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ION DOCUMENT FILECat. \_\_\_\_\_  
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# A Conversation With Charles Wallach

**Is there a health risk in using CRT-type VDTs for prolonged periods of time? In this interview conducted by TECHNICALITIES editor Brian Alley, research scientist Dr. Charles Wallach discusses potential hazards and possible solutions.**

*Alley:* The issue of potential health hazards (VDT Operator Distress or VOD) stemming from the use of VDTs has been with us for some time. Yet nobody is certain of the exact nature of the hazard or the extent to which it poses a serious threat to human health. Many of the symptoms have been identified, but so far, there is no official position on either exact cause or techniques for prevention. First, let's talk about the nature of the problem. What actually takes place in or on an operating terminal that creates a potential hazard?

*Wallach:* The basis of the problem, and the one thing that all CRT-type VDTs have in common, is the relatively high, positive, electrostatic voltage charge induced on the exposed face of the CRT. This charge, which may quickly reach many thousands of volts when the tube is energized, is not in itself a hazard. It merely creates the hazard within the foot or so of airspace between it and the operator's face.

The hazard can be defined simply as "ion depletion." The positive charge causes the negative ions to be drawn to the display and the positive ions to be quickly repelled out of that critical airspace continuously.

*Alley:* All VDTs may not be suspect. Which varieties seem to be causing the problems?

Charles Wallach currently heads ion research for a major consulting corporation in McLean, VA that is engaged in research for government, industries, and medical institutions.

*Wallach:* The only variety of VDT that creates this problem is that which employs a direct-view cathode-ray tube. This is an important note for the future, because while CRT-type VDTs represent better than 99% of the current population, we expect to see other nonhazardous types of VDTs coming into greater use in the next decade. Examples of these are plasma or liquid-crystal displays, low-voltage flat displays, and mirror-reflected or projected displays, which are now far too costly for most applications.

## Possible Hazardous Effects

*Alley:* Has scientific research determined what psychological or physiological changes occur when the operator of a CRT is exposed to its high positive charge?

*Wallach:* Yes and no. To be very precise, scientifically gathered *statistical data* clearly indicate that prolonged exposure produces 2 categories of symptoms in the majority of operators, that women are more susceptible than men, and that the severity of at least the first category of symptoms appears to increase with age. These data also strongly indicate that the biological stresses induced by these effects have an impact—sometimes severe—on the development of fetuses of pregnant operators and on the course of the pregnancy.

The first category of symptoms is biochemical and relates to the over- or under-production by the body of various families of hormones and particularly to those biochemical changes that are invariably correlated with stress. There is a great deal of

hard, scientific, *clinical* evidence that short-term exposure of minutes or hours to environments in which positive ions are dominant, or insufficient negative ions are present to balance or cancel them, has precisely the same effects reported in statistical studies of VOD. Long-term exposure of weeks or months to environments deficient in both negative and positive ions on a daily basis produces similar effects. It is therefore assumed that the same phenomena are involved, but this direct relationship has not yet been established by *clinical* studies of large populations of VDT operators.

The second category of VOD symptoms is more superficial and relates to surface irritation of the eyes and areas of sensitive facial skin. In this category, it has been demonstrated *both clinically and statistically* that this temporary irritation may be caused by airborne particles or aerosols, carrying positive charges, which are violently repelled by the positive charge on the CRT and are driven into these sensitive tissues at something like 10 times the normal drift velocity of such particles. In this context, it should be noted that most of the pollutant and contaminant aerosols in normal building environments carry positive charges. These include dust, bacteria, virus and mold spores, and irritant chemical molecules commonly out-gassed by synthetic carpets, adhesives, copiers, and other electrical machinery and appliances. Negatively charged aerosols are, of course, attracted to the face of the CRT, which accounts for the grimy film that often builds up on the faces of VDTs and TV sets over a period of time.

*Alley:* Standards for CRT use developed in Europe require operators to spend no more than 2 hours at a time working at a terminal. Has it been determined that the effect of high concentrations of positive ions is dangerous only under short-term conditions or are there, in your judgement, long-term health hazards which should be addressed as well?

*Wallach:* This depends largely on individual sensitivity, which varies over a broad scale. Sensitive individuals may experience the gradual onset of respiratory distress within the first 10 minutes, headaches within 20 minutes, and depressive mood changes within the first hour, but these individuals will probably be in the minority. A larger percentage of less sensitive operators may become irritable and/or fatigued towards the end of a 2-hour period, and it is this larger segment with greater statistical significance in office-environment studies on which the compromise 2-hour limit was based.

However, it is emphasized that this whole question of 2-hour limits relates only to the short-term effects and not to long-term effects. Two-hour *per day* limitations

would probably be adequate to protect all but the most hypersensitive individuals. But working 3 such intervals in a working day constitutes 6 hours per day, and although we have no hard data on this length of exposure of humans on a regular, daily basis, we feel from animal experiments in the laboratory that this may not be adequate protection. In any case, such time limits are terribly wasteful in terms of productivity and cost to industry and could easily be abolished by effective countermeasures against the basic cause of the various hazards.

### How to Set Up a Safe Environment

*Alley:* Is it possible, using technology currently available (including ion measuring devices), to set up a relatively safe environment for a CRT installation?

*Wallach:* I thought you'd never ask! Of course it is. For existing CRT-hazard conditions, it is easy to introduce enough negative ions into the critical airspace with a device known as a negative ion generator (NIG), which will accomplish 2 things: (1) At least for the first few minutes, most of the negative ions will be drawn toward the CRT until its positive charge is greatly reduced or cancelled; the charge can be measured with an electrostatic voltmeter. (2) Enough negative ions may be introduced into the respiratory airspace of the operator to counteract both the short-term effects of positive ion dominance (ion balance) and the long-term effects of absence of both ion polarities (ion deprivation).

There are 2 precautions to take for optimum results: (1) Use an NIG device of good quality and proper design. (2) Properly position it with respect to the VDT, the operator, and the convection currents of the site-specific ventilation system.

There is really no requirement for the sophisticated instrumentation used in ion laboratories. Any responsible NIG distributor should have the simple measuring devices and the knowledge of NIG models necessary to set up a site-specific installation. After this is done, there are simple tests or procedures to determine, without special instruments, whether or not the device is working properly. Moreover, the maintenance of these devices is negligible; they may need to be cleaned at very infrequent intervals or have filter elements replaced. The important thing is to choose a proper device in the first place, which is not easy today as there are so many ineffective devices on the market.

*Alley:* Libraries are now dedicated users of a variety of CRT/VDTs, with more units being installed daily. What are some steps libraries can take now toward protecting their operators?

*Wallach:* The most important steps have been mentioned already. In addition, it is a good idea to install VDTs whenever possible in well-ventilated locations, away from large pieces of metal furniture, and near windows admitting natural daylight which does not hinder screen visibility.

*Alley:* If the use of negative ion generators constitutes an approach to neutralizing the harmful effects of CRTs, how would the concerned library manager go about selecting such equipment? Are there specifications for such generators that can be considered reliable for purchasing purposes?

*Wallach:* Considerations should be brand and model. Insofar as brand is concerned, there are 43 known manufacturers of negative ion generators on the American market, of which most are small, often unreliable, single-model producers of home-type units. Of the rest, there are now only 2 or 3 well-established companies with technically trained distributors who can be relied upon to supply appropriate models for this application.

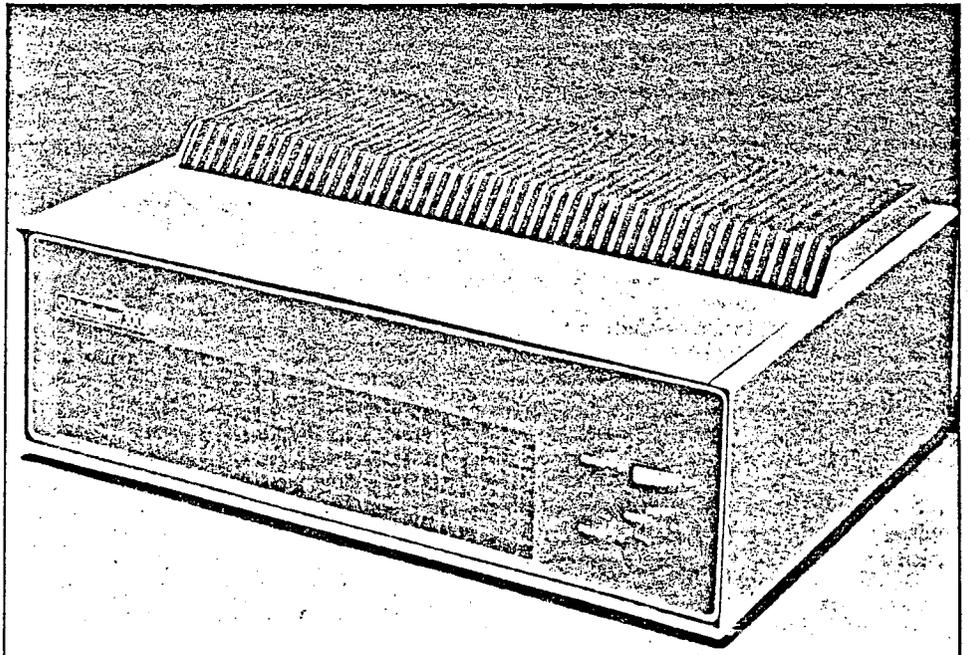
It is not possible to generalize in recommending models, because the configuration and design of the most appropriate unit will vary from one installation to another. Certain units may be hung from the ceiling between the operator and the screen, a foot or so above the head level. Others may be placed on a table a foot or so from the critical airspace. Perhaps the most effective are the self-contained fan/filter/ionizer models that can be placed to one side at some convenient distance and relied upon to blow the negative ions into

the airspace and remove all irritant particles.

In any case, it is important not to overkill the situation with too many negative ions. While negative ions are not intrinsically hazardous in themselves, as there are no known side effects from even very high concentrations in such applications, there is the possibility that the operator's body will absorb negative ions faster than they can be discharged. The result is that a negative electrical charge will build up on the skin or on synthetic clothing. When this occurs, the operator begins to repel negative ions and attract positive ions, which is the opposite of the desired effect. This is a case where "more" is not necessarily "better," and the ion population can be more easily controlled with either a variable-output generator, or, particularly, one with a controllable blower or fan behind it.

*Alley:* Are there rules for generator placement to achieve maximum coverage?

*Wallach:* I realize that the information given here is too vague for a concerned administrator to make the best selection and placement decision, but this would require a substantial case book to pin down. I can suggest that s/he send a photograph of the installation, together with data on ceiling height and composition, a description of the ventilation system used, the probable direction of air currents around the CRT, and a check for \$35 to the International Bio-Environmental Foundation (IBEF), Box 994, Blair Station, MD 20910, for a competent analysis and recommendations. In most cases, the manufacturer will refund this fee in the form of a discount on factory



One of a family of negative ion generators, with a highly effective fan/filter backup, capable of covering 2,000 to 4,000 square feet.

orders placed on this basis. Some distributors will also offer a similar concession.

## Monitoring for a Safe Environment

*Alley:* Once you've set up a safe environment, how do you go about the process of monitoring it?

*Wallach:* There is little or no monitoring necessary, as the devices are highly reliable and require no maintenance other than a rare cleaning. The beneficial effects are very often not even noticeable, because there is nothing remarkable about feeling normal. But we frequently hear from users that, on some particular day, they got a headache, stuffy nose, or felt unusually fatigued after operating the VDT for a while. Upon checking, they found that the ion generator had become unplugged or was not turned on. Many distributors offer a low-cost maintenance contract under which they send a technician around every 3 months or so to check the output and effectiveness of the unit with proper measuring equipment. And, of course, the management may purchase a meter and institute a routine testing procedure. But usually an operator who has become subliminally accustomed to the effects will be the first to notice their absence when something goes wrong.

*Alley:* Are there any federal or state standards being developed or even proposed to ensure safe CRT operation?

*Wallach:* Yes. The CRTs are intrinsically safe because of regulatory standards governing ionizing and nonionizing radiation which have been in effect for some time. However, these do not cover *de-ionizing radiation*—the static, DC charge on the face of the tube—because this is not intrinsically harmful. It is the effect of the de-ionizing radiation on the environment which is something that cannot be regulated in any practical way, since it does not create a problem in every environment, for every individual, and for operators who use the devices sporadically for short intervals. However, because a direct relationship has been statistically established between VDT operation and certain health problems, and since the cause is not widely understood, regulation is being considered to limit the operator's time working at a VDT station—which would be very costly to industry in terms of productivity.

*Alley:* Is there a body of reliable consumer information available on ion generators?

*Wallach:* The American Society for Testing and Materials (ASTM) has created a special committee of experts from science and

industry—Committee D22-11—to develop industrial standards for ionization devices. This process is in the works, but it may be some time before the standards are approved and published. When this occurs, they will probably be adopted by state and federal agencies. In the interim, the International Bio-Environmental Foundation has received a small grant to act as an informal source of consumer guidance. This involves laboratory testing of all available ion generator models, and the development of a short list of approved models which is being continuously updated as new models appear on the market. This list is available to the general public at no charge in return for an SASE sent to Box 994, Blair Station, MD 20910.

*Alley:* In your estimation, why is it taking so long to establish the causes of VOD? Are there steps that concerned users can take to speed up the process?

*Wallach:* Factors such as postural problems and glare and other optical effects have been conscientiously worked out over the years, and active radiation hazards have been brought under close control. But until very recently, there has been little understanding of the significance of air-ion distortion hazards, probably because their effects are so subtle, varied, and intermittently found. Also, no attention has been paid to the distance factor. People watching television, which uses much higher positive voltages than most VDTs, generally sit far enough away so that air circulation prevents ion depletion in their respiratory airspace, so VOD has no precedent. But VDT operators usually are within 18 inches of the screen; this is analogous to the fact that hair doesn't singe until it gets so close to the fire that air convection cannot keep it cool enough.

But perhaps the main reason for delay in accepting the ionic involvement in VOD is the fact that so little research in this area has been funded or that it has been assigned such a low priority by funding agencies. As to what concerned users may do, I can only say that, in our experience, the sort of VOD problems we are concerned with here have disappeared with proper ion control in every case. We presume this will continue to be true for other users. The most effective thing that concerned people can do is to try ionization control when they have VOD problems and report the results (good, bad, or indifferent) to the National Institute for Occupational Safety and Health, Attention: Dr. Barbara Cohen, 4676 Columbia Parkway, Cincinnati, OH 45226, with a copy to the Office of Medical Devices, US Food and Drug Administration, 8757 Georgia Avenue, Silver Spring, MD 20910. Only by this means will a sufficient body of statistical evidence be developed to justify federal research funding.

*Alley:* With the boom in home or personal computer sales and the potential for interactive systems to be launched on commercial TV, isn't the risk of VOD even greater unless safeguards are developed and announced soon? Would you care to predict what form such safeguards might take and how they could change our approach to TV and personal computer use?

*Wallach:* Here, there is not so much of a hazard from ion effects, for several reasons. In the first place, people generally sit far enough away from TVs to minimize these effects. People who sit close to big-screen TVs often may simply doze off from the ion effects without trying to fight them, which thereby also creates stress. Secondly, most users of home computers and games, although generally closer to the VDT element, don't spend as much time that close to the screen as does a working VDT operator. Children are notoriously fond of bringing their faces up to the tube, and this is bad. But on the other hand, children are more likely to be subconsciously aware of the ionic effects on their bodies and simply walk away from the set when they sense the need to do so. This probably accounts for the apparent short attention span of small children, who frequently interrupt their intensive TV watching at "hyperactive" intervals.

*Alley:* Is there currently a body of consultants available to examine CRT sites and make safety recommendations? How does a library manager select such a consultant without running the risk of picking an opportunist—someone out to make a fast buck in what is currently a gray area with respect to health standards?

*Wallach:* There are, as yet, very few experienced or knowledgeable consultants in this country. Many of these are graduates of an intensive course in ion technology offered by Behavioral Research Associates, Inc., 1205 Springwood Building, Silver Spring, MD 20910. Others are students of Professor A.D. Moore of the University of Minnesota or members of the Electrostatic Society of America. There are, however, many amateurs without adequate training or understanding of the basic principles, who are largely motivated by interests other than the client's. Again, I would suggest that an executive desiring such services call upon the IBEF (Box 994, Blair Station, MD 20910) for a recommendation in his/her area, indicating the number of employees involved or the size of the area of concern, so that some judgment can be made as to whether the task is small enough for a mail consultation or large enough to warrant a field survey. ♣