

AIR AS A SERVICE



Articles on air quality in enclosed spaces:

Dental Clinics

Offices

Schools

Indoor Air Quality in a dentistry clinic

Written by Asaf Mendelovits *

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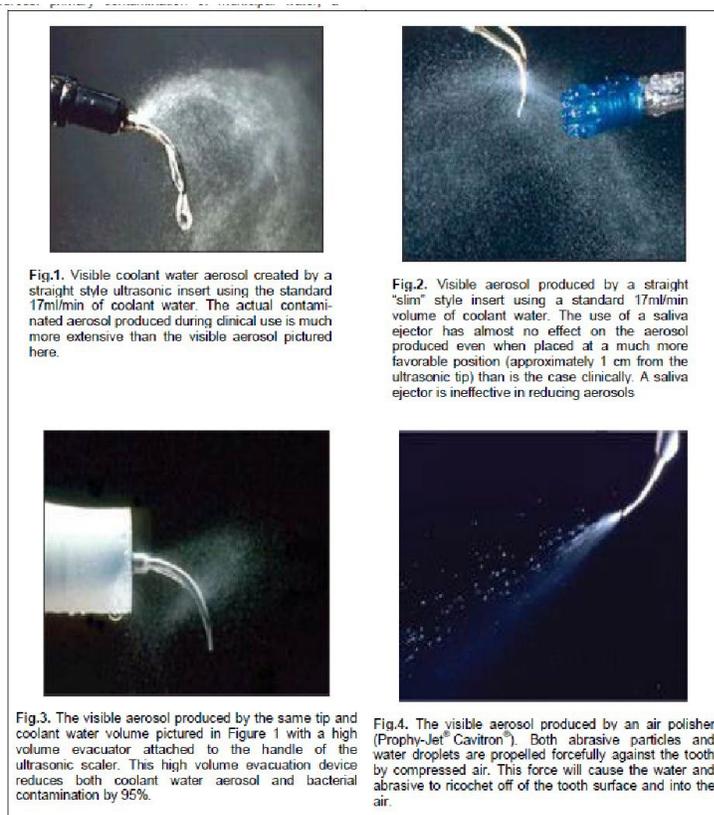
Poor quality of the indoor air can harm the health of the occupants, workers or occupants of the building and its surroundings. Exposure to intra-structural air pollution poses a health risk.

The quality of the indoor air is affected by a number of factors: A) Intra-structural sources of pollution both of the materials from which the building is built and of the content of the materials inside the building; B) The quality of the outside air entering the building; Air exchange between the interior of the building and the external environment; D) The ventilation systems themselves.¹

Intra-structural air quality in medical centers, including dental clinics requires special attention due to unique characteristics of the work environment. Studies from recent years have shown that clinic staff as well

Patients are exposed to a variety of contaminants that can pose a health risk.

One of the risk factors found in dental treatment rooms is bio-aerosols that are formed As a result of the use of dedicated equipment in the treatment process.



The four illustrations show examples of aerosol release from instrumentation in the dental clinic ²

These bio-aerosols may be inhaled by dentists, clinic staff, and patients. The same aerosols that carry microorganisms (bacteria, fungi) and viruses can remain suspended in the air for hours, carry away and sink on surfaces and contaminate them.³

The staff working in the dental clinics are exposed to a wide range of microorganisms found in the blood, saliva and tissues of the patients' oral cavity. These microorganisms can cause a large number of diseases

Infectious, such as pneumonia, tuberculosis, shingles, viral hepatitis and more.⁴

In a study examining microbial bio-aerosols in dental clinics found that high levels of these bio-aerosols appear in certain dental procedures, especially during scaling .mechanical decrease in concentration

The bio-aerosols to the background level, occurs only after about 10 to 30 minutes following the settling of these particles

To the floor or other surfaces.⁵

In these days of coronary heart disease in which asymptomatic or symptomatic corona patients may visit dental clinics there is a high risk of contracting SARS-CoV-2 both among the clinic staff and among the patients. The others due to the therapeutic procedure that produces aerosols that may carry the virus.⁶

Despite the medical staff's use of protective equipment (face mask, eye protection) during treatment, the fact that bio-aerosols continue to float in the air for a long time, the medical staff, administration staff and patients are still exposed to the same microbial contaminants and therefore it is important to take care of air treatment of the clinic.

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Indoor Air Quality in Offices

Written by Asaf Mendelovits *

Intra-structural air quality (IAQ) is the quality of air in enclosed environments, such as buildings and their environment, including private homes, offices, public buildings and mass transit systems.

Poor quality of the indoor air can harm the health of the occupants, workers or occupants of the building and its surroundings, exposure to intra-structural air pollution poses a health risk.

The quality of the indoor air is affected by a number of factors: a) Intra-structural sources of pollution both of the materials from which the building is built and of the content of the materials inside the building; b) The quality of the outside air entering the building; Air exchange between the interior of the building and the external environment; D (Ventilation systems themselves. ^[1]

The situation in which people live in buildings in which they feel discomfort and suffer from negative health effects as a result of the quality of the buildings in general and the quality of the internal air in particular is referred to as the "sick building syndrome" .SBS - Sick Building Syndrome) ²⁾

In the industrialized world millions of people stay during the work day, eight hours or more, in an office building without going outside. Office workers often share common workspaces, computers, chairs, restrooms and common spaces found to contain a wide variety of microorganisms.³

The number of complaints about the quality of intra-structural air in offices has increased in recent years, along with the increase in modern construction, which is widely used in [synthetic products. These natural ventilation By opening these windows a forced ventilation or air conditioning system is activated.^{4,5}

Among the various pollutants that originate from the activity in the structure are:

Microorganisms - Certain conditions can lead to the proliferation of various microorganisms: fungi (molds, yeast, (bacteria, viruses and amoebas). This microbial activity leads to exposure to volatile organic compounds, toxins and spores. The development of microorganisms can occur in the ventilation system and the merger as a result of poor maintenance of these systems.⁶

These microorganisms usually appear in the form of bioaerosol particles. Between 5-34% of intra-structural air pollution.⁷

In a study published in 2018 and conducted in Poland in an office building, researchers showed that the amount of the bacterial bioaerosol, expressed as a viable-culturable count, is four times greater in the air. Intra-structural than outside the structure.⁸

The symptoms associated with a biological infection are cough, chest tightness, fever, chills, muscle aches and reactions allergies such as irritation of the mucous membranes and congestion in the respiratory tract.²

Formaldehyde - a colorless and pungent-smelling gas. Formaldehyde has many uses in industry and product manufacturing. The sources of its presence in buildings are cigarette smoke, compacted wood furniture (MDF), mainly new furniture (products such as adhesives, parquet and laminate floors, insulation materials, etc. Formaldehyde is classified as a carcinogen by the International Agency for Research on Cancer) on Research for Agency International - IRAC (Formaldehyde cancer may cause irritation, pain or dryness in the throat, nosebleeds, headaches, fatigue, problems with concentration and memory, dizziness, shortness of breath and burning eyes.^{9,10,6}

Volatile organic compounds - Among the substances are acetone, toluene, xylenes and more. Sources of materials, these can be cigarette smoke, printing or photocopying processes, paints and thinners, paint removers, adhesives, varnishes, furniture (especially if it is new, (detergents, etc.) Exposure to volatile organic compounds leads to symptoms which include headaches, drowsiness, weakness, joint pain, peripheral or tingling numbness, skin irritation and more.⁶

Particles - Particles in the air are solid or liquid substances that float in the air. The particles are found in dust, cigarette smoke, cooking products and food heating. A 2007 study in Australia found that the office where there are laser printers, the amount of particles is 5 times greater than in the external environment exposed to vehicle pollution. The average printer emits ink particles that can penetrate the lungs and cause breathing problems and coronary heart problems. Particles in very high concentrations can cause allergic reactions, skin irritation, In the throat and nose, cough, sneezing, difficulty breathing and more.^{6,12,11}

Perfume Distributors - In recent years, institutions and offices have begun to make use of perfume-distributing facilities at various ease. Along with the fragrances that are distributed, there is also a health concern. Even in the case where natural materials are used, for example the substance linoleum (thyme (or lemon) found in citrus peels, these substances tend to oxidize when they are emitted into the air and lead to the formation of formaldehyde. In addition, these perfumes may also contain other substances like phthalates and benzene which cause allergies and irritate the respiratory system.¹³

Studies conducted in recent years have found an association between intra-structural air quality and the level of performance and productivity of employees. A 2004 study D.P) (Wyon, showed an increase in the incidence of headache and a reduction in the ability to concentrate. A decrease of 6-9% in employee performance was also found.¹⁴

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Indoor Air Quality in School

Written by Asaf Mendelovits *

Intra-structural air quality (IAQ) is the quality of air in enclosed environments, such as buildings and their environment, including; private homes, offices, public buildings and mass transit systems.

Poor quality of the indoor air can harm the health of the occupants, workers or occupants of the building and its surroundings exposed to intra-structural air pollution poses a health risk.

The quality of the indoor air is affected by a number of factors: a) Intra-structural sources of pollution both of the materials from which the building is built and of the content of the materials inside the building; b) The quality of the outside air entering the building; Air exchange between the interior of the building and the external environment; D (Ventilation systems themselves. ^[1]

The situation in which people live in buildings in which they feel discomfort and suffer from negative health effects as a result of the quality of the buildings in general and the quality of the internal air in particular is referred to as the "sick building syndrome" .SBS - Sick Building Syndrome) ²⁾

Exposure to intra-structural air pollution can lead to respiratory diseases, cardiovascular disease and lung cancer. The World Health Organization has reported that intra-structural air pollution is responsible for 14 more deaths than extra-structural air pollution. It should be noted that children and asthmatics are more susceptible to air pollution (extra-structural and intra-structural) than Healthy adults. ³⁾

Schools are places that are characterized by a high level of activity and population density of children. Air quality Intra-structural schools are characterized by a number of pollutants such as: volatile organic compounds (VOCs) Aldehydes, particulate matter PM10) and, (PM2.5 fungi and bacteria. ⁴⁾

Table 1. Indoor air pollutants and their sources in schools.

| Pollutants | Sources | |
|-------------------------------------|---|-----------------------------------|
| | Indoor | Outdoor |
| Particulate Matter (PM) | Chalk dust, soil dust, new furniture, cleaning activities, resuspension of particles due to children's movements, combustion sources such as heaters, gas- and woodstoves and smoking | Traffic and industrial emissions |
| Carbon monoxide (CO) | Heaters, gas and woodstoves and smoking | Traffic and industrial emissions |
| Nitrogen dioxide (NO ₂) | Gas appliances, heaters and smoking | Traffic and industrial emissions |
| Sulphur dioxide (SO ₂) | – | Burning of coal and other fuels |
| Ozone (O ₃) | Ozone generators, electrostatic air cleaners, photocopiers and laser printers | Secondary photochemical reactions |
| Volatile organic compounds (VOCs) | Furnishings such as desks and shelves, resins of wood products, adhesives, glues, paints, fibre board, plywood, cleaning products and carpets | Traffic emissions |
| Bioaerosols | Human occupants and heating, ventilation and air-conditioning system | Pollens |

Table: 1 List of pollutants and their sources in schools ⁵⁾

School labs can be a hotbed for intra-structural air pollution for two main reasons:

1. Laboratory floor is generally coated with PVC (poly-vinyl chloride) (phthalate-releasing) chemicals that disrupt endocrine activity (studies have shown that children whose room floor is coated in PVC, they tended to get more asthma.
2. Short-term exposure to the substance may cause headaches, and long-term exposure may cause liver damage and cancer.³ Carbon monoxide or dioxide.³

In addition, in schools where ventilation systems are installed, these systems may also be a source of biological contamination viruses, bacteria and fungi.³

The following is an overview of several studies linking intra-structural air quality to diseases:

A study published this year (2021) found that children exposed to air pollution, such as burning smoke or car exhaust, may be at higher risk for heart disease and other health problems, even if the exposure lasts only one day. The analysis published in the scientific journal Reports Scientific Nature presented the effect of air pollution at the individual cell level and focused on both the cardiovascular and immune systems in children. The study confirms previous studies that have shown that poor quality air can alter genetic regulation in a way that may affect long-term health. Since air from the outside environment penetrates buildings both naturally, through windows, and as a result of forced ventilation systems, in schools located near roads, it is very important to take care of the installation of air purification systems.⁶

A study conducted in the USA) was published in (2017 - among children 4 to 13 in elementary schools found higher levels of allergens originating from mice in schools than in homes. More than 99.5% of the dust samples sampled were found to be allergenic. High concentrations of allergens originating from school mice have been found as the most important value in determining illness associated with asthma syndromes and low levels of 7 (FEV1 FEV1) Obstruction of the airways. This value symbolizes the flow rate of the exhaled air in the first second. This value decreases when airway obstruction worsens.

A study conducted in Sweden (2001) found that the incidence of children with asthma increased in general that there were more students in the class who had cats.⁸

Additional studies have examined the relationship between interstitial air quality in schools and student performance:

A US study (2011) of 100 schools showed that classroom ventilation levels are related Direct with student achievement. It was found that improving the air quality in the classroom led to the progress of student achievement

In Mathematics and Reading 9. Another study conducted in Austria (2013) found declines in school classrooms in cognitive performance of students with the increase in PM2.5 particulate matter concentrations (PM10, and CO2 concentrations)¹⁰

A study conducted in Spain (2015) that examined the effect of air pollution from transportation near 19 schools on student performance on cognitive abilities - concentration and memory, found that schools in areas with low levels of: fine particulate pollution, carbon particles and NO2 originating from vehicle emissions, performance The students were 13% higher than in schools with high levels of these pollutants.¹¹

These and other findings, along with the sensitivity of the school's student population, require measures to be taken that will ensure a high level of intra-structural air quality and thus lead to the maintenance of students' health and the prevention of academic harm.

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