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HUMAN HEALTH AND CAR EXHAUSTS



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Human health and car exhausts

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Summary:

Living organisms need different amounts of "heavy metals", such as iron, cobalt, copper, manganese, molybdenum, zinc and selenium. The consumption of these minerals is necessary and important to maintain the metabolism process in the organism's body.

Heavy elements are divided into basic elements and non-essential elements, as the basic elements are important for the functioning of enzymes such as Zn⁺⁺, Mg⁺⁺, where these elements act as co-factor ions (necessary for cell metabolism in low concentrations), while non-essential heavy elements are toxic to the cell and its components. It can destroy cell components at low concentrations, such as cadmium, Cd, and lead Pb.

The danger of heavy metals stems from their ability to accumulate in the bodies of marine organisms such as: fish and crustaceans, and the consumption of large quantities of them that contain high concentrations of heavy metals leads to human poisoning, which is the final consumer of these organisms, which is known as (heavy metal poisoning), where they accumulate within the body faster than being degraded through metabolism or excreted.

Content

Article No.	Article Title	Page No.
1	Introduction	2
2	Literature review	5
2-1.	The Gases	
2 - 2.	Carbon monoxide gas	6
2 - 3.	Carbon dioxide sources and its environmental effects	14
2 - 4.	Sulfur dioxide gas	17
2- 5.	Trace elements	19

2- 6.	lead sources	21
2-7.	Cadmium	25
	References	34

1- Introduction :

Contemporary man faces many diverse problems, but the problem of environmental pollution is considered one of the important issues, rather it is one of the most dangerous problems of the age, the most complex and the most difficult to solve, because it is a problem with health, social and economic dimensions because of its effects, and therefore it is natural that attention to it occupies a distinct priority on the scale of priorities of science Applied and human alike and one of the most important types of pollution is air pollution due to its continuous increase and causing daily suffering for the residents of industrial areas in addition to the multiplicity and diversity of sources of this pollution and its direct impact on human health . Vehicles, in particular, had a major role in polluting the air of cities due to the concentration of transportation services in crowded urban centers. Therefore, their atmospheres became saturated with high levels of carbon oxides, nitrogen, sulfur, suspended particles, hydrocarbons, lead, etc. These pollutants are mainly among the main waste emitted from vehicle exhausts, and the encyclopedia indicates Globally, the most dangerous pollutants known to researchers are carbon monoxide, lead, ozone, carbon dioxide, sulfur dioxide, as well as other pollutants .

At the beginning of the eighties, it was found that every hundred million vehicles throw the following pollutants into the atmosphere annually: (66)

million tons of carbon monoxide (CO), (6) million tons of nitrogen dioxide (NO₂), (12) million tons of hydrocarbons (HC). One million tons of lead, and on average, what each vehicle throws is equivalent to (2) kilograms of pollutants in the air per day, of which carbon monoxide (CO) constitutes about 75% (Suleiman Beck, 2010). One of the main causes of pollution in cities.

Many epidemiological studies have proven that the main source of many diseases that people suffer from in the second half of the twentieth century and the beginning of the current century, such as respiratory diseases, heart diseases, lung cancer, influenza of all kinds, and many other diseases is air pollution, and pollution rates have reached many regions To the degree of danger, or in other words, it increased beyond the limits of the potential capacity of some elements of the vital system, and many residents began to feel the problems of pollution and its seriousness. For example, carbon monoxide gas, which is a highly toxic gas for humans because it impedes the absorption of oxygen and its transfer to the cells of the body, which causes death in cases of severe poisoning. Carbon dioxide gas, which leads to environmental pollution and a rise in temperature on the surface of the globe. While the increase in the concentration of sulfur dioxide gas leads to acid rain, the concentration of this gas in surface water has increased in the last two decades, which led to the disappearance of some organisms from rivers. And lakes because it causes low pH.

Reactive oxygen species (ROS) are generated as a result of external factors, the most important of which are various environmental pollutants. These radicals tend to acquire electrons from vital molecules such as proteins, fats and nucleic acids in order to become stable and thus cause many complex human conditions, including cardiovascular and respiratory diseases and

cancer. Since pollution is a global problem before it is a regional problem, therefore most sought The countries of the world have led to the formation of many environmental institutions and the holding of many conferences. The first global environmental conference was held under the protection of the United Nations in Stockholm in 1972, and an institution was created to coordinate all environmental activities at the global level. Then international and regional seminars and conferences followed (Al-Hamish, 2004). In Iraq, environmental protection centers have been formed and improved in each province, in addition to a council for environmental protection . In recent years, a ministry has been formed to deal with environmental matters and preserve it, and to issue annual and monthly reports in Iraq, as is the case with most countries that This ministry was established.

2- Literature review

2-1: The Gases

Gases directly affect humans and are divided into three categories based on this basis:

First: suffocating toxic gases that poison body tissues and interact with these tissues by absorbing them, such as carbon monoxide, hydrogen sulfide, and methane.

Second: Asphyxiating gases that do not cause a harmful effect on the body except when their presence increases because they reduce the percentage of oxygen in the atmosphere, such as CO_2 and N_2 .

Third: Irritating gases, which lead to inflammation of the area to which they reach, whether the parts exposed to their influence or the internal parts of the body, for example gas: SO_2 , ammonia and nitrogen oxides.

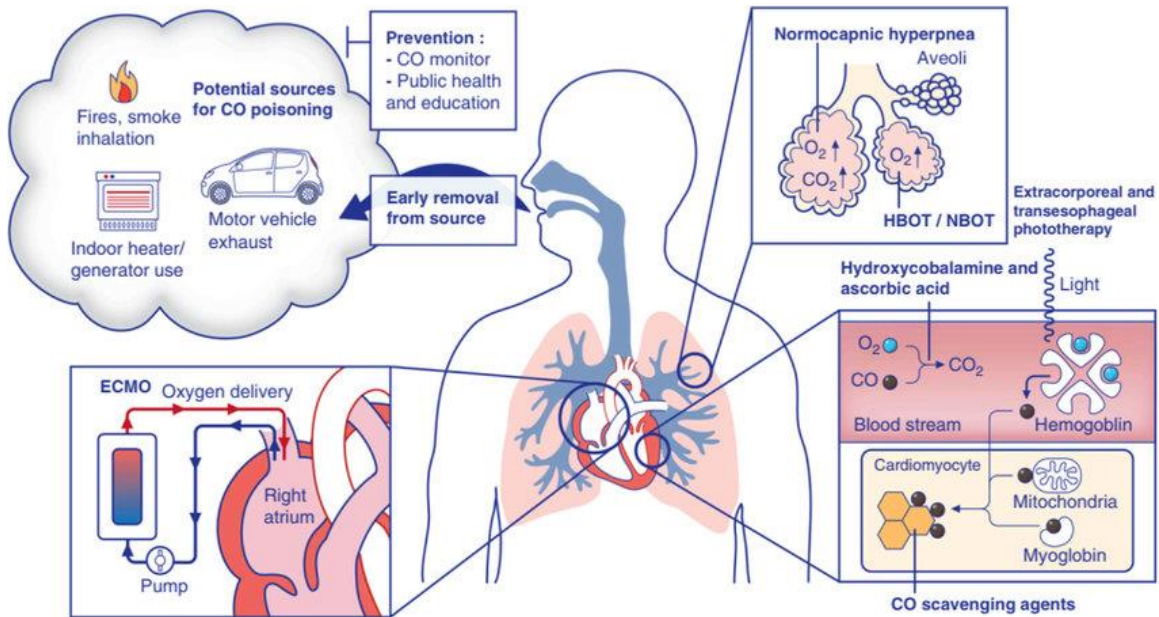
There are several factors that play a major role in the difference in the effect of these gases, including:

1- The degree of concentration of the gas in the air, as the effect state increases when the degree of concentration increases.

2- The exposure time period The intensity of the effect of the polluted gas increases with the increase in the exposure time period.

3- The degree of solubility of gas in water: The degree of solubility of a gas decreases with the increase in the temperature of the environmental medium.

4- Degree of gas activity or interaction: Active gases dissolve quickly and cause acute and rapid infections in the eyes, mucous membranes, and respiratory system .



2-2: Carbon monoxide gas

A colorless, tasteless and odorless gas that is lighter than air and burns in air with a blue flame. This gas is considered one of the most dangerous gaseous pollutants in the atmosphere of cities and industrial plants. Natural resources generate basic concentrations of it at one part per million (1ppm), and it is known that the levels of this gas do not increase continuously due to the

presence of some natural processes that limit its danger and stand behind its removal from the atmosphere. It is believed that it turns into CO₂ gas .

This gas arises from the incomplete combustion of fuel used in car exhausts and heaters from homes or in industrial facilities. The annual increase of this gas in the atmosphere is estimated at (0.03) parts per million. The continuous decrease of CO gas is a good condition, and this comes through continuous attention to what is presented to the environment. For example: the use of new-made machinery or cars and the use of good fuel quality for these mechanisms. Other sources of CO emission are from burning fuel such as steam boilers that blow 12%, industries 8%, heavy waste 3%, and other pollutants up to 14% .

CO gas is a very suffocating substance, and it binds with blood hemoglobin about (200-300) times faster than oxygen, and thus it hinders the work of normal hemoglobin as a carrier of oxygen. hemoglobin; This gas is characterized by its easy absorption by the lung, its high affinity, and its association with hemoglobin, forming carboxyhemoglobin, which impedes the association of oxygen with hemoglobin and thus its access to the cells and tissues of the body . This is done by increasing the affinity of functional hemoglobin towards oxygen that is not bound to CO (O₂ affinity), which impedes the release of oxygen towards tissues. Many studies agree that the Iraqi air was greatly affected during the period of the first Gulf War and the events that followed, which included the emission of gases and large polluting materials due to fires in oil wells, refineries, and warehouses, as well as other chemicals. On the other hand, pollution included the emission of particles and particles that constitute The vast majority of them are carbon .

There is a group of chemical reactions that take place under the influence of sunlight on the air polluted by the smoke of cars and factories, known as photochemical reactions, which are supposed to have taken place in the smoke and gases emitted from the fires ignited due to the hostile air bombardment, but the smoke that works on Reducing the light intensity led to a decrease in these interactions.

Exposure to carbon monoxide

Man receives small amounts of carbon dioxide gas during his daily activities, depending on the nature of the different environments, such as his use of means of transportation such as mechanisms, cars, and motorcycles, especially in crowded cities whose environments are polluted with gases emitted from these media, in addition to consuming energy of all kinds, such as cooking and heating using gas or using gas. Wood fire, as well as smoking, and above all, the greatest exposure to carbon monoxide gas results from wheels, vehicles, and indoor work.

The development of devices for detecting small quantities of this gas contributed to calculating its concentration in people's environments, at their workplaces, and in indoor or outdoor spaces. Studies assumed that personal exposure decreases when the gas decreases in the external environment and increases with the increase of the gas in environment.

Factors involved in changing the degree of exposure or the amount of exposure have been identified. These readings indicate that occupational exposure in some workplaces or exposure in poorly ventilated homes is due to the presence of high consumption of fuels, and this may increase the proportion of CO gas to (110 mg/m³) and thus lead to an increase in the

proportion of carboxyhemoglobin Co-Hb to more than 10% in the case of continuous exposure (Radford and Drizd 1982).

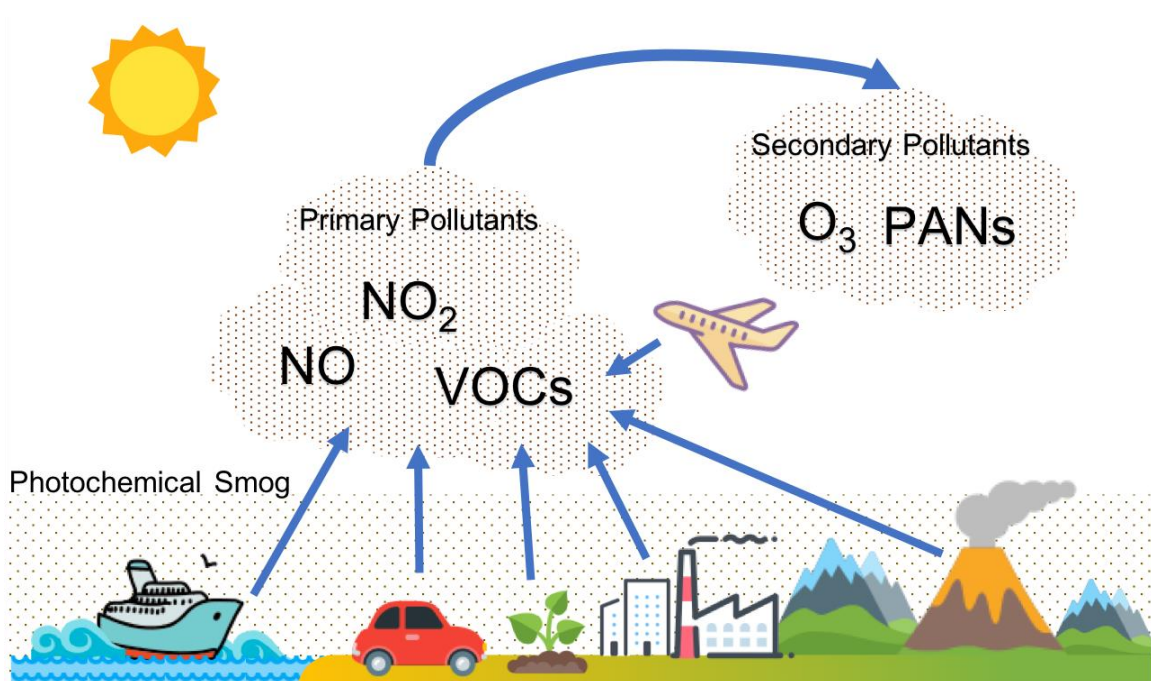
Studies have shown that car engines emit, continuously and regularly, the most important amount of this gas, which leads to a high percentage, and the workplace is very important in raising the degree of exposure in general. Occupational and non-occupational exposure may overlap together in raising the level of carbon monoxide in the blood. More importantly, some professions carry a high risk of exposure to carbon monoxide, especially vehicle drivers, maintenance workers, and garage guards, in addition to that people working in power plants. electric vehicles that use crude oil or diesel fuel, oil refineries and the manufacture of carbon black, as well as workers in filling stations, bus drivers, large trucks, taxis, police and traffic men, as well as people working in industrial cities and some industrial sites where they are exposed to direct carbon monoxide emission .

Many studies indicated that the impact of carbon monoxide pollution with its different concentrations is reflected on humans at the limits or near the dangerous limits of CO-Hb concentration, which are diagnosed

By medical methods, where the health of the individual is linked to exposure to this pollutant, and the effects are reflected on the vascular system, the nervous system, as well as on endocrine secretions of .

Carbon monoxide is responsible for a high percentage of poisoning and death incidents recorded around the world every year and in different circumstances inside or outside buildings. From industrial sources in places with little ventilation such as covered car parks, tunnels, mines, and places that depend on burning fuel (Raub 1999).

The symptoms of acute exposure correlate with the intensity of the CO-Hb concentration in the subjects, so a low concentration does not reflect all symptoms of infection. When there are high concentrations of CO-Hb, difficult symptoms appear such as headaches, dizziness, weakness, confusion, nausea, confusion, lack of visual focus, blurred vision, as well as some abnormal secretions with increased breathing rate. These symptoms were seen in the case of continuous exposure that results in a high concentration of CO. -Hb shows a state of blue blood, and in the case of a higher concentration, symptoms of fainting, heart attack, and myocardial infarction appear, or health complications may appear, including hypotension and lung hemorrhage. Most of the dangerous effects of carbon monoxide appear after a period of (3) weeks of exposure, especially if it was The effect on the nervous and behavioral systems of children. Carbon monoxide affects pregnant women as well as fetuses, or precedes fetal death or the arrival of mental confusion in the fetus or the occurrence of infections in the nervous system (Raub, et al., 2000).



The mechanism of carbon monoxide poisoning

Symptoms of carbon monoxide poisoning begin to appear on the face of the person exposed to this gas, where it is bright red as a result of an increase in the percentage of carboxyhemoglobin in the blood, CO-Hb, or a decrease in the percentage of hemoglobin in it, but these symptoms are not the only indicator of the state of poisoning with this gas. The following table shows the relationship between The percentage of CO-Hb in the blood and the pathological symptoms that occur .

The concentration of CO-Hb in the blood at any time depends on several factors. When equilibrium with the outside air, the blood content depends mainly on carbon monoxide (CO) absorbed through the lung and breathing oxygen. In any case, if the degree of equilibrium is not reached, the concentration of Carboxyhemoglobin (CO-Hb) will depend on exposure time and respiratory ventilation . Also, carbon monoxide binds to myoglobin, cytochrome, and some metalloenzymes such as cytochrome C oxidase and cytochrome P-450, but it is insignificant when compared to the case of This gas binds with hemoglobin to form carboxyhemoglobin .

The exchange of carbon dioxide between the breathing air and the human body is controlled by different methods.

Physiologic factors such as quantitative transport and diffusion, and physiological factors such as ventilation of the alveoli and activity.

The heart generally absorbs this gas from the lungs into the blood and in the last steps of it.

The competitive binding of carbon monoxide and oxygen with hemoglobin occurs in red blood cells, and these two gases produce carboxyhemoglobin and oxyhemoglobin.

When the link between carbon monoxide and hemoglobin occurs, the compound carboxyhemoglobin (CO-Hb) is produced, which leads to a decrease in the blood transport capacity for oxygen. The reduced state of oxygen transport is the disruption of the tissues and organs of the body as well as the related secondary mechanism that causes poisoning as well as the formation of CO-Hb has been hypothesized and not proven relatively when determining the amount of exposure . The percentage of carboxyhemoglobin

formed in the blood is more acceptable as a physiological indicator used to calculate the endogenous carbon monoxide and the joint effects resulting from the endogenous production of carbon monoxide and the concentration of CO-Hb with the CO resulting from external exposure, whose effect depends on the concentration, duration of exposure and respiratory rate , even when exposed to relatively low concentrations in the gas, it may lead to the production of a high amount of CO-Hb in this case (Thom 1992).

And the concentration of carboxyhemoglobin in the blood can be calculated directly through blood analysis or indirectly by calculating its concentration in the inhaled air and calculating it in the air has the advantage that it is fast, easy and accurate and accepted by the individual and most likely the accuracy of calculating the CO in the breathed air and the success or acceptance of this method Or measuring the amount in the blood remains a question when adopting environments with low concentrations of CO . In spite of the fact that the principle of the effect of carbon monoxide in the case of low exposure is the injury of tissues to a state of poisoning resulting from lack of oxygen, which causes carbon dioxide to bind to hemoglobin, and some physiological indicators resulting from exposure have not been explained precisely through the decrease in the oxygen content between cells, and that the molecular pressure is that The amount induced by the presence of CO-Hb and, consequently, the secondary metabolism of CO intoxication depends on how much CO the cells receive, which has been the subject of many research studies .

And that the association of carbon monoxide with many cellular structures has been clarified through studies conducted on laboratory animals or humans, but doubts still revolve around the main cause of toxic effects, is it the cells

receiving CO in the presence of hemoglobin, or is it the result of a defect in a tissue? Therefore, current knowledge of the determination of cellular carbon monoxide content suggests that iron-transporter protein is functionally inactivated at certain concentrations of CO-Hb and is evident in the heart and muscular system (Wittenberg and Wittenbry 1993).

Health effects of carbon monoxide exposure

The close association between blood hemoglobin (Hb) and carbon monoxide gas is the main factor in the health effects of this gas and may be due to the relationship of carboxyhemoglobin production in the blood of people exposed to the air of polluted environments with this gas, which affects the process of transporting oxygen in the blood. The oxygen permeability of hemoglobin is affected and changed by the presence of this compound, so the transport of oxygen to the tissues decreases more and more, and the affinity of carboxyhemoglobin in humans for carbon monoxide is 250, twice the affinity for oxygen, and the ratio of carboxyhemoglobin to oxyhemoglobin depends on this affinity, as well as the weakness of oxygen and carbon monoxide .

Continuous exposure to carbon monoxide may lead to chronic bronchitis or emphysema, where in such a case the walls of the alveoli are destroyed, leading to a decrease in the amount of membranes available to transport oxygen from the lung to the blood . And when taking into account the health threats resulting from poor exposure to carbon monoxide, which were studied preferably using humans or experimental animals, and were carried out under different and controlled conditions, they came with important results that showed the toxic effects of CO in the blood, the role of different body tissues, the functions of different organs, and the changes that occurred in them.

Concentrations unexpected in nature were also used and their results and effects in laboratory animals were discussed .

Carbon dioxide is a colorless and odorless gas, with a weak acidic taste that does not help ignite, does not conduct electricity, and is heavier than air. Carbon dioxide is present in the atmosphere with concentrations ranging from (0.06_0.03%), and this percentage may increase in volcanic areas. Seismic cracks and crowded places (Al-Janabi, 2008)

2-3: Carbon dioxide sources and its environmental effects

This gas is not usually considered a hazardous substance, although humans produce it in large quantities through combustion processes and the use of fuels such as coal, oils, petroleum and natural gas. Also, this gas is one of the normal natural components of the air, and its higher percentage than the normal limit in the atmosphere leads to an increase in the temperature of the environment. Where the heat emitted from the earth is reflected, and thus it is confined to the atmosphere, causing this rise in high temperatures , as well as residential homes and public facilities are considered environments that contain a high percentage of carbon dioxide gas, in a study conducted in Chicago.

Published in 2001, the rate of carbon dioxide gas in the air of homes was measured for a period of four years.

Twenty hours, on a daily basis, for a full year, starting from May 1994 until April 1995. It was found that the rate of carbon dioxide in indoor air (inside homes) ranged between (0.04_3.76%) at a rate of 0.52%. Heating and other household activities lead to an increase in the percentage of this gas in the air of homes .

The natural cycle of carbon dioxide gas lies between air and plant and animal life, in addition to the dissolution of this gas in water with the help of several factors, including temperature, acidity, and salinity. For its concentrations, when the visible light reaches the surface of the earth, about a third of this energy is reflected back to the atmosphere, and the remaining two-thirds are absorbed by rocks and cement structures in cities and the like. Where these rocks or structures cool down and lose the energy they absorbed, and the thermal energy emitted from the surface of the earth cannot leave the earth with high efficiency when there are high concentrations of carbon dioxide gas in the atmosphere because of the ability of this gas to absorb the infrared rays that transmit heat by it, and therefore the heat is confined under This layer creates the phenomenon of the glass house (Al-Jabouri, 2000).

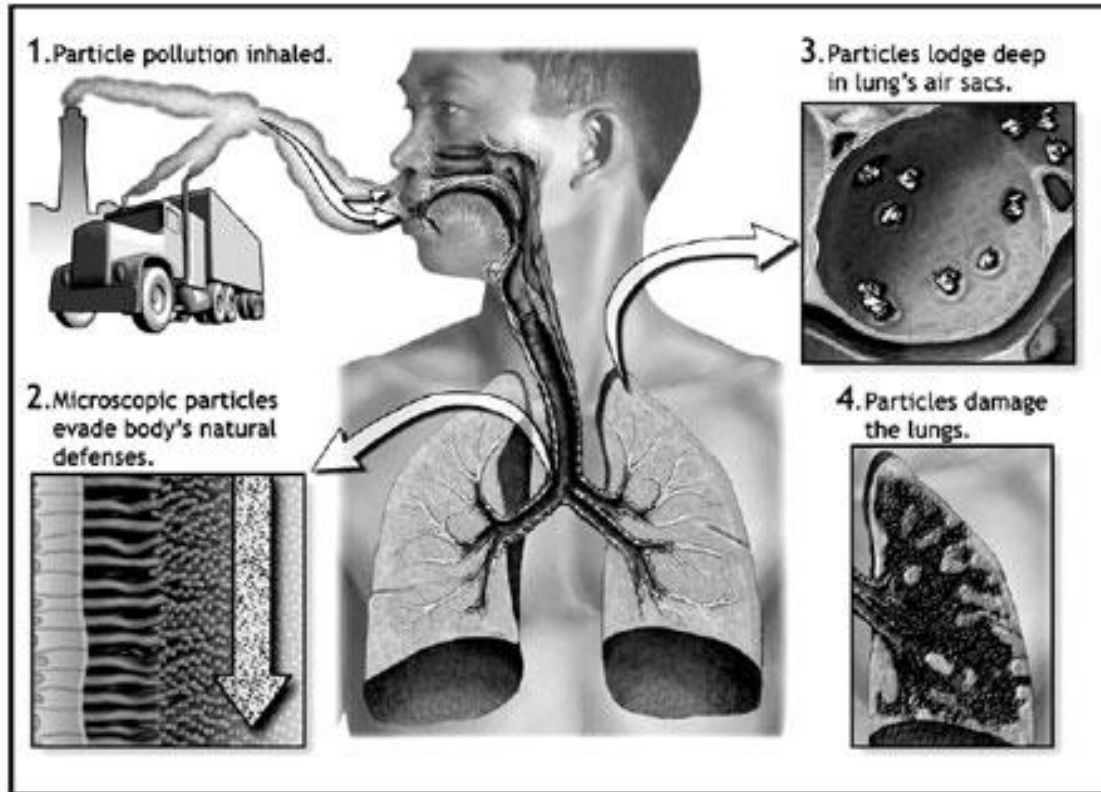
Scientists are increasingly interested in finding out the causes of the rise in temperature resulting from the increase in the concentrations of carbon dioxide gas, resulting in turn from the increase in human activities in nature, and carbon dioxide gas is primarily responsible for this increase in temperature .

The amount added by man to the outer atmosphere of carbon dioxide gas amounted to about 360 billion tons, an increase of 10% from what it was in the nineteenth century, as the increase reached about 30% at the end of 2002, and it is an increase that will remain without decreasing as long as the person could not So far, effective means have been invented to clean and rid the air of this gas , as vehicles alone emit more than 900 million metric tons of carbon dioxide per year worldwide, and these emissions constitute more than 15% of global emissions of this gas. Gas, resulting from the fuel used from the ground, and heating the surface of the earth in the long term can increase extreme

climate fluctuations such as hurricanes, droughts and floods. It is expected that the area of the ice layer will continue to decline in the northern hemisphere at a rate of 1.2 m, in addition to the associated disturbance in environmental systems. Ecosystems (Jafar, 2001).

The physiological and health effects of carbon dioxide

Carbon dioxide gas is a suffocating gas and when it has a concentration of 5% in the atmosphere, which is equivalent to 50000 ppm, it will affect the breathing process and cause headaches, and if its concentration rises to 15%, it causes unconsciousness and Thus death due to the loss of oxygen, and the injured person is rescued by giving him fresh oxygen and moving the injured person to fresh air is very necessary. An increase in the concentration of carbon dioxide in the surrounding air increases its percentage in the air entering the room.



The lungs, as a result, increase the respiratory movements, which work to introduce larger amounts of air.

Inhale during a few periods of time to treat the imbalance that occurred in the air entering the process of inhalation (Nunn, 1987).

2-4: Sulfur dioxide gas

Sulfur dioxide gas is colorless and has a pungent, irritating odor to sensitive tissues of the eyes, nose and mouth, and is non-flammable (Dunnell, 1990). Sulfur dioxide gas is produced from natural sources such as the decomposition of sulfuric organic materials and volcanoes, and the atmosphere contains 0.0002 ppm of this gas and sulfur dioxide gas is also produced from artificial sources such as fuel, coke ovens, mining, wood pulp production, oil refineries,

brick and tanning factories, and sulfuric acid production factories. Half of what is emitted from sulfur dioxide gas, because when fuel is burned at these stations, sulfur is released in the form of SO₂ at most .

And that the permissible limit of sulfur dioxide gas in the air is 0.03 ppm, which is equivalent to 80 micrograms / m³, while the permissible limit for one day a year is 0.14 ppm, and when exposed for 3 hours / year, which is equivalent to 1300 micrograms / m³, then High concentration of sulfur dioxide in the air leads to a nervous spasm (Dunnel, 1990).

The health and physiological effects of sulfur dioxide gas

Sulfur dioxide enters the body through the respiratory system and is excreted With urine in the form of sulfate, the majority of it is absorbed in the nose and upper part.

From the respiratory tract and a little bit of it reaches the lower part of the respiratory tract and is inhaled.

It leads to skin ulcers and erosion of the lining membrane of the nasal passage, throat and eye, in addition to the occurrence of shortness of breath due to the difficulty of gas exchange between the blood and the lung, which causes continuous coughing and irritation of the lungs. the lacrimal glands, and when its concentration in the air reaches from (110-50 ppm) leads to death within 10 minutes .

Sulfur dioxide gas also affects the sense of taste and smell, and also affects the outer layer of the teeth when exposed to the gas for a long time, and causes spasm of the vocal cords when its concentration increases.

2-5: Trace elements

Trace elements are found in the tissues of living organisms in very low concentrations estimated at parts per million.

However, some of them are of very great importance to sustain the life of living organisms, and the increased concentration of these.

Elements to certain limits within the tissues of living organisms are harmful or toxic to those organisms .

There are currently (16) essential elements called trace elements, including iron, iodine, manganese, nickel, lead, zinc, cobalt, molybdenum, selenium, chromium, chlorine, tin, arsenic, cadmium, mercury, and copper (Underwoeder, 1977). Undesirable physiological effects that lead to the death of the organism when it is absent from its body, and living organisms use several methods to maintain the concentrations of these elements within their bodies, including the process of absorption, transport, assembly and re-cycle within the cell, and the trace elements have a toxic effect despite their vital importance because they cannot be decomposed By bacteria and other natural processes, as well as its persistence in the environment and its spread to long distances from its place of origin .

Perhaps the most dangerous thing in the trace elements is due to the ability of some of them to bioaccumulate in the organs and tissues of aquatic organisms (Al-Fahadi, 2002). Among the main sources of contamination with trace elements are the various industrial processes that enter into the refining of materials and the polluting fumes and dust generated by them, as well as the various industries of dyeing industries Batteries, plastics, and plastics are among the contaminated sources. Some of these elements play a role of great

importance for enzyme systems in living organisms because they enter into the chemical composition of the enzyme, its active site, or co-factors in its effectiveness .

And a number of researchers showed the importance of the elements for the enzymatic systems, for example, an element.

Copper is the active site for a number of enzymes that participate in oxidation and reduction processes . Also, the element cadmium has the ability to replace zinc in a number of organic compounds, including a number of enzymes that require its presence .

Many researchers also pointed out that lead has no vital importance, but on the contrary, it has harmful effects and has toxic properties , and there is a close relationship between the toxicity of these elements as well as their deficiency, in addition to the overlap that occurs between these elements, so It is difficult to apply a specific relationship to a single element alone, for example, to increase an element.

What may affect another element by interfering with its absorption through the intestinal walls , for example, iron deficiency leads to an increase in the absorption of cadmium by the intestine, or at the expense of the absorption of zinc, and this leads to activation in The action of enzymes, or the destruction of the cell membrane, may affect the immune and nervous systems .

Lead is an element present in nature. It was used at the beginning of the emergence of civilizations because of its industrial interference and spread, as its percentage in the environment increased dramatically, and all humans have lead in their bodies due to exposure in one way or another (Kunkel, 1986).

And that lead is one of the main pollutants that are emitted from the combustion of fuels of all kinds (diesel, gasoline) in cars (Chamberlerlain, et al., 1975). In a study to measure the particles suspended in the air in the city of Baghdad and their content of heavy elements, including lead and cadmium for the period from September 1984 to September 1985, the study found that the highest values of lead concentrations were in the city center (Bab Al-Sharqi, Al-Mansour, Bab Al-Moadham) as a result of the high traffic density there. The lowest values were in the outskirts of the city (Al-Zafaraniya, Al-Sayidiyah), as well as the decrease in lead values during school and university interruption times as a result of reduced traffic.

Studies indicate that exposure to lead depends on the nature of work, the duration of exposure, the concentration of the element and the chemical form that It is found on it (Al-Fahadi, 2003).

2-6: lead sources

Air, water and food are the three main sources that a living organism can survive.

In pamphlets made of newspaper or printed papers, especially foodstuffs

Fried foods such as potatoes or foods preserved in cans sealed with lead solder.

Varying concentrations of lead are transmitted through water. In natural conditions, about 10% of the lead entering the human body comes through water . The World Health Organization has set permissible concentrations of lead in drinking water at 0.01 mg/kg. (WHO, 1995) Inhalation of lead-

containing dust and smoke is one of the most prevalent methods of occupational exposure , as lead particles emitted from car exhausts are among the largest sources of exposure in urban areas, especially in traffic congestion areas, as lead is present in the air in a form Small particles whose size does not exceed 1 micron . As for the amount of inhaled lead, it depends on the concentration of lead in the air, which is estimated at about 0.5 g / cm³ (WHO, 2001).

absorption and subtraction of lead

Lead particles enter the respiratory system and then to the rest of the body, and the body does not convert it biologically, as it enters the body through breathing or the skin and is metabolized in the liver, but in the rest of the body's organs, it does not metabolize, but it is absorbed, spreads and excreted, and the rate of absorption depends on the chemical and physical properties of lead and the condition of the person Exposed .

Lead is deposited in the lower regions of the respiratory tract and is completely absorbed. A total of 10-15% of the total lead enters the body enters the digestive system, and absorption can increase to 50% in the case of fasting or in the case of a deficiency. Iron or calcium, and lead accumulates in the bones, where lead is replaced by blood in inactive sites, as it causes health risks as internal sources of lead in the future . Which increases its percentage in the blood as the stores of lead grow and because of the slow disposal of lead even when it is removed from the surrounding environment. 25 days and 40 days in soft tissues, and because of the poor ability of the body to get rid of lead, any presence, even if it is a little in the atmosphere, will have a serious health impact in the future.

Lead is excreted from the body at a relatively low rate, and its accumulation in the organs of the body is easy and effective, and its excretion rate varies greatly between children and adults, as about 32% of the lead entering the body is excreted by children, while the rate of excretion in adults reaches 98% of the total lead entering the body (Saryan and Zenz, 1994)

Regardless of the type of exposure to lead, whether it was occupational or as a result of environmental pollution, and the method of its absorption, the body can get rid of lead compounds in several ways, as the absorbed lead is excreted by the gastrointestinal tract and transferred to the tissue mainly through the urine . Approximately 30 micrograms of lead is excreted daily with urine, and given that about 90-85% of lead compounds that reach the digestive system are not dissolved in water and are not absorbed in the digestive tract, so they are eliminated and excreted from the body with the feces to about 0.2 mg per day . Bile is another means for excreting lead, as the blood transports the absorbed lead to the liver, and then through bile secretions, part of the lead is expelled with it to the intestines, in addition to excreting small amounts of lead with falling hair, nails and sweating . Another source of lead excretion is breast milk, which is the main food source for newborn babies .

The physiological and health effects of lead

Anemia is one of the oldest symptoms associated with lead poisoning.

Its effect on the necessary enzymes in the chain of hemoglobin formation (Jaffe, et al., 2001) as well as its direct effect on the life rate of red blood cells due to their increased fragility.

Effects may result from exposure to very low concentrations sometimes

In addition to memory impairment, children's ability to learn, and their intelligence levels decline. These effects were observed even in children whose blood lead level was less than 10 micrograms / 100 ml , in addition to the interference with neurotransmitter functions. As a result of competition with calcium .

It has been observed that the level of vitamin E tocopherol decreases in the blood of workers in lead factories . Scientific studies have indicated that lead, as a result of its ability to bioaccumulate, targets various tissues and organs of the body after acute and chronic exposure to various lead compounds, especially the organs in which it accumulates. at relatively high concentrations (Aykin_Burns, et al., 2003).

Many researchers also showed the toxic effect of lead on the urinary system, which is represented by causing dysfunction of the urinary tubules and renal glomeruli, and the resulting urine of the type (Amino acid urea), and this in turn leads to high blood and gout with an increase in the level of urea and creatinine in the blood .

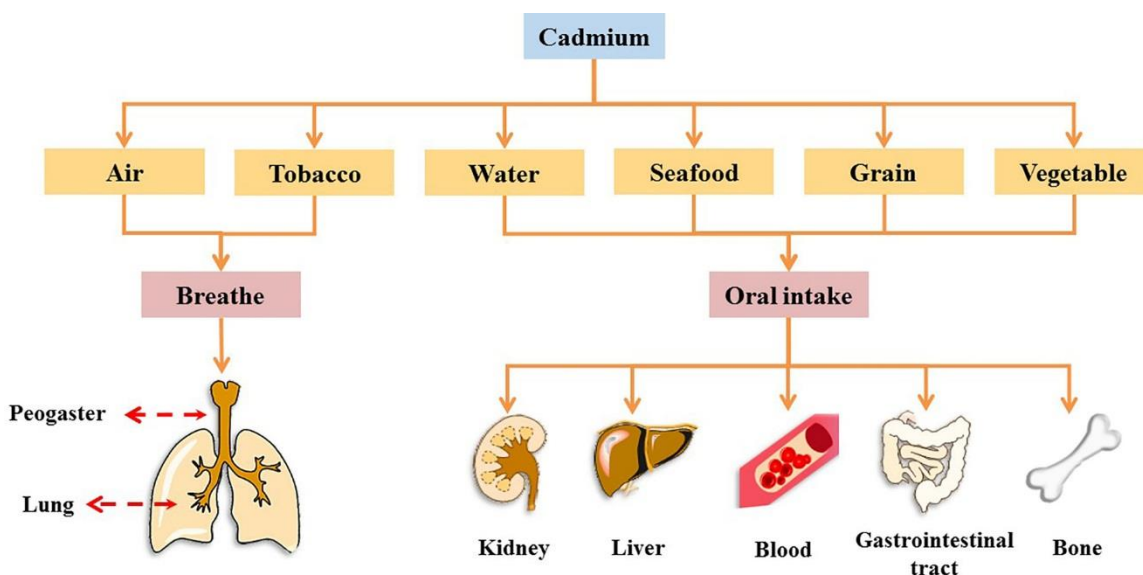
In addition to tissue changes whose severity varies depending on several factors, and may develop in severe cases into renal failure, and due to the long half-life of lead in the bones, which may reach 25 years, in addition to its interference with calcium. It directly affects the growth, rebuilding, and structure of bones (Carmouchi, et al, 2005). Lead poisoning also affects thyroid function, as it was found that there is a negative relationship between the duration of exposure to lead and the concentration of thyroxin.

2-7: Cadmium

It is a heavy independent metallic element, its atomic mass is (112.041) and its atomic number is (48). It is often found in nature in the form of other ores such as zinc due to the great similarity in their composition and chemical properties . Cadmium is extracted from the ores called Greenockite.) which is cadmium sulfide, of which there is a large part of it in the soil, its color is white, soluble in organic and inorganic solvents and among the well-known cadmium compounds are oxide, sulfate, chloride, nitrate and iodide.

Carbonates and sulfides, and the solubility of these compounds varies in water , and factories and other sources leave pollutants containing cadmium equivalent to 10 times its natural sources.

Cadmium is used in the dental industry, and its oxides are used in coloring glass and ceramics, and in the manufacture of clothes and batteries (Al-Amr, 2000).



Sources of cadmium and its polluting effect on the environment

Cadmium plays an important role in our environment, and its importance has increased due to industrial progress and its uses, as well as the use of some fuels originating from fossils. Some communities are affected by exposure to high levels of this metal, as cadmium reaches the environment with the waste water of metal smelting industries. (such as lead, copper, and zinc) and its coating to protect it from rust and resist corrosion (such as iron). It is also used in the manufacture of oils, especially pump oils, and the manufacture of dyes, metal alloys, tires, rubber goods, and plastics. Cadmium is also used in the composition of organic fertilizers at a ratio of (0.8_0.3) mg/kg, nitrogenous fertilizers (0.05_8.5) mg/kg, phosphate fertilizers (0.1_170) mg/kg, and limestone (0.1_0.04) mg/kg.

Cadmium appeared as a pollutant in food and fresh water, and the water coming out of landfills and garbage contains high concentrations of it that may reach several micrograms / liter. (5 µg/L).

As for the air, it can be said in general that it contains average concentrations between (0.5-0.001) micrograms / m³, and this is greatly affected by industrial density and cadmium uses.

(Eriksen, et al, 1988) High concentrations of cadmium were found in the air surrounding cities near factories or laboratories or crowded with cars. A recent study in India showed that the air of New Delhi contains a high percentage of cadmium, lead and nickel.

And that the sources of this pollution are waste from vehicles and factories located in this city. Cadmium is a very toxic heavy metal that shows symptoms of poisoning after several years and after the accumulation of large

amounts of it in the body, and there is no balance between the amount of cadmium in the blood and the amount that is excreted from it in the urine, due to the strength of the bond between cadmium and protein. It is the best in determining the amount of cadmium in the body and not urine analysis because it does not give a good indication of knowing the real amount present in the body and this accumulation leads to many diseases and disturbance of the balance of the kidneys in the first degree, for example the occurrence and spread of disease (Itay _ Itai) relative to the presence of This disease in the Japanese Itai-Itai province, which leads to bone damage and fracture, has occurred as a result of the discharge of factory and mine waste, which leads to an increase in the concentration of cadmium in the water from 5 ppm to 180 ppm, and the percentage of cadmium in fish and its products should not exceed 100 ppm, and therefore the World Health Organization determines The maximum allowable limit for cadmium is 450 micrograms per capita. Cadmium is also released from the friction of car tires on road asphalt because it is added to rubber in the manufacture of car tires (Abbasi, 2004).

absorption and excretion of cadmium

The main sources of cadmium polluted for humans are from water, air, then food, and this element is absorbed in humans through the digestive and respiratory systems, through the skin, and through the , This absorption is affected by several factors, including age, lack of calcium in the body, and lack of iron and protein. It is affected by the composition of cadmium salts, and it was also found that the absorption of cadmium in women who suffer from iron deficiency may increase by 20% of the cadmium entering the body.

The absorption of cadmium through the lungs is faster than what happens in the intestines, i.e. approximately (50_25%) of the absorbed cadmium is

through the lungs, as pulmonary absorption depends on the volume of particles entering the lungs, the speed of their solubility, the depth and rate of respiration, as well as the presence of milk and bile salts. In food, it reduces the amount of cadmium absorbed, and the protein metallothioneine (metallothionine) plays an important role in determining the amount of zinc and cadmium that is absorbed through the intestine (Wolf et al., 2000).

The absorption of cadmium is affected by the presence of other elements such as calcium, phosphorus, iron, copper, and zinc in the diet (Peraza, et al., 1998). The daily intake of cadmium for the average person in normal conditions is 200 micrograms, but 40 micrograms are excreted through urine. That is, the equivalent of about 20% of the absorbed cadmium, but the body retains approximately (1.8 – 0.9%), while the rest is excreted through the feces .

As for the rate of skin absorption of cadmium, it is very limited and occurs if the cadmium is dissolved as a liquid and its percentage reaches 1.8% every 5 hours .

It is clear to us from the foregoing that cadmium is absorbed through the lungs, skin, intestines, and the placenta. Although cadmium accumulates in the placenta, a little of it is sufficient to cause damage to the fetus .

As for the excretion of cadmium, it is mainly in the urine , and the excretion of cadmium in the urine increases when an impairment of kidney function occurs (Schilderman, et al, 1997), which causes a decrease in its level in both the liver and kidneys, and small and non-significant amounts are excreted through milk Lactation and hair and avoiding exposure for one year reduces the amount of cadmium in the blood and urine, as the transfer of proteins to the urine stops as an indicator of stopping exposure .

After that, the absorbed cadmium is transmitted, whether through the alimentary canal or the respiratory system, to the blood, as its level rises in the plasma and becomes higher than its level in red blood cells. And these tissues serve as warehouses for cadmium in the body, and it competes with some other minerals that the body needs in certain quantities, such as iron and copper, and hinders its absorption in the intestine ; and the content of cadmium increases in the liver when exposed to large amounts of it and for periods It accumulates over a long period of time, as it appears in the lungs, pancreas, spleen, testicles and other organs, especially some endocrine glands such as the thyroid gland . The level of cadmium in the blood of an adult who is slightly exposed to it reaches less than one milligram for the body.

As a whole, because the placenta makes methylene as a barrier that prevents cadmium from reaching the fetus from the mother .

Its health and physiological effects

Due to the ability of cadmium to cause severe harm to most of the cells of the human body.

Exposure to it at different periods, long or short, as it is considered one of the environmental and industrial pollutants

Inhalation of cadmium dust leads to acute respiratory problems followed by various symptoms, including headache, dizziness, a feeling of dryness in the mouth, pharynx and tonsils, nausea, vomiting, diarrhea, as well as high body temperature, tissue changes in the liver, frequent coughing and distress. In breathing, the condition may develop into pneumonia, then the lungs will be filled with fluid (swelling of the lungs), and it may eventually lead to suffocation and then death (Al-Omar, 2000).

Cadmium accumulates in liver and kidney cells, and its percentage is higher in exposed people compared to non-exposed persons. Pollution with cadmium and exposure to it is accompanied by kidney damage.

Sometimes and some studies indicated that cadmium causes.

Hyperplasia of the bone marrow, as well as the development of anemia.

Small red cells with little pigment, which is called pernicious anemia.

Some researchers have shown that cadmium has a direct relationship with anemia through the microscopic study of blood cells at the beginning of exposure and fragmentation of red blood cells, and the osmotic breakdown resulting from exposure to cadmium rises with the increase in the intensity of exposure, but it adapts to the length of the exposure period, causing anemia.

Cadmium is an important cause of high blood pressure in individuals exposed to it, especially during systole rather than diastole .

The Scientific Authority for Cancer Research also stated that cadmium is a carcinogen in both the lung and prostate of individuals who are occupationally exposed to it, especially battery workers , as well as individuals who smoke because tobacco contains cadmium. Necrosis of the renal cortex is also noted in cases Long-term exposure.

(Al-Fahadi, 2002) indicated that there was a significant accumulation of cadmium in the blood of occupationally exposed persons in Nineveh Governorate at different rates according to the following sequence (oil workers, traffic personnel, generator operators, battery workers, bus drivers), and other studies in Salah al-Din Governorate indicated that The same effects

caused by cadmium and some researchers indicated that cadmium can replace zinc in some enzymes, thus losing their original function .

There are some studies that indicated that cadmium at two doses (60_30) mg/kg of body weight for male rabbits affects some blood components, as Hb concentrations, the volume of packed blood cells, and the total number of red blood cells are significantly reduced .

They did not notice any relationship between age and cadmium poisoning, as between (Mirand, et al., 2000) that the accumulation of cadmium in females increases more than that of males, especially in the kidneys, blood and liver of experimental animals. Cadmium does not accumulate or attack The nervous system because it does not form organic compounds that dissolve in fats, and thus it differs from lead in this case .

Types of suspended matter

They are of two types:

1_ Solid particles

Such as dust, soot, and heavy metals such as lead and cadmium, and these materials remain suspended in the air according to their size, weight, the effect of gravity, and climatic conditions on them, and these are of various types.

A- dust

Tiny granules that are created by crushing, grinding and blasting some materials, such as stones, ores, coal, wood, grains, and others.

B- metallic vapor (Fume)

They are solids formed as a result of condensation (Abdul Hamid and his group, 1996).

2- Liquid Droplets

Such as acids, oils, pesticides, and they are in forms

A-Fog

It is a liquid particles suspended in the air with a size greater than 10 μm formed when evaporated liquids are condensed.

B- Mist

It is a liquid particles suspended in the air with a size of less than 10 μm when evaporating liquids are condensed (Nashi, 2011).

The sources of these pollutants are many, they are either emanating from vehicle exhausts as a result of combustion products or from the external environment because the emission of vehicles in an area full of dust and dirt is sufficient to lead to its dissemination and suspension in the air for a long time, and this depends on the volume of traffic, its composition and the type of tiling As for the period of its presence in the air, it is within time limits, and it does not leak automatically, and the speed of falling depends on the size of the particles and on several factors, including wind directions, as they can move the particles and spread them over vast distances, which affects the climate .

Damage to suspended materials in the air

1- It has a negative effect on the respiratory system, such as bronchitis, emphysema, allergic diseases, asthma, and others.

2- Infection with pulmonary damage or pulmonary stone “silicosis” resulting from inhalation of dust emanating from cement factories.

3_ Asbestos disease caused by inhalation of asbestos dust.

4_ Infection with lung and liver cancer as a result of air pollution with factory smoke, cigarettes, and the harmful impurities and fumes they carry.

5_ The negative effect on the skin and eyes.

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