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Effects of Gaseous Ions on the Environment and Human Performance

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Abstract: All air-borne particles on which electrical forces exercise an essentially greater effect than the forces of weight and inertia are called air ions. Negative air ions exert a beneficial effect on animals and man. The most dangerous levels of harmful positive ions occur in the polluted, large industrial and heavily populated cities. Exhaust fumes from cars, trucks and buses, factory smoke, cigarette smoke, dust and soot, electromagnetic pollution and overall atmospheric pollution caused by air and sea crafts; all combine to create a mixture of harmful positive ions and reduces the production of beneficial negative ions in our surroundings. This gradually affects our lungs, can ruin our health and cause general lethargy and depression. All these modify the physics and chemistry of the human body. These environmental aspects will be adequately illuminated in this study.

Key words: Particles, force, pollution, ion, environment, depression, physics, chemistry, depression, soot, atmosphere

INTRODUCTION

Electrical charges of the atmosphere are called ions (Goldstein and Arshavskaya, 1997). They are atoms and molecules that have gained or lost an electron. Those that have lost an electron are called positive ions, while those that have gained an electron are negative ions. In nature, we tend to find between a few hundred to a few thousand of these ions per cubic centimeter. An air ion begins to exist when sufficiently high energy acts on a gaseous molecule (or atom) to eject an electron. The source of this energy is mostly the radioactivity of the Earth's crust and the cosmic radiation. However, the shearing forces of water droplets in waterfalls (also known as Lenard effect) or the friction developed by rapidly moving of great volumes of air over a land can also be actual sources of ionizing energy. The displaced electron attaches itself to an adjacent molecule, which becomes a negative ion, the original molecule then becoming a positive ion.

In normal pollutant-free air over land, there are 1,500 to 4,000 ions per cm³ (Krueger, 1972; Ryhshi *et al.*, 1998). The normal ratio of positive to negative ions in normal pollutant-free air over land is 1:2 (Livanova *et al.*, 1999).

HAZARDOUS AND BENEFICIAL EFFECTS OF AIR IONS

Air ions are physiologically active and can produce functional alterations varying from barely discernible to considerable. They are capable of evoking a wide range of responses in both plants and animals. Sometimes, both positive and negative ions induce essentially the same reactions; in other cases they elicit the opposite effect. We are constantly bombarded both with negative and positive ions. These invisible charged particles affect our physical and mental well being.

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Virtually all particles in the air have a positive charge, while negative ions have a negative charge. In which case, negative ions and particles magnetically attract to one another. When there is a high enough concentration of negative ions in the air, they will be attracted to floating particles in large numbers. This causes the particles to become too heavy to remain airborne. As a result, the particle will fall out of the air, preventing it from being inhaled into the respiratory tract where it can trigger breathing and health problems.

Air ions can bombard the skin surface and produce electrical currents, which not only exert a direct effect on nerve receptors but by penetrating the inner layers of the skin produce functional changes in some organs. It is interesting to note that where there are a number of people, that is, in an enclosed space, the number of negative small ions gets used up quickly resulting in a predominance of positive ions. The concentration of positive ions tends to make people feel uncomfortable. The introduction of negative ions improves substantially the environment wherein a group of people is congested.

In cities, the heavy traffic and the emanations from the chimneys, the scarcity of proper vegetation all result in heavy pollution of the air that reduces the number of small ions and creates a predominance of the positive ones which are detrimental to health. In poorly ventilated living quarters, offices and factories, aero-ionization is subject to similar modifications. In such places, moderate amount of artificially generated aeroions with preponderance of the negative polarity, restore comfort and the feeling of well being contributing to the fast elimination of the somatic and mental after effects of tiresome physical work.

Ionization or negative ion generation is often referred to as the thunderstorm effect. It is observed that prior to a thunderstorm, animals and even many humans feel nervous, jittery and irritable. However, after the storm there seems to be a feeling of calm. Both animals and humans experience this phenomenon. This is due to the amount of negative ions in the air around us. Prior to a thunderstorm, there is a very high concentration of positive ions in the air. These tend to be pollutants such as dust, bacteria, pollen, chemicals etc. The storm releases electrical discharges consisting of high concentration of negative ions. Negative ions destroy many of these air pollutants and, therefore, give us a sense of well being.

In nature, negative ions are generated by processes such as sunlight, lightening, waves from the ocean and from waterfalls. They increase the flow of oxygen to the brain; resulting in higher alertness, decreased drowsiness and more mental energy. They also may protect against germs in the air, resulting in decreased irritation due to inhaling various particles that make us sneeze, cough or have a throat irritation. They are odourless, tasteless and invisible molecules that we inhale in abundance in certain environments; mountains, waterfalls and beaches. Once they reach our bloodstream, negative ions are believed to produce biochemical reactions that increase levels of the mood chemical serotonin (a powerful neurohormone), helping to alleviate depression, relieve stress and boost air daytime energy. High proportion of negative ions makes us feel lively, uplifted and enthusiastic.

Beyond reducing the number of active harmful bacterial in the air, negative air ions have a general stimulating effect also on plant growth like rainwater which is an abundant source of negative ions. In a similar way, by its re-ionization effect, a shower also has a tonic effect on the body.

Kornbluh *et al.* (1958) found that negative ions, but not positive air ions, afforded relief from hay fever and that burn victims reported cessation of pains and early formation of eschars after exposure to negative air ions. The study also showed that negative ionizers help people to sleep better, by preventing the production of the chemical serotonin in the brain and that people exposed to negative ion treatment perform much better in mentally oriented activities than those who are not.

The negatively charged small ions are the most beneficial ones to all forms of life. For an indoor environment, the artificial production of negative air ions has been found to be an effective means of counter-acting the effects of excessive positive air ions. Negative air ions are destroyed by pollution and dust, which explains the low negative ion count in urban environments.

All air pollutants; nuclear, industrial and domestic, result in increasing the accumulation of positive charges in the surrounding atmosphere. The air in open country areas is predominantly positive due to probably wind-carried pollutants originating from distant industrial zones. At home, the screen of a television gives off electric emissions that generate positive charges in the air and on the surface of all items within its close vicinity. A negative ion generator, however, can neutralize positive emissions as they are produced.

Hot or cool air forced through the duct work of most central heating and air conditioning systems set up friction that results in the loss of almost all the negative ions and also draws most of the positive ions out of the air as well. This air with some positive and virtually no negative ions is forced out through vents into rooms, offices and passages. As it passes through the vents more friction is set up that generates an additional overload of positive ions. What finally comes out of most heating or air-conditioning outlets in the offices we work in and the rooms we live in is likely to be an overload of positive ions which will upset the mental and physical equilibrium of man, since too many positive ions will have you feeling depressed, lethargic and full of aches, pains and complaints.

If the positive ions naturally occur in high concentration, for instance, during the onset of a hot and dry desert wind, it can cause depression, nausea, insomnia, irritability, lassitude, migraine, asthma attacks and also disturb the normal function of the thyroid glands (Gualtierotti *et al.*, 1968). In this way, the body may become exhausted and this state can lead to an increase in accidents and violent crime. The disturbances mentioned above can be counteracted with the beneficial effects of negative ions (Livanova *et al.*, 1999).

CONCLUSION

Environmental air ion concentration levels and balance can affect a wide range of biological organisms, including humans. Elevated negative air ion levels are believed to have beneficial effects on humans including enhanced feeling of relaxation, reduced tiredness, stress levels, irritability depression and tenseness.

Enhanced positive ion levels are also reported to have deleterious effect. Abundance of positive ions which is otherwise known as ion poisoning produces an overdose of stress-response neurohormone, serotonin, in human and animal systems.

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