AIR QUALITY ASSESSMENT – A REVIEW

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ABSTRACT

Air pollution is a mix of particles and gases that can reach harmful concentrations both outside and Indoors. Its effects can raise higher disease risks to rising temperatures. Soot, smoke, mold, pollen, methane, and carbon dioxide are a Just few exam common pollutants. Air pollution exposure is associated with oxidative stress and inflammation in human cells, which ma, foundation for chronic diseases and cancer.

Breathing clean air can lessen the possibility of disease from stroke, heart disease, lung cancer as well as chronic and acute respiratory illnesses such as asthma. Lower levels of air pollution are better for heart and respiratory health both.

Keywords: - Air Pollution, Environment and Health.

INTRODUCTION : -

Air pollution is the presence of substances In the atmosphere that are harmful to the health of humans and other living beings, or cause damage to the climate or to materials. There are different types of air pollutants, such as gases (such as ammonia, carbon monoxide, sulfur dioxide, nitrous oxides, methane and chlorofluorocarbons), particulates (both organic and inorganic), and biological molecules. Air pollution may cause diseases, allergies and even death to humans; it may also cause harm to other living organisms such as animals and food crops, and may damage the natural or built environment. Both human activity and natural processes can generate air pollution. Air pollution is a significant risk factor for a number of pollution-related diseases, including respiratory infections, heart disease, COPD, stroke and lung cancer (WHO, 2014). The human health effects of poor air quality are far reaching at principally affect the bodys respiratory system.

Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, and the individual’s health status and genetics (Vallero, 2007). Indoor air pollution and poor urban air quality are listed as two of the worlds worst toxic pollution problems in the 2008 Blacksmith Institute Worlds Worst Polluted Places report. Outdoor air pollution alone causes 2.1 (Silva et al,, 2013) to 4.21 million deaths annually (Lelieveld et al., 2019). Overall, air pollution causes the deaths of around 7 million people worldwide each year, and Is the world's largest single environmental health risk (Reed, 2016). Productivity losses and degraded quality of life caused by air pollution are estimated to cost the world economy $5 trillion per year (McCauley, 2016). Various pollution control technologies and strategies are available to reduce au pollution (Fensterstock et al., 2012). Fig. 1 shows the tracks of all tropical cyclones which formed worldwide from 1985 to 2005. The points show the locations of the storms at six hourly intervals and use the color scheme shown to the right from the Saffir-Simpson Hurricane Scale.

LITERATURE REVIEW : -

Air Pollutant – Risk assessmet for human health – An alterative.

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Today,it is common knowledge that gaseous air pollutants and ultrafine particulate matter in the air are present worldwide, especially in big cities. Already decades ago this fact had been observed, and already at these times, scientists in Medicine had the suspicion that air pollutants were responsible for certain severe diseases. With todays means and techniques exact measurements of concentrations — provided standardized conditions were defined and kept constant - could be carried out. Since a number of years several kinds of disease appear to be connected with air pollutants.

Ways out of this situation are under discussion, and various approaches arc used for the determination of limits of upper concentrations allowed by the Governments. These approaches are a matter of ongoing discussions and reasonable solutions both regarding the determination of critical concentrations of air pollution, and suggested solutions for their avoidance are not available. A study of the available scientific literature on these topics shows that, in most cases, the kind of disease in the human body or in certain organs is investigated hut, in many cases, the life circumstances are not well defined. There is a need for au alternative approach. It should allow exactly defined experimental conditions. After all. this should be a laboratory— medical approach that could lead to an improved knowledge of details which are needed for diagnosis of a disease and the treatment of the patient.

During the last few years. experiments with animals and even humans - volunteers - were carried out. with unreliable results. As a rule. it was speculated that certain air pollutants could be responsible. however, often combinations of different air pollutants could not be considered. Diseases indicate dysfunctions of organs.

Nickel : human health and environmental and Toxicology

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Abstract:

Nickel is a transition element extensively distributed in the environment, air, water, and soil. It may derive from natural sources and anthropogenic activity. Although nickel is ubiquitous in the environment, its functional role as a trace element for animals and human beings has not been yet recognized. Environmental pollution from nickel may be due to industry, the use of liquid and solid fuels, as well as municipal and industrial waste. Nickel contact can cause a variety of side effects on human health, such as allergy, cardiovascular and kidney diseases, lung fibrosis, lung and nasal cancer. Although the molecular mechanisms of nickel-induced toxicity arc not yet clear, mitochondrial dysfunctions and oxidative stress are thought to have a primary and crucial role in the toxicity of this metal. Recently, researchers, trying to characterize the capability of nickel to induce cancer, have found out that epigenetic alterations induced by nickel exposure can perturb the genome. The purpose of this review is to describe the chemical features of nickel in human beings and the mechanisms of its toxicity. Furthermore, the attention is focused on strategies to remove nickel from the environment, such as phytoremediation and phytomining.

Introduction

Nickel is a hard, ductile, silvery-white transition metal; it is the 28th element in the periodic table. It may exist in several oxidative states nevertheless, the +2 oxidation state (Ni) is the most widespread in the environment and biological systems. Nickel belongs to the ferromagnetic elements, and it is naturally present in the Earth crust usually in combination with oxygen and sulfur as oxides and sulfides. In combination with other elements, nickel may be present in the soil, meteorites and emitted from volcanoes. About eight billion tons of nickel are in the sea. Thanks to its unique physical and chemical properties, nickel is used in modem metallurgies in a broad variety of metallurgical processes, such as ahoy production, electroplating, in the production of nickel-cadmium batteries and as a catalyst in chemical and food industry. The high spread of products containing this metal unavoidably leads to pollution of the environment by nickel and its secondary products at all stages of manufacturing, recycling and disposal. Even though no existing evidence denotes the nutritional value of Ni in humans, it has been recognized as an essential nutrient for some microorganisms, plants, and animal species. Enzymes or cofactors containing nickel are not known in higher organisms, but nickel-based enzymes are well known in the Archaea, bacteria, algae, primitive eukaryotes and plants. Nickel is essential in proper growth and development.

Nickel is a metal of widespread distribution in the environment. Contact with soluble and insoluble nickel compounds can cause a variety of side effects on human health. Human exposure to Ni may occur through food, water or air. Workers in Ni producing and processing industries are exposed by inhalation, and to a lesser extent, dermal contact. The nervous system is one of the main target organs for Ni toxicity; in fact, it can he accumulated in the brain. Allergy to nickel and metals is caused by the materials used in our daily life; therefore, the chances of triggering the onset of allergic reactions are high. This metal can cause an allergy that manifests as contact dermatitis, headaches, gastrointestinal and respiratory manifestations. The molecular r mechanisms of Ni induced neurotoxicity are still not clear, but the researchers think that oxidative stress and mitochondrial dysfunctions have a primary and important role. Mitochondrial damage induced by Ni may occur first as mitochondrial membrane potential damage, then as mitochondrial ATP concentration reduction and finally as mitochondrial DNA destruction. Damage to mitochondrial functions interferes with the mitochondrial transport chain, amplifies ROS and exacerbates oxidative stress.

In the last 25—30 years, researchers, trying to characterize the carcinogenidty, due to nickel, have uncovered that epigenetic alterations induced by nickel exposure, can perturb the epigenome. DNA hypermethylation, histone modification and interference with mirna network, and finally condensed chromatin structure create an aberrant epigenetic landscape that contributes to nickel- induced gene silencing, tumor initiation and progression. Indeed, nickel is known to cause cancer by an epigenetic mechanism, which appears to involve the substitution of Ni2 for Fe2’ in non-heme iron dioxygenases that are involved in DNA and histone demethylation. In vitro studies demonstrated

Environmental and Health Impacts of Air Pollution: A Review

Loannis Manisalidis, Elisavet Stavropoulou, Agathangelos Stavropoulos and Eugenia Bezirtzoglou.

One of our era's greatest scourges is air pollution, on account not only of its Impact on climate change but also Its Impact on public and Individual health due to increasing morbidity and mortality. There are many pollutants that are major factors in disease in humans. Among them, Particulate Matter (PM), particles of variable but very small diameter, penetrate the respiratory system via inhalation, causing respiratory and cardiovascular diseases, reproductive and central nervous system ctysfunctions, and cancer. Despite the fact that ozone in the stratosphere plays a protective role against ultraviolet irradiation, it Is harmful when In high concentration at ground level, also affecting the respiratory and cardiovascular system. Furthermore, nitrogen oxide, sulfur dioxide, Volatile Organic Compounds (VOCs). dioxins. and polycyclic aromatic hydrocarbons (PAHs) are all considered air pollutants that are harmful to humans. Carbon monoxide can even provoke direct poisoning when breathed In at high levels. Heavy metals such as lead, when absorbed into the human body, can lead to direct poisoning or chronic intoxication, depending on exposure. Diseases occurring from the aforementioned substances include principally respiratory problems such as Chronic Obstructive Pulmonary Disease (COPD). asthma, bronchiolitis. and also lung cancer, cardiovascular events, central nervous system dysfunctions. and coetaneous diseases. Last but not least, climate change resulting from environmental pollution affects the geographical distribution of many infectious diseases, as do natural disasters. The only way to tackle this problem is through public awareness coupled with a multidisciplinary approach by scientific experts: national and international organizations must address the emergence of this threat and propose sustainable solutions.

In 2018, during the first WHO Global Conference on Air Pollution and Health, the WHO's General Director, Dr. Tedros Adhanom Ghebreiesus. called air pollution a 'silent public health emergency" and "the new tobacco" .

Undoubtedly. children are particularly vulnerable to air pollution, especially during their development. Air pollution has adverse effects on our lives in different respects. Diseases associated with air pollution have not only an important economic impact hut also a societal impact due to absences from productive work and school.

Despite the difficulty of eradicating the problem of anthropogenic environmental pollution, a successful solution could be envisaged as a tight collaboration of authorities, bodies, and doctors to regularize the situation. Governments should spread sufficient information and educate people and should involve professionals in these issues so as to control the emergence of the problem successfully.

Effects of Air Pollution on Covid-19 and Public Health

Mario Coccia, Collegio Carlo Alberto

The pandemic of conavirus disease 2019 (Covid- 19), generate by a novel virus SARS-C V-2, is rapidly spreading all over the world, generating a high number of deaths. one of the current questions in the field of environmental science to explain the relationships determining the diffusion of COVID- 19 in specific regions of countries. The research here focuses on case study of Italy one of the countries in the World to experience a rapid increase in confirmed cases and deaths. Results such that diffusion of COVID-19 is very high in cities its high air pollution generating severe negative effects on public health o. In particular, results reveal that, among Italian provincial capitals. the number infected people was higher in cities with more than 100 days per year exceeding limits set for PM10 or ozone, cities located in hinterland zones (i.e. away from the coast), cities having a low average intensity of wind speed and cities with a lower temperature. In hinterland cities (mostly those ordering large urban conurbations) with a high number of days exceeding PM10 and ozone limits, coupled with low wind speed (atmospheric stability), the average number of infected people in April 2020 more than tripled those that had less than 10 days of excessive air pollution. In fact, results show that more than 50% of infected individuals and about 81% of deaths in Italy of COVID-19 are in regions with high air pollution. This study must conclude that a long-run strategy to constrain future epidemics similar to the COVID-19, reducing the negative impact on public health has also to be designed in terms of environmental and sustainability policies and not only in terms of efficient approaches in medicine.

Results here suggest that the increasing share of people vaccinated against COVID-19 seems to be a necessary but not sufficient health policy to reduce mortality of COVID-19 pandemic in society This finding can be due to the mutant viral agent of SARS-CoV-2 that generates high transmissibility and other environmental and socioeconomic factors that support the diffusion of

COVID-1 9 and reduce the effectiveness of new vaccines (Coccia. 2020 , Coccia 2021 a. Figure 2 systematizes some factors that may increase the COVID-1 9 mortality ratio between countries, though a high share of vaccination in society. These aspects should be considered to design effective public policy to cope with next pandemic crisis in order to reduce the negative impact of new infectious diseases in society when countries roll out vaccination plans Hence, low air pollution, hot temperature, low humidity and high wind speed are environmental aspects that can improve sustainability and benefits for immune system of people. These aspects reduce the circulation of COVID-19 and related mortality, supporting the effectiveness of vaccination (Coccia, 2020 (Coccia, . 2020a (Coccia,. 2021 a Lau et al. (2021) argue that in the presence of a continuous global pandemic threat, the mortality ratio is a main indicator to evaluate the effectiveness of containment and vaccination policies (cf. Liu et al .2021).

Athens 2004 : The Pollution Climate and Athletic Performance

Geraint D Florida – James, Ken Donaldson, Vicki Stone

Athens sits in a basin approximately 450 km^2 in area, surrounded by mountains and open sea' Anthropogenic emissions in conjunction with the topographical and meteorological conditions can result in high air pollution within the city. The pollutants of concern for athletes competing in Athens 2004 appear to be nitrogen dioxide ($N0^2$), ozone and particulate (PM_{10}) pollution.

Exposure to elevated ozone concentrations has been reported to give rise to symptoms that include cough, chest pain, difficulty in breathing, headache, eye irritation and a decrease in forced expiratory volume in one second. All of these effects are likely to impact upon performance, and several studies of cyclists suggest this to be the case. In contrast, the impact of ambient concentrations of $N0_2$ appears to be negligible on normal activities, but at high exercise intensities the impact remains unclear. The use of currently available information and models to predict the effect of ozone and other pollutants on elite athletes is problematical, since such models are based upon significantly lower ventilation rates than those achieved by some elite athletes. In addition, it is already known that the response to ozone can vary somewhat between individuals. Since the individuals who will be competing in Athens are physiologically very different to the participants in most published studies, it is difficult to predict individual responses. There is some evidence to indicate that adaptation to the adverse health and performance effects of ozone can occur, so that performance is partially recovered on re exposure. The adaptation is not seen in all studies and appears to be dependent on several factors, including the initial sensitivity of the individual to ozone. Antioxidant supplementation has also been shown in some studies to partially ameliorate the adverse effects of ozone by counteracting the oxidative stress mechanism associated with this pollutant. Whether this transfers to performance enhancement per se remains unclear at present. Additional research is required to gain a sound understanding of the effects of a complex mixed air pollution exposure on the pulmonary function and performance of athletes exercising at high work intensities.

Air Quality Assessment in the Central Indian State of Chhattisgarh :

Neha Singh, Kamlesh Jain,Punita Kumar,Nitha Thankam George, Vishvaja Sambath and Melisha Shilpy Lakra.

Air pollution is a foremost public health problem in India and there are enormous pieces of evidence that it exacerbates health inequities.'1 Thés calls for ctTcctivc strategies and taigctcd interventions. Particulate matter (PM). particles of variable but very small diameter. penetrate the respiratory system via inhalation. causing respiratory and cardiovascular diseases. reproductive and central nervous system dysfunctions. and cancer.'21 Chhattisgarh. a progressive mineral-rich state. becoming polluted due to rapid development of infrastructures and industries. The capital of Chhattisgarh. Raipur. has become one of the major polluted cities in the world.'l Since the formation of the state in 2000. tremendous industrial development has been taking place in the last 20 years. To generate electricity, the stale burns millions of tons of coal every day. due to which carbon and ash generated are polluting the industrial areas on a large scale. The Abo-Hawa.

Overall air quality findings for Particulate matter PM2.5. Fe. Zn. Cu. Ni. Ph. and Si for the Raipur and Korba locations of Chhattisgarh state are summarized in Tables 1 and 2. The levels of PM2.5 in all the samples were above the prescribed limits of the Government of India (60 tgrn).°' PM2.5 levels in all samples in Raipur ranged from 131.4 to 653.8 tgm' which is2. IX- I 0.XX limes higher than standards prescribed by the Ministry of Environment. Forest and Climate Change (MoEFCC) of 60 .tg/m1. Samples taken from seven areas in Raipur (Acholi Urla. Mazdoor Nagar Raipur. Urla Raipur. Birgaon Saheed Nagar I. Utkal Nagr Sendhwapara. and Birgaon Saheed Nagar 2)were found lobe more than 250 tg m. Six out of seven sites are kxated around the sponge. iron. timber industries, and llajrang power plant. Samples collected from 13 areas in Korba (Gandhi Nagar Sirki. EmliC’hhapar. Sirki Khurda.Beltekri 2.Hardi Bazat Pankhadafai.Dharampur Gerva. Chainpu Beltekri l.Manikpur. KanshinagarNihanka. Rani Dhanra Kunwar P1K Korba) were found to be in the category of “llazardous.”ln Korba. the levels ofPM2.5 in all samples ranged from 150.3 to 1699.2 igm [Table 2J. which was at least 2.5 —28.3 times above the prescribed limits of the MoEFCC limits. The levels of very fine particulates in all the air samples pose a significant risk to the human health of residents. Most of them are located near thermal power plants which include Chhattisgarh Stale Electricity Board (USELI) power stations.Manikpur islocated 1km away from a garbage dump yard. Samples taken from two areas in Korba around the power plants (District Hospital Korba. Checkpost Balco) have very unhealthy levels of PM2.5. All 12 samples from Raipur and 14 samples from Korha had silica levels higher than that of California OIillllA (California The 0111cc of Environmental 1-I earth Hazard Assessment) annual average for exposure of 3 .tg’m3. Sample location at Urla Raipur showed the highest level of silica at 33.8 1gm whereas, from Korba. Emli Chhaparshowed the highest value ofXQ.9 tgm. Nickel (Ni) levels in the filtered air samples of Raipur collected between November2020 to February 2021. and all the filtered samples of Korba collected between February 2021 and June 2021 reflect conditions that then persons living in these areas would sufferan cxcesslifetimc riskof cancer of4 per I million (compared to 1 .6 per I million for typical levels of nickel in urban air). Raipur air samples indicated a high level of presence oflead (Pb)as compared to Korba.Out of 12 samples. 6 samples collected from different Raipur areas named as Mazdoor Nagar. ‘Tikrapara. Acholi Urla. Sendhwapara. Urla Raipur. and Amlidih showed higher levels of lead (Pb) when compared with the US environmental protection agency (ER) standard oft), IS gm3.averaged for3 months. Lead (Pb) cui.

CONCLUSION :

Particular matter PM and heavy metal toxicity can have several adverse health effects on the body and can damage and alter the functioning of organs such as the brain, kidney. lungs. Iiver and blood.’ Existing environmental health impacts of climate change and air pollution is a life-threatening combination for the short- and long-term disaster in *these* districts, Children and asthmatics of any age. those with allergies. and the elderly who have reduced lung capacity can be affected in less time. It is. thus, essential to strengthen the health system with mitigation strategies in order to address the health burden in association with air pollution and take necessary preventive measures to control the pollution levels in ambient air across Raipur and Korba. Raipur is also one of the nonattainment cities accruing to the National Clean Air Program. and despite the recommendations made in the previous reports and considering the ongoing situation of the pandemic (COVID)-19.' it seems like no initiative or action has been taken in order to check the ptxr air quality as of now. It is also concluded that geological conditions need to be considered keeping climate change in view. Climate change is an acknowledged phenomenon in Raipur. Korba. and other nearby districts that necessitates unavoidable action. The most ideal choice to tackle this problem is through public cognizance coupled with a multidisciplinary approach by scientific professionals: national and internaitonal authorities must address the emergence of this threat and propose justifiable solutions.

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