AIR QUALITY IN SCHOOLS: EVERYBODY'S DUTY, CHILDREN'S RIGHT

ANNEX

MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

REGIONAL ENVIRONMENTAL CENTER

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CHAPTER 1

MAIN INDOOR POLLUTANTS AND ALLERGENS

a. Biological Agents

√ Mites
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Many of these biological pollutants are small enough to be inhaled. They are to be found in damp areas and in areas where food is available (e.g. Cooling coils, humidifiers, condensation trays, poorly ventilated bathrooms). They can also be found in spaces where dust gathers (e.g. Drapes, household laundry, rugs).

MITES

Mites have been identified as the leading indoor allergen. Mites, particularly Dermatophagoides Pteronyssinus (DPP) and Dermatophagoides Farinae (DPF), nest and spread in carpets, rugs, upholstered furniture and dust.

Sources. **The ideal environment for the growth and spread of dust mites is a temperature of between 15 and 30 degrees C combined with humidity of between 60% and 80%. These conditions tend to be present in mattresses and cushions, which is understandable given that the warmth of the human body on raising the temperature and humidity of these materials; besides this, there is also a significant build-up of the human dandruff and dead skin which provides food for mites.**

Effects on Health. **In sensitive subjects, they can cause rhino-conjunctivitis and bronchial asthma. The symptoms caused by these occur at all times of year.**

MOULD

Mould is a microorganism belonging to the vegetable kingdom. While growing, they produce tiny, spherical spores (similar to pollen), which are dispersed through the air during sporing periods (mainly in Summer and Autumn) and cause allergic symptoms. Mould is a micro-organism which belongs to the fungus kingdom rather than the animal or vegetable.

Sources. **Mould can grow both indoors and outdoors: indoors, they are to be found on damp walls and floors, wallpaper, on the leaves and in the soil of ornamental plants, within air-conditioning systems and humidifiers. The ideal temperature for its growth is between 18 and 32 degrees C with humidity of at least 60%. We should also bear in mind their possible presence in incorrectly stored food and wool, cotton or kapok clothing. Outdoors, they are to be found mainly in the soil and rotting vegetation: fruit, wood, leaves etc.**

Effects on Health. **While large spores (> 10 μm) lodge in the upper airways (nose and pharynx) causing symptoms such as hay fever,**

small spores (diameter < 10 µm, and particularly < 5 µm) can penetrate into the lower airways and the deeper sections of the respiratory system. These allergens are fungal proteins with dimensions of between 10,000 and 50,000 Dalton, and are found on the surface of fungal spores.

The continuous inhalation of spores or volatile fungal components present in the air in a confined space can cause: allergies (asthma and rhinitis, various types of hypersensitivity, extrinsic alveolite allergies (EAA) or Hypersensitive Pneumopathy (HP), comparable to farmer's lung disease).

ANIMAL ALLERGIES

By derivations of animal skin we generally mean highly allergenic proteins coming from skin, saliva, and above all, dandruff and dead skin from animals such as: dogs, cats and horses.

Sources. Animal allergens are particularly concentrated in dust, cushions, mattresses, covers and duvets. These particles can also be found in animals where there are no animals, having been carried in on the clothing of individuals who have been in contact with them.

Effects on Health. In allergic individuals, they can cause difficulty breathing with wheezy breathing and/or coughing, sneezing, discomfort in the eyes, eczema, allergic rhinitis and conjunctivitis.

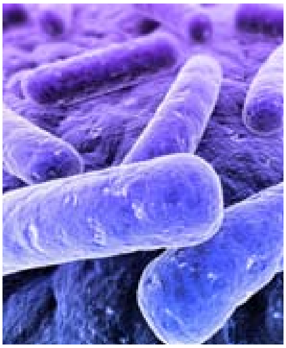
BACTERIA

Bacteria fall into two categories: gram-negative and gram-positive. The former produce endotoxins, which is an integral component of these bacteria; therefore, the levels of endotoxins in the environment is directly correlated to the presence of gram-negative bacteria.

This is an inflammatory substance which is associated with the pathologies typical of indoor pollution such as "sick building syndrome[1]" and "building related illnesses[2]". Meanwhile, gram-positive bacteria include various species such as Stafilococcus and Micrococcus, whose principal carrier is humans but is also found in very humid conditions such as those present in air conditioning units, de-humidifiers and

[1] A series of symptoms reported by the occupants of a building associated with spending time in the building. It manifests as unease, irritability and sensory discomfort.

[2] Pathologies with which there is a direct correlation with time spent within a building or with which, unlike "sick building syndrome", the specific eziological agent present within the confined environment is known.



damaged buildings. In many cases, the presence of these bacteria indicates the presence of humans and their concentrations are higher in highly populated buildings.

Sources. Bacteria are transmitted by people and animals, but are also present in spaces where temperature and humidity conditions encourage their growth.

Effects on Health. Effects on health vary according to the bacterium. Air can be a carrier for many bacteria such as a few species of Legionella Pneumophilla, Pseudomonas, Acinetobacter, Staphilococcus and Candida. These multiply and spread in air conditioning and sanitary water appliances, which gives the possibility of them causing other severe pathologies.

POLLEN

Pollen is an essential part of the life cycle of the most evolved vegetable organisms, which have developed the ability to produce seeds. Pollen is a male reproductive cell (gametophyte) which is spread by plants and is transported by insects, animals and by the wind in order to fertilise the female reproductive apparatus in another plant of the same species.

It is typically considered an outdoor allergen, but thanks to its ability to spread, be transported and remain suspended in the air for an extended period, it is also considered an indoor pollutant.

Sources. When pollen comes mainly from outdoor plants, indoor levels are generally lower than they are outdoors. Pollen can penetrate confined environments through doors, windows and other openings, or be deposited on clothes, shoes or domestic animals. Among the vegetable families related to pollen allergies, there are: the grass families (wheat, rye, barley, Bermuda grass, fern grass), whose flowering season runs from March to September; the oleaceous family (olive, ash), whose flowering season runs from April to July; the birch family (birch, alder), which pollinate between February and March; the willow family (willow, poplar), which flower from February to April; the plane family (plane tree), which flower from February to April; and the

beech family (beech, horse chestnut, oak, holm oak, forest oak), which flower from March to May. The nettle family (sticky weed), which are often the cause of allergic attacks between April and October; and the wormwood family (absinthium, marguerite, sunflower), which flower from August to October.

Effects on Health. The main health effect resulting from exposure to pollen is allergy. The characteristic symptoms are: rhinitis, conjunctivitis, DISPNEA and asthma.

MAIN INDOOR POLLUTANTS AND ALLERGENS

b. Chemicals

The principal indoor chemical pollutants are:

- √ Carbon dioxide (CO_2)
- √ Carbon monoxide (CO)
- √ Nitrogen dioxide (NO_2)
- √ Sulphur dioxide (SO_2)
- √ Volatile organic compounds (VOC)
- √ Formaldehyde
- √ Benzene
- √ Polycyclic Aromatic Hydrocarbons (PAH)
- √ Ozone (O_3)
- √ Fine particles (PM_{10} - $PM_{2.5}$)
- √ Environmental tobacco smoke
- √ Asbestos

CARBON DIOXIDE (CO_2)

Is a colourless, scentless gas which is produced by the combustion of carbon, in human metabolic processes and in all combustion of carbon-based fuels (eg. Motor vehicles).

Sources. **In school classrooms, the single largest source of CO_2 is air breathed out. In concentrations of over 1.5% (15,000 PPM), it causes reduced concentration.**

Effects on Health. **CO_2 has immediate and acute toxic effects on the respiratory system: for periods of exposure of up to 15 minutes and for atmospheric concentrations of up to 5%, CO_2 causes vasoconstriction and increased respiratory activity; in concentrations > 10%, it causes respiratory paralysis and fainting; in concentrations > 25% it causes immediate death.**

CARBON MONOXIDE (CO)

Produced by the incomplete oxidation of carbon in combustion processes. It is a colourless, scentless gas.

Sources. **Old or poorly maintained and managed combustion devices (e.g. boilers, ovens) or those with an insufficient, obstructed or switched off exhaust or discharge system; also vehicle exhausts from garages and/or streets and/or parking close to schools.**

Effects on Health. **Carbon monoxide's toxicity is due to its greater affinity for bonding with haemoglobin (COHb) than oxygen, and the consequent reduction of oxygen transported in the blood. Low concentrations of carbon monoxide in the air cause tiredness, and chest pain for those suffering heart complaints; medium concentrations cause coordination problems, headaches, nausea and dizziness. Exposure to high concentrations can be fatal.**

NITROGEN DIOXIDES (NO_2)

Nitrogen oxides are toxic gases, and NO_2 is also a highly corrosive reactive oxidant.

Sources. **The principal indoor sources are combustion processes (e.g. poorly functioning combustion appliances such as gas stoves, soldering and tobacco smoke). The principal outdoor sources are vehicles and other specific machinery for maintaining gardens and grounds.**

Effects on Health. Nitrogen dioxide is a gas which acts as an irritant to the mucous of the eyes, nose throat and airways. Exposure to high doses of NO_2 can cause pulmonary oedema and diffuse pulmonary lesions. Continued exposure to high levels of NO_2 can contribute to the development of acute or chronic bronchitis. Exposure to low levels of NO_2 can cause increased bronchial reactivity in some asthmatics, reduced pulmonary function in patients with chronic pulmonary obstructive diseases and increases the risk of respiratory infections, particularly in young children.

SULPHUR DIOXIDE (SO_2)

Sulphur dioxide (SO_2) is a colourless, water-soluble, irritant, non-flammable gas with a strong odour. It is derived from the oxidation of sulphur in the course of combustion processes of substances containing this element either as an impurity (in the case of fossil fuels) or as a core constituent. It tends to gather in lower areas as it is heavier than air.

Sources. The primary natural sources are volcanoes, which contribute to maintaining the environmental level, while man-made sources include the combustion of solid (carbon) or liquid (petrol) fuels used for domestic heating, to fuel vehicles or for industrial purposes (emissions from plastic production, desulphurisation of natural gases, pyrite furnaces and waste incineration). In indoor environments, as for other products of the combustion process, concentration depends on the presence of internal sources linked to the use of stoves, ovens, gas and kerosene heating appliances and tobacco smoke. Concentrations of SO_2 in confined environments are usually lower than those found in the air, both because SO_2 is absorbed into the surfaces of furnishings and hangings, and because it is neutralised by the ammonia present in indoor environments as a result of the presence of humans.

Effects on Health. At low concentrations, the damage associated with exposure to sulphur dioxide occurs mainly in the respiratory system (chronic bronchitis, asthma and tracheitis), the skin and mucous membranes. Brief exposure to high concentrations can cause tachypnea, tachycardia and irritation of the eyes, nose and throat.

VOLATILE ORGANIC COMPOUNDS (VOC)

The name Volatile Organic Compounds relates to a range of liquid and gas substances with boiling points which range from 50-100 °C to 240-260 °C. The term "volatile" indicates the capacity for these chemical substances to evaporate easily at room temperature.

Indoor Sources. **Produced by cleaning; paining and related products; pesticides, insecticides and disinfectants; glues and adhesives; produced by people and cosmetics; produced by cars; furniture and materials; construction materials; printers and photocopiers; tobacco smoke.**

Outdoor Sources. **Exposure to VOCs can cause acute responses which, depending on the concentrations concerned, can manifest as irritation to the eyes, nose and throat, as headaches, nausea, dizziness and asthma attacks. Exposure to high concentrations, on the other hand, can cause chronic conditions such as kidney or liver failure, damage to the central nervous system, and cancer.**

Among Volatile Organic Compounds, the most frequent source of trouble in indoor environments is:

FORMALDEHYDE

Which is a colourless gas with a characteristic strong odour which acts as an irritant to the eyes and respiratory pathways.

Principal Sources. **Wallpaper, chip-board, insulation, colorants, plastic materials, carpets, fabrics, detergents, conservatives, disinfectants and cigarette smoke.**

Effects on Health. **As formaldehyde is extremely soluble in water, it can easily cause irritation to the mucous membranes by coming into contact with them. It also affects the nose, throat, respiratory pathways, eyes and skin in this way. Exposure can also have consequences at the neurological level, manifesting as tiredness, anxiety, migraines, nausea, drowsiness and dizziness. Acute intoxication mostly occurs as a result of accidental ingestion. Exposure to high concentrations can quickly result in death. Chronic intoxication mostly occurs as a result of inhalation or physical contact. Formaldehyde is a carcinogenic compound.**

BENZENE

Benzene is an aromatic hydrocarbon present in products derived from coal and petrol. At room temperature it appears as a colourless liquid

which can evaporate very quickly into the surrounding air; as with all Volatile Organic Compounds (VOCs), it has a strong, sweet smell which most people are able to smell at concentrations of 1.5-4.7 PPM. It is a highly flammable substance, but its main threat is posed by the fact that it is known to be highly carcinogenic to humans.

Indoor Sources. Cigarette smoke, incomplete domestic combustion of coal or petrol and fumes released by products containing benzene such as glues, paint, furniture wax and detergents.

Outdoor Sources. Exhaust fumes from motor vehicles and industrial emissions from the combustion of natural fuels.

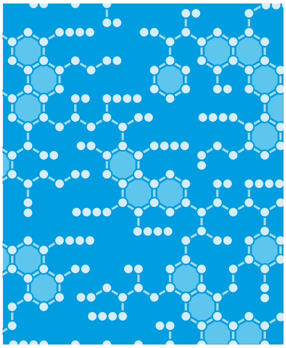
Effects on Health. Benzene exposure occurs primarily through inhalation, but can also occur through physical contact with the skin or ingestion.

Brief exposure to high concentrations (10,000-20,000 PPM) has acute toxic effects and can be fatal. Lower concentrations (700-3000 PPM) can cause dizziness, drowsiness, increased heart rate, tremors, confusion and losses of consciousness.

More prolonged exposure to lower concentrations can cause memory problems and altered mental status.

Repeated exposure to concentrations of only a few PPM over a decade or more can cause cancer.

POLYCYCLIC AROMATIC HYDROCARBONS (PAH)



Polycyclic Aromatic Hydrocarbons (PAH) are a broad range of (around 500) organic compounds comprised of two or more rings of condensed benzene. Due to their lower levels of volatility, they are not considered VOCs – with a few exceptions (naphthalene) – and are instead considered to be Semi Volatile Organic Compounds (SVOCs). PAHs consisting of three to five rings can be present in the atmosphere either as gases or as particles, while those characterised by five or more rings more often tend to appear as solids. They are identifiable by their low level of solubility in water, their high capacity to bond with organic materials and their high level of solubility in lipids and a number of organic solvents.

Sources. PAH sources are predominantly outdoor, being mainly derived from the combustion of fossil fuels and industrial processes. Other temporary sources are forest fires and campfires. Indoor sources occur in the form of wood burning fires, in chimneys and cigarette smoke. Other indoor sources are the fumes from foods cooked over flames, smoked foods etc.

Effects on Health. Toxic properties vary according to the spatial dispersal an number of the rings condensed. Benzopyrene (BP) is the most regularly investigated of these, and information on the toxicity and abundance of PAHs often refers to this compund. These substances have carcinogenic effects.

OZONE (O_3)

Ozone is a pale blue coloured, poisonous gas, which is unstable and has a strong odour. It is present in layers of the atmosphere (in the stratosphere, 15-60 km up), but also, in small quantities, in the air we breathe (the troposphere). The ozone layer provides protection from ultraviolet solar radiation; that present in the troposphere, however, contributes to air pollution and is poisonous to people and the environment. Ozone present in the lower atmosphere is produced by reactions, taking place in sunlight, involving nitrogen oxides and volatile organic substances which, for these reasons, are referred to as the "precursors" of tropospheric ozone in the presence of solar radiation. Ozone is therefore considered a worrying pollutant, above all in summer in Mediterranean Europe when the conditions favourable to its formation (strong insulation, scarce ventilation).

Sources. Indoor sources of ozone mainly consist of equipment functioning at high voltage or using ultra-violet rays such as photocopiers, laser printers or ultraviolet lights, but also include some types of air purifiers. In the absence of specific indoor sources and under normal ventilation conditions, the main source of indoor ozone is the entry of air from the outdoors.

Effects on Health. Exposure to ozone does not occur through ingestion or through absorption through the skin, since ozone's chemical reactivity is so high that its half-life as a solid or a liquid is negligible. Exposure among humans takes place through inhalation.

Absorption through the nose or mouth are the most common and accounts for around 30-40% of inhalation. 20% of inhaled ozone

is removed in the upper airways. As a powerful antioxidant, O_3 reacts with many cellular component and biological materials in low concentrations, and can cause a variety of reactions in different individuals. The most common symptoms of exposure are coughing, irritation of the throat, pain upon deep inhalation, pain behind the chest, headaches and nausea, while exposure can also cause bronchial hyperactivity.

Short term effects include: increased reactivity of the airways, inflammation of the airways, reduced respiratory function, aggravation of existing pathologies such as asthma, increased hospitalisations for respiratory problems and increased fatality rates. In low concentrations, exposure to ozone results in tiredness, headaches, reduced breathing capacity and, at higher concentrations, in coughing and irritation of the mucous membranes.

FINE PARTICLES ($PM_{2.5}$)

$PM_{2.5}$ is a component of diesel motor exhausts with dimensions of less than 2.5 microns in diameter. They can consist of a droplet of solid or liquid containing residues of various types.

Sources. **The main source is traffic, and in winter months the contribution of domestic heating installations should also be considered; cooking food, household detergents, housework and the presence of people also cause the re-suspension of course particles.**

Effects on Health. **$PM_{2.5}$ particles are associated with a range of serious health effects, including lung disease, asthma and other respiratory problems. Children are particularly susceptible to pollution by atmospheric particles. Fine particles pose the greatest health risk as they are able to pass through the nose and throat and become deposited in the lungs. This results in an irritant effect on the airways (asthma, chronic bronchitis, reduced pulmonary function, blockage of the alveoli etc.), heart problems and the possibility of suffering trouble with the immune system, encouraging the onset of chronic illnesses such as greater sensitivity to allergens.**

ENVIRONMENTAL TOBACCO SMOKE

Exposure to environmental tobacco smoke (or passive smoking) refers to the inhalation of smoke breathed out by other people, produced during the combustion of tobacco-based products. It consists of a component known as "mainstream", which refers to the smoke inhaled by the smoker, and a component known as "side stream", given off by the cigarette. Environmental tobacco smoke (ETS) is generated by the combustion of tobacco products. ETS consists of a side stream (SS) of smoke given off by the burning tobacco and the main stream of smoke exhaled by the smoker (MS). When a cigarette is smoked, approximately half of the smoke generated is in the form of SS, and the other half is MS. ETS, SS and MS contain a complex mixture of around 4000 substances. These include more than 40 known or suspected carcinogens such as 4-aminobiphenyl, 2-naphthylamine, benzene, nickel and a range of polycyclic aromatic hydrocarbons (PAHs) and nitrosamine. A number of irritants such as ammonia, nitrogen oxide, sulphur dioxide and several aldehydes are present, as well as cardiovascular intoxicants such as carbon monoxide, nicotine and some PAHs.

Sources. The only source of ETS is the combustion of tobacco-based products. The only method of exposure to ETS is inhalation.

Effects on Health. Active smoking is the main predictable cause of sickness and death, in Italy and throughout the western world. Passive smoking has been classified as a cause of cancer in non-smokers by the EPA (the US Environmental Protection Agency) and the IARC (the International Agency for Research on Cancer).

Non-carcinogenic Effects. There is a connection between ETS and chronic respiratory symptoms or chronic pulmonary obstructive illnesses, including asthma. Smoke is responsible for a considerable proportion of childhood respiratory pathologies from otitis to asthma and broncopulmonia.

Active smoking by pregnant women, or their exposure to passive smoke, causes a significant reduction in birth weight and is associated with sudden infant deaths (SIDS, Sudden Infant Death Syndrome). This is the sudden, unexpected and inexplicable death of newborn infants aged 1 to twelve months.

Cardiovascular Effects. ETS causes a reduced ability to transport oxygen causing a reduced tolerance for exercise and ischemia, an increase in platelet activation, endothelial damage, altered levels of lipoproteins and thickening of arterial walls, which can cause atherosclerosis and, where there is increased platelet activation, thromboses. Ischemia, atherosclerosis and thromboses increase the risk of myocardial infarction and other severe cardiovascular effects.

LEAD (PB)

Lead is a highly toxic metal.

Sources. Sources include drinking water, food, the soil, dust, air and lead-based paint.

Toxicity. Lead can cause severe damage to the brain, kidneys, nervous system and red blood cells. Children are particularly vulnerable to its effects. Exposure to lead in children can cause stunted physical development, lowering of intelligence quotients, reduced attention capacity and increased behavioural problems.

ASBESTOS

"Asbestos" is a generic term used to cover a group of silicates (materials containing silicon) in the form of fibres which are resistant to heat, humidity and chemical agents. Its principal materials can be divided into two groups depending on the structure of their crystals: amphibolic fibres (which are linear in shape and penetrate all the way in to the pulmonary alveoli); coiled fibres (structured in leaves or in layers and are more easily intercepted by the bronchi and bronchioles).

Main Sources. Asbestos was used widely in construction (sheets or panels, in pipes, cisterns and flues, covering metal structures and beams, plaster, attic insulation panels, flooring made from vinyl-asbestos), in industry (primary materials for many manufacturing processes and objects, thermal insulation for high temperature industrial processes, sound-dampening materials), in products for domestic use (hair-dryers, ovens and stoves, irons, oven gloves, ironing boards, fire-starting elements, casing for the protection of heating appliances, boiler doors, in fire-retardant blankets),

in transport (rail, ship and bus caulking, brakes, flame-retardant screens, brake-linings).

Effects on Health. Health effects arising from asbestos are linked to its fibrous nature: the fibrous particles released are extremely fine and, when inhaled, can reach the pulmonary alveoli; they can also remain suspended in the air for extended periods. Exposure to asbestos fibres is associated with illnesses affecting the respiratory system (asbestosis, pulmonary carcinoma) and the serum membranes, mainly of the pleura and peritoneum (mesothelioma). These symptoms manifest themselves after several years of exposure: 10-15 years in the case of asbestosis and 20-40 years in the case of pulmonary carcinoma and mesothelioma. According to IARC (International Agency for Research on Cancer) classification, asbestos is considered a carcinogen.

MAIN INDOOR POLLUTANTS AND ALLERGENS

c. Physical Agents

The physical agents responsible for poor indoor air quality are:

- √ Radon
- √ Electromagnetic fields
- √ Noise

RADON

Radon is a radioactive gas, belonging to the family known as noble or inert gases, has no colour, and is an extremely volatile product of decay of three progenitor NUCLIDI which provide three different radioactive families; these are Thorium 232, Uranium 235 and Uranium 238. It is colourless, odourless and tasteless. It is produced by the "nuclear decay" of radium which is a derivative of uranium.

Sources. Radon is an inert gas, and as such does not react chemically with its surrounding environment. Radon is continually developed by some of the rocks in the Earth's crust, particularly lava, tufa, pozzolana, some granites etc.

Effects on Health. Radon in a carcinogenic agent. The World Health Organisation (WHO), through the IARC, has classed radon in Group 1 since 1998. Its main health consequences are pulmonary tumours.

ELECTROMAGNETIC FIELDS

The term "electrosmog" was coined in 1980 and covers all types of electromagnetic fields and electromagnets that the public believes may have biological effects.

Sources:

Extremely Low Frequency (ELF) Fields (0 to 300 Hz): all of the devices used in the generation, distribution and use of electric energy such as computers and domestic appliances (usually 50 or 60 Hz);

Intermediate Frequency (IF) Fields (from > 300 Hz to 10 MHz): anti-burglary and security devices, induction radiators and video display units;

Radio Frequency and Micro Wave Fields (from > 10 MHz to 300 GNz): mobile telephones and telecommunications transmitters, radar and diatermiche units and medical uses, microwave ovens.

Effects on Health. The effects of low frequency electric or magnetic fields and high frequency electromagnetic fields are varied. High intensity and low frequency electric fields cause tingling and pins and needles in the skin, while high frequency effects penetrate into the body, stimulating muscle and nerve cells. According to their frequency, high frequency electromagnetic fields can penetrate the body to varying degrees. The absorption of radiation has a thermal effect.

NOISE

Noise is now considered a significant environmental problem, mostly due to its harmful effects on health.

Sources. The principal sources of environmental noise pollution are road traffic (motorways, city streets, lorries, motorbikes), rail traffic (railways, underground trains, trams), air traffic (civil and military) and industrial sources.

Effects on Health.

√ **Auditory Effects:** continued exposure to noise of 85-90 dB (A), particularly in industrial situations, can lead to progressive hearing loss, with an increase in the hearing threshold. The consequent reduction in hearing is a direct result of the effects of sound energy on the inner ear.

√ **Extra-Auditory Effects:** disruption of sleep and rest, interference with verbal conversations, psycho-physiological effects, mental health effects, on performance and learning, general disturbance and annoyance (annoyance: feeling of discontent in reference to noise which the individual knows or believes could have a possible negative effect on him. “Cosa e Vicoli 1998”).

CHAPTER 2

LIVING WITH ASTHMA: SOME SUGGESTIONS

a. School

b. Playing sport

a. SCHOOL

Inform teachers and non-teaching staff preventatively of the possible risks for an asthmatic child and of the potential seriousness of the attacks that the child could suffer, possibly through certification from your paediatrician stating current therapies and instructions to be carried out should the need arise along with foods and medicines that the child may be allergic to.

- √ **The child should always have their medicine with them,** both on normal days and on school trips.
- √ **The school canteen should be duly alerted** to any special dietary requirements, allowing them to avoid certain components during the preparation of meals.
- √ **Constant and thorough washing and cleaning of school areas are important,** particularly in the interests of preventing the spread of mould and mites.
- √ **The Physical Education teacher should support the child's participation in activities** (non-outdoor activities are best), while ensuring that he has with him and has preventatively taken any medicines that may be necessary, remaining vigilant for the potential emergence of symptoms during the lesson in order to be able to deal with them immediately.

b. PLAYING SPORT

Children **at pre-school age** participate in physical activity more spontaneously, particularly in the form of games.

At school age, this activity tends to become increasingly organised until it takes the form of competition and becoming competitive in some cases.

It is therefore essential to ensure that this physical exertion is facilitated as it contributes to the harmonious physical and psychological development of the child.

The role of the parent/teacher becomes particularly delicate when faced with children suffering from respiratory trouble, asthma in particular. In such cases, it is crucial to contact the child's paediatrician to find out the correct way of managing a problem which could seriously influence the child's physical activities.

Physical exercise, in fact, is often a cause of asthma attacks in asthmatic individuals, particularly in the case of children and adolescents, and presents as a condition which can impose limitations on their lifestyles.
Bronchial asthma, on the other hand, when correctly treated, does not present a major barrier to physical exercise. The child's paediatrician will know the correct therapies and action to take.

In every case, some general rules and precautions should be taken into consideration.

- √ Evaluate the chances of the child participating in physical activities with your paediatrician and, if so, which methods should be used (types of exercise, duration, precautions).
- √ The educator should be informed of the child's pathology, of the paediatrician's recommendations in relation to physical activity, to the necessary precautions and of the methods of intervention in the case of an attack.
- √ Avoid physical activity in environments where there is a strong allergenic threat, such as in gyms with mats or, for those allergic to pollen, in the country during plants' flowering periods.
- √ Avoid activities in highly polluted environments (among traffic in cities) and in poor climatic conditions: try to provide a warm, humid environment.
- √ Not all sports are the same: characteristics indicating that an activity may be more likely to provoke and asthma attack are:
  - √ *aerobic activity;*
  - √ *continued sub-optimum intensity;*
  - √ *durations of over 6-8 minutes.*

The most easily tolerated and therefore best sports are:

- √ ***Those which do not involve hyperventilation and breathing through the mouth without accompanying "nasal conditioning".***
- √ ***Sports requiring power and dexterity involving short bursts of activity with little increase in breathing rate.***
- √ ***The principal also holds that the child who presents with effort-induced asthma is a child with asthma that it not well controlled and whose family and doctor should therefore be informed of the condition in order to alter or integrate their therapeutic regime.***

Increased breathing rates (hyperventilation) also involves increased breathing through the mouth: particular attention should be paid to maintaining optimal nasal and sinus function.

- √ **Always warm up before exercise: a warm-up period (of at least 10 minutes) can help to avoid attacks of exercise induced asthma, even if it is not particularly intensive.**
- √ **Physical activity should end gradually.**
- √ **Train at sub-optimal levels in order to increase the maximum capacity for exercise, raise the anaerobic threshold and re-establish the levels of ventilation for a chosen exercise.**
- √ **Use the nose as a "limiter": breathing through the nose, intended to filter, heat and humidify air, is essential to the prevention of exercise-induced asthma.**
- √ **Suspend physical activity during periods of respiratory infection (for example colds, flue) and decide with the paediatrician when to start again.**
- √ **Pay attention to obesity, which is a negative factor. An overweight asthmatic child tires easily, even with a lower level of physical effort.**

CHAPTER 3

IMPROVE YOUR AIR QUALITY BY USING HOUSE PLANTS

USING "POLLUTION-EATING" PLANTS

Scientists at NASA researching the recycling of exhaust air and waste water asked themselves how the Earth manages to produce clean air and water: through the biological processes occurring within plants. Based on this basic understanding, experts began studying closed ecologies as a means of supporting vital functions. In doing so, they discovered that houseplants were able to purify and renew the air within unventilated rooms.

Houseplants can, therefore, become and integral and indispensible component of an ecologically sound building. The cultivation of plants indoors and outdoors can be the most effective way of improving individuals' physical and mental wellbeing. Not only do these plants have a decorative aspect, they also make the environment more comfortable and seem to have a calming effect; the presence of a few houseplants has been found to reduce indoor pollution.

In 1980, the John C. Stennis NASA space station discovered that houseplants had the ability to remove chemical substances from the atmosphere of unventilated experiment laboratories. A two year joint study was then funded by NASA and the Associated Landscape Contractors of America (ALCA) researching the effectiveness of common houseplants in removing formaldehyde, benzene and trichloroethylene from isolated environments. The studies were intended to research possible solutions for the elimination of these substances in the event of long stays on permanent space stations by humans.

Plants bring colour to the apartment, have a nice smell and also have beneficial effects on health. "Studies carried out on 50 of the main houseplants to test their ability to absorb pollutants present in enclosed environments demonstrated that some of them succeed in eliminating toxic substances such as formaldehyde, xylene or benzene, which are contained in building and furnishing materials. The most effective of these", continues Ibimet-Cnr's researcher, "are dragon trees, philodendrons, spatifilum and gerneras, which absorb more than 80% of indoor pollutants. Other active forms are aloe, cyclamens, begonias and poinsettias".

Later, in order to take these studies further, NASA created the "bio-house", a prototype of a hermetically sealed house built with synthetic materials which effectively caused symptoms of environmental intolerance (burning sensation in the eyes and throat accompanied by respiratory difficulties) in those who entered it. Researchers took samples of the air before and after introducing houseplants into this environment. Analyses carried out on air samples taken after different numbers of days showed an effective reduction in the levels of volatile, harmful substances. The people who entered the experimental house following plants' stay no longer experienced the same unpleasant symptoms. It was thus found that plants can be a very useful tool in the process of air purification in enclosed environments.

The extraordinary properties of these plants can be used advantageously in our homes as well, where there are many different sources of pollution contaminating the air in our houses: chipboard furniture, glues, stain removers etc.

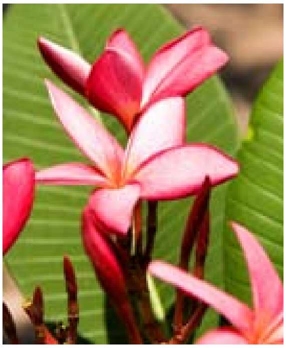
In the past, houseplants were only studied in terms of their attractiveness and therapeutic value from a psychological point of view; these days, their ability to improve the quality of the air we breathe is a matter of scientific fact.

Formaldehyde is the toxin most commonly present in the air within enclosed environments, and the ability to remove it has therefore been used as the reference standard used to assign values to the examples studied. The following table shows the formaldehyde removal rates of 50 plant species studied by Wolverton.

Plant	µg/h	Plant	µg/h
Boston Fern *(Nephrolepis exaltata)*	■■■■■■■■■■■■■■■■■■■■	**Aglaomena**	■■■■■■■
Chrysanthemum	■■■■■■■■■■■■■■■	**Spider plant** *(Chlorophytum)*	■■■■■■■
Gerbera	■■■■■■■■■■■■■■	**Dwarf Cavendish Banana** *(Musa cavendishii)*	■■■■■■■
Pygmy date palm *(Phoenix roebelenii)*	■■■■■■■■■■■■■■	**Philodendron “Emerald Queen”**	■■■■■■
Dracaena Janet Craig	■■■■■■■■■■■■■■	**Dieffenbachia Camilla**	■■■■■
Bamboo palm *(Chamaedorea seifritzii)*	■■■■■■■■■■■■■■	**Filodendro Elephant**	■■■■■
Fern Kimberly Queen *(Nephrolepis obliterata)*	■■■■■■■■■■■■■■	**Pothus Aureu**	■■■■■
Ficus	■■■■■■■■■■■■	**Norfolk Island Pine**	■■■■■
Ivy	■■■■■■■■■■■■	**Begonia**	■■■■■
Ficus benjamin	■■■■■■■■■■	**Maranta**	■■■■
Spathiphyllum	■■■■■■■■■■	**Cissus**	■■■■
Areca Palm	■■■■■■■■■■	**Epiphillum**	■■■■
Dracaena Massagena	■■■■■■■■■■	**Filodendrum selloum**	■■■■
Rhapis Excelsa	■■■■■■■■■	**Syngonium**	■■■■
Schefflera	■■■■■■■■■	**Green Pathos**	■■■■
Red-edge Dracaena *(Dracaena Marginata)*	■■■■■■■■	**Anthurium**	■■■■
Ribbon Plant Light *(Dracaena Warneckei)*	■■■■■■■■	**Peacock Plant** *(Catathea)*	■■■■
Liriope	■■■■■■■■	**Poinsettia** *(Euphorbia pulcherrima)*	■■■■
Dendrobium	■■■■■■■■	**Cyclamen**	■■■■
Dieffenbachia	■■■■■■■■	**Phalenopis**	■■■
Tulip	■■■■■■■	**Aechmea**	■■■
Ficus Alii	■■■■■■■	**Croton**	■■■
Hamalomena	■■■■■■■	**Sansevieria**	■■
Chamadorea	■■■■■■■	**Aloe vera** *(Aloe barbadensis Miller)*	■■
Azalea	■■■■■■	**Kalanchoe**	■■

Tests on xylene and toluene were jointly conducted because of their similar chemical properties.

Xilene e Toluene Removal Rate		Ammoniaca Removal Rate	
Plant	**µg/h**	**Plant**	**µg/h**
Areca Palm	■■■■■■■■■■■■■■■■■■■	**Rhapis Excelsa**	■■■■■■■■■■■■■■■■■■■
Pygmy date palm *(Phoenix roebelenii)*	■■■■■■■■■■■■■■■■■■	**Hamalomena**	■■■■■■■■■■■■■
Phalenopis	■■■■■■■■■■■■■■■■	**Liriope**	■■■■■■■■■■■
Dieffenbachia Camilla	■■■■■■■■■■	**Anthurium**	■■■■■■■■■■
Red-edge Dracaena *(Dracaena Marginata)*	■■■■■■■■■■	**Chrysanthemum**	■■■■■■■■■
Dendrobium	■■■■■■■■■■	**Peacock Plant** *(Catathea)*	■■■■■■■■
Dieffenbachia	■■■■■■■■■■	**Dendrobium**	■■■■■■■■
Philodendron “Emerald Queen”	■■■■■■■■■■	**Tulip**	■■■■■■■
Fern Kimberly Queen *(Nephrolepis obliterata)*	■■■■■■■■■■	**Chamadorea**	■■■■■■
Ribbon Plant Light *(Dracaena Warneckei)*	■■■■■■■■■	**Syngonium**	■■■■■
Anthurium	■■■■■■■■	**Ficus benjamin**	■■■■
Dracaena Massagena	■■■■■■■■	**Spathiphyllum**	■■■■
Ficus benjamin	■■■■■■■■	**Dracaena Massagena**	■■■
Spathiphyllum	■■■■■■■■	**Azalea**	■■■



Houseplants are capable of increasing the capacity for removing toxins from the atmosphere of enclosed environments after just 24 hours of exposure. Vegetable species play a key role in air purification, carrying toxins to the radical microbes in the rhizosphere, which destroy them. The environmental adaptability of microbes, and therefore their specialisation to this specific function, provides the explanation for plants' ability to combat atmospheric pollution effectively and also the way in which they are able to improve their performance over time.

Plants are also able not only to remove bio-waste (ethanol, acetone methanol, acetic ether) produced by humans in the course of the respiration process, but also to produce photochemical substances which suppress mould spores and environmental bacteria. Recent research shoes that rooms rich in plant life contain 50-60% less spores and bacteria than rooms without any plants; the plants actually produce harmful compounds in order to protect themselves from attacks by harmful micro-organisms carried by air currents.

Most ornamental plants belong to species originating in the topical rainforests. Their habitat is a warm, humid climate with little light, and their roots and surrounding soil provide a hospitable environment for colonies of microbes which are capable of decomposing the complex organic structures contained within dead leaves. Their foliage can absorb organic gases which are taken in and transported to the roots of the plant as food for the microbes. Another method through which the plant carries atmospheric pollutants to the colonies of microbes in the rhizosphere is transpiration. Transpiration creates convection currents which cause air movement; in this way, water is transferred to the roots and air is pushed towards the soil in the rhizosphere. In this way, the plant provides the microbes in its roots with nitrogen and oxygen, with the latter converting them into nitrate, which provides nutrition for the plant. From the introduction of plants into the individual respiration zone (an area of 0.17-0.23 cubic metres surrounding an individual) to achieving biotechnological progress such as containment and filtering systems, plants are contributing to man's battle for a clean, healthy atmosphere, particularly in the case

of enclosed environments. This research demonstrates that plants are effective in improving indoor air quality, making them no longer a luxury item but an essential factor for individuals' health; they are genuine, real live air purifiers.

Some houseplants are capable of metabolising the harmful substances which contribute to forming indoor air pollution. "Pollution-Eating Plants", as they are often called. The ideal solution would be to have a medium-large sized plant for each 9 square metres of surface area in a room.

The most useful species are: gerberas, chrysanthemums, chlorophytes, smoke-eating plants, sansevieria, philodendrons, pothoses, dracaena fragrans, and schefflera in particular is a great indicator of unhealthy air in that it provides immediate signs of damage in the presence of pollutants. Philodendrons, on the other hand, tolerates many different gases and is able to survive even in fairly unhealthy working environments.

Take care, however, not to place plants in bedrooms, as they need light in order to carry out photosynthesis and absorb oxygen in the dark.

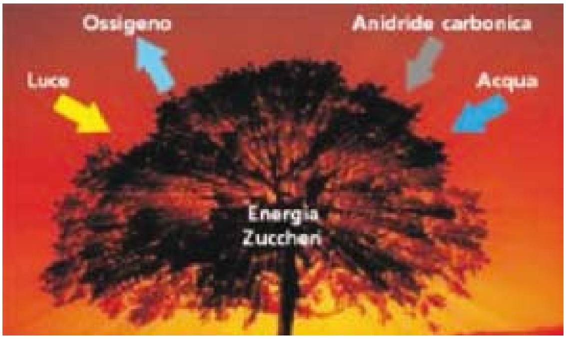
CHAPTER 4

IMPROVE YOUR AIR QUALITY BY USING SPECIAL PAINT: PHOTOCATALYTIC PAINTS

IMPROVE YOUR AIR QUALITY BY USING SPECIAL PAINT: PHOTOCATALYTIC PAINTS

Photocatalysis is the natural phenomenon by which a substance, called a photocatalyst, alters the speed of a chemical reaction in the presence of light (natural or provided by special lamps). In the presence of air and light, a strong oxidative process is activated which leads to the decomposition of organic and inorganic substances coming into contact with these surfaces.

The city of dreams.
Source:
www.infinitytio2.com/fotocatalisi.php



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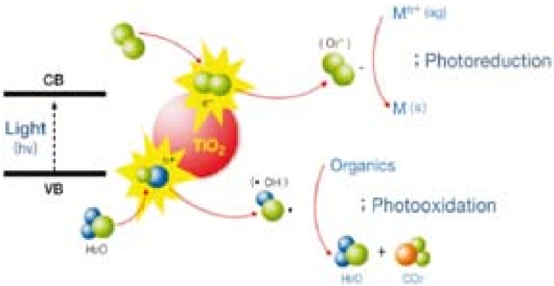
How it works. When we look into the detail, we discover that its function imitates a natural phenomenon: chlorophyll photosynthesis (which transforms substances which are harmful to humans into inert compounds). The chemical process which provides the basis for this is in fact oxidation occurring in the presence of light (solar or artificial) and air.

The two elements (light and air), upon contact with the covering of these surfaces, promotes the reaction and consequent decomposition of organic and inorganic substances (which can be assimilated to all fine dust - PM_{10}), microbes, nitrogen oxides, poly-condensed aromatics, benzene, sulphur dioxide, carbon monoxide, formaldehyde, acetaldehyde, methanol, ethanol, ethylbenzene, mexylene and nitrogen monoxide and dioxide. The toxic and pollutant substances are transformed, as shown in the diagram below, by photocatalysis into sodium nitrate ($NaNO_3$), sodium carbonate (Na_2CO_3) and limestone ($CaCO_3$), which are harmless and measurable in PPB (parts per billion). The result is a noticeable reduction in toxic pollutants produced by automobiles, factories, domestic heating and other sources.



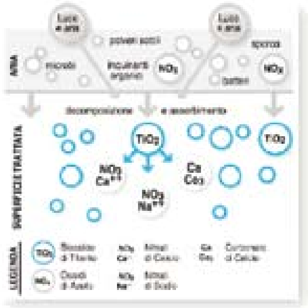
Source: www.infinitytio2.com/fotocatalisi.php

In other words, photocatalysis accelerates the oxidation processes which already exist in nature, aiding the more rapid decomposition of pollutants present in the atmosphere and preventing their accumulation.

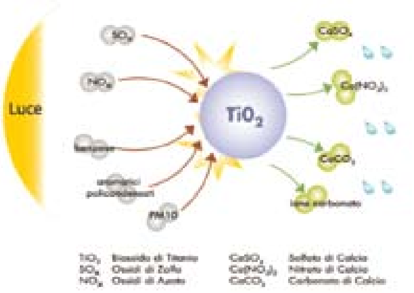
This process has been shown to be effective in dealing with nitrogen oxides, polycondensed aromatics, sulphur dioxide, fine particles,

carbon monoxide, formaldehyde, acetaldehyde, methanol, ethanol, benzene, ethylbenzene, toluene, xylene and organic and inorganic substances. It also works against microbes and bacteria. The photo-oxidation reaction transforms all of these substances into common inorganic salts (sodium nitrate - $NaNO_3$; sodium carbonate - $CaNO_3$; limestone ($CaCO_3$).

Photo-catalysts do not lose their properties over time, as they act solely as catalysts to the process without bonding with the pollutants, remaining available for further cycles of photocatalysis.
Just three minutes of sunlight can reduce environmental pollutants by 75%. Photocatalysts are effective for external pollution as well as indoors. In order for proper activation of the photocatalytic surfaces to occur, installation of an adequate source of lighting which gives out light in the wavelength between 380 and 400 nm (ultraviolet).



Transformation of pollutants by the photocatalytic process. Source: http://www.bettinelliluciano.it/materiali/pitturefotocatalitiche.htm



TiO_2 successfully attacks and decomposes pollutant organic compounds and gases. Source: http://www.rinnovabili.it/presidio-antismog-nelle-nostre-citta-500311

Titanium dioxide is one of the most used catalyst materials, as it has some very specific characteristics which make it very well suited to application on cement and mortar and can immediately be applied as a covering or decoration on walls as well as on previously available surfaces.

Eco-redecoration regarding light sources allows the use of this technique in enclosed environments as well, and is an instrument which can offer a significant contribution to solving the problem of

indoor atmospheric pollution in a simple, direct manner and without any special technological interventions.

REAL AND IMMEDIATE ADVANTAGES

The advantage of using photocatalysis shows its worth with three real qualities:

√ anti-pollution
√ anti-dirt
√ anti-bacteria

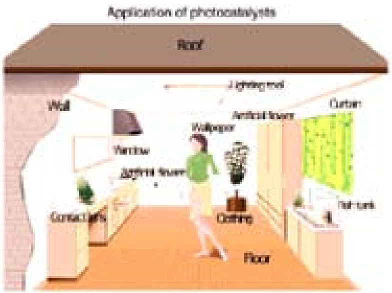
These properties, which we have already explained in practical terms, are the simple result of the oxidation of substances which come into contact with a photocatalytic surface. If these are pollutants (nitrogen dioxide, sulphur dioxide, carbon monoxide, ultra fine particles), we can talk about anti-pollution reactions, if these are dirty (soot, colorants), we can talk about anti-dirt reactions and if they are bacteria, mould, fungus and micro-organisms, we can talk about anti-bacterial reactions.

Photocatalysis provides an ideal opportunity for the development of practical applications which can be used in everyday situations. From the early days of Japanese applications of self-sealing masses as flooring, we have today arrived at a long list of products which use the concept of photocatalysis to improve the environment in which we live while still be compatible with the demands and style of the modern world. The list runs from photocatalytic glass coated with a transparent film of titanium dioxide which keeps the glass shiny without rings, and purifies the water on the inside of containers to materials which remove odours from the air and reduce the production of indoor pollution, as well as decomposing the dirt that forms on the lights themselves, allowing them to function to their maximum potential. From photocatalytic plants, obviously fake, but with added titanium dioxide to reduce indoor pollution to deodorant filters consisting of TiO_2 cards which are four times more effective than the conventional active carbon-based filters developed by K.G. Pack. From photochemical bedrooms to reduce bacteria to anti-spore and anti-fog film. There are also protective paints for car bodywork,

self-cleaning materials, photochemical tiles and ceramics and water treatments using photocatalytic filters and active surfaces.

As you can see from the above image, there is a range of products that could potentially be created for daily use and which could provide significant advantages in improving the air we breathe.

Source:
La Fotocatalisi al servizo dell'ambiente.
Global Engeniring and Trade



PHOTOCATALYTIC ECO-PAINTING

Hydropaints are the simplest and at the same time the most effective method of introducing photocatalysis into the environment of eco-active architecture, or architecture which uses products able to interact positively with the environment.

Today, potassium silicate-based and silicon-cleaning paints are available which are all washable whether on indoor or outdoor surfaces, in many colours, provided that they are light (in order to ensure maximum efficiency in photocatalysis, surfaces should be brightly coloured).

Their applications, like their physical characteristics, are the same as those of other commonly used paints, with only one difference, their increased elasticity and guaranteed breathability, along with their photocatalytic properties. As in the case of hydropaints, photocatalytic plasters possess all of the characteristics of traditional plasters, but with one added benefit. They are all able to reduce the amount of pollution present in the house, maintain their colour in the weather outdoors or inside a building, or even in a gallery, and generate anti-bacterial processes resulting in a significant reduction in odours and mould which can proliferate in these environments.

Today, various applications of these paints have already been carried out in coating train stations, the inside and outsides of residential complexes, offices, public areas such as restaurants or gyms and, not least, in hospitals.
We can therefore conclude by saying that the principal benefits that we would expect to obtain from the use of photocatalytic materials are:

1. air purification - they transform pollutants into harmless residues;
2. building aesthetics - they reduce the dirt left by pollution (reduction of nitrogen oxides and benzene; decomposition of fats, dust, rain, and other agents which cause buildings to become dirty);
3. deodorant effect - decomposition of organic toxic gases which can be smelled;
4. anti-microbe action - reduction of bacteria and fungi.

LONG LIFE

One interesting aspect is that photocatalysts do not lose their functional properties over time as they act only as activating agents for the process; by not bonding with the pollutants, they remain constantly ready for the next catalytic cycle.

THE MECHANISM FOR DEGRADATION OF POLLUTANTS BY ECO-COATING

The specific reactions involve radical hydroxyls (OH) and other reactive particles which consequently have fragmented molecular formations (type R) which can in turn be transformed into inert compounds.
The degradation of nitrogen dioxide forms nitrates, which are soluble in water, and eventually nitrites; the quantity of these is very small. The molecules of calcium nitrate, resulting from the photo-oxidation reaction, remain on the eco-coating as inert substances.

Formaldehyde is decomposed into carbon monoxide and carbon dioxide. The eventual oxidation of formaldehyde leads to the formation of carbon dioxide and traces of formic acid, which would be absorbed by the alkaline substrate of the eco-coating.

Sulphur Dioxide is oxidated into sulphuric acid and is then absorbed by the alkaline substrate of the eco-coating. The result is the formation of calcium sulphate, which is slightly soluble in water. Calcium sulphate (chalk) does not represent a problem for the environment.

The oxidation of carbon monoxide leads to the formation of carbon dioxide, an inert substance. CO can also be oxidated by radical hydroxyls, forming radical hydrogen (H), which quickly reacts with oxygen to form radical hydrogen peroxide ($H+O_2 = H_20$); this radical possesses livelier anti-oxidant properties than OH; in this way, carbon monoxide can increase the oxidant properties of the eco-covering.

With regard to ozone, eco-coverings can influence its formation and its decomposition. As far as its formation is concerned, this is a very remote possibility. Ozone is derived from the photolysis of nitrogen dioxide, whose molecules react quickly with the radical OH present on the surface of the eco-covering, whose speed of formation is lower than or equal to that present in the atmosphere. It is more likely that the eco-covering will contribute to the decomposition of ozone on its surface. The availability of electrical loads and free radicals provokes reactions that can lead to the decomposition of ozone and the probable formation of oxygen.

The decomposition of benzene on photocatalytic surfaces takes place very slowly. The oxidated molecules can become transformed into simpler compounds such as aldehyde or bivalent acids which do not pose any threat to the environment. Benzene can also bond with radical OH and transform into phenyl, a water-soluble substance which is of little environmental interest in small concentrations.
The reaction of fine particles won the eco-coating has not yet been recorded. Particles, attracted to the surface by the presence of free loads, could react with free radicals or molecules of oxygen and water, decomposing into oxygenated, water-soluble organic substances. Their inorganic components should remain unchanged.

CHAPTER 5

PREVENTION AND MANAGEMENT OF INDOOR ENVIRONMENT IN SCHOOL: KEY LEGISLATIVE MEASURES IN ITALY

PREVENTION AND MANAGEMENT OF INDOOR ENVIRONMENT IN SCHOOL: KEY LEGISLATIVE MEASURES IN ITALY

Italy does not currently have a specific set of regulations governing air quality and health assistance in schools, although things have started to change over the last seven years.

As far as homes are concerned Local Goverments can set specific standards under "Hygiene and Health Regulations", according to the instructions being issued by the Ministry for Health.

With regard to the healthiness of air within working environments, the measures indicated under Leg.D. 81/08 "Enactment of article 1 of the Law of 3rd August 2007, n. 123, relating to health and safety in the workplace", which identifies employers as those responsible for safety. School buildings are considered "working environments" and, as such, "the employers" are the school heads, as named by the Ministry for Education's Decree of 21st June 1996, n. 292, and are therefore responsible for health and safety issues falling under the heading of "management".

Local Authorities (Town and Regional), are in charge of providing spaces to be used as schools and are also responsible for their ordinary and extraordinary maintenance, under the heading of "making sound" of buildings, regulated by the Law of 11th January 1996, n. 23.

This division of responsibilities and duties can, as you might imagine, generate problems in relation to possible interventions between school heads, the "management", the "making sound" and the bringing up to standards of the schools assigned to them.

The situation emerged even more clearly in the report by the Ministry for Education, Universities and Research which, with Circular n. 85 of 8th May 2001 "Monitoring of Safety in Schools", February 2002, published the results of this monitoring (carried out through issuing questionnaires to School Heads), in the booklet entitled "the culture of safety in schools, focusing on the application of Law 626/94".
The survey, to which 98% of the independent education institutes significantly replied to in every form (10,800 Schools housed in 41,000 buildings, attended daily by around 8,000,000 Pupils/Students and 1,000,000 workers), provided evidence that the unfortunate school buildings of Italy are not in good health (I can report on the information from their certificates of fitness for habitation, stability, hygiene etc.), a situation which still persists today as evidenced by the results of investigations carried out in recent years by civic organisations looking after the interests of citizens and according to the recent reports testifying that in many schools the environmental and hygienic conditions are decidedly not ideal and are often accompanied by severe structural problems.

With the aim of indicating the instruments to be used in order to reduce the concentration of indoor pollutants and therefore reduce their harmful effects, in 1998, with MD 08/04/1998, the Ministry of Health instituted a technical and scientific Commission which produced the "Guidelines for the protection and promotion of health in enclosed spaces", published in the G.U. of 27th November 2001, n. 252; within this Commission, an "Allergies" Working Group set out criteria for monitoring the quality of indoor air in terms of allergy risks in domestic and public environments and produced a proposal for a specific programme for schools.

To underline the Health Plan 2006-2008, in line with the European "SCALE" strategy (Science Children Awareness Legislation Evaluation) on health and the environment, which set out a roadmap for preventing chronic illnesses, paying particular attention to children, as they are more vulnerable than adults to exposure to environmental factors.
The plan proposes interventions to improve the quality of air in

enclosed environments as a priority, particularly in schools, where children spend 4 to 8 hours a day for at least 10 years.
With the goal of encouraging the enactment of the Health Plan 2006-2008, the Ministry for Health produced an update in 2008 of the "lines to address in order to achieve a programme for the prevention of indoor allergy and asthma risk factors in schools", currently under scrutiny by the Regional-State Conference.
Should this document be well received at regional regulation levels, it would be an ideal contribution to the planning, financing and implementation of lines of action intended to provide healthy air quality and the regulation of the body of Italian schools.
As far as health assistance in schools is concerned, there are still few measures foreseen at the national level. In each case, the number of children affected by allergies is rather higher, which should require the provision of adequate health assistance within school buildings and would obviously need to be capable of facing other "unexpected health issues".

In fact, the only environmental prevention is not sufficient to ensure the protection of individuals affected by allergic and respiratory conditions and, in particular, the need to provide medication during school hours presents a difficult problem in Italy as there is no law which accounts for the presence of staff able to administer medications during school hours; these activities are permitted only to professionally qualified staff, as happens in other European countries and the United States.
The Legislative Decree of 9th April 2008, n. 81 (ex Leg.D. 626/94) "Enactment of article 1 of the Law of 3rd August 2007, n. 123, in relation to the protection of health and safety in the workplace", published in Gazzetta Ufficiale n. 101 of 30th April 2008 - Ordinary Supplement n. 108, which defines the criteria for the protection of health and safety in the workplace, as well as help with resolving this problem.
Our legislation, by equating Schools with Businesses (workplaces), is governed by the measures provided under Leg.D 81/08 (already Leg.D. 626/94) indicated above, whose application and regulation by the Decree Leg.D 388/2003 "regulations providing measures for first

aid in the workplace, in enactment of art. 15 para 3 of Leg.D. 626/94", published in Gazzetta Ufficiale n. 27 of 3rd February 2004 and does not foresee, between the duties and responsibilities of first aid staff, the possibility that this can provide for the provision of medications. The decree foresees:

- **first aid to act while awaiting the arrival of emergency units (118);**
- **minimum characteristics for first aid equipment;**
- **requirements for qualified staff and their training.**

These regulations classify companies in three groups, taking into account the type of activities in which they are engaged, the number of employees and associated risk factors:

- **Group A: Companies with associated risks (for example electro-thermal centres), companies with more than 5 employees attached to them under government workplace insurance with an injury rate permanently above four or a production unit with more than 5 employees working unspecified hours in agriculture;**
- **Group B: Companies with three of more workers which do not fit into Group A;**
- **Group C: Companies with less than three workers which do not fit into Group A.**

From 3rd August 2004, when this law came into force, in companies or production units in group A or B, the employer should ensure that there is a first aid box containing the minimum requirements (indicated in annex 1 of the decree). The organisation of first aid and the training of staff in its use varies according to which category they belong to. First aiders should be trained with theoretical and practical instruction in using first aid measures and activating first aid interventions.

Schools are classed with Group B companies, due to the government workplace injury rate associated with them and, as such, should guarantee the provision of: first aid boxes, a means of communication fit for rapidly activating the SSN emergency system, nominated first aiders who should be adequately trained.

These regulations provide the following minimum criteria for training:

- **Course of 3 four-hour modules = 12 hours total (8 hours of theory, 4 hours of practice)**
- **4 hour practice module to be repeated every 3 years**
- **Training carried out prior to regulations coming into force is still valid**
- **Those who trained before February 2002 should be scheduled for at least the 4 hour module (practice)**

In fact, with the SSN being responsible for health assistance, the school's duty should the need arise is only to put into action the first aid measures learned in the above training courses for companies in class B, without administering any medicine, and to make the 118 call to the emergency services.

gruppo rem