



## Investigating the Histological effects of industrial and oil pollutant dust in the air of Assaluyeh, on the pancreas and ovary

F. Ershad<sup>1</sup>, P. FarzadiNia<sup>2</sup>, M. Shariati<sup>3</sup>, Afshar. Bargahi<sup>4</sup>

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### ABSTRACT

Today air pollution as a very important issue nationally and internationally known. The annual air pollution leads to disease and death of thousands of people around the world. Although some countries take measures in order to minimize the amount of environmental pollutants, but there are still an increase in morbidity and mortality caused by air pollution. Scientific findings have shown a wide range of air pollution effects on the. Air pollution can have devastating effects on children's health, this article tries to explore the effects of oil contamination and pollutants in the air of Assaluyeh on pancreas and ovary of maternal and neonatal rats.

**Keywords:** air pollution, Assaluyeh, health effects, histological changes

### Introduction

By the progress of human civilization and the development of technology and the proliferation of ever-increasing population, already world is facing with air and earth pollution problem. Pollution contains different types, they are divided on the basis of which earth elements can be contaminated by them. Air pollution is one of the types of pollution which is known as one of the most serious problems in some cities in the world. Pollutant Elements, including carbon monoxide, hydrocarbons, nitrates, sulfur oxides and particulate matter that can cause a variety of respiratory diseases and other complications. Particles at very low concentrations can have adverse effects on the human's body and environment, it has been approved that these dust impacts on fertility rates. Dust and air pollution cause infertility in women and sterility in men [Sorouri et al, 2010 ]. The effects of fine dust and particles in the air on pregnant women, especially in the first trimester, reduces the amount of oxygen to the fetus, and this can be very dangerous for it, especially for its brain and also it causes disruption in fetal health, low birth weight, lack proper development of the fetus, and prematurity and all the aforementioned effects would rarely occur in the clean air. Uncontrolled emission of industrial fine particles could affect

### Author's Address

<sup>1</sup>Department of Biology, Kazerun branch, Islamic Azad University, Fars, Iran Mehrana.ershada@yahoo.com

<sup>2</sup>Assistant Professor, Bushehr University of Medical Sciences, Iran,

<sup>3</sup>Faculty members of Islamic Azad University of Kazerun branch, Fars, Iran,Mehrdadshariati@hotmail.com

<sup>4</sup>Assistant Professor, Bushehr University of Medical Sciences, Iran,

**E-mail:** abargahi@yahoo.com

human health. Increasing in human exposure to fine air particles is associated with an enhancing in the risk of cardiovascular and pulmonary diseases, such as lung cancer and allergies. Suspended particles in the air has a relationship with unpleasant results during pregnancy, general inflammation and rise in DNA damage in infected children [Basu,1986]. Several animal studies have shown that inhalation of fine particles generated from diesel engines is affected growth, immune system, nervous and sexual differentiation of the fetus and the nanoparticles produced by industry can be expected to exert same effects. In this study, histological effects dust particle of Assaluyeh on Maternal tissue (pancreatic and ovarian) and embryo development in rats were investigated.

### 2.The definition of pollution

The factors that cause instability, disorder, harm or discomfort for living organisms in one environment is called pollution. Environmental pollution is the pollution that is caused by any means and is harmful to humans and endangers its life [Johnson,1994]. Pollutants that arise in the wake of natural events when would recognized as pollutants that exceed the amount of the normal range [Ahluwala et al, 2011] Pollution contains different types, they are divided on the basis of which earth elements can be contaminated by them. Land pollution, thermal pollution, light pollution, visual pollution (visual), noise pollution, water pollution, air pollution is some of the pollution types.

### 3. Air Pollution Definition



Air pollution is one of the most serious problems in some cities in the world that this is especially seen among developing countries [Basu,1986]. According to the dictionary, air pollution accompanies with smoke and harmful gases, mainly carbon oxides, sulfur and nitrogen. This type of pollution is more important than other types because it leads to contamination of vast dimensions and produces other pollution and may enter the soil and water [Basu,1986].

#### 4. The effect of air pollutants on human health

Normally, pollutants have some short-term effects and sometimes severe such as increase in the level of carbon monoxide in open spaces results headache and dizziness, but at home and indoor places will lead to death. Carbon monoxide prevents oxygen to reach the heart and brain and can cause death. This gas does not exert any taste and smell and gradually makes person sleepy until he or she go to coma stage, so, heaters should not be used to warm up bathroom. Gas convectors without using chimney is very dangerous and the accumulation of carbon monoxide can cause headaches, dizziness and nausea in a person. chimney is also effective in room air ventilation [Shariati et al,2009].

#### 5. The effects of dust on the health and growth of the fetus

All traces of dust for adults are mentioned above, naturally the fetus and newborn due to low fetal weight and their sensitivity to the harmful effects, they becomes more severe and even effects are more tangible in fertility of women [Gonadotropins Regulate Inducible Cyclic Adenosine,2001]. Dust particles in the air on pregnant women, especially in the first trimester reduces the amount of oxygen for the fetus, and this can be very dangerous for the fetus, especially for its brain [Christopher,2001], [Cidlowski ,1975]. High levels of air pollution particles which are smaller than 10 microns can cause fetal death without any deficiency, it means that fetus is healthy and has normal weight [Byrd et al,1993]. Exposure to particle during pregnancy affects fetal organs morphology [Erickson,2003], and shown that smoke from burning hydrocarbons composed of very fine particles that impair fertility [Ernst knobil et al,1994] ,[ Fahey et al,2002].

#### 6. The city of Assaluyeh on the verge of crisis

Environmentalists describe water and soil pollution and continue of the process of beach destruction in Assaluyeh as terrible disaster. Officials, emphasize refineries as the main cause of pollution which releases their pollutant gases in the air emissions without refinement.

But air pollution is not only the result of chemical production and waste in the region. Environmentalists describe water and soil pollution and continue of the process of beach destruction in Assaluyeh as terrible disaster. On waste in this area which is approximately industrial and exerts great level of pollution, often, any type of purge running is not applied, and also bacterial infections caused by the discharge of sewage into the sea is dangerous not only for fish and sea creatures but can have adverse effects on residents and is pathogenic.

#### 7. The previous studies

The relationship between fetal birth defects and dust in the air has been investigated in different countries. In a study [AL-Howiriny,2008] on the toxicity of nanoparticles on health and reproductive development in females has been studied in various models.

In [Biuin et al,1997] and [Byrd et al,1993] experience and research has shown that mother exposure and response to allergens and fine dust particle allergens can be transmitted to the fetus through the umbilical cord blood also, but the intensity and amount of damage depends on the allergen.

[Li B, et al,2010]In their study, transfer of particles into the lungs and illuviation of respiratory tract depends on three major factors: the anatomical structure of the respiratory tract, the air flow pattern and particle flow characteristics. As soon as the illuviation of the nanoparticles, these tiny particles are capable of passing through the tissue-blood-air barrier and enter the bloodstream and reach the organs.

The researchers in two decades [Morsy ,2010] and [Piao et al,2015] mentioned on key role of hormones on the development of the reproductive system and control its function as soon as the development occurs. Because of it, they do research about the effects of endocrine disrupting chemicals on Endocrine System(EDC) and reproductive health.

In a study [Sekhon et al, 2010] stated that nanoparticles are able to accumulate in the solutions. The range and extent dependent on the size, shape, concentration, time, temperature and

type of nanoparticle. Because of the changes in surface features, aggregated nanoparticles behave differently than any alone particle. So, their interact with cells and protein intake is largely influenced. Aggregation greatly affects the cellular uptake and therefore influences inhalation toxicity, then nanoparticles can penetrate deeper into the lungs and interact with epithelial cells. It can cause inflammation and chronic effects which leads to more penetration in the interstitial space and eventually enter the lymph nodes.

## 8. Methods

In this study, 21 Sprague-Dawley rats with approximate age of 120-100 days and approximate weight of 200-150 grams were purchased from the Breeding and Keeping Laboratory Animals of Bushehr University of Medical Sciences. And rats were kept in an area of 4 × 3 meter room and the air the with two windows were embedded in both north and south side of room was ventilated.

### Grouping

In this study, rats were divided into three groups of 7 as follows:

1. Group 1 (free of dust) are for three weeks.
2. Group 2 (fine dust particle of area clean) studied that for twenty-one days and every day for eight hours (8 to 12 pm and 4-8 pm) in an environment with collected fine dust particle environment, free of petroleum and industrial pollutants in the reconstruction environment which was made by aquarium glass with fan that constantly circulates dust in the environment. In an environment with fine dust particle of clean air.
3. Group 3 (fine dust particles of Assaluyeh region containing oil and industrial pollutants) that for twenty-one days and every day for eight hours (8 to 12 pm and 4-8 pm) in environments contaminated with dust that were collected from Assaluyeh which is contaminated with aromatic hydrocarbons, which was made by aquarium glass with fan that constantly circulates dust in the environment.

### Mating

To ensure that rats became pregnant, they should all be placed on a sexual cycle at the same time, Estrous cycle in female rats lasts 4 to 5 days, to equalize cycles of the rats, vaginal Smear method was used. Then, six days before the grouping, female rats mated with male animals, and after

four days, they were separated and then weighed and grouped.

### Sampling of organs

Upon delivery of rats, mother and their fetus anesthetized with inhalation of ether and their the pancreas, lung and ovary is removed, and after removing the part of the organs, they put in 10% formalin. Later they were taken to the pathology laboratory to provid tissue sections. Measuring the hormone was done in a Razi laboratory located in the Bushehr by Electrochemiluminescence method. The samples were taken small and thin to fixatives penetrates deep into the tissue easily, samples were cleaned after washing with saline and fixative solution formalin 10% (for study under a microscope Optical) were placed.

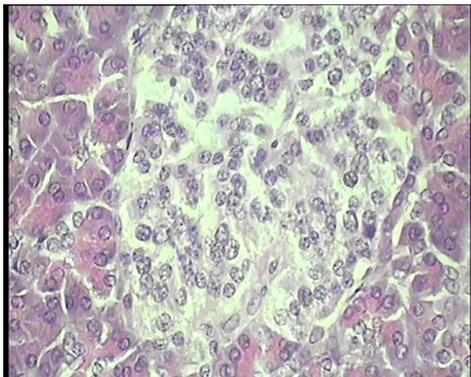
### Studying with optical microscopy

Samples were kept for at least 48 hours at room temperature in formalin solution 10%, Then the samples were placed in special container in Autotechnicon device to process of passage or circulate tissue. In tissue circulation process, Eosin - Hematoxylin was used for examination by light microscopy.

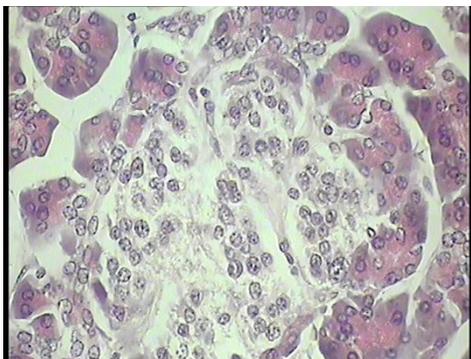
## 9. Histological effects of dust on the pancreas

In the study of tissue sections in various categories, some factors such as Acini's density in the microscope and ducts and pancreatic islet density, diameter, height of Acini cells and the diameter of cell's nucleus were taken into account. Pancreatic tissue cell studies showed that sometimes air group with emissions of fine particles, was similar to clean air group and free of dust and air with dust, exocrine sinus (gray arrow) was normal and no pathological changes were seen in them. But Langerhans islet in regular uniform, consistent and cells with lower density and non-uniform tonality and their cytoplasm have non uniform staining and their nuclei have relatively euchromatic and active but in some cells serious damage could be seen. However, in the group with dust in some cells, we had relative injury. As you can see in Figure 1, all pancreas tissues, including exocrine sinuses and Langer Hans Islands and the delicate connective interstitial tissue were smooth, orderly, uniform and normal. Cells have cytoplasm with normal staining and uniform and active nuclei and there are no specific histopathologic changes. In Figure 2 also exocrine Sinuses were relatively normal and no histopathologic changes were not detected. But

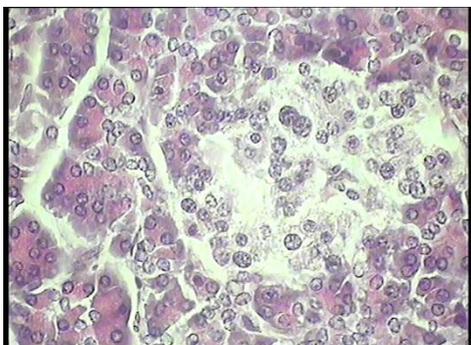
Langerhans islet cells were not regular uniform, consistent and normal, cells has cytoplasm with fair staining and uniform and active nuclei, but in some cells partial damage could be seen and In Figure 3, also exocrine Sinuses were approximately normal and no histopathologic changes were not observed. But Langerhans islet cells were not regular, uniform, consistent and normal, cells with lower density and non-uniform staining cytoplasm and relatively euchromatic and active nuclei, but there were serious damages in some cells.



**Figure 1: optical Photo micrograph of pancreas tissues of the Group 1**



**Figure 2: optical Photo micrograph of pancreas tissues of the Group 2**



**Figure3: optical Photo micrograph of pancreas tissues of the Group 3**

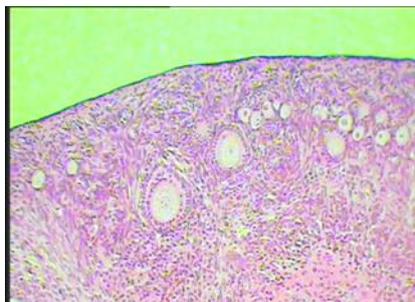
## 10. Ovarian Histological Changes in Different Groups

In examining the various tissue sections, various parameters such as the overall situation follicles and granulosa cells, internal and external solo cells, yellow flesh and delicate connective tissues were considered multicellular interstitial stroma, the results showed that all slides of ovarian tissue in study groups, follicles and granulosa cells and delicate connective tissue system as well as the solo internal system multicellular interstitial stroma, consolidation rather irregular and cytoplasmic staining of cells with relatively dense, dark and nucleus are signs of heterochromatinism. Luteal cells has irregular and abnormal consolidation and is filled highly with blood and vacuolation. In the negative control group, consistency and density of internal and external solo cells, Granulosa interstitial stromal cells tissues is relatively uniform and normal and in the pristine control group these parameters are quite homogeneous and without any irregularities. In figure [Biuin et al,1997] as you can see, all ovarian tissues, including the overall situation follicles and granulosa cells, and internal and external solo system and delicate connective tissue of multicellular interstitial stroma, It has smooth, orderly, uniform and normal consolidation and cells have cytoplasm show normal staining and the active euchromatic nucleus. Specific histopathological changes not seen. Specific sections of the corpus luteum, as it turns out luteal cells also has smooth, orderly, uniform and normal consolidation and cells have cytoplasm show normal staining and the active euchromatic nucleus. Specific histopathological changes not seen. In figure [Byrd et al,1993] as you can see, all tissues of the ovary including the overall condition of the follicles and internal and external solo system and delicate connective tissue of multicellular interstitial stroma, It has smooth, orderly, uniform and normal consolidation and cells have cytoplasm show normal staining and the active euchromatic nucleus. Specific histopathological changes not seen. As it turns out specific sections of the corpus luteum, luteal cells also has smooth, orderly, uniform and normal consolidation and cells have cytoplasm show normal staining and the active euchromatic nucleus. In figure [Christopher et al,2001] as you can see, including the overall situation follicles and granulosa cells, and internal and external solo system and delicate connective tissue of multicellular

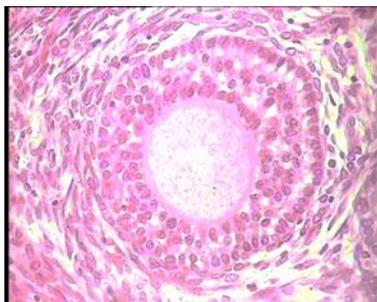
**Investigating the Histological effects**

interstitial stroma, It has irregular consolidation. Cytoplasmic cells shows relatively dense, dark staining euchromatic nucleus. Specific sections

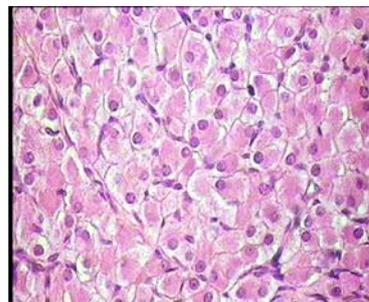
of the corpus luteum as it turns out luteal cells has irregular and abnormal consolidation and is filled highly with blood and vacuolation.



Ovarian tissue magnification (× 100)



Ovarian tissue magnification (× 400)



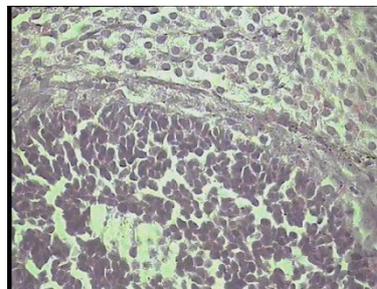
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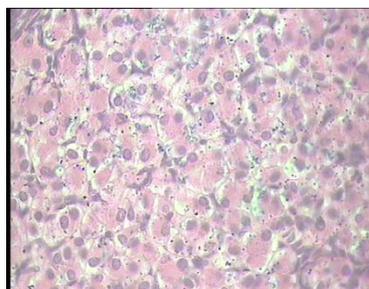
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Ovarian tissue magnification (× 100)



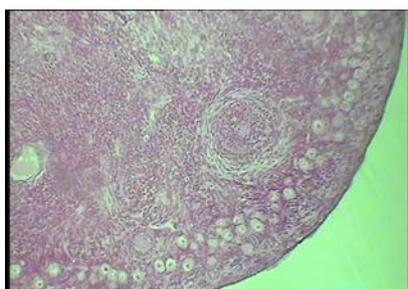
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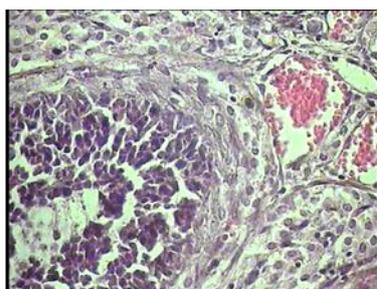
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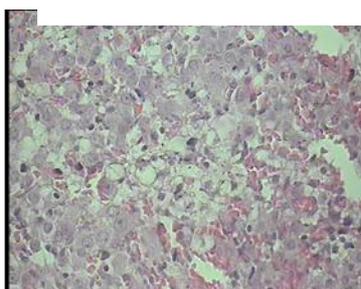
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Ovarian tissue magnification (× 100)



Ovarian tissue magnification (× 400)



CL with magnification (× 400)

**11. Conclusion**

In this study, investigations of histological ovarian tissue, is in line with the results of counting follicles and measurement of serum levels of pituitary-Gonad axis hormones in animals -Group 3. Follicles and granulosa cells, and internal and external solo system and delicate connective tissue of multicellular

interstitial stroma, It has irregular consolidation. Cytoplasmic cells shows relatively dense, dark staining heterochromatin nucleus. Luteal cells has irregular and abnormal consolidation and is filled highly with blood and vacuolation. The pathological changes in group 3 by dust effects affected on follicles life. And in the reduction of the process steroid production and reduction



process is inhibited ovarian follicular. The histological examination of the pancreas, the observed pathological changes in is not intense as the ovarian tissue. In some cells have seen serious damage.

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