

UP IN SMOKE: SMOKING AND THE HEART

BY

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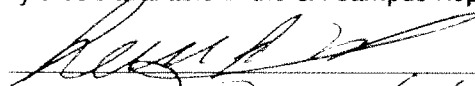
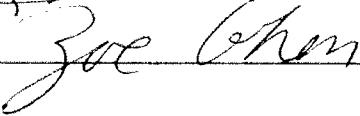
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**Abstract:**

Many diseases have been known to be caused by tobacco consumption but the public seems to be undereducated about the cardiovascular risks associated with this habit. The tobacco plant has a long history of use amongst many cultures dating back to the dawn of civilization.

Traditionally consumed during rituals and ceremonies, tobacco consumption is still deeply ingrained into the culture of many different people. When tobacco use became widespread across the United States it was very much in fashion and little was known about any potential negative side effects from smoking. Twentieth century advertisements propagated tobacco use among the entire population, targeting every demographic including women and children.

During the 1960's the United States Surgeon General conducted studies linking smoking to lung cancer. Cigarette smoking began to drop as more people became aware of the dangers associated with tobacco consumption. Emerging research is bringing to light even more health concerns caused by smoking, including cardiovascular health risks that were previously not widely known.

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## **Introduction:**

Cigarette smoking is an increasing problem in our society. The numerous diseases caused by being exposed to tobacco smoke affect over 393,000 Americans every year<sup>(38)</sup>. According to the American Cancer Society, smoking is the major cause for 30% of cancer cases and over 80% of chronic pulmonary diseases<sup>(37)</sup>. As an experiment I conducted, a subject was asked to name the first disease that comes to mind when the word “cigarettes” was mentioned. Out of a hundred people 55% said cancer, 41% said respiratory problems, and only 4% said heart disease. Since the public seems to be unfamiliar with the cardiovascular risks associated with tobacco smoking, creating more educational campaigns to serve that purpose seems like a necessary step to resolve this issue. One might think that these problems are new to our society but the fact is tobacco use has a long history throughout the world. Some ancient civilizations such as the Mayans and Babylonians carved drawings in stones emphasizing the early use of this plant as a part of religious rituals. American Indians used tobacco for medicinal and ceremonial purposes as early as 1 B.C<sup>(6)</sup>. In 1492 dried tobacco leaves were offered as a gift to Christopher Columbus by the natives of the Bahamas islands<sup>(4)</sup>. Columbus brought some tobacco seeds back to Europe and the plant became very popular among Europeans after that. John Rolfe was the first person in the United States to raise tobacco as a cash crop; his business took place in Virginia in 1612 and achieved a major success in less than seven years<sup>(4)</sup>. Smoking advertisement reached its peak in the 20<sup>th</sup> century and led to an increase in cigarettes sale and consumption among men and women and even children especially after the appearance of candy cigarettes. In this thesis I discuss four different cardiovascular diseases associated with or

caused by cigarette smoking. Following a brief overview of the cardiovascular system's physiology, the underlying mechanism of these diseases should be easier to comprehend.

### **History and background:**

Cigarette smoking has become a problem of increasing concern in our society. Young smokers face serious consequences of a lifelong addiction that could lead to lung cancer and heart disease. Research has showed that 90% of current smokers tried their first cigarette when they were under 18 years old and two thirds of them became regular smokers by the age of 19<sup>(8)</sup>.

According to the American Lung Association, 18.1 percent of high school students are current smokers and this number increases to about 18.7 by the time they graduate high school<sup>(38)</sup>.

Cigarette smoke contains 4,800 chemicals and 69 of these components are known to cause cancer<sup>(9)</sup>. Considering the fact that this habit is associated with some horrifying health issues, preventing people from starting would be a great achievement. The first step should be to address the issue amongst kids and teenagers whom are more susceptible to advertisement and peer pressure.

Learning about the long history of the tobacco plant will easily prove to the reader that cigarette addiction has been a problem in many societies over the centuries. The early use of tobacco is dated back to 5000 BC. It was first used for healing and spiritual purposes by many ancient civilizations such as the Aztecs and the Mayans<sup>(6)</sup>.

The scientific name for the tobacco plant is *Nicotiana tabacum*. It was the main herb burned during rituals in many different cultures. Although tobacco can be consumed in several different ways, smoking and inhaling its addicting substances was the most common mode of consumption among the Mayans who believed in its healing powers and its ability to drive away the “evil spirits that reside inside some people”<sup>(5)</sup>.



Figure 1. Mayan priest smoking from the temple at Palenque, Mexico  
[commons.wikimedia.org](https://commons.wikimedia.org)

Green tobacco was used as a snuff and was kept by Mayans in small jars called, “tzual moy.” Small quantities of the tobacco were then consumed by placing it between the cheek and jaw or under the tongue. The resultant hallucinations due to the potency of the tobacco’s green leaves led the Mayans to believe that this plant was sent to humans from the Gods. Thus, it was

believed that it should be offered to the Gods as their food and only used ritualistically, not for the purpose of pleasure<sup>(10)</sup>.

Tobacco was also very important for the Aztecs who believed that the bodies of Gods were composed of tobacco. The Aztecs burned the leaves during ceremonies to honor their war God (Huitzilopochtli) <sup>(5)</sup>. Aside from its important uses in their spiritual lives, they believed that it helped to break spells and protect them against poisonous animals such as scorpions and snakes<sup>(5)</sup>.

Once tobacco was introduced to Europe, it quickly became wide spread as people saw it as a fashionable new habit. This habit was only available to people who could afford it, thus smoking was considered to be a luxury. Supply grew to meet demand though, and soon the pleasure of inhaling these chemicals was available to and affordable by most people, regardless of economic stature<sup>(5)</sup>.

In 1571 a Spanish physician named Nicolas Monardes described the great qualities of this “holy herb”<sup>(39)</sup>. He mentioned its importance in healing and curing many diseases such as cancer, headaches, stomach aches, bone ache, swelling of the body and reducing the pain associated with syphilis. On top of all the physical benefits that Monardes believed tobacco offered he also believed that this unique plant could be used to drive away evil spirits and help some people relax and cope emotionally with their grievances and daily troubles<sup>(11)</sup>.

By the beginning of the seventeenth century, smoking had spread across Europe and into Asia and India. There, the popularity of smoking soared amid the perception that it was a stylish new

social habit that could give their gatherings another dimension of entertainment and proved to be quite the topic of conversation<sup>(4)</sup>.

Pipe smoking started in Japan around 1600. The pipe was used to smoke small amounts of tobacco due to the harshness of its chemicals. Soon after that time, pipe smoking became part of the culture in Japan, adopted by the men, women, and even children<sup>(5)</sup>.

Tobacco was brought to China by the Spanish. The intoxicating effects of nicotine led the Chinese to believe in its magical healing powers. Thus tobacco was used to treat malaria, rheumatism, and the common cold. Smoking had become a major part of the world's culture; it lifted peoples spirits up and helped relieve their stress<sup>(5)</sup>.

At the end of the seventeenth century tobacco smoking started to cause certain social problems. Its use was heavily criticized by state and religious leaders. In Japan, military officials banned smoking due to its threat to their economy. Valuable farm land was allocated for planting tobacco plants instead of being used to grow food crops<sup>(4)</sup>.

Consequently, smoking became a crime in many different countries. Depending on where the infraction occurred, an offender could be punished by varying and severe methods. For example, Moscow signed a law that sentenced men and women who smoked or sold tobacco to have their nostrils cut as a punishment for their crime<sup>(5)</sup>.

#### Cigarette smoking in the United States:

George Washington Duke was an American tobacco industrialist and philanthropist. In 1874 he started to grow tobacco and shortly after that he moved to the city of Durham where he started his

tobacco business<sup>(12)</sup>. In 1881, W. Duke, Sons, and Company was built and started manufacturing pre-rolled cigarettes. Around that same time is when James Bonsack invented the cigarette making machine, a contraption that was able to produce 120,000 cigarettes a day. James Bonsack went into business with Washington Duke's son, James Duke, and these two built a factory that manufactured about ten million cigarettes in its first year. This company made the first pre-packaged brand of cigarettes and they called it, "Duke of Durham."<sup>(13)</sup>



Figure2. 1892 Duke of Durham box of machine-rolled cigarettes  
northcarolinatravels.com

In 1890 James Buchanan Duke merged a number of U.S tobacco manufacturers into one large company named, "The American Tobacco Company." This company was also known as the "tobacco trust," and its main focus was making and selling cigarettes<sup>(13)</sup>.

The American Tobacco Company started to spread its business interests into Great Britain, China, and Japan and held a virtual monopoly over the tobacco trade in North America. It was at this point that the U.S. government decided to intervene with the creation of the Sherman

Antitrust Act in 1890, a law meant to bar anticompetitive business practices. With the creation of this act, the American Tobacco Company clearly was in violation of the law and was forced to dissolve into four firms: American Tobacco Company, R.J.Reynolds, Liggett & Myers, and Lorillard. As a result of this dissolution, an increase in advertisements and competitive promotions was created between the companies.<sup>(13)</sup>

In 1911 the American Tobacco company's share in British American Tobacco was sold. In 2004 all of the American Tobacco company's offices in Durham were sold and later converted into shops and restaurants.<sup>(13)</sup>

By the early 1900's many cigarette brands had become household names. One such brand was Marlboro. Marlboro was owned by a company called Philip Morris which a cigarette company based out of England. In 1924 the Marlboro brand was advertised as a women's cigarette complete with a red banded filter that would hide lipstick stains.<sup>(14)</sup>

The 20<sup>th</sup> century featured colored magazine advertisements that portrayed smoking as a social habit for the modern and chic and since the scientifically proven side effects for smoking were not yet known, tobacco smoking reached its highest peaks during this time.<sup>(4)</sup>



Figure 3. Smoking advertisement ad from the 1950's  
ethicsoup.com

After studies conducted in 1964, the United States Surgeon General linked smoking to lung cancer, naming tar and nicotine as the two main causes. <sup>(15)</sup>

Cigarette consumption rates dropped after the health issues associated with smoking were confirmed. Tobacco companies began to produce new kinds of cigarettes that had lower percentages of tar and better filters to reduce the amount of nicotine inhaled. The advertisements for these new and improved cigarettes tried to reduce the consumer's fear of lung cancer to keep selling rates high. <sup>(16)</sup>



Figure 4. Advertisement for Duke and Kent cigarettes  
 sciencedirect.com

In 1971 Congress passed a law that prohibited cigarette advertisements on TV and in 1984 the Comprehensive Smoking Education Act forced tobacco companies to change the warning labels on cigarette packs every three months. Airline companies saw to another law being passed which prohibited smoking on flights lasting less than six hours.

In 1998 a law was established in all fifty states restricting the sale of cigarettes to minors in an effort to prevent children under the age of 18 from smoking.<sup>(17)</sup>

Many countries enacted laws in 2007 in order to halt underage persons from purchasing cigarettes out of vending machines. The age requirement to buy cigarettes varies for different countries. For example, the legal age in Turkey is 18, where as in Japan it's 20. Then, there are countries such as Egypt where cigarettes can be bought by a person of any age.<sup>(18)</sup>

The United States was the first country to require warnings about the adverse health effects of smoking printed on cigarette packs; although, as of 2010 there have been 39 other countries that have begun to do the same. In 2011 a new law was established by the Canadian government requiring all tobacco companies to cover 75 % of the cigarette pack with graphic pictures depicting the physical health consequences of smoking. Other countries such as Australia considered similar policy and as of December 1, 2012 Australia is the first country to produce a cigarette package with health warnings covering 70-90 percent of the front and back of the pack.<sup>(18)</sup>



Figure 5. Cigarette packs with graphic pictures of the physical health effect associated with smoking  
[researchonmedical.com](http://researchonmedical.com)

### **Tobacco and Youth:**

Cigarette ads are likely to appeal to children and teenagers, which are perhaps an intended demographic. According to U.S Surgeon General Jocelyn Elders, every day four thousand teens smoke their first cigarette and one thousand teenagers under the age of 18 become regular

daily smokers. Thus, the number of teens smoking cigarettes in the US averages about three million and the mean age of first time smokers is 14.5 years old.<sup>(19)</sup>

The cartoon character “Joe Camel,” was placed on Camel cigarette packs made by R.J Reynolds in 1988 in an effort to increase their annual sales by attracting teenagers and younger adults. The old Joe Camel campaign ran for about nine years and faced immediate criticism from the public for influencing children to smoke.<sup>(20)</sup>

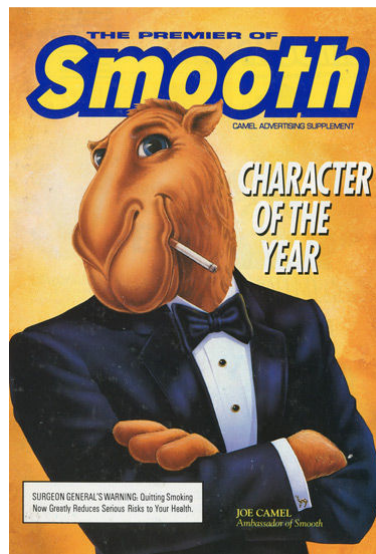


Figure 6. Joe Camel cigarette advertisement theme released in 1990  
tobacco.stanford.edu

Certain studies published in the journal of the American Medical Association (JAMA) confirmed that placing pictures of Joe Camel on cigarette packs makes them very appealing to children because his cartoonish depiction and association with the word smooth is intended to give kids the impression that smoking is cool<sup>(21)</sup>. One study released in 1991 revealed that 91.3% of six year old kids were able to successfully match Old Joe with a picture of a cigarette. This number is shocking because it is the same percentage of kids who were able to match Mickey Mouse

with the Disney channel logo<sup>(22)</sup>. Another good example is Philip Morris' Marlboro cowboy ad that first appeared in 1954 and led to an increase in cigarette sales to young kids. The picture of a healthy, rugged, and macho cowboy riding horses and working on a ranch with a cigarette in his hand gives the viewers the idea that smoking Marlboro cigarettes will give them a cool, tough look desirable to teenagers<sup>(23)</sup>. The use of the Marlboro Man campaign from 1954 to 1999 generated very successful results from its inception. Sales of Marlboro cigarettes increased by 300% between the years of 1955 and 1957, going from five to twenty billion dollars annually over the course of two years.<sup>(24)</sup>



Figure 7. Marlboro cigarettes ad in the 1950's

[quitsmokingpainlesslynow.com](http://quitsmokingpainlesslynow.com)

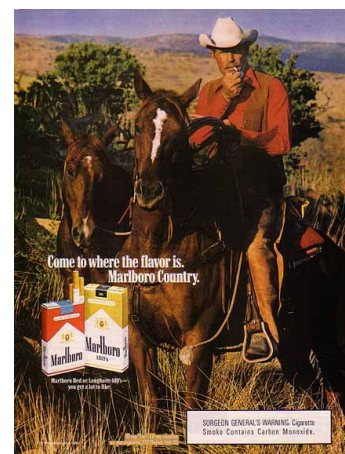


Figure 8. Marlboro cigarettes ad 1986

[bambootrading.com](http://bambootrading.com)

Three of the men who modeled in the Marlboro Man campaign contracted and died of lung cancer. The deaths of Wayne McLaren, David McLean, and Dick Hammer led to Marlboro cigarettes, particularly Marlboro Reds, being informally referred to by the nickname, "Cowboy Killers." It is interesting to note that in the twilight of McLaren's life he became an anti-smoking

activist, which led to Marlboro initially denying that he had ever appeared in any of their ads. Though that stance was eventually amended and his participation in their advertisement campaign conceded, the company clarified that McLaren was never *the* Marlboro Man. That title belongs to Darrell Winfield, the rugged and real cowboy who appeared in Phillip Morris advertisements between 1968 and 1989.<sup>(25)</sup>

Another factor that strongly contributed to an increase in tobacco consumption by teenagers and young adults was the appearance of candy cigarettes in the early 1950's. These candy sticks were made out of chalky sugar, bubblegum, or chocolate. Some of them even had a red tip on one end to give children the illusion that it was lit. Candy cigarettes were offered in many brands which gave the kids the option to choose the packs that were named after real tobacco products or the ones that had pictures of their favorite cartoon characters like Spiderman, Tom and Jerry, or Popeye.



Figure 9. Candy cigarette ad from the 1950's digmyworld.blogspot.com

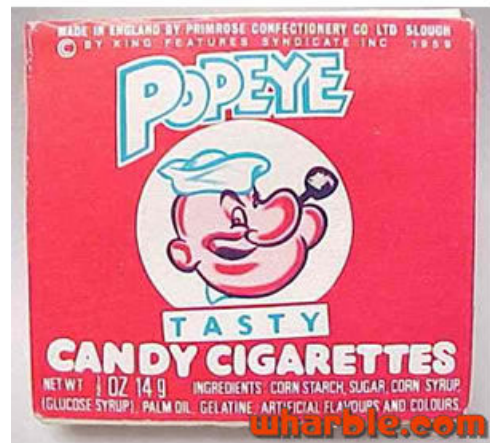


Figure 10. Popeye candy cigarette ad from the 1950's pdxretro.com

Popeye candy cigarettes were originally sold with a red tip on one end so that their consumption would more closely resemble an authentic cigarette smoking experience. After the appearance of laws that prohibited candy cigarette sales in many parts of the world, Popeye candy cigarettes and other brands were manufactured without the red tip and renamed candy sticks. The U.S. state of North Dakota enacted a ban on candy cigarettes from 1953 until 1967. Today, candy cigarettes are officially banned by the Food and Drug Administration. The Family Smoking Prevention and Control Act was signed into law in June 2009. Some studies have shown that this type of candy leads children to become smokers later on in life and due to this, many countries like Turkey, Norway and Ireland prohibited the manufacturing and selling of this type of candy.<sup>(26)</sup>

Studies have been conducted that link smoking to the consumption of candy cigarettes during early childhood. One of the studies surveyed 25,887 U.S adults online and it showed a statistical link between the two. Twenty two percent of current smokers have previously consumed candy cigarettes sometime in their early childhood. And about fourteen percent of current smokers have played with candy cigarettes or have been around other kids who consumed them.

In addition to the hard candy and the bubble gum cigarettes that came out in the 1960's, there was another type of candy stick that had a coating of fine sugar particles. With a sharp puff these particles would come off the candy cigarette to simulate the appearance of actual smoke and providing a more authentic experience for their adolescent consumers. There has been evidence that cigarette companies worked with the candy makers to advertise their brand names among children. Some candy cigarette packs looked exactly like actual the actual packs

of Marlboro, Camel, and Lucky Strike cigarettes which convinced the public that tobacco companies were trying to lure the children into buying their cigarette brands later on in life.<sup>(27)</sup>

**Tobacco ads for the rest of the public:**

As some cigarette ads specifically targeted a younger generation, others were intended to connect with the growing female demographic. When the Marlboro cigarette brand first showed up on the market in 1924 the ads featured a beautiful, slim, and sophisticated looking woman holding a cigarette in hand. Below her portrait was the slogan “mild as May.” In 1955 the addition of a red banded filter to hide lip stick stains played a successful role in helping to attract more women to the Marlboro brand of cigarettes.<sup>(14)</sup>

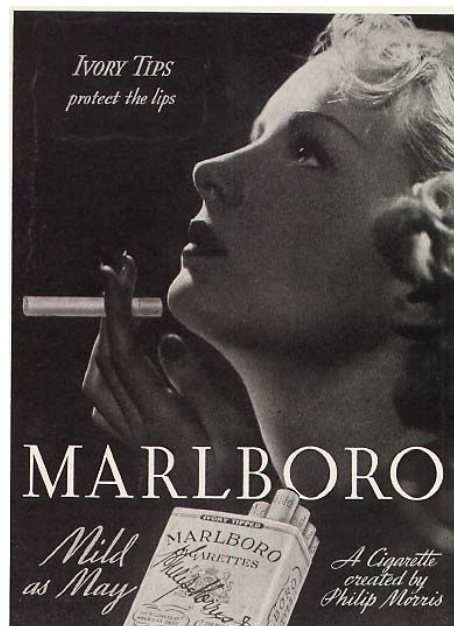


Figure 11. Marlboro cigarette ad from the 1930's  
grayflannelsuit.net

Other ads ironically aimed to leverage a woman's pursuit of the ideal body against her cravings for unhealthy food with promises that the rich flavor of a cigarette would help them suppress their appetite and keep them slender<sup>(28)</sup>. One example for this type of advertisement is the Lucky Strike ad pictured below. This poster clearly states that a woman should reach for a Lucky Strike cigarette whenever she has a craving for something sweet so that she can maintain a slim and desirable figure.



Figure 12. Lucky cigarette advertisement from the 1930s  
pzrservices.typepad.com

When the horrifying health problems that cigarette smoking causes started to become a major concern for the public in the 1960's, certain cigarette companies began featuring athletes and healthcare professionals in their ads to assuage their customers fears of the health risks associated with smoking. The Lucky Strike cigarette company hired Frank Gifford, a famous football player, to model for their ads in magazines and posters<sup>(29)</sup>. Using a prominent athletic

figure like Frank Gifford, who was idolized by many Americans at the time, encouraged many of his fans to smoke. People who follow sports know that professional football players must be in tremendous physical shape in order for them to be successful on the field. So when a cigarette company features these types of athletes smoking their brand of cigarettes, it gives the public a false sense of security. By having recognizably strong and healthy athletes endorse their brand, cigarette makers aimed to imply that smoking was not as dangerous as mounting evidence suggested.



Figure 13. Lucky strike cigarette ad in the 1960s  
pophistorydig.com

Other ads even featured healthcare professionals endorsing the products, with doctors espousing the benefits of smoking one brand over another. These advertisements were meant to address consumer's rising concern of the health risks associated with smoking tobacco as

new research emerged that shed light on its inherent danger.

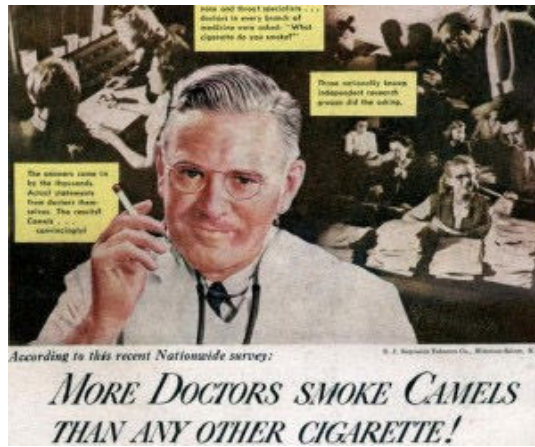


Figure 14. Camel cigarettes advertisement featuring a doctor smoking their brand  
cigaretteism.wordpress.com

# Structure of the human heart

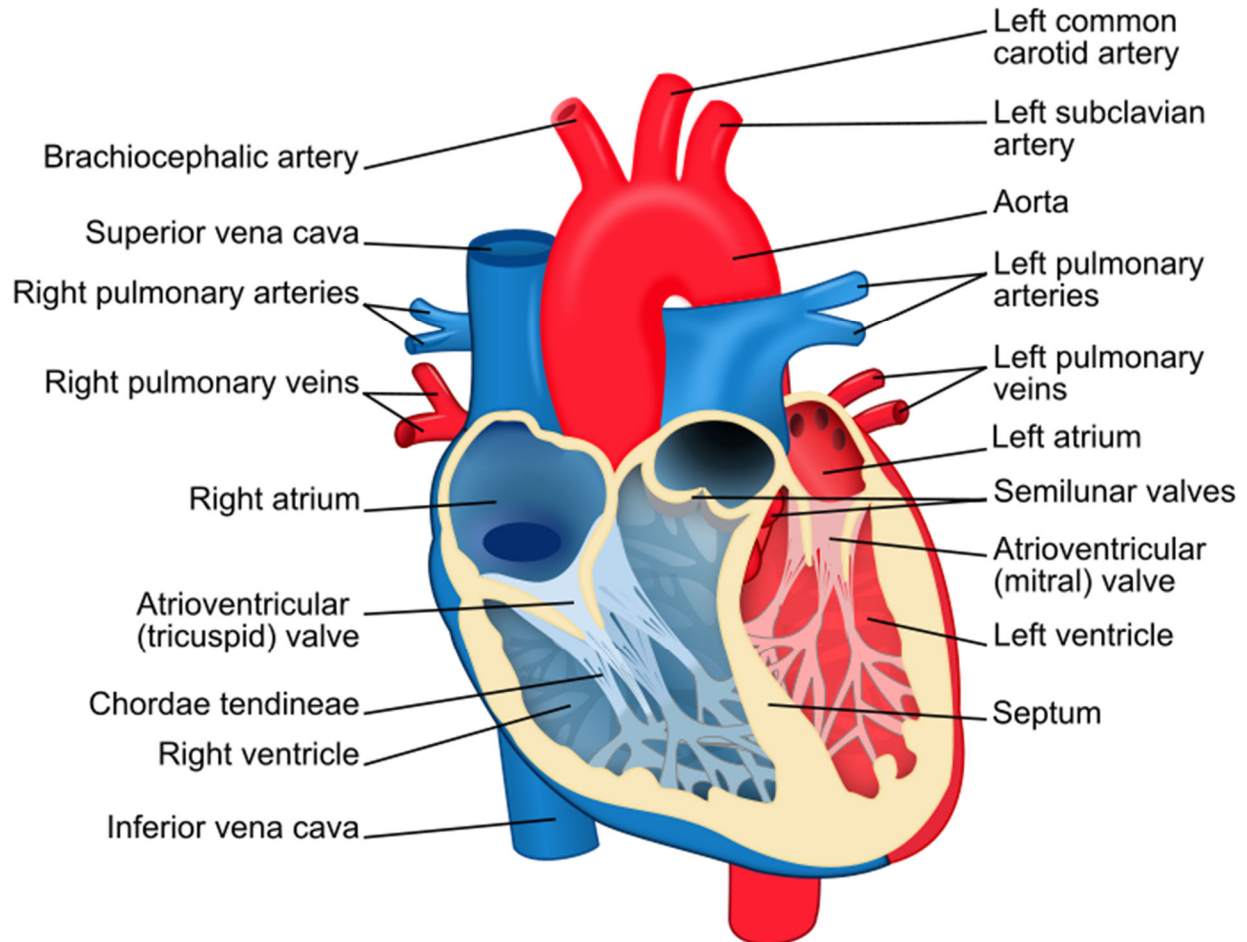


Figure 15. Structure of the human heart  
tutorvista.com

The heart is a four chambered hollow organ located medial to the lungs inside the thoracic cavity where it is protected by the rib cage. It has a mass of 250-350 grams and it is about the size of a fist. Two thirds of the heart is located on the left side of the chest and the remaining third is on the right side. The bottom side of the heart is called the apex, whereas the top is known as the base. The heart works as a double pump to eject the blood into the body with the

right pump sending blood to the lungs and the left pump sending the oxygenated blood to the rest of the body. The right and left sides of the heart are separated by a thick wall called the septum that houses the bundle of His. The heart contains four valves that help coordinate the movement of blood in and out of the chambers. There are two atrioventricular (AV) valves that allow the flow of the blood from the atria to the ventricles during diastole and prevent the backflow of blood from the ventricles to the atria during systole. The AV valve between the right atrium and the right ventricle has three cusps, thus it is called the tricuspid valve. Whereas the AV valve on the left side of the heart has two cusps and called the bicuspid, or the mitral, valve. These two valves are anchored to the papillary muscles located in the walls of the ventricles by cord like tendons called the chordate tendineae. During ventricular systole, the chordate tendineae pull the flaps of the AV valves and causes them to remain in a closed position during this period which prevents the backflow of the blood.<sup>(1)</sup>

The other two valves are called the semilunar valves and their job is to permit the passage of the blood from the ventricles into the aorta and the pulmonary trunk and prevent the backflow of the blood from these arteries into the ventricles. The semilunar valve located between the right ventricle and the pulmonary artery is called the pulmonary valve. This valve opens during ventricular systole allowing the deoxygenated blood to reach the lungs and then it closes at the end of ventricular systole. The second semilunar valve is located between the left ventricle and the aorta. Thus it is called the aortic valve. This valve opens during ventricular systole when the blood pressure in the left ventricle rises above the blood pressure in the aorta pushing the oxygenated blood into the systemic circulation. This valve closes at the end of ventricular

systole when the pressure in the left ventricle decreases allowing the aortic pressure to forces it shut.

The muscle wall of the heart consists of three layers:

1-Epicardium: the outer layer of the heart wall consists mainly of connective tissue

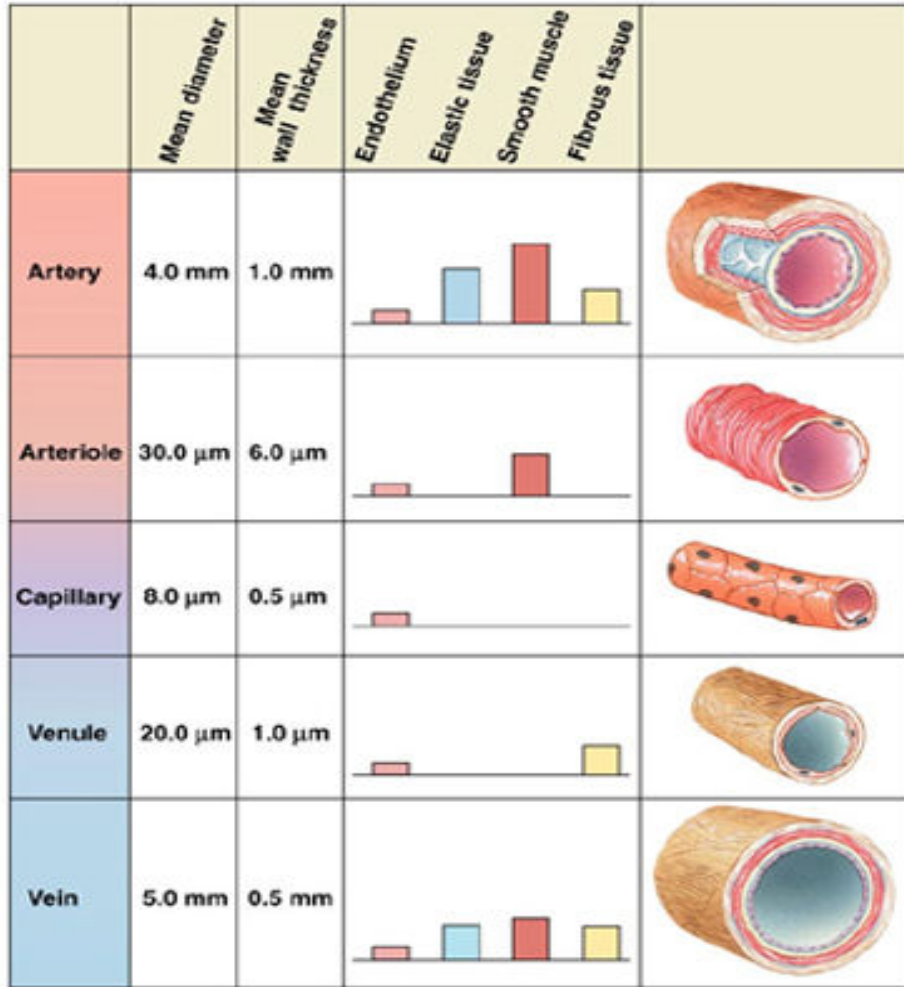
2-Myocardium: the middle layer of the heart layer and it is composed of cardiac myocytes

3-Endocardium: an endothelium inner membrane that lines the inside of the heart and the entire cardiovascular system

The heart is enclosed in a double-walled sac called the pericardium. Pericardial fluid resides between the two walls and reduces the friction between the heart and the pericardium in every beat.

The sinoatrial node (SA node) is responsible for generating the action potential in the heart which in turn triggers the cardiac muscle contraction. Although other parts of the heart are responsible for generating the electrical impulses, the SA node is considered the main generator of normal sinus rhythm. This little node is located in the right atrium and composed of a group of specialized cardiomyocytes that have the ability to initiate the action potential.<sup>(1)</sup>

**Blood vessels:**



**Fig. 15.2**

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Figure 16. Comparisons of the various blood vessels

Blood vessels are hollow tubes that carry the blood from the heart to all body regions and then bring it back to the heart again. The base of the heart is connected to the major arteries and veins in the body which are the aorta and the vena cava. An endothelial layer lines the inside portions of the entire cardiovascular system. This smooth layer of tissues allows the blood to

travel through the heart and the vessels in a smooth manner which prevents the formation of blood clots. <sup>(2)</sup>

The three major types of blood vessels are arteries, capillaries and veins. The blood is pushed in the arteries under high pressure which requires these vessels to have thick, elastic walls which allows them to stretch to withhold this high pressure. Arterioles are smaller arteries that contain more smooth muscle in their walls. Since arterioles handle less blood pressure than arteries do, their walls tend to be thinner and less elastic with smaller lumens. Arterioles are the primary site of vascular resistance due to autonomic nervous system innervations and the effect of circulating hormones on their receptors. Norepinephrine and epinephrine are two hormones that cause the arterioles of the cardiac muscle to vasodilate by acting on beta-adrenergic receptors. Increasing the diameter of arterioles leads to an increase in blood flow to certain areas of the body to match its metabolic needs. Capillaries are the smallest type of blood vessels. They have a single endothelial layer which allows for gas and nutrient exchange to happen between the capillaries and the body cells. Venules pick up the blood from the capillaries and give it to the veins. Since the blood pressure at that point is very low, the veins have thin walls that are less elastic and muscular than those of the arteries. Veins have one way valves and they depend on these valves and the contraction of the skeletal muscles to push the blood back to the heart.<sup>(2)</sup>

### **Blood:**

Blood is the medium that carries oxygen and nutrients to the body and brings back carbon dioxide and other waste products such as nitrogen compounds, water, phosphates and some

nitrates. Blood is composed of two types of cells. Red blood cells are oval and flexible biconcave disks composed of hemoglobin which is an iron-containing protein that facilitates oxygen transportation to the body through the reversible binding mechanism. White blood cells “leukocytes” are the cells of the immune system responsible for protecting the body against infections and viruses. There are five different types of leukocytes that exist in the blood and lymphatic system and can be categorized based on presence of granules in their cytoplasm into two categories:

- Granulocytes: include neutrophils, basophils and eosinophils. They all contain granules which are membrane bound enzymes that are involved in endocytosis.
- Agranulocytes: include lymphocytes, monocytes and macrophages. These cells are characterized by the absence of granules in their cytoplasm.

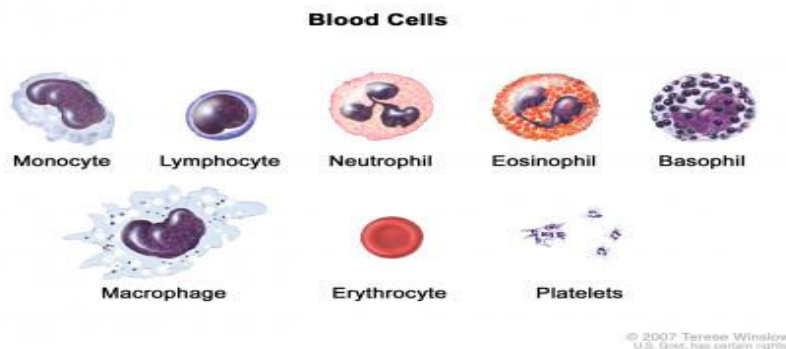


Figure 17. The different types of blood cells  
dentalarticles.com

Platelets are the most abundant cells of the blood. They are involved in the formation of blood clots and wound repair. The normal platelets count in humans range between 150,000 and



**2-systemic circulation:** during ventricular systole, the oxygenated blood gets ejected into the aorta and reaches the various organs of the body. The capillaries form a wide net called the capillary bed in which each capillary penetrate a cell and deliver oxygen and nutrient to it and takes away the waste. The deoxygenated blood travels through the veins and returns to the right atrium via the inferior and superior vena cave.

**3-Coronary circulation:** provides the myocardium with oxygenated blood which circulates in the coronary arteries. The cardiac veins remove the deoxygenated blood from the heart muscle. The right and left coronary arteries originate from the right and left aortic sinus. The left coronary artery "LCA" provides blood supply to the left side of the heart by branching into the anterior interventricular artery and the left circumflex artery. The right coronary artery provides blood supply primarily to the right ventricle and some of its supply goes to the left ventricle as well.<sup>(2)</sup>

### **Cardiovascular diseases associated with smoking**

#### **1-Coronary artery disease: (CAD)**

Also known as coronary heart disease (CHD), is the narrowing or blockage of the coronary arteries that supply the heart tissue with oxygen and nutrients. This disease is usually caused by atherosclerosis which is the hardening of the arteries walls. Without enough blood, the heart becomes starved for oxygen and this could lead to the death of certain areas of the heart tissue (a heart attack)<sup>(30)</sup>. Smoking is associated with 54% of CHD cases. Carbon monoxide, nicotine and other substances in tobacco can cause (CHD) by lowering the good cholesterol, high density

lipoproteins (HDL). The cholesterol carrying lipoproteins which is the bad cholesterol (LDL), can easily enter the walls of the arteries where they accumulate to form plaque.<sup>(31)</sup>

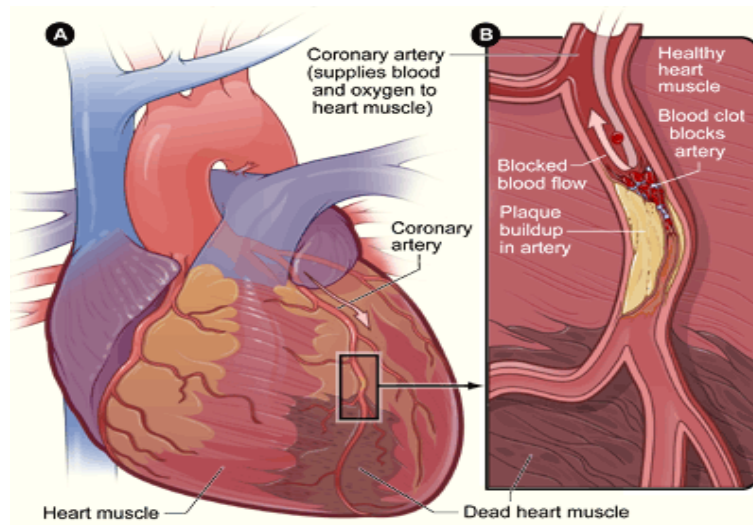


Figure19. Coronary artery disease  
pediatricct.surgery.ucsf.edu

For people with coronary artery disease, smoking can speed up the process of atherosclerosis by damaging the cell tissue that lines the cardiovascular system. Smoking can also cause the platelets in the blood to stick together and form clots which can lead to the blockage of arteries.

Heavy smokers are 2-4 times more likely to have a heart attack than nonsmokers. Also smokers are at higher risk of having a second heart attack. For people who quit smoking, their risk of developing cardiovascular diseases drops to about 50% within one year and completely reverses after three years.<sup>(32)</sup>

## 2- Peripheral artery disease: (PAD)

Peripheral artery disease (PAD) is an obstruction of the large arteries that supply blood to the arms and legs. PAD can result from atherosclerosis and other inflammatory processes which can lead to stenosis or thrombus formation. Patients with peripheral artery disease may experience sharp pain and cramps in their leg muscles while walking or exercising and even when they are resting.<sup>(33)</sup>



Figure 20. Peripheral artery disease (PAD)  
clinicaladvisor.com

Tobacco smoking is the number one cause of PAD across the world. Studies have showed that smokers have a tenfold increase in the risk of developing PAD over time. Second hand smokers are also at a high risk of having major damage to the inner lining of their cardiovascular vessels which can lead to atherosclerosis and peripheral artery disease.<sup>(34)</sup>

### **Smoking and strokes:**

Strokes are the third leading cause of death in the United States, affecting about 700,000 Americans every year. For smokers the risk of having a stroke is about three times higher than it is for non-smokers.

Tobacco contains many toxic chemicals such as carbon monoxide, formaldehydes, and hydrogen cyanide. These substances can damage the walls of the arteries resulting in the build-up of fatty plaque which leads to the hardening and narrowing of the arteries and in turn restricts the blood flow to the brain leading to a stroke.

Smoking can cause major inflammation of pulmonary arteries and formation of blood clots that can travel in the bloodstream and get stuck in the major arteries leading to the brain which as a result can cause a stroke and a possible sudden death.<sup>(35)</sup>

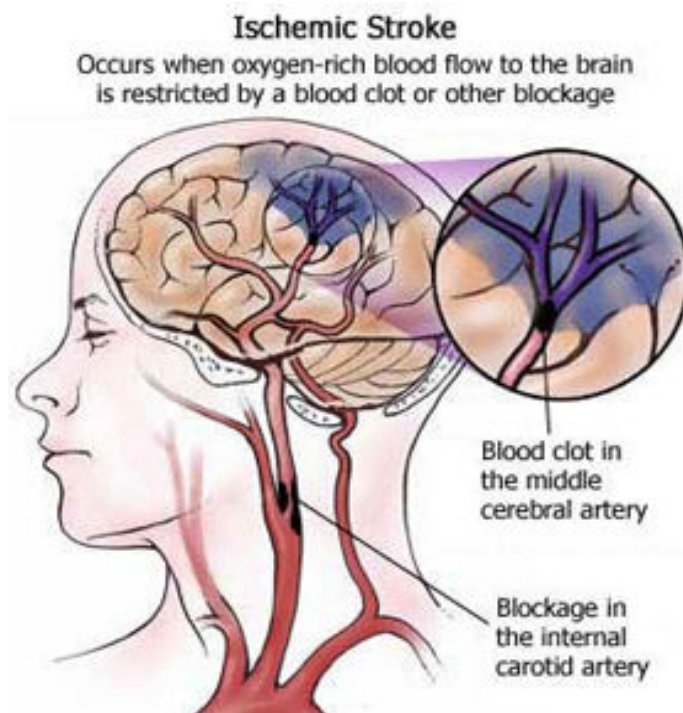


Figure 21. Ischemic stroke due to blockage of the a brain vessel  
interhomeopathy.org

### **Smoking and poor wound healing:**

Smoking can also delay the process of wound healing in the body due to the lower oxygen levels in the blood and the narrowing of the blood vessels walls. The main toxic chemical in tobacco is nicotine, which makes wound healing a complicated process due to the fact that smokers have an unhealthy cardiovascular system. In addition to restricting blood circulation in lower extremities, smoking can also decrease collagen synthesis and delay the growth of new blood vessels within the wound. Smokers are advised to stop any nicotine consumption at least three days before any surgical procedure to avoid the risks of infections and scarring. <sup>(36)</sup>



Figure 22. Patient with a skin ulcer. His condition is associated with tobacco consumption

## **Conclusion:**

Tobacco consumption is deeply rooted in societies across the world, and has been throughout human history. While some people still believe that smoking has no harmful consequences there are over 60,000 scientific studies that can prove them wrong<sup>(4)</sup>. Deadly cardiovascular conditions, such as coronary artery disease, have been linked to cigarette smoking. Although it's widely known that smoking may compromise a person's health, many people still fall prey to persuasive tobacco ads which aim to instigate and encourage a lifelong addiction to destructive behavior. Tobacco was a sacred plant for many cultures whose people believed it had magical powers that would bring them closer to God during ceremonies<sup>(5)</sup>. When cigarette smoking started to spread across Europe and the US people were not aware of the health risks associated with this new habit. It wasn't until studies that linked tobacco consumption to lung cancer became public that society started to take these health risks seriously. Today, over 50 million adults in the United States are current smokers, including over twenty percent of high school students<sup>(31)</sup>. Quitting smoking is always recommended for smokers, even those who might think they have lost their chance of recovering and being healthy again. Health risks associated with smoking drop to about 50% in the first ten years of recovery and reach almost 0% after fifteen years<sup>(9)</sup>. Despite the fact that the dangers of smoking have been well established, it is perhaps surprising just how far the extent of the damage can reach inside the body. Fortunately though, the harmful effects of smoking can be easily controlled and completely avoided by choosing not to expose oneself or others to this lesser known initiator of heart disease.

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