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# Session 3:

## Respiratory Recovery

**Reiterate:** that when you quit smoking, the body very quickly switches to repair mode. Recovery starts immediately on quitting.

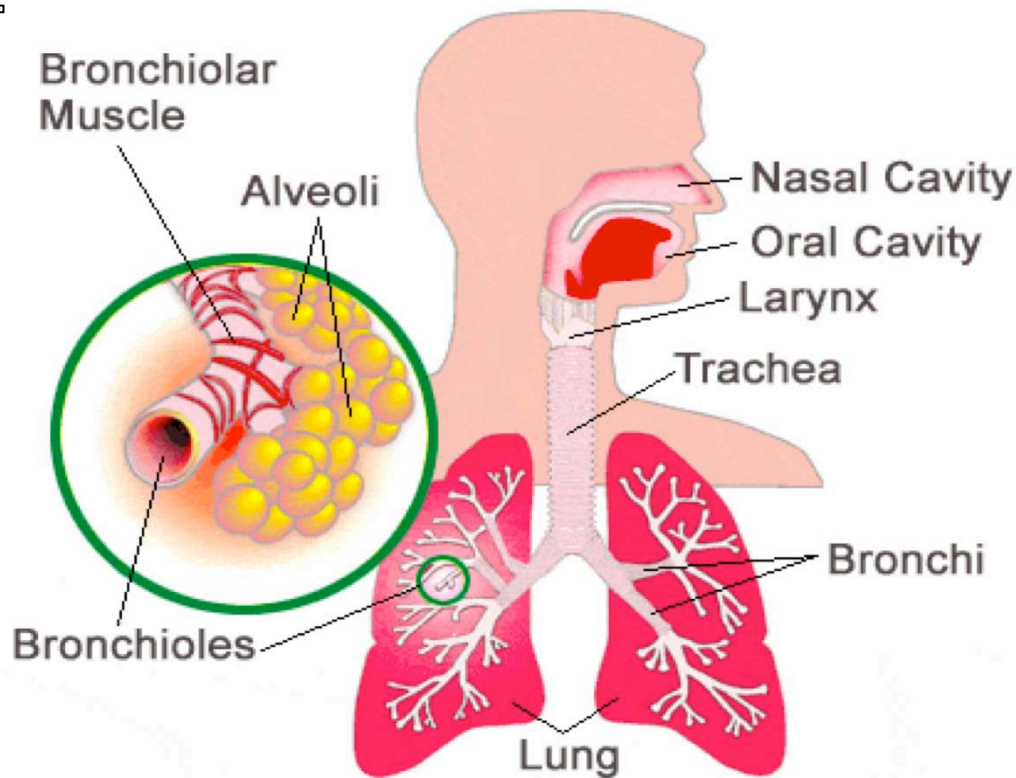
**State:** that tobacco has 2 main types of effects on the body being:

1. Acute – (explain meaning)
2. Accumulative (explain meaning)

**State:** in our last session, we talked about the acute effects of inhaled nicotine (vasoconstriction) and carbon monoxide (secondary polycythaemia).

**State:** in today's session we are going to look at the accumulative effects from smoking.

**State:** These effects are largely in the respiratory system. Most of these effects are reversible. For those that are not, the risk of developing smoking related respiratory disease drops dramatically on cessation of smoking.



**Explain:** the structure and function of the lungs and respiratory system.  
**Describe:** the bronchial tree.

**Draw attention:** to the trachea with its rings of cartilage, the carina and cough reflex, the bronchi (left and right leading into left and right lungs respectively), the bronchioles and the alveoli.

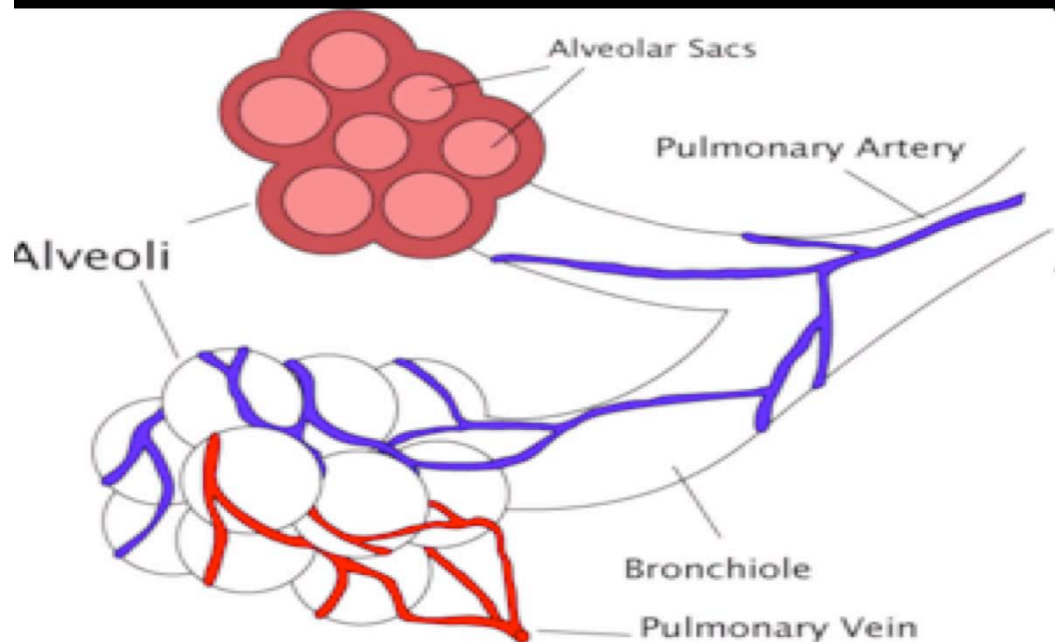
**Draw attention:** to the tiny diameter of the bronchioles (2mm) and that each leads into a single alveolus.

**Compare:** the alveoli to being like a bunch of small balloons which expand on inspiration and release on expiration.

**Emphasize:** the enormous number of alveoli in each lung (approx 600 million.)

**Highlight:** the importance of the bronchioles being patent.

# Interface: Lung and Blood Vessels

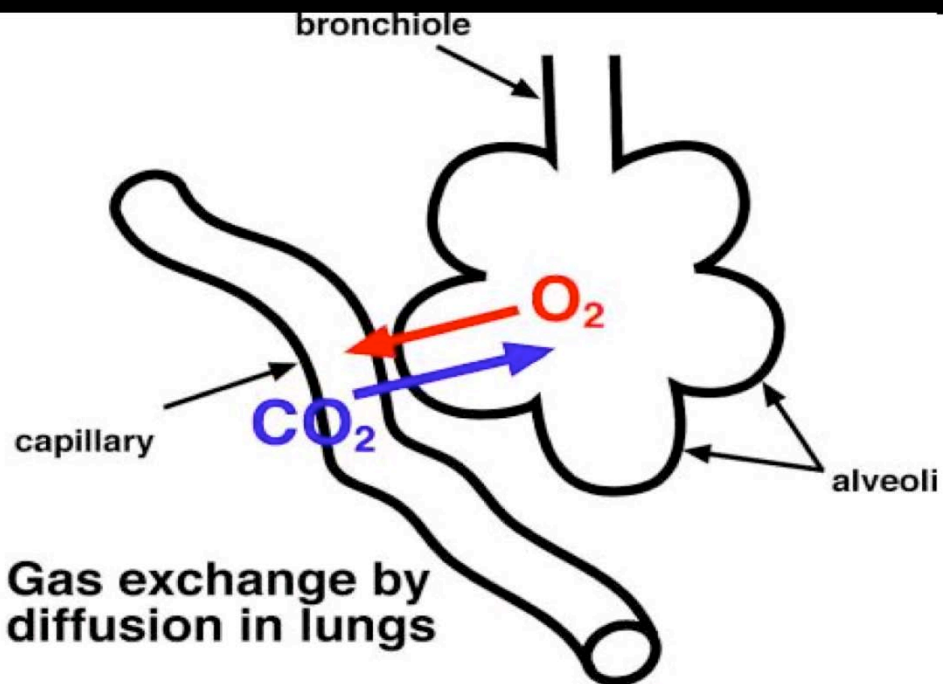


**Highlight:** the proximity and permeability of the surface of the alveoli with the circulatory system.

**Explain:** the significance of the red and blue coloured blood vessels. Compare this to the real life colour of oxygenated vs. deoxygenated blood eg. point to your brachial or radial veins.

**Explain:** why the body needs to excrete carbon dioxide and to absorb oxygen.

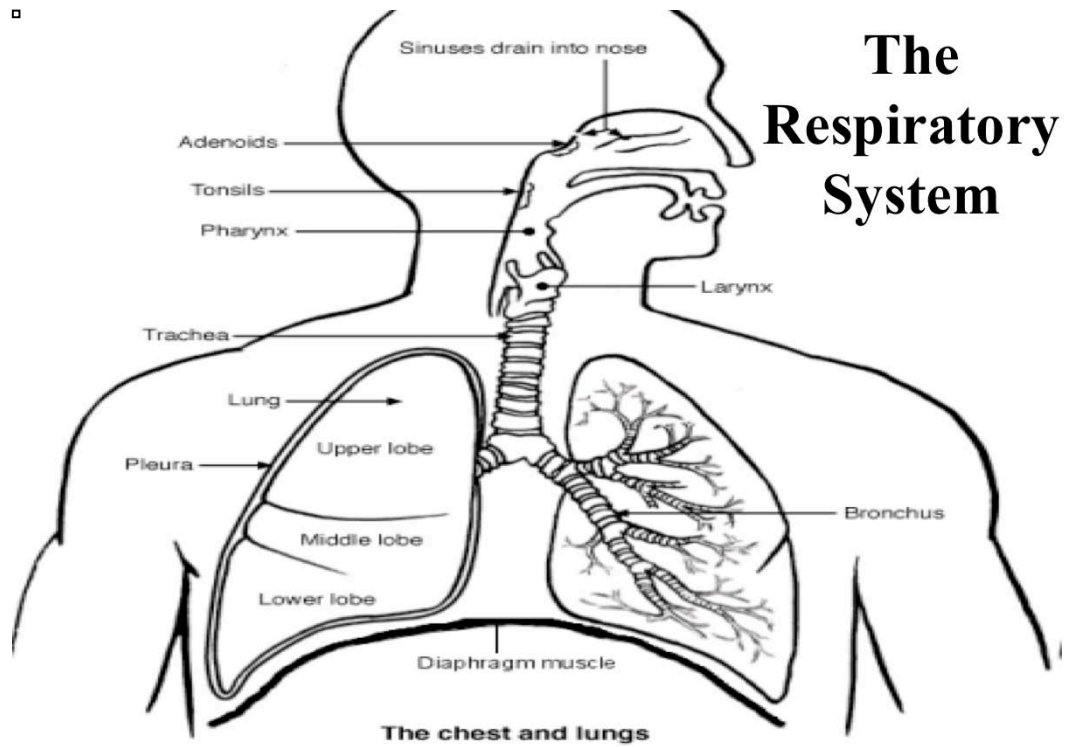
# GAS EXCHANGE



**State:** that the diagram shows a single alveolus.

**Draw:** attention to the tiny, single bronchiole supplying a single alveolus.

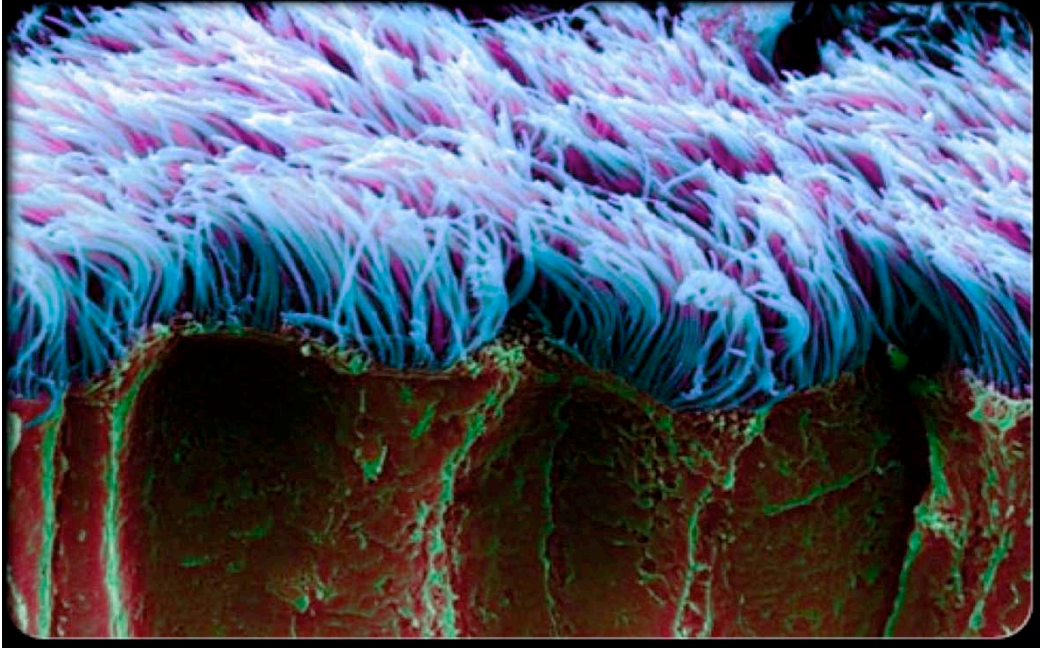
**Explain:** the process and purpose of gas exchange.



**Explain:** that air breathed into the upper respiratory tract contains many foreign particles including dust and irritants.

**State:** that the lungs and respiratory system have their own cleaning and filtering mechanisms to avoid the absorption of potentially dangerous substances into the body.

# CILIA



**State:** that the lungs have a great self cleaning capacity.

**Explain:** how cilia (hairy cells) work in relation to coughing and swallowing foreign particles.

**Explain:** cough reflex activation from foreign particles at the site of the carina.

# Particles in Tobacco Smoke



**Explain:** that tobacco smoke contains 2 main types of particles:

1. Microscopic
2. Macroscopic

## 1. Microscopic Particles:

**Explain:** that cigarette smoke contains a lot of particulate matter. These very tiny particles are vaporised and highly concentrated, particularly in mainstream smoke (smoke that is breathed in from the cigarette) and in side stream smoke (smoke that comes out the burning end of a cigarette).

**State:** that nicotine and carbon monoxide are examples of microscopic particles in tobacco smoke. Because of their tiny size, they travel very quickly down the respiratory tree and diffuse directly through the alveolar wall, into the blood stream.

# 1 YEAR = NO TAR



**2. Macroscopic Particles:** are the much larger particles in tobacco smoke.

**Describe:** the analogy of the lungs being like a sieve. While microscopic particles (nicotine, carbon monoxide) pass through the sieve very quickly, the much larger particles travel more slowly and deposit on the inside lining of the bronchial tree. There, they cool down, solidify and form a sticky, gooey substance called tar.

**State:** that tar consists of thousands of chemicals in tobacco smoke which are too large to be absorbed through the alveoli. Some tar deposits are able to lodge in the bronchioles, totally blocking off whole air sacs so that normal gas exchange cannot occur.

**Discuss:** the ramifications of bronchiole obstruction from a respiratory, cardiovascular, cerebrovascular, peripheral vascular, fitness, reproductive and cosmetic perspective.

**State:** That tar in tobacco smoke is named after tar on the road as it is very similar in appearance and consistency

# SMOKE!



**Pose the question:** If you are in a house fire, and there is a lot of smoke around, how does your respiratory system respond?

**Explain:** that it causes you to cough very, very hard to stop smoke containing CO entering the lungs.

**Re emphasize:** the structure, function and importance of the cough reflex.

**Pose the question:** If you cough in a house fire, why don't you cough when you are smoking?

**Explain:** that while you are smoking, nicotine paralyses the 2 main defence mechanisms of the respiratory system: the cough reflex and the cilia.

**Advise:** that the inactivation of these defence mechanisms, enables a perfect route for nicotine, carbon monoxide and tar to be delivered right down into the lungs.

**Explain:** the relationship between tar deposits and chronic obstructive pulmonary disease (COPD). Highlight airway obstruction from a mechanical perspective with tar deposits.

**Explain:** the inflammatory processes which occur via macrofage activation with the clearance of tar deposits within the bronchial lining. Relate this to chronic bronchitis and the formation of scar tissue.

**Emphasize:** the importance of these clearance mechanisms in between cigarettes to avoid total airway obstruction.

**Emphasize:** that approx 20% of tar deposits remain in the airways in the face of clearance mechanisms and that this is one of the causes of COPD in smokers.

**Emphasize:** that in between every cigarette smoked, the respiratory system cleans out tar deposits so that the person does not "drown in tar".

**Explain:** the theory that emphysema may be caused by tar deposits totally blocking single bronchioles.

**Explain:** that this blocks air (O<sub>2</sub>) entry into the alveolus and stops carbon dioxide being expelled.

**Explain:** the ballooning effect in the alveoli and the consequences for gas exchange.

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## **What happens when you quit?**

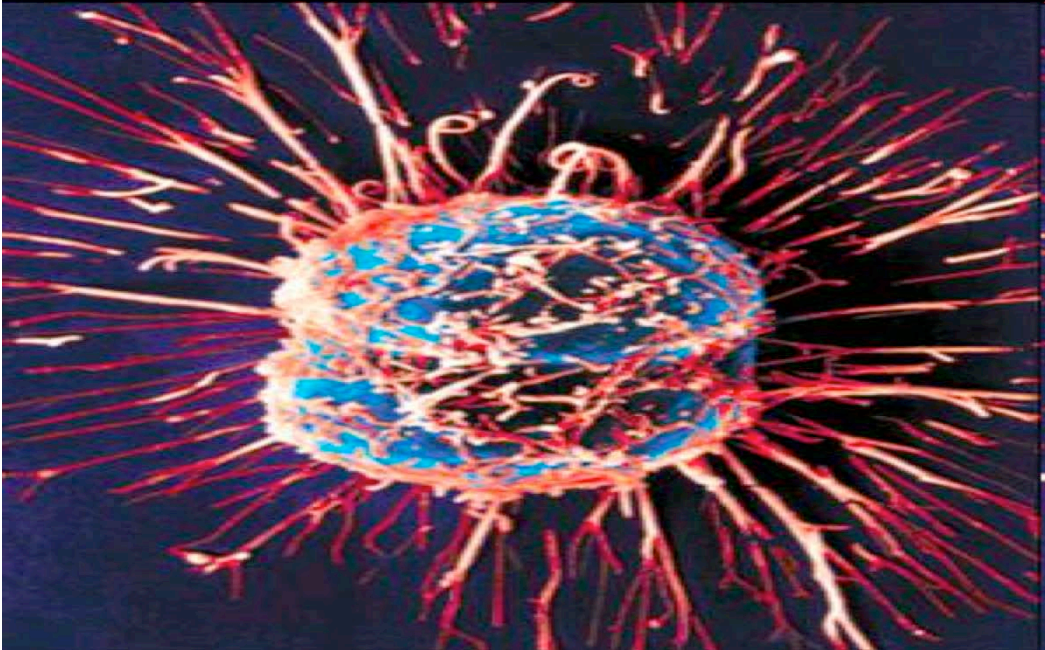
- The lungs clean up **very quickly**.
- The cilia are re activated.
- Your cough reflex re activates.
- You may find that you **cough** up or sneeze out brown mucous. This is tar.

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## **What happens when you quit?**

- Bronchi & bronchioles clear out tar.
- Distended alveoli with intact membranes go back to their normal state.
- At **3 months** abstinence, **80%** of tar deposits are cleaned out. By **1 year**, totally cleared.
- Respiratory function improves, fitness and personal complexion improve.
- **NEVER “TOO LATE” TO QUIT!!!!**

## Reducing the Risk of Lung Cancer



**Advise:** that this is a generic drawing of a cancer cell.

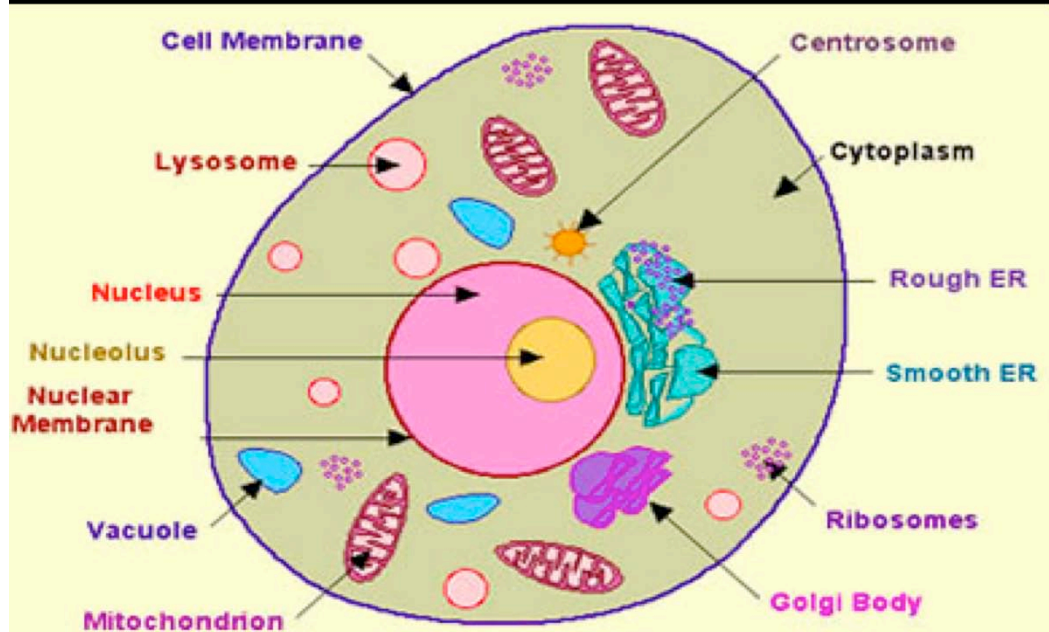
**Explain:** that lung cancer is a disease which primarily occurs from the accumulative effects of tobacco smoking.

**State:** that the longer someone smokes, the greater the risk of developing lung cancer.

**State:** that most forms of lung cancer in Australia are caused either directly by long term cigarette smoking or indirectly by breathing in passive smoke.

**Advise:** that on quitting smoking, the risk of developing lung cancer drops dramatically.

# A CELL



**Advise:** that to understand how the risk of lung cancer decreases on smoking cessation, we need to first understand how cancer develops.

**State:** that cancer is a disease of human cells.

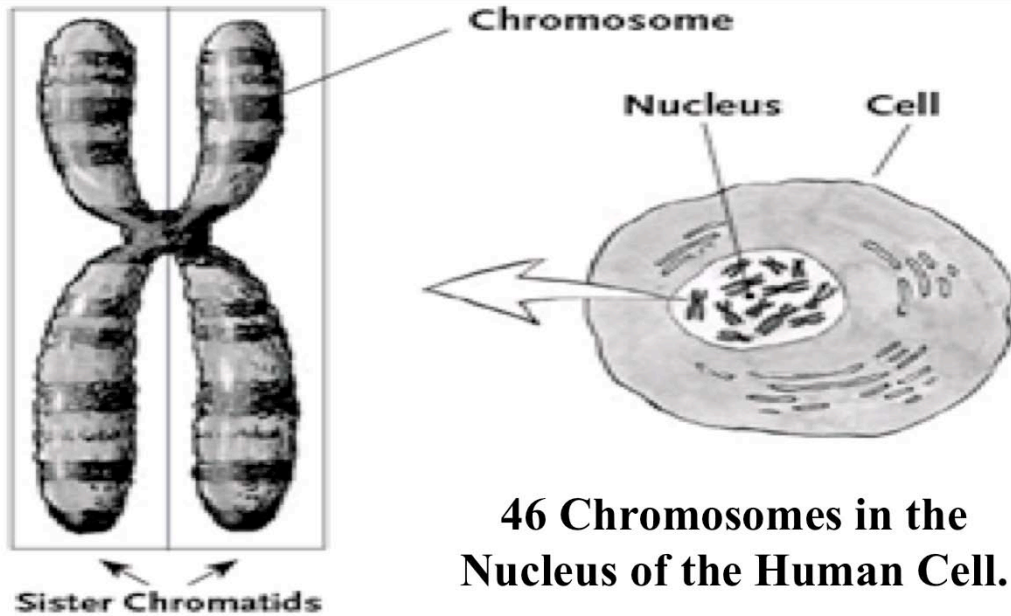
**Describe:** the cell's structure and function.

**Identify:** the cell membrane, cytoplasm and nucleus.

**Explain:** cell variations with different organs and tissue types.

**Focus:** on the nucleus. Describe it as the “brain” or “control centre” of the cell.

# Chromosomes:



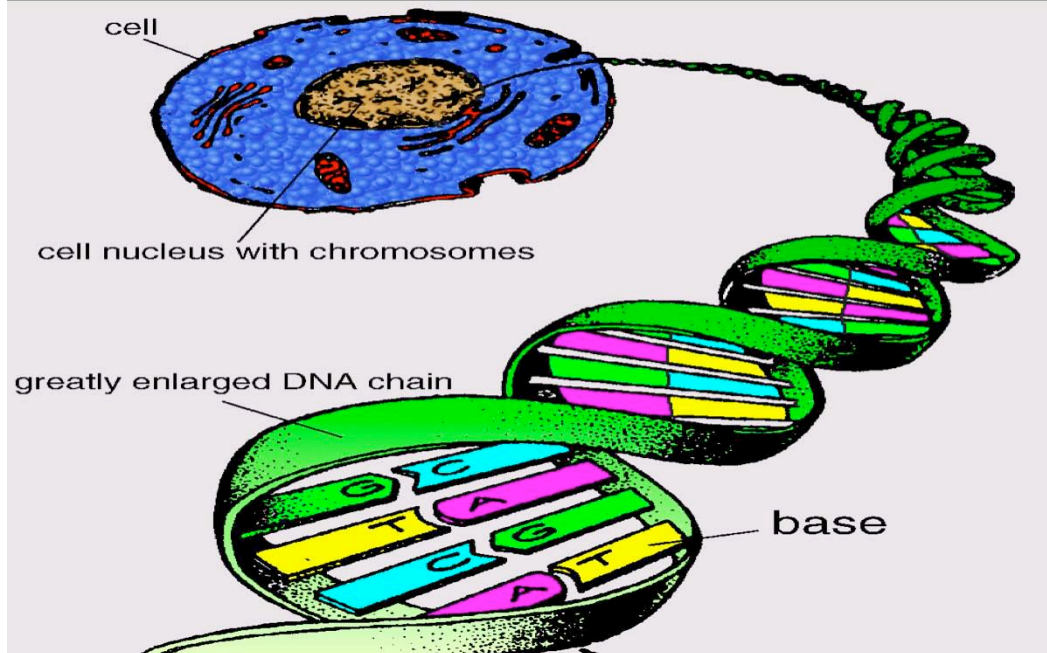
**46 Chromosomes in the Nucleus of the Human Cell.**

**Explain:** that the nucleus contains chromosomes.

**Describe:** their structure, function and origin (maternal, paternal).

**Draw:** attention to the genes lining each chromatid.

# GENES



**Explain:** the concept of genes.

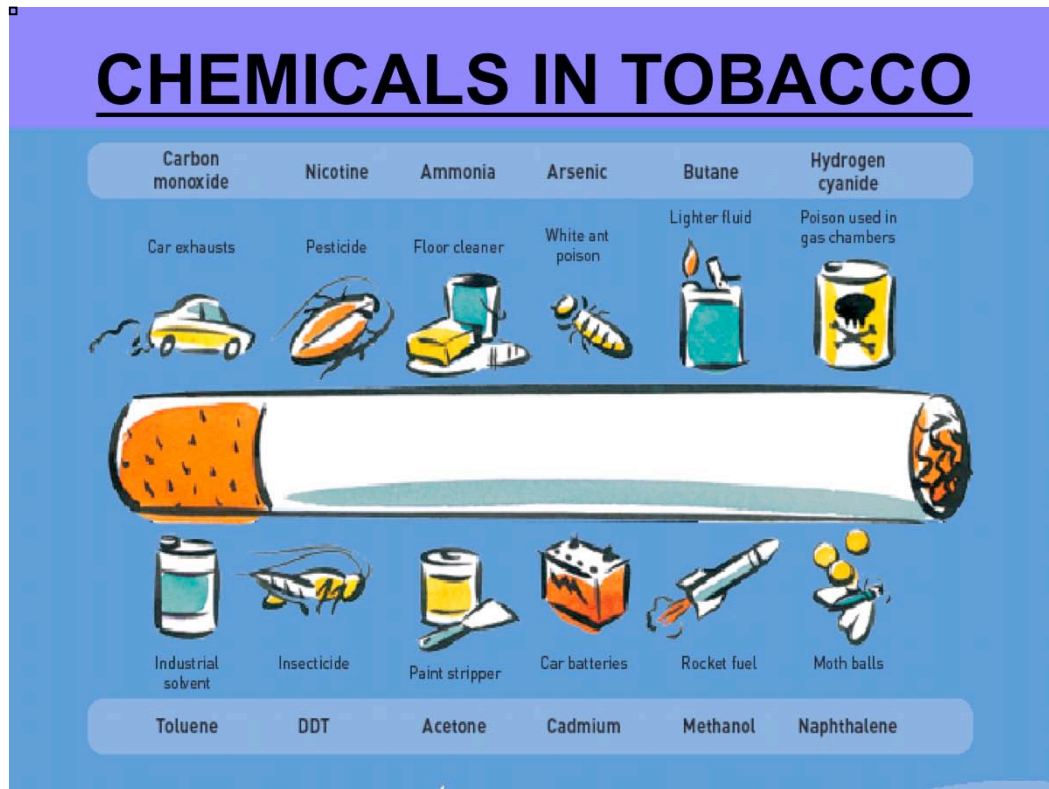
**Describe:** their structure and function.

**Explain:** the chemical bases that make up genes.

**Discuss :** the concept of chemical coding via DNA sequences.

**Emphasize:** that individuals have unique gene sequences and that these determine various characteristics of the person.

**Explain:** gene mutation and its possible consequences.



**Explain:** that tobacco contains approx. 4000 chemicals.

**Advise:** that many of these are very dangerous to the human body.

**Emphasize:** that many are carcinogenic.

**Explain:** that the curing of tobacco has changed dramatically over the last 30 years. During the 1950's and 60's, tobacco leaves were dried slowly in the sun. Today, the leaves are cured by freeze drying them. This process alters the chemical structure of nicotine to nicotine nitrosamine. Nicotine nitrosamine is an organ specific carcinogen of the lung.

**Advise:** that other carcinogens in tobacco smoke can in the long term, cause gene mutations which can result in a variety of cancers: lung, throat, bladder, kidney, stomach, bladder, pancreas, lip, tongue and cervical.

# Lung Cancer

- A numbers game: the more cigarettes smoked, the greater the risk.
- Stop now to stop adding numbers!



**Advise:** with quitting smoking, the risk of developing lung cancer drops dramatically.

**Explain:** that reduction in risk is in the order of 5:1 smoking to non smoking years respectively, whereby the risk of developing lung cancer becomes equivalent to someone who has never smoked.

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## **CONCLUSION:**

- Tobacco smoking has **acute** and **accumulative** effects in the human body.
- The accumulative effects have an impact on the **respiratory** system.
- Tobacco smoke contains **microscopic** and **macroscopic** particles.
- **Tar** deposits are mainly responsible for **COPD**.

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## **CONCLUSION:**

- **3 months** post cessation, **80%** of tar deposits have cleared. **12 months** all tar is cleared.
- **Emphysema** is not reversible, but distended alveoli with intact membranes, go back to normal size.
- The risk of developing **lung cancer** declines rapidly with every day of not smoking.