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## Effect of cigarette smoking on human health and promising remedy by mangroves

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## ABSTRACT

This article reviews the evils of cigarette smoking and the promise of mangroves to cure them. Chemicals in cigarette smoke are leading cause of death to both smokers and non-smokers. Plant is the potential source to produce medicine for almost all the diseases. Mangroves are promising as a novel source of anti-cancer drugs in regulating the cancer pathways and stimulating immunity in the body system. Research on medicine from mangroves for the treatment of cancer has not only been shown to have an effect on cancer, but also provided important methods for the study of cancer therapy and mechanism. This report may help to explore the medicinal properties of the mangroves.

## 1. Introduction

Tobacco is regarded as “holy herb” and “God’s remedy”[1]. The genus *Nicotiana* belongs to the botanical family Solanaceae with characteristic viscid foliage and tubular flowers. There are more than 60 species of the genus, differentiated based on size and shape of leaves and flowers[2]. *Nicotiana tobacum* (*N. tobacum*) is an indigenous species to South America, while *N. rustica* to the West Indies. Nicotin is a volatile, colourless and oily liquid with poisonous alkaloid, which differentiates *Nicotiana* from other plants.

Tobacco causes human deaths, more than by all deaths from HIV, illegal drug use, alcohol use, and motor vehicle injuries, suicides, and murders combined[3]. Smokers die 14 years earlier than nonsmokers[4]. Tobacco smoking is a leading cause of human cancer and deaths which are higher in developing countries than in developed countries. About 70% of tobacco-related deaths will occur in developing countries[5].

About 1.3 billion smokers worldwide and half of them die due to smoking-related diseases[6]. About 13.3% of total deaths are expected in the year 2020 due to tobacco use[7]. About 50% of all smokers will be killed by use of tobacco[8]. Tobacco smoking is causing over 3 million deaths every year worldwide, and if current smoking trends continue the annual mortality will exceed 10 million by 2030[9].

Cigarette smoking, particularly beedis and chewing tobacco (smokeless use), is an age-old practice in India. However, the popularity of smoking among women and young children has increased recently many folds and is a significant public health problem[10]. In India alone, nearly 1 in 10 adolescents initiate tobacco use before 10 years of age. About 47% of the Indian males and 14% of the Indian females are tobacco users. Every year about 850000 new cancer cases are diagnosed, resulting in India about 580000 cancer related mortality[11]. Realising the seriousness of smoking, the present review has been prepared to analyze the status of issue.

## 2. Toxic chemical composition of cigarette

Tobacco is grown and sold in many countries. The largest producers of tobacco are China, USA, the former Soviet States,

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Brazil and India. Cigarettes are made from dried leaves of the tobacco plant. The chemical composition of tobacco varies widely with different sites due to the diversity of climatic conditions. Even within the same tobacco, the chemical composition of different leaves can be significantly different[12]. Chlorophyll a and b, neoxanthin, violaxanthin, lutein and  $\beta$ -carotene are also present in *N. tabacum*[13]. After the leaves of the tobacco plant are harvested and dried, they are treated with many chemicals. Cigarette smoke contains over 4000 different chemicals and many of them cause cancer[14,15]. The cigarette smoke contains black sticky tar that contains toxic chemicals such as ammonia, toluene and acetone. Tar is the main cause of throat and lung cancer. It also causes the yellowish brown stains on fingers, teeth and lung tissue. Nicotine is the major drug found in tobacco which contributes to addiction to cigarette smoking which was first isolated from tobacco leaves as early as 1828[16]. Nicotine has a number of harmful effects on the human body in stimulating the nervous system, increasing heart beat, raising blood pressure and shrinking the small blood vessels under the skin shrink, which can cause wrinkles. Carbon monoxide is a poisonous gas that reduces the amount of oxygen taken up by red blood cells. Hydrogen cyanide damages the tiny hairs which act as natural lung cleaners of human bodies leading to accumulation of toxic substances in the lungs. The toxic heavy metals found in the cigarette smoke are: lead, nickel, arsenic and cadmium. Cancer-causing radioactive compounds are also found in cigarettes. Pesticides like DDT and methoprene do present in tobacco smoke which is used during tobacco cultivation. Other chemicals such as benzene, creosote, and some asphalts cause skin cancer, lung cancer and reduction in reproductive capacity. Among the 2256 different smoke components, 542 find place in conventional smoke by a cigarette[17]. The highly carcinogenic compounds such as dimethylbenz(a)anthracene, dimethylnitrosamine and methylnaphthalene are added when the cigarettes are being made[18].

### 2.1. Cigarette smoking and cancer

Cancer-related death was estimated at 100 million in 20th century and is 1 billion in 21st century[19]. Cancer prevalence in the United States is about 300 cases per 100000 populations, whereas that in Asian countries is less than 100 cases per 100000 due to tobacco smoke[20]. It is estimated that in 2015, tobacco is projected to kill 50% more people than HIV/AIDS and will be responsible for 10% of all deaths globally[21]. Over 3000 teenagers light up the cigarette for the first time every day[22]. In India, the International Agency for Research on Cancer estimated that about 635000 people died from cancer in 2008, representing about 8% of all estimated global cancer deaths and about 6% of all deaths in India[23]. The temperature estimated at glowing tip of lighted cigarette burning is 800 °C. A smoker with each puff draws into his mouth and lungs, a hot collection of gases and many toxic particles[24]. Tobacco smoke may

lead to changes in the lung tissue shortly after exposure, so called precancerous changes. Tobacco-related cancers represent 11.45% male cancer deaths and there were twice as many deaths from oral cancers as lung cancers in India[25]. Most of the lung cancer and emphysema, as well as a high percentage of heart attacks are caused by cigarette smoking[26].

Lung cancer is an aggressive and heterogeneous disease and most common malignant tumours worldwide[27-31]. The lungs are the most important organs that help us breathe and give oxygen to all the cells in the body. These organs affect directly or indirectly by cigarette smoking. Like all cancers, lung cancer cells have the ability to invade neighboring tissues and spread to distant parts of the body. It is usually classified as non-small cell lung cancer, which accounts for more than 80% of lung cancers and it is the most common cause of cancer deaths worldwide[32,33]. In women, lung cancer is the third-most common cancer worldwide, after breast and colorectal cancers[34]. Smokers are 5-10 times likely to develop lung cancer, about 87% of lung cancer cases are caused by cigarette smoking[35]. Every year, one million smokers die of lung cancer in USA, accounting for 25% of total smoking-related deaths (Figure 1). One in 10 moderate smokers and one in 5 heavy smokers (15 cigarettes per day) will die of lung cancer. About 85% of smokers with lung cancer die within 5.5 years. Many types of cancers including pancreatic cancer and colon cancer, bladder and kidney cancer are caused due to tobacco smoking[37]. Tobacco smoking is also associated with cancer of the oral cavity (including lip and tongue) in both men and women. Cigarette smoking causes not only lung cancer, but also cancer in urinary tract, oral cavity, oropharynx and hypopharynx, oesophagus, larynx, pancreas, stomach, cervix, leukaemia, female breast and prostate[38].

### 2.2. Cigarette smoking and human reproduction

Cigarette smoking affects adversely human fertility[39]. Chemical agents may affect male reproduction by means of direct effect on the testicular function and spermatogenesis. The mechanisms involve the hormonal control of spermatogenesis or through direct effect upon the germ cells and sertoli cells of the seminiferous epithelium. Such alterations in the spermatogenic capacity in the male may lead to infertility or production of mutated spermatozoa which may subsequently cause poor pregnancy if the mutated spermatozoa are to fertilize an egg. Cigarette smoking causes different negative effects on human reproductive process such as abnormal sperm morphology, less motile sperm, smaller quantity of sperm, lower proportion of normally shaped sperm and changes in the number and arrangement of the microtubules of the sperm in a smoker as compared to a non smoker group of men[40-44].

Women are likely to have menstrual irregularities, infertility problems, cramps and hot flashes during menopause due to smoking. Smoking lowers the level of estrogen and attains early menopause with increased risk of osteoporosis and fractures[45].

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