medication promotes and strengthens system activity against cells growth. Pembrolizumab and nivolumab for the carcinoma treatment were approved by U.S.A agency in the year 2015. They inhibit check points and area that control immune reaction and promotion of immunity reaction (Miao *et al.*, 2018).

1.6.7. RFA-Radio frequency ablation;

It is applied and used as an alternative to surgery, notably in stages of early carcinoma. During the sort of treatment, there is needles insertion in the skin into tumor, typically beneath steering by CT scanner. The electrical energies transmission to tips of the needles wherever producing heat within tissue, to kill cancer (Testa *et al.*, 2018).

Today due to absence of availability of standard lung cancer therapy treatment, doctors offer therapies which are experimental. This is a proof that doctors still have not come up with effective therapies to be used for lung cancer treatment, combinations of new drugs are on clinical trials this is to discover efficiency of this new drugs compared with existing ones. The study of newer immunotherapy types which include therapy related-vaccines which use defense system of body for fighting cancer cells directly. Clinical trial studies in lung cancer vaccine treatment are on progress (Ke *et al.*, 2016).

1.6.8. Prevalence of lung cancer

1.6.9. Worldwide occurrence of lung cancer.

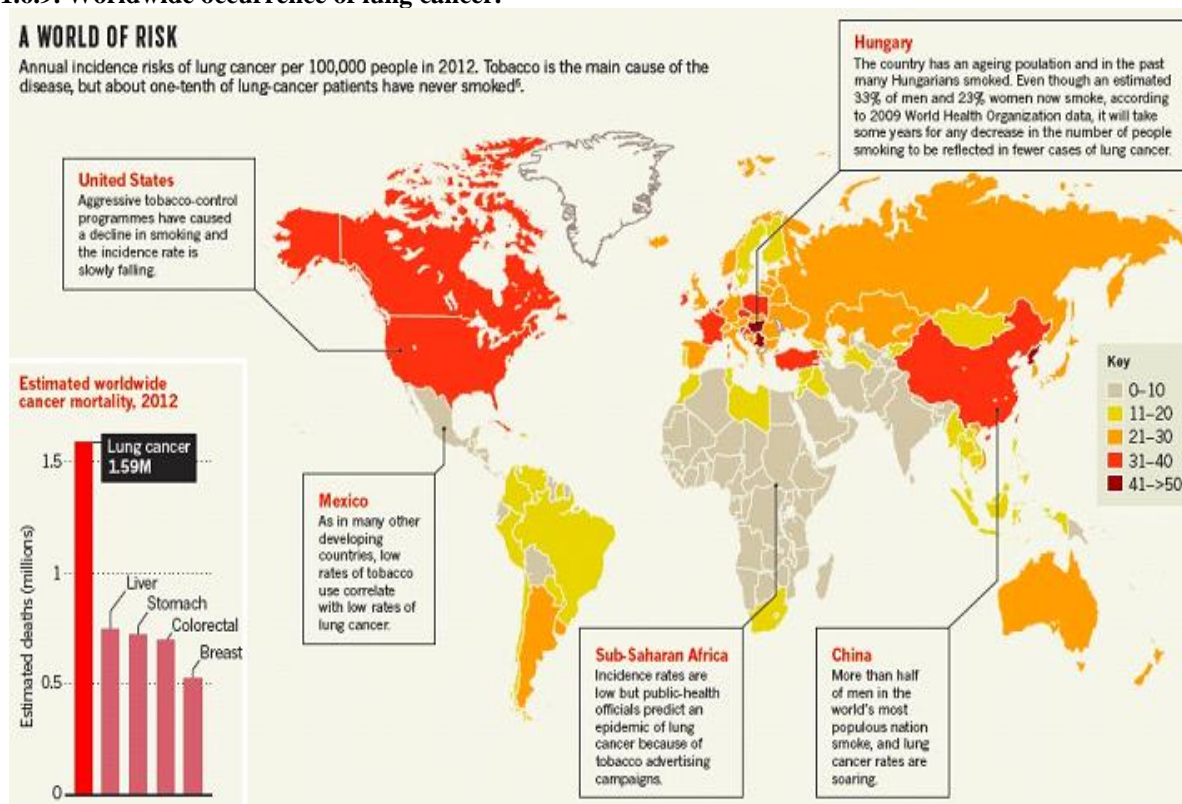


Figure 3. Lung cancer occurrence (Jaklitsch *et al.*, 2012)

The use of tobacco is leading main causes of cancer of the lung; the world map figure 3 shows the most affected countries worldwide. Hungary, United States and China are the most affected with higher smoking rates sub-Sahara Africa were minimal lung cancer cases as shown in figure 3. Tamil Nadu India there was low lung cancer cases but risk of lung cancer because of tobacco advertising campaigns.

1.6.10. Modern drugs for treatment of lung cancer

- Imatinib
- Cyclophosphamide
- Cisplatin
- Vinblastine
- Vincristine
- Actinomycin D
- Mitomycin
- 6-Thioguanine
- 6-Mercaptopurine
- Methotrexate (Kim *et al.*, 2018).

1.6.11. Side effects of modern drugs for treatment of lung cancer

- Loss of hair.
- Sores of the mouth.
- Appetite loss
- Vomiting and nausea
- Constipation and diarrhea
- Infections due to less white blood cells
- Bleeding
- Fatigue- having few red blood cells
- Fertility issues men and boys.
- Fertility issues women and girls (Scott *et al.*, 2012).

II. Conclusion

This review highlighted the world wide cases of lung cancer, the methods used to treat lung cancer drugs used and their side effects, through these scientists are researching on alternative methods with minimal side effects. In future the researchers opt for medicinal plants which may have fewer side effects compared to synthetic drugs.

References

- [1]. Bray, F., Ferlay, J., Soerjomataram, I., Siegel, R. L., Torre, L. A., & Jemal, A., 2018. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians*, 68(6), 394-424.
- [2]. Wisastra, R., & Dekker, F., 2014. Inflammation, cancer and oxidative lipoygenase activity are intimately linked. *Cancers*, 6(3), 1500-1521.
- [3]. Chen, R. L., Zhao, J., Zhang, X. C., Lou, N. N., Chen, H. J., Yang, X., Su, J., Xie, Z., Zhou, Q., Tu, H. Y., Zhong, W. Z., Yan, H. H., Guo, W. B., Wu, Y. L., Yang, J. J., 2018. Crizotinib in advanced non-small-cell lung cancer with concomitant ALK rearrangement and c-Met overexpression. *BMC cancer*, 18(1), 1171.
- [4]. Norum, J., & Nieder, C., 2018. Tobacco smoking and cessation and PD-L1 inhibitors in non-small cell lung cancer (NSCLC): a review of the literature. *ESMO open*, 3(6), e000406.
- [5]. Higano, N. S., Hahn, A. D., Tkach, J. A., Cao, X., Walkup, L. L., Thomen, R. P., & Woods, J. C., 2017. Retrospective respiratory self-gating and removal of bulk motion in pulmonary UTE MRI of neonates and adults. *Magnetic resonance in medicine*, 77(3), 1284-1295.
- [6]. Saad, M., & Ruwanpura, S. M., 2018. Tissue Processing for Stereological Analyses of Lung Structure in Chronic Obstructive Pulmonary Disease. In *Inflammation and Cancer*, 42 (2), 155-162
- [7]. Chen, S., Zhao, S., Wang, X., Zhang, L., Jiang, E., Gu, Y., & Yu, Z., 2015. Crocin inhibits cell proliferation and enhances cisplatin and pemetrexed chemosensitivity in lung cancer cells. *Translational lung cancer research*, 4(6), 775.
- [8]. Galon, J., Mlecnik, B., Bindea, G., Angell, H. K., Berger, A., Lagorce, C., & Nagtegaal, I. D., 2014. Towards the introduction of the 'Immunoscore' in the classification of malignant tumours. *The Journal of pathology*, 232(2), 199-209.
- [9]. Butler, K. M., Rayens, M. K., Wiggins, A. T., Rademacher, K. B., & Hahn, E. J., 2017. Association of Smoking in the Home with Lung Cancer Worry, Perceived Risk, and Synergistic Risk. *Oncology nursing forum*, 44(2), E55-E63.
- [10]. Roman, M., Baraibar, I., Lopez, I., Nadal, E., Rolfo, C., Vicent, S., & Gil-Bazo, I., 2018. KRAS oncogene in non-small cell lung cancer: clinical perspectives on the treatment of an old target. *Molecular cancer*, 17(1), 33.
- [11]. Lee, G. A., Hwang, K. A., & Choi, K. C., 2017. Inhibitory effects of 3, 3'-diindolylmethane on epithelial-mesenchymal transition induced by endocrine disrupting chemicals in cellular and xenograft mouse models of breast cancer. *Food and Chemical Toxicology*, 109(1), 284-295.
- [12]. Hu, M., Peng, S., He, Y., Qin, M., Cong, X., Xing, Y., Liu, M., Yi, Z., 2015. Lycorine is a novel inhibitor of the growth and metastasis of hormone-refractory prostate cancer. *Oncotarget*, 6(17), 15348-15361.
- [13]. Kato, Y., Ninomiya, K., Ohashi, K., Tomida, S. & Makimoto, G., 2018. Combined effect of cabozantinib and gefitinib in crizotinib-resistant lung tumors harboring ROS1 fusions. *Cancer science*, 109(10), 3149-3158.
- [14]. Xu, Y., Gao, P., Lv, X., Zhang, L., & Zhang, J., 2017. The role of the *ataxia telangiectasia* mutated gene in lung cancer: recent advances in research. *Therapeutic advances in respiratory disease*, 11(9), 375-380.
- [15]. Smits, S. E., McCutchan, G. M., Hanson, J. A., & Brain, K. E., 2018. Attitudes towards lung cancer screening in a population sample. *Health expectations : an international journal of public participation in health care and health policy*, 21(6), 1150-1158.
- [16]. Varricchio, C.G., 2004. A cancer source book for nurses, VIII. Jones and Bartlett Publishers, Boston, 229.

- [17]. Hoffman, E. A., Lynch, D. A., Barr, R. G., van Beek, E. J., Parraga, G., & Iwpfi Investigators, 2016. Pulmonary CT and MRI phenotypes that help explain chronic pulmonary obstruction disease pathophysiology and outcomes. *Journal of Magnetic Resonance Imaging*, 41(3), 544-557.
- [18]. Socinski, M. A., Evans, T., Gettinger, S., Hensing, T. A., VanDam Sequist, L., Ireland, B., & Stinchcombe, T. E., 2013. Treatment of stage IV non-small cell lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest*, 143(5), e341S-e368S.
- [19]. Brueckl, W. M., Achenbach, H. J., Ficker, J. H., & Schuette, W., 2018. Erlotinib treatment after platinum-based therapy in elderly patients with non-small-cell lung cancer in routine clinical practice - results from the ElderTac study. *BMC cancer*, 18(1), 333.
- [20]. Yoon, J. H., Nouraei, M., Chen, X., Zou, R. H., Sellares, J., Veraldi, K. L., Chiarchiaro, J., Lindell, K., Wilson, D. O., Kaminski, N., Burns, T., Trejo Bittar, H., Yousem, S., Gibson, K., Kass, D. J., 2018. Characteristics of lung cancer among patients with idiopathic pulmonary fibrosis and interstitial lung disease - analysis of institutional and population data. *Respiratory research*, 19(1), 195.
- [21]. Reuland, D. S., Cubillos, L., Brenner, A. T., Harris, R. P., Minish, B., & Pignone, M. P., 2018. A pre-post study testing a lung cancer screening decision aid in primary care. *BMC medical informatics and decision making*, 18(1), 5.
- [22]. Ke, E. E., & Wu, Y. L., 2016. Afatinib in the first-line treatment of epidermal-growth-factor-receptor mutation-positive non-small cell lung cancer: a review of the clinical evidence. *Therapeutic advances in respiratory disease*, 10(3), 256-64.
- [23]. Ferrer, I., Quintanal-Villalonga, A., Molina-Pinelo, S., Garcia-Heredia, J. M., Perez, M., Suarez, R., Ponce-Aix, S., Paz-Ares, L., Carnero, A., 2018. MAP17 predicts sensitivity to platinum-based therapy, EGFR inhibitors and the proteasome inhibitor bortezomib in lung adenocarcinoma. *Journal of experimental & clinical cancer research*, 37(1), 195.
- [24]. Song, Z., Yang, F., Du, H., Li, X., Liu, J., Dong, M., & Xu, X., 2018. Role of artemin in non-small cell lung cancer. *Thoracic cancer*, 9(5), 555-562.
- [25]. Miao, D., Margolis, C. A., Gao, W., Voss, M. H., Li, W., Martini, D. J., & Horak, C., 2018. Genomic correlates of response to immune checkpoint therapies in clear cell renal cell carcinoma. *Science*, 359(6377), 801-806.
- [26]. Testa, U., Castelli, G., & Pelosi, E., 2018. Lung Cancers: Molecular Characterization, Clonal Heterogeneity and Evolution, and Cancer Stem Cells. *Cancers*, 10(8), 248.
- [27]. Jaklitsch, M. T., Jacobson, F. L., Austin, J. H., Field, J. K., Jett, J. R., Keshavjee, S., & Strauss, G. M., 2012. The American Association for Thoracic Surgery guidelines for lung cancer screening using low-dose computed tomography scans for lung cancer survivors and other high-risk groups. *The Journal of thoracic and cardiovascular surgery*, 144(1), 33-38.
- [28]. Kim, Y. Z., Park, Y. H., Choi, H. J., Jung, J. E., Ryu, J. H., Song, H. Y., & Chung, C. W., 2018. *U.S. Patent Application No. 15/276,231*.
- [29]. Scott, W. J., 2012. *Lung cancer: A guide to diagnosis and treatment*. Addicus Books.

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