Smoking and its effects on health

Smoking tobacco dramatically increases the risk of developing many diseases. It is responsible for a substantial majority of cases of lung cancer and chronic obstructive pulmonary disease, and most smokers die either from these respiratory diseases or from ischaemic heart disease. Smoking also causes cancers of the upper respiratory and gastrointestinal tracts, pancreas, bladder and kidney, and increases risks of peripheral vascular disease, stroke and peptic ulceration. Maternal smoking is an important cause of fetal growth retardation. Moreover, there is increasing evidence that passive (or 'second hand') smoking has adverse effects on cardiovascular and respiratory health.

But it’s not so easy to stop smoking!
- nicotine acts on the nervous system to create dependence, so that smokers experience unpleasant effects when they attempt to quit
- addiction means that the person – even if they know it’s bad, still continue to smoke

Chronic Obstructive Pulmonary Disease (COPD)
This is a group of diseases of the lung that cause the airways to become narrowed – leading to shortness of breath due to decreased flow of air to the lungs. It is similar to asthma, but COPD is not as reversible as asthma can be.

As mentioned before, the most common cause of COPD is smoking. This is because tobacco smoke contains free radicals and this leads to what is known as oxidative stress. This is where there are reactive oxygen particles which cause damage to the cells.

Smoking also causes inflammation by irritating the airways. This leads to the production of cytokines, which can further damage the lung tissue.

There are enzymes in the lung area called protease enzymes (we know what they do from GCSE as well as work from this year – so I won’t bore you with what they do….I’m sure you know…and know where they are produced in the digestive system too *cough*).

Anyhoo, the protease would break down all the protein in the lungs including elastin. Elastin is needed to maintain the airway. So normally, there is something called α-1 antitrypsin which stops the protease breaking things down. Smoking impairs the activity of α-1 antitrypsin leading to break down of the lung tissue by protease.
COPD is split into two main diseases:
- emphysema
- bronchitis

**Bronchitis**
Lung damage and inflammation in the large airways results in chronic bronchitis. Chronic bronchitis is defined in clinical terms as a cough with sputum (phlegm) production on most days for 3 months of a year, for 2 consecutive years.

In bronchitis, the mucous producing cells (called **goblet cells**) are increased in number and size.

This means there’s more mucous leading to a cough with mucous produced.

Inflammatory cells are also produced leading to remodelling and thickening of the walls.

All of these lead to difficulty in breathing, a chronic cough and wheezing.

**Emphysema**
Emphysema is caused by loss of elasticity of the lung tissue. As with bronchitis, this is due to inflammation being caused by toxic chemicals within tobacco smoke (e.g. **elastase**). These toxic chemicals lead to breakdown of the alveolar tissue.

To try to compensate for the decrease in the oxygen uptake, the chest expands. Eventually, there is still not enough oxygen perfusing the vessels. So part of the blood going to the lungs is shut off. This causes a backlog to the heart leading to right sided heart failure.

Emphysema is irreversible. Symptoms include shortness of breath (initially on exertion and then at rest), breathing more and an expanded chest. The person may also have a wheeze. In advanced disease, there is excessive fluid which can lead to fluid in the lungs.

**Lung Cancer**
Smoking is the main contributor to lung cancer. In the developed world, about 90% of lung cancer deaths are caused by smoking.

Cigarette smoke contains many **carcinogens** (toxins that cause cancer). The smoke also depresses the immune response. Therefore, the more a person smokes, the more chance they have of developing cancer. If a person stops smoking, the chance steadily decreases.

Atherosclerosis
Atherosclerosis is really just a fancy way of describing when fatty substances (e.g. cholesterol) are deposited along the walls of the arteries.

In time, thick deposits known as “plagues” build up and stop blood flow. These plaques can rupture and a blood clot (called a “thrombus”) can break away and lodge in another part of the body, stopping blood flow in that part of the body (“embolus”). Fatty embolisms that block blood flow to the heart cause a heart attack. If they block blood vessels to the brain, it is a stroke.

The risk factors for atherosclerosis are cholesterol levels and high blood pressure.

Smoking aggravates both of these risk factors. The toxins in the tobacco smoke lower a person’s high density lipoprotein (HDLs) which are “good cholesterol” and help cholesterol to be taken up by the body. They also increase the levels of low density lipoproteins (LDLs) which are “bad cholesterol” and increase the atherosclerotic risk.

Nicotine and carbon monoxide also cause damage to the endothelium leading to the build up of plaque.

Smoking doesn’t directly increase blood pressure, but it does cause normal hypertension (high blood pressure) to result in high blood pressure that stays the same.

CHD and Stroke.