

Current Comments

Do Air Ions Affect Our Lives and Health?

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A few months ago I paid \$69.95 for an ionizer. This particular model is a truncated cylinder seven inches high and three inches in diameter. A small piece of metal fuzz sits atop the cylinder. The ionizer creates negative ions, charged particles in the air which are alleged to provide two major benefits. The distributor's advertisement claims the ions will remove dust and bacteria from the air. It also asserts that negative ions will create a feeling of mental well-being.¹

Shortly after switching on the ionizer, I left Philadelphia for a few days. When I returned, I found that the ionizer had indeed removed some dust from the air. Unfortunately, the dust was deposited on my bedroom wall in a semi-circular pattern. Apparently the ionizer creates static electricity and this causes the charged particles of dust to stick to the wall. I moved the ionizer to the center of the room only to find a ring of dirt on the carpet. Also, I could not observe a change in my mental state.

I tried this uncontrolled experiment on myself at the behest of a friend and because I am curious

about the belief that ions in the air can affect human health and emotions. This theory has received a good deal of attention in newspapers and magazines.²⁻⁷

Air ions are formed when free electrons become attached to nitrogen, carbon dioxide, oxygen, and other molecules in the air. The energy that produces air ions comes from soil radioactivity, the sun, cosmic rays, lightning, wind, and waterfalls. There are about five positive ions for every four negative.⁸ (p. 22) There are normally more positive ions than negative ions because the earth itself carries a negative charge. It repels the negative ions and attracts the positive ones.

Ions are easily destroyed by air pollution, air conditioning and heating systems, and static electricity from synthetic fabrics. In natural conditions, only a few thousand molecules per cubic centimeter are ionized. The same cubic centimeter contains about 10 million trillion uncharged particles. Fresh mountain air contains about 4,000 ions per cubic centimeter, but a typical office at the end of a working day may have as few as 60,

according to Albert P. Krueger, biometeorologist and professor emeritus at the University of California at Berkeley.⁹

The research that has been done up to now suggests that a "natural" ion balance or an excess of negative ions is beneficial to humans, and that air with too many positive ions, or no ions at all, is harmful.^{8,9}

Interest in the biological effects of air ions is not new. As early as 1780, Abbe Bertholon of France reported changes in patients' health induced by the electrical state of the air. Long before that time, however, psychological effects were attributed to the hot, dry winds that blow during certain seasons in certain parts of the world. In the fifth century BC, Hippocrates said many people seemed sensitive to changes in the weather. He observed in particular that "northern winds occasion disorder and sickness." Other winds, such as the *sharav* of Israel, the *foehn* of Germany, the *mistral* of France, and the Santa Ana of California, have been blamed for causing difficulties in breathing, headaches, nervousness, depression, listlessness, diminished sex drive, stomach problems, and other maladies.

P. Czermak suggested in 1901 that air ions might cause these effects.⁹ Thirty years passed before scientists began to follow up Czermak's suggestion that air ions influence human biology. According to Albert P. Krueger, Russian scientist A. L. Tchijewsky and colleagues reported in 1933 that high negative air ion concentration in-

hibits the growth of some common bacteria. Their studies remained little known in the US and Europe for about 20 years because of the language barrier.

But since then these findings have received wide support.^{5,8} Krueger says that micro-organisms seem to be the only form of life harmed by high negative ion concentrations. Nobody knows why.⁹

Krueger began his own air ion research 22 years ago by examining the effects of ionization on barley, oat, lettuce, and pea plants. He reported that plants grew faster in pure air filled with ions of either charge.¹⁰

Krueger and associates reported that silkworms, too, respond favorably to ions of either charge. Silkworm eggs and larvae grew larger and faster in ionized air.¹¹ Krueger says ions appear to accelerate the production of the growth and moulting hormone and increase the production of cytochromes and other iron-containing enzymes.

To test the effects of air ions on higher animals, Krueger placed several hundred mice in three different environments for a few days. The mice were exposed to air with a high positive ion concentration, air with a high negative ion level, and "normal" air. Krueger then infected the mice with pathogenic fungi, bacteria, or an influenza virus. He reported that 35% of the mice that had been exposed to "normal" air and 59% of the mice that had been put in the positive-ionized air died of infection. But only 19% of the mice that had been placed in the

negative ion environment died. Krueger attributed these results to the action of ions on the mice's tracheas. Negative ions improve the trachea's filtering function and positive ions impair it, he concluded.⁹

Ions also appear to influence levels of a neurohormone called serotonin. Serotonin, discovered in 1950, is found in the brain, blood, and intestinal and connective tissues. It occurs in the venom of wasps and toads. The hormone, which is a potent constrictor of blood vessels, may contribute to the pain of burns. Furthermore, it plays a role in the transmission of chemical signals in the brain. Serotonin thus may exercise an influence on human and animal moods.

Experiments performed by Krueger and co-workers show that air ions affect blood levels of serotonin. Positive ions seem to raise the levels and negative ions seem to lower them. Krueger injected serotonin into rats and found that the effects paralleled those of an "overdose" of positive ions.¹² In 1973, Jean-Michel Olivereau of Pierre and Marie Curie University in Paris showed that ions change blood serotonin levels in rats which in turn affects their psychomotor performance, adaptation to stress, and eating habits. Olivereau also found that negative ions appear to calm rats placed in stressful situations.¹³

The most intriguing line of air ion research concerns the effects of ionization on people. By 1963, N.

Robinson and F. S. Dirnfeld of the Israel Institute of Technology had reported that the *sharav* of Israel indeed brought a large dose of positive ions with it, as Czermak predicted in 1901. They said that the wind-related symptoms began to show themselves at about the time the ion balance changed.¹⁴

Felix Gad Sulman of Hebrew University's Hadassah Medical Center measured the effects of the *sharav* on people who complained of ill effects. He found that a large percentage of them had elevated blood serotonin levels. He also reported that he softened the *sharav* effects with negative ions and drugs, like the tranquilizer reserpine. Sulman estimates that 20 to 30% of the population is "weather sensitive;" that is, most likely to feel the effects of the *sharav*.^{15,16}

The possible role of serotonin in burns raises the possibility of using ions to treat them. Before his death in 1973, Igho Kornblueh and associates of the University of Pennsylvania published results of experiments in which they used negative ions to treat burns. They reported that most patients, whose burns ranged from severe to mild, felt less pain within 10 to 15 minutes after "aeroionotherapy" began. Few patients needed painkillers, Kornblueh said. He attributed the improvement to reduced blood serotonin levels.¹⁷ (Kornblueh also reported that ionization altered human electroencephalograms.¹⁸)

Some of the most recent work on the effect on humans of air ions concerns their effects on psycho-

motor performance. L. H. Hawkins and T. Barker of the University of Surrey in England put 45 people in positive-ionized, negative-ionized, or "normal" atmospheres. The subjects weren't told what kind of air they were breathing, and they didn't know what the experiments were for. Hawkins and Barker measured their reaction times to light and sound stimuli. They also had the subjects perform some simple tasks to test their manual abilities. Hawkins and Barker reported that subjects performed best in the presence of negative ions. But their performances in the positive-ionized air were the same as those in normal air.¹⁹ Other researchers have suggested that air ions influence human psychomotor performance.²⁰

One criticism of the ion hypothesis is that the biological effects observed may really be caused by the electrical field generated by the ionizer. This in itself would be a remarkable discovery. Some researchers have suggested that such effects do occur.²¹⁻²⁶

Krueger and his associates recently tried to separate the effects of ions from the possible effects of electrical fields. They grew barley in three different environments. The first had an electrical field, but no air ions. The second had a negative ion imbalance and an electrical field of the same strength as the one in the first environment. The control environment had no ions and no field. The researchers reported that only the seedlings in the en-

vironment with both ions and field showed improved growth. This, they say, suggests that ion effects are not connected to other possible electrical effects.²⁷

Despite the evidence gathered so far, many scientists remain skeptical about the biological effects of ionization, especially on humans. Krueger lists three major reasons for this. First, he says, some experiments were poorly designed and controlled.⁹

Second, many people have trouble believing that so few ions in the air can significantly influence biology. But Krueger points to precedents in nature for the observable effects of very small stimuli. He provides two interesting examples: 1) Male silkworms react to fewer than 200 molecules of female silkworm sex attractant per cubic centimeter.²⁸ 2) When a single quantum of the proper frequency reaches the human retina, a person can perceive a flash of light.²⁹

The third and perhaps most important reason people are skeptical is that the ionizer merchants of the 1950s gave ionization a bad name. Unscrupulous salesmen claimed their machines would cure any ailment you cared to name, up to and including heart disease and cancer. Some machines produced ozone, a gas dangerous to humans.^{2,7,8,9}

The American ionizer market was badly damaged when the US Food and Drug Administration set standards for ozone emission and forbade advertisers to make medical claims. Ionizer advertisers are

now permitted to say only that the devices clean the air.^{7,8} Since the 1950s, ionization's bad reputation has cast a cloud over the research of serious scientists.

Scientific research on the biological effects of air ions seems to be recovering. Though the area remains controversial, Krueger and co-author Eddie James Reed published a review article on the subject in *Science*.³⁰ Many questions remain unanswered, however. Among them: Why do some people seem to be highly sensitive to ions? To what extent, if any, do ions affect people who are not "sharav-sensitive"? Do the effects of ionization depend on the positive-negative ratio as well as the dosage? Do ions affect body chemicals other than serotonin?

Two scientific groups have been formed to promote studies of the interaction between the atmosphere and biology. One group is interested in the effects of weather, pollution, and other factors, including air ions, on all biological processes. The International Society for Biometeorology, Hofbroucken 54, Oegstgeest (Leiden), The Netherlands, was formed in 1956. It publishes the quarterly *International Journal of Biometeorology*, in which a good deal of air ion research has appeared. The journal is covered in *Current Contents*[®] /Agriculture, Biology & Environmental Sciences and the *Science Citation Index*[®].

The American Institute of Medical Climatology, 1023 Welsh Road,

Philadelphia, PA 19115, was founded in 1958. It was formed to study the effects of climate and weather on humans. The group acts as an advisor on questions pertaining to ionization and related topics. In 1961 it sponsored an International Conference on Ionization of the Air, which was held at the Franklin Institute in Philadelphia.³¹

The American ionizer industry seems to be recovering from the debacle of the 1950s, too. Several people in the ionizer business estimate that there are about 20 manufacturers and retailers in the US today. There are also ionizer manufacturers and retailers in Switzerland, Israel, England, Hungary, and the Federal Republic of Germany. One Los Angeles ionizer manufacturer estimates that last year 50,000 to 75,000 ionizers were sold in the US. Prices range from \$70, for desk or automobile dashboard units, to over \$2,000 for units to ionize the air in an entire building.

Some ionizer salesmen predict that ionization will become a multi-billion dollar industry within the next decade. They believe they are in the same position today as the air conditioning industry was in the 1950s.

Though he refuses to endorse any particular model, Krueger uses ionizers.² "When [air] pollution is reduced," he wrote in *New Scientist*, "air ionization may return to its normal level; until that felicitous day arrives, air ion generators can be used to establish natural condi-

tions in living and working quarters."³²

Not everyone is sold on the value of ionizers. Dr. Joseph B. Davis of the FDA Bureau of Medical Devices says he has heard a few complaints from people who bought ionizers and said they didn't produce any effects. He believes that the ionizers sold today are worthless.⁷ "People will buy anything," he said in a telephone interview. "I sometimes think I could sell horse manure" for therapeutic purposes. Still, he does approve of further scientific research on air ionization.

The FDA has never tested or conducted clinical studies to determine whether the claims made for ionizers are true, Davis said. But the FDA has found "a number of

ionizers that emit harmful levels of ozone," he added. To the best of our knowledge and Davis', no reputable independent group, such as the Consumers Union, has performed such tests either.

Expanded scientific research on the biological effects of air ions would seem to be justified if people do in fact buy as many ionizers as their manufacturers forecast. We should not only find out whether the machines actually work for a significant part of the population, but we should also be very sure they don't produce unexpected side effects. When we are trying to conserve energy we shouldn't be turning on millions of ionizers unless there is a proven justification for them.

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