

Impact of Environmental Pollution on Healthy and Productivity of Farm Animals

Habeeb, A. A. M.¹, A. A. EL-Tarabany¹, A. E. Gad¹ & M. A. A. Atta¹

¹Biological Applications Department, Radioisotopes Applications Division, Nuclear Research Center, Atomic Energy Authority, P.O. 13729, Inshas, Cairo, Egypt.

Correspondence: Prof. Dr. Alsaied Alnaimy Mostafa Habeeb, Biological Applications Department, Radioisotopes Applications Division, Nuclear Research Center, Egyptian Atomic Energy Authority, Inshas, Cairo, Egypt. Email: dr_alnaimy@yahoo.com, Tel: 00201283912177

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Abstract

Pollution may be defined as addition of undesirable material into the environment as a result of human activities. Pollution may be of the following types: air pollution, water pollution, soil pollution, thermal pollution, radiation pollution and noise pollution. The impact of different pollution as a general on healthy of farm animals are cancer, neurobehavioral disorders, cardiovascular problems, reduced energy levels, premature death, asthma, asthma exacerbations, headaches and dizziness, irritation of eyes, nose, mouth and throat, reduced lung functioning, respiratory symptoms, respiratory disease, disruption of endocrine and reproductive and immune systems. Exposure to environmental pollutants affected reproductive functions and in particular, produced adverse effects on pregnancy outcomes, fertility, and fetal health. Exposures to ambient levels of pollutants are associated with low birth weight, intrauterine growth retardation, prematurity, neonatal death, and decreased fertility and decrease of sperm quality in males and indicated also that female fertility was also disturbed. The most common disorder of male fertility is the insufficient production of normal sperm, with good mobility in the somniferous tubules. Polluted drinking water by chemicals produced waterborne diseases like, typhoid, liver and kidney damage. In this paper the effects of various environmental factors on healthy, function of animal, fertility and reproductive efficiency are reported.

Keywords: Pollution, Animal, Fertility, Production, Reproduction.

INTRODUCTION

Pollution of the environment and contamination of animal tissues and organs is serious problem in most countries. The basic law for environmental pollution control defines environmental pollution as any activity by corporations or individuals which compromises the health and/or environment of other persons in a localized area where the causal link is clearly established [1]. Pollution may be defined as addition of undesirable material into the environment as a result of human activities. The agents which cause environmental pollution are called pollutants. A pollutant may be defined as a physical, chemical or biological substance unintentionally released into the environment which is directly or indirectly harmful to humans and other living organisms [2].

Human activities directly or indirectly affect the environment adversely. There are a few examples which show how human activities pollute the environment. A stone crusher adds a lot of suspended particulate matter and noise into the atmosphere. Automobiles emit from their tail pipes oxides of nitrogen, sulphur dioxide, carbon dioxide, carbon monoxide and a complex mixture of unburnt hydrocarbons and black soot which pollute the atmosphere. Domestic sewage and run off from agricultural fields laden with pesticides and fertilizers pollute water [3]. Effluents from tanneries contain many harmful chemicals and emit foul smell. Developmental activities such as construction, transportation and manufacturing not only deplete the natural resources but also produce large amount of wastes that

leads to pollution of air, water, soil, global warming and acid rains. Untreated or improperly treated waste is a major cause of pollution of rivers and environmental degradation causing ill health and loss of crop productivity [4].

Farm animal's healthy and performance can be affected by exposure to a wide variety of agents, including particulate air pollution, dioxins, poly-chlorinated biphenyls, phyto-estrogens such as iso-flavones, heavy metals; chlorination disinfection by-products in water, organic solvents, poly-aromatic hydrocarbons, substances emitted from landfill sites and caffeine [5].

In this review paper, the effects of various environmental factors on healthy and productive and reproductive performance are reported.

REVIEW OF LITERATURE

Environmental Pollution:

Categories of pollution:

There are seven categories of pollution as presented in **Table (1)**.

Types of pollution:

Pollution may be of the following types: Air pollution, water pollution, soil pollution, thermal pollution, radiation pollution and noise pollution

I. Air pollution

Air pollution is a result of industrial and certain domestic activity. An ever increasing use of fossil fuels in power plants, industries, transportation, mining, construction of buildings, stone quarries had led to air pollution. Air pollution may be defined as the presence of any solid, liquid or gaseous substance including noise and radioactive radiation in the atmosphere in such concentration that may be directly and indirectly injurious to humans or other living organisms, plants, property or interferes with the normal environmental processes [6]. Defining air pollution is not simple. One could claim that air pollution started when humans began burning fuels. In other words, all manmade (anthropogenic) emissions into the air can be called air pollution, because they alter the chemical composition of the natural atmosphere. The increase in the global concentrations of greenhouse gases CO₂, CH₄, and N₂O, can be called air pollution using this approach, even though the concentrations have not found to be toxic for humans and the ecosystem. One can refine this approach and only consider anthropogenic emissions of harmful chemicals as air pollution. However, this refined approach has some drawbacks. Firstly, one has to define what "harmful" means. Harmful could mean an adverse effect on the health of living things, an adverse effect on anthropogenic or natural non-living structures, or a reduction in the air's visibility. In addition, a chemical that does not cause any short-term harmful effects may accumulate in the atmosphere and create a long-term harmful effect [7]. Air pollution is a result of industrial and certain domestic activity. An ever increasing use of fossil fuels in power plants, industries, transportation, mining, construction of buildings, stone quarries had led to air pollution. Air pollution may be defined as the presence of any solid, liquid or gaseous substance including noise and radioactive radiation in the atmosphere in such concentration that may be directly and indirectly injurious to humans or other living organisms, plants, property or interferes with the normal environmental processes.

Air pollutants are of two types:

(1) Suspended particulate matter, and (2) Gaseous pollutants

As general, polluted air contains one, or more, hazardous substance, pollutant, or contaminant that creates a hazard to general health [8]. However, the main pollutants found in the air we breathe include, particulate matter, lead, ground-level ozone, heavy metals, sulphur dioxide, benzene, carbon monoxide and nitrogen dioxide. Air pollution in cities causes a shorter lifespan for city dwellers [9].

Classifications of air pollutants:

Criteria Pollutants: As listed above, there are 6 principal, or criteria pollutants regulated by [8] and most countries in the world:

1- Total suspended particulate matter, with additional subcategories of particles smaller than 10 μm in diameter and particles smaller than 2.5 μm in diameter. Inhalation of enough PM over time increases the risk of chronic respiratory disease.

2- Sulfur dioxide (SO₂). This compound is colorless, but has a suffocating, pungent odor. The primary source of SO₂ is the combustion of sulfur-containing fuels (e.g., oil and coal). Exposure to SO₂ can cause the irritation of lung tissues and can damage health and materials.

3- Nitrogen oxides (NO and NO₂). NO₂ is a reddish-brown gas with a sharp odor. The primary source of this gas is vehicle traffic and it plays a role in the formation of troposphere ozone. Large concentrations can reduce visibility and increase the risk of acute and chronic respiratory disease.

4- Carbon monoxide (CO). This odorless, colorless gas is formed from the incomplete combustion of fuels. Thus, the largest source of CO today is motor vehicles. Inhalation of CO reduces the amount of oxygen in the bloodstream and high concentrations can lead to headaches, dizziness, unconsciousness, and death.

5- Ozone (O₃). Troposphere (low-level) ozone is a secondary pollutant formed when sunlight causes photochemical reactions involving NO_x and VOCs. Automobiles are the largest source of VOCs necessary for these reactions. Ozone concentrations tend to peak in the afternoon, and can cause eye irritation, aggravation of respiratory diseases, and damage to plants and animals [8].

6- Lead: The largest source of lead (Pb) in the atmosphere has been from leaded gasoline combustion, but with the gradual elimination worldwide of lead in gasoline, air Pb levels have decreased considerably. Other airborne sources include combustion of solid waste, coal, and oils, emissions from iron and steel production and lead smelters, and tobacco smoke. Exposure to Pb can affect the blood, kidneys, and nervous, immune, cardiovascular, and reproductive systems.

These pollutants are presented in **Table (2)**.

Ambient air pollution:

The largest source of lead in the atmosphere has been from leaded gasoline combustion, but with the gradual elimination worldwide of lead in gasoline, air lead levels have decreased considerably. Other airborne sources include combustion of solid waste, coal, and oils, emissions from iron and steel production and lead smelters, and tobacco smoke. Exposure to lead can affect the blood, kidneys, and nervous, immune, cardiovascular, and reproductive systems [10] [11]. In addition, human populations and animals are often exposed to the airborne pollutants in plumes from incinerators. The incineration of chemical and other waste may release polychlorinated hydrocarbons, some of which have estrogenic properties.

Toxic pollutants:

For normal healthy growth most living organisms require some heavy metals in small but critical concentrations as micronutrients or essential trace elements and excess concentrations, though, cause toxic symptoms. These heavy metals are essential for animals and whose deficiency causes disease under normal living conditions including Cu, Mn, Fe and Zn. Most of the micronutrients owe their essentiality to being constituents of enzymes and other important proteins involved in key metabolic pathways. A deficient supply of the micronutrient will result hence in a shortage of the enzymes which lead to metabolite dysfunction causing disease [12]. Some heavy metals have no known essential biochemical function are called non-essential elements and are sometimes incorrectly referred to as toxic elements. These elements, which include As, Cd, Hg, Pb, Pu, Sb, Tl and U cause toxicity at concentrations which exceed the tolerance of the organism but do not cause deficiency disorders at low concentrations such as micronutrients [12].

Some of heavy metal are dangerous to health or to the environment (e.g. mercury, cadmium, lead, chromium), some may cause corrosion (e.g., lead), some are harmful in other ways (e.g. arsenic may pollute catalysts) [13]. From another point of view, within the European community, the eleven elements of highest concern are arsenic, cadmium, cobalt, chromium, copper, mercury, manganese, nickel, lead, tin, and thallium, the emissions of which are regulated in waste incinerators. Some of these elements are actually necessary for humans in minute amounts (cobalt, copper, chromium, manganese, nickel) while others are carcinogenic or toxic, affecting, among others, the central nervous system (manganese, mercury, lead, arsenic), the kidneys or liver (mercury, lead, cadmium, copper) or skin, bones, or teeth (nickel, cadmium, copper, chromium) [14]. Hazardous air pollutants, also called toxic air pollutants or air toxics, are those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects. The US-EPA is required to control 188 hazardous air pollutants. Examples of toxic air pollutants include benzene, which is found in gasoline; perchlorethylene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries [15] [16].

Radioactive pollutants:

Radioactivity is an air pollutant that is both geogenic and anthropogenic. Geogenic radioactivity are results from the presence of radionuclides, which originate either from radioactive minerals in the earth's crust or from the interaction of cosmic radiation with atmospheric gases. Anthropogenic radioactive emissions originate from nuclear reactors, the atomic energy industry (mining and processing of reactor fuel), nuclear weapon explosions, and plants that reprocess spent reactor fuel. Since coal contains small quantities of uranium and thorium, these radioactive elements can be emitted into the atmosphere from coal-fired power plants and other sources [17].

Indoor pollutants:

When a building is not properly ventilated, pollutants can accumulate and reach concentrations greater than those typically found outside. This problem has received media attention as Sick Building Syndrome. Environmental of the main contributors to indoor pollution are CO, NO, and SO₂, which can be emitted from furnaces and stoves. Cleaning or remodeling a house is an activity that can contribute to elevated concentrations of harmful chemicals such as VOCs emitted from household cleaners, paint, and varnishes [18].

Impact of air pollution on animal healthy and performance

Air pollution on health, generally, results are cancer [8], neurobehavioral disorders [19], cardiovascular problems [8], reduced energy levels [20], premature death [8], asthma [21], asthma exacerbations [22], headaches and dizziness, irritation of eyes, nose, mouth and throat, reduced lung functioning, respiratory symptoms [20], respiratory disease [8], disruption of endocrine [20] and reproductive and immune systems [8] [23]. High air pollution levels have been linked to infant mortality [24]. Air pollutants can also indirectly affect human health through acid rain, by polluting drinking water and entering the food chain, and through global warming and associated climate change and sea level rise [25].

In female: In recent years, numerous studies showed that exposure to environmental air pollutants affected reproductive functions and in particular, produced adverse effects on pregnancy outcomes, fertility, and fetal health. Epidemiological studies demonstrated that exposure to ambient levels of air pollutants are associated with low birth weight, intrauterine growth retardation, prematurity, neonatal death, and decreased fertility. Experimental animal data supported these findings and indicated that female fertility was also disturbed. Although there are various mechanisms of action suggested to show the manner in which air pollutants alter pregnancy and the reproductive systems in both genders, further studies are needed to correlate causal relationships. This information would serve to better understand the underlying physiologic changes in the reproductive system induced by exposure to air pollutants and possibly establish a link between the dose and response of individual or mixture of air pollutants [26] [27].

In ovaries, cadmium causes decrease of relative volume of growing follicles and significant increase of the number of atretic follicles. The most frequent ultra-structural alterations observed were undulation of external nuclear membrane, dilatation of perinuclear cistern and endoplasmic reticulum. In a single nickel and nickel-zinc administration experiment on the structure and function of rabbit ovary fine follicular structures were analyzed. Various alterations in the relative volume and follicular antrum formation were found [28].

In male: few documented studies have explored the link between exposure to potentially toxic substances and the emergence of health problems. Effectively, several studies showed that there was a catastrophic decrease of sperm quality. The infertility, in many cases, 95% of research budgets are allocated to the studies for substances with estrogenic effects, 5% of the credit for substances with androgenic effects. The most common disorder of male fertility is the insufficient production of normal sperm, with good mobility in the somniferous tubules. Normal male sperm: number of sperm cells upper to 20 millions/ml of sperm. At least 15 % of these must be normally formed and 50 % of them to have a good mobility. If these values are not reached, the ability of man to procreate is reduced [29] [30].

In male, the proper maturation of sperm cells is the key of the fertility. Besides the environmental pollution, the causes of abnormalities of the sperm cells maturation are multiple includes consequence of mumps contracted during puberty, presence of varicose veins in the scrotum (varicocele), hormonal disorders, testes located high (cryptorchidism), operated tumors, stress, hereditary predisposition may also be involved. The semen characteristics including concentration, morphology or mobility, are associated with the likelihood of pregnancy and also the characteristics of the sperm nucleus such as the integrity of sperm DNA or the rate of sperm aneuploidy [31]. In testes, the administration of selected environmental contaminants (Hg, Pb, Co, Cd, Ni) resulted in undulation of basal membrane, dilatation of blood vessels in interstitium and occurrence of empty spaces in germinal epithelium. Decreased relative volume of germinal epithelium, increased relative volume of interstitium and increased apoptosis occurrence suggest damaged interstitium and revealed occurrence of oedema as the most significant change. In vitro studies, Hg and Cu showed dose as well as time-dependent decrease of spermatozoa motility and cell membrane integrity changes [32] [33] [34] [35].

II. Water pollution

Water pollution is one of the most serious environmental problems. Water pollution is caused by a variety of human activities such as industrial, agricultural and domestic. Agricultural runoff laden with excess fertilizers and pesticides, industrial effluents with toxic substances and sewage water with human and animal wastes pollute our water thoroughly.

Natural sources of pollution of water are soil erosion, leaching of minerals from rocks and decaying of organic matter. Rivers, lakes, seas, oceans, estuaries and ground water sources may be polluted by point or non-point sources. When pollutants are discharged from a specific location such as a drain pipe carrying industrial effluents discharged directly into water body it represents point source pollution. In contrast non-point sources include discharge of pollutants from diffused sources or from a larger area such as runoff from agricultural fields, grazing lands, construction sites, abandoned mines and pits, roads and streets [8].

Sources of water pollution: Water pollution is the major source of water born diseases and other health problems. Sediments brought by runoff water from agricultural fields and discharge of untreated or partially treated sewage

and industrial effluents, disposal of fly ash or solid waste into or close to a water body cause severe problems of water pollution. Increased turbidity of water because of sediments reduces penetration of light in water that reduces photosynthesis by aquatic plants.

Pollution due to pesticides and inorganic chemicals: Pesticides like DDT and others used in agriculture may contaminate water bodies.. Metals like lead, zinc, arsenic; copper, mercury and cadmium in industrial waste waters adversely affect humans and other animals. Consumption of such arsenic polluted water leads to accumulation of arsenic in the body parts like blood, nails and hairs causing skin lesions, rough skin, dry and thickening of skin and ultimately skin cancer. Pollution of water bodies by mercury causes Minamata disease in humans and dropsy in fishes. Lead causes displexia, cadmium poisoning causes Itai – Itai disease etc. Oil pollution of sea occurs from leakage from ships, oil tankers, rigs and pipelines. Accidents of oil tankers spill large quantity of oil in seas which kills marine birds and adversely affects other marine life and beaches [8].

Thermal pollution: Power plants- thermal and nuclear, chemical and other industries use lot of water (about 30 % of all abstracted water) for cooling purposes and the used hot water is discharged into rivers, streams or oceans. The waste heat from the boilers and heating processes increases the temperature of the cooling water. Discharge of hot water may increase the temperature of the receiving water by 10 to 15 °C above the ambient water temperature. This is thermal pollution. Increase in water temperature decreases dissolved oxygen in water which adversely affects aquatic life. Due to thermal pollution biological diversity is reduced. One of the best methods of reducing thermal pollution is to store the hot water in cooling ponds, allow the water to cool before releasing into any receiving water body [8].

Ground water pollution: Lot of people around the world depends on ground water for drinking, domestic, industrial and agricultural uses. Generally groundwater is a clean source of water. However, human activities such as improper sewage disposal, dumping of farm yard manures and agricultural chemicals, industrial effluents are causing pollution of ground water [34].

Impact of water pollution on animal performance

Polluted drinking water by chemicals produced waterborne diseases like, Typhoid, liver and kidney damage, Alzheimer's disease, hormonal problems that can disorder development and reproductive processes, cancer, heart disease, damage to the nervous system, Damage to the DNA and even death, meanwhile, polluted beach water contaminated people like stomach aches, encephalitis, Hepatitis, diarrhoea, vomiting, gastroenteritis, respiratory infections, ear ache, pink eye and rashes. Loss of wild life is directly related to pollution and according to Water Pollution Effects on animals i) Nutrient polluted water causes overgrowth of toxic algae eaten by other aquatic animals, and may cause death. ii) Chemical contamination can cause declines in frog biodiversity and tadpole mass iii) Oil pollution can increase susceptibility to disease and affect reproductive processes and negatively affect development of marine organisms and it can also a source of gastrointestinal irritation, damage to the nervous system, liver and kidney damage iv). Mercury in water can cause reduced reproduction, slower growth and development, abnormal behavior and death v) Persistent organic pollutants may cause declines, deformities and death of fish life and Fish from polluted water and vegetable/ crops produced or washed from polluted water could also make impact on human and animal health. More sodium chloride (ordinary salt) in water may kill animals [34].

III. Soil pollution

Addition of substances which adversely affect the quality of soil or its fertility is known as soil pollution. Generally polluted water also pollutes soil. Solid waste is a mixture of plastics, cloth, glass, metal and organic matter, sewage, sewage sludge, building debris, generated from households, commercial and industries establishments add to soil pollution. Fly ash, iron and steel slag, medical and industrial wastes disposed on land are important sources of soil pollution. In addition, fertilizers and pesticides from agricultural use which reach soil as run-off and land filling by municipal waste are growing cause of soil pollution. Acid rain and dry deposition of pollutants on land surface also contribute to soil pollution.

Sources of soil pollution

1-Plastic bags: Plastic bags made from low density polyethylene (LDPE), is virtually indestructible, create colossal environmental hazard. The discarded bags block drains and sewage systems. Leftover food, vegetable waste etc. on which cows and dogs feed may die due to the choking by plastic bags. Plastic is non biodegradable and burning of plastic in garbage dumps release highly toxic and poisonous gases like carbon monoxide, carbon dioxide, phosgene, dioxine and other poisonous chlorinated compounds.

2-Industrial sources: It includes fly ash, chemical residues, metallic and nuclear wastes. Large number of industrial chemicals, dyes, acids, etc. find their way into the soil and is known to create many health hazards including cancer.

3-Agricultural sources: Agricultural chemicals especially fertilizers and pesticides pollute the soil. Fertilizers in the runoff water from these fields can cause eutrophication in water bodies. Pesticides are highly toxic chemicals which affect humans and other animals adversely causing respiratory problems, cancer and death.

IV. Radiation pollution

Sources and hazards: Radiation pollution is the increase in over the natural background radiation. There are many sources of radiation pollution such as nuclear wastes from nuclear power plants, mining and processing of nuclear material etc. The worse case of nuclear pollution was the chernobyl disaster in Russia occurred in 1986 but the effects still longer today.

Radiation: Radiation is a form of energy travelling through space. The radiation emanating from the decay of radioactive nuclides is a major source of radiation pollution. Radiations can be categorized into two groups namely the non-ionizing radiations and the ionizing radiations.

Non-ionizing radiations: Non-ionizing radiations are constituted by the electromagnetic waves at the longer wavelength of the spectrum ranging from near infra-red rays to radio waves. These waves have energies enough to excite the atoms and molecules of the medium through which they pass, causing them to vibrate faster but not strong enough to ionize them. In a microwave oven the radiation causes water molecules in the cooking medium to vibrate faster and thus raising its temperature.

Ionizing radiations: Ionizing radiations cause ionization of atoms and molecules of the medium through which they pass. Electromagnetic radiations such as short wavelength ultra violet radiations (UV), X-rays and gamma rays and energetic particles produced in nuclear processes, electrically charged particles like alpha and beta particles produced in radioactive decay and neutrons produced in nuclear fission, are highly damaging to living organisms. Electrically charged particles produced in the nuclear processes can have sufficient energy to knock electrons out of the atoms or molecules of the medium, thereby producing ions. The ions produced in water molecules, for example, can induce reactions that can break bonds in proteins and other important molecules. An example of this would be when a gamma ray passes through a cell, the water molecules near the DNA might be ionized and the ions might react with the DNA causing it to break. They can also cause chemical changes by breaking the chemical bonds, which can damage living tissues. The ionizing radiations cause damage to biological systems and are, therefore, pollutants.

Radiation damage: The biological damage resulting from ionizing radiations is generally termed as radiation damage. Large amounts of radiation can kill cells that can dramatically affect the exposed organism as well as possibly its offspring. Affected cells can mutate and result in cancer. A large enough dose of radiation can kill the organism. Radiation damage can be divided into two types: (a) somatic damage (also called radiation sickness) and (b) genetic damage. Somatic damage refers to damage to cells that are not associated with reproduction. Effects of somatic radiation damage include reddening of the skin, loss of hair, ulceration, fibrosis of the lungs, the formation of holes in tissue, a reduction of white blood cells, and the induction of cataract in the eyes. This damage can also result in cancer and death. Genetic damage refers to damage to cells associated with reproduction. This damage can subsequently cause genetic damage from gene mutation resulting in abnormalities. Genetic damages are passed on to next generation.

Radiation effects and radiation doses: The biological damage caused by the radiation is determined by the intensity of radiation and duration of the exposure. It depends on the amount of energy deposited by the radiation in the biological system. In studying the effects of radiation exposure in *humans*, it is important to realize that the biological damage caused by a particle depends not only on the total energy deposited but also on the rate of energy loss per unit distance traversed by the particle (or linear energy transfer). For example, alpha particles do much more damage per unit energy deposited than do electrons. A traditional unit of human-equivalent dose is the *rem*, which stands for *radiation equivalent* in man. At low doses, such as what we receive every day from background radiation (< 1 *m rem*), the cells repair the damage rapidly. At higher doses (up to 100 *rem*), the cells might Environmental.

CONCLUSION

The impact of different pollution as a general on healthy of farm animals are cancer, neurobehavioral disorders, cardiovascular problems, reduced energy levels, premature death, asthma, asthma exacerbations, headaches and dizziness, irritation of eyes, nose, mouth and throat, reduced lung functioning, respiratory symptoms, respiratory disease, disruption of endocrine and reproductive and immune systems. Exposure to environmental pollutants affected reproductive functions and in particular, produced adverse effects on pregnancy outcomes, fertility, and fetal health. Exposures to ambient levels of pollutants are associated with low birth weight, intrauterine growth retardation, prematurity, neonatal death, and decreased fertility and decrease of sperm quality in males and indicated that female fertility was also disturbed. The most common disorder of male fertility is the insufficient production of normal sperm, with good mobility in the somniferous tubules. Polluted drinking water by chemicals produced waterborne diseases like, typhoid, liver and kidney damage.

REFERENCES

- [1] Vrzigulova M, Bires J and Vrzigula L. (1993). The effect of copper from industrial emissions on the seminiferous epithelium in rams. *Reprod. Dom. Anim.*, 28, 2, 108

- [2] Schlerka G, Tataruch F, Hoegler S, Url A, Krametter R, Koessler D, Schmidt P (2004). Acute lead poisoning in cows due to feeding of lead contaminated ash residue. *Berl. Munch Tierarztl. Wochenschr.* 117: 52-56.
- [3] Gamcik P, Bires J, Vrzgula L and Mesaros P. (1990): Effect of experimental intoxication with copper from industrial emission on reproductive ability in rams. *Reprod. Dom. Anim.*, 25, 3, 235
- [4] Swarup D, Patra RC, Naresh R, Kumar P, Shekhar P (2005). Blood lead levels in lactating cows reared around polluted localities of lead into milk. *Sci. Total Environ.* 347: 106-110.
- [5] Alonso ML, Mantaña FP, Miranda M, Castilho C, Hernández J. and Benedito JL (2004). Interactions between toxic (As, Cd, Hg and Pb) and nutritional essential (Ca, Co, Cr, Cu, Fe, Mn, Mo, Ni, Se, Zn) elements in the tissues of cattle from NW Spain. *Biometals* 17:397- 398.
- [6] López-Alonso M, Prieto F, Miranda M, Castilho C, Hernández JR and Benedito JL (2005). The role of metallothionein and zinc in hepatic copper accumulation in cattle. *Vet. J.*, 169: 262-267.
- [7] Durgut R, Koc A, Gonenci R, Bal R, Celik S, Guzel M, Altug M, and Atesoglu E (2008): Effects of high dose lead toxication on liver, kidneys, heart, brain and blood in rabbits: an experimental study. *J Appl. Biol. Sci.*, 2: 11- 18.
- [8] European Public Health Alliance, (2009). Air, Water Pollution and Health Effects. Factors and Allergic Bronchial Asthma, *Clinical & Experimental Allergy*, 35(9), pp.1113- 1124.
- [9] Progressive Insurance, (2005). Pollution Impact on Human Health. Retrieved from <http://www.epha.org/r/54>.
- [10] Holland, W. W., Bennett, A. E., Cameron, I. R. , Florey, C. V., Leeder, S. R., Shilling, R. S. F., wan, A. V. & Waller, R. E. (1979). Health Effects of Particulate Pollution: Reappraising the Evidence. *Am Journal Epidemiol*, 110(5), pp. 525- 659.
- [11] Krametter-Froetscher R, Tataruch F, Hauser S, Leschnik M, Url A, Baumgartner W (2007). Toxic effects seen in a herd of beef cattle following exposure to ash residues contaminated by lead and mercury. *Vet. J.* 174: 99-105.
- [12] Alloway, B.J.and Ayrea D.C.(1997). *Chemical Principles of Environmental Pollution*. Blackie Academic & Professional, London.
- [13] Abdul-Wahab, Sabah Ahmed; Marikar, Fouzul Ameer, (2011). "The environmental impact of gold mines: pollution by heavy metals". *Central European Journal of Engineering* 2 (2): 304–313.
- [14] Zevenhoven, Pia Kilpinen (2001): Control of Pollutants in Flue Gases and Fuel Gases. TKK, Espoo.
- [15] United States Environmental Protection Agency (1998). "National Air Quality and Emissions Trends Reports"
- [16] Ozmen O and Mor F (2004). Acute lead intoxication in cattle housed in an old battery factory. *Vet. Hum. Toxicol.* 46: 255-256.
- [17] National Ambient Air Quality Standards for Ozone; (1997). Final Rule, Federal Register, 62 FR 38856, Washington, DC.
- [18] Leaderer, B.P., Cain, WS., Isseroff, R., Berglund, L.G.(1985)."Ventilation Requirements in Buildings II". *Atmos. Environ.* 18:99-106. See also: Repace, J.L. and Lowrey, A.H. "An indoor air quality standard for ambient tobacco smoke based on carcinogenic risk." *New York State Journal of Medicine*; 85:381-83.
- [19] Stein, J., Schettler, T., Wallinga, D. & Valenti, M. (2002). In Harm's Way: Toxic Threats to Child Development, *Journal of Developmental & Behavioral Pediatrics*, 23(0), pp. S13-S22.
- [20] Colls, J. (2002). *Air Pollution*. New York: Spon Press. Coordination, American Journal of Agricultural Economics 61(4):591-600.
- [21] Brauer, M., Hoek, G., Smith, H. A., de Jongste, J. C., Gerritsen, J. & Postma, D. S. (2007). Air Pollution and Development of Asthma, Allergy and Infections in a Birth Cohort, *European Society for Clinical Respiratory Physiology*, 29(5), pp. 879-888.
- [22] Nel, A. (2005). Air pollution Related Illness: Effects of Particles. *Science*, 308 (5723) : 804- 806.
- [23] Lewis NJ, Fallah-Rad AH and Connor ML (1997). Copper toxicity in confinement-housed ram lambs. *Can. Vet. J.* 38: 496-498.
- [24] Fereidoun, H., Nourddin, M. S., Rreza, N. A., Mohsen, A., Ahmad, R. & Pouria, H., (2007). The Effect of Long-Term Exposure to Particulate Pollution on the Lung Function of Teheranian and Zanjanian Students, *Pakistan Journal of Physiology*, 3(2), pp. 1-5.
- [25] Mishra, V. (2003). Health Effects of Air Pollution, Background paper for Population- Environment Research Network (PERN) Cyberseminar, Retrieved from http://www.mnforsustain.org/climate_health_effects_of_air_pollution_mishra_pern.htm
- [26] Miranda M, López-Alonso M, Garcia-Partida P, Velasco J, Benedito L (2006). Long-term follow-up of blood lead levels and haematological and biochemical parameters in heifers that survived an accidental lead poisoning episode. *J. Vet. Med. A.* 53: 305-310.

- [27] Mohallem SV, de Araújo Lobo DJ, Pesquero CR, Assunção JV, de Andre PA, Saldiva PH, Dolnikoff M.(2010). Air pollution and effects on reproductive-system functions globally with particular emphasis on the Brazilian population. *J Toxicol Environ Health B Crit Rev.* Jan;13(1):1-15.
- [28] Massanyi P and Uhrin V. (1997). Histological changes in the uterus of rabbits after an administration of cadmium. *J. Environ. Sci. Health, A32, 5, 1459*
- [29] Michael j. (2003). Infertility and environmental pollutants, *British Medical Bulletin* 2003; 68.
- [30] Mathur N, Pandey G and Jain GC. (2010). Male reproductive toxicity of some selected metals: Review. *J. Biol. Sci., 10(5): 396.*
- [31]. Roychoudhury S and Massanyi P. (2008). In vitro copper inhibition of the rabbit spermatozoa motility. *J. Environ. Sci. Health, A43, 6, 658.*
- [32] Blottner S, Frolich K, Roedlants H, Streich J and Tataruch F. (1999). Influence of environmental cadmium on testicular proliferation in roe deer. *Reprod. Toxicol., 13, 4, 261*
- [33] Tropical Rainforest Animals (2008). Pollution Effects on Humans, Animals, Plants and The Environment. Retrieved from <http://www.tropical-rainforest-animals.com/pollution-effects.html>
- [34] Kopaska-Merkel, D. (2000). How Does Water Pollution Affect Plant Growth? *Mad Sci Network.* Retrieved from <http://www.madsci.org/posts/archives/2000-1/974847556.En.r.html>
- [34] Apostoli P, Kiss P, Porru S, Bonde JP, Vanhoorne M and Asclepios A (1998). Study group. Male reproductive toxicity of lead in animals and humans. *Occup Environ Med; 55: 364–74.*
- [35] Vrzgulova M, Bires J and Vrzgula L. (1993). The effect of copper from industrial emissions on the seminiferous epithelium in rams. *Reprod. Dom. Anim., 28, 2, 108.*

Appendixes

Table 1: Categories of pollution

Category	Major causes	Major symptoms
Atmospheric pollution	Smoke, dust, exhaust fumes, toxic substances such as sulfur dioxide and nitrogen dioxide	Asthma, bronchitis
Water pollution	Polluted waste water, waste fluids such as petroleum, sludge, household sewage, sewage discharge, general waste, agricultural chemicals	
Soil pollution	Arsenic, heavy metals, especially, in agricultural chemicals	Noxious odors, poisoning
Noise	Factories, construction work, road traffic, trains and aircraft, late-night commercial operations, advertising	Headaches, insomnia, depression, hearing loss
Vibration	Factories, construction work, road traffic, trains and aircraft	Dizziness, discomfort, homes damage
Ground subsidence	Up swelling of groundwater, gravel quarrying, coal mining	Structural damage to buildings
Noxious odors	Exhaust fumes, river contamination, sanitation facilities, accumulated sewage livestock farms	Headaches, discomfort

Source: Based on the Basic Law for Environmental Pollution Control.

Table 2: Gaseous air pollutants

Pollutant	Source	Harmful effect
Suspended, particulate matter (SPM), construction, activities, particles suspended and lead	Thermal power plants, lead interferes with the development, automobiles	Poor visibility, breathing problems metalurgical processes of red blood diseases and cancer, smoge (skoke & fog) formation leads in the air, (flush, dust, to poor visibility and aggravates
Sulphur compounds (SO ₂ and H ₂ S)	Power plants and refineries, volcanic eruptions	Respiratory problems in humans, loss of chlorophyll in plants (chlorosis)
Carbon compound (CO and CO ₂)	Automobile exhaust, burning of wood and coal	Respiratory problems, greenhouse effect
Hydrocarbons (benzene, ethylene)	Automobiles, petroleum industries	Respiratory problem, cancer causing properties
Nitrogen Compound (NO and N ₂ O)	Motor vehicle exhaust, atmospheric reaction	Irritation in eyes and lungs, low□ productivity in plants
Fibers (cotton, wool)	Textiles and carpet weaving industries	Lung disorders

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