CONGRESSIONAL TESTIMONY

STATEMENT OF

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Before the

SUBCOMMITTEE ON HEALTH AND SAFETY
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Mr. Chairman and Members of the Subcommittee:

I am Dr. J. Donald Millar, Director of the National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control, in the Department of Health and Human Services. Thank you for inviting me to comment on the health issues of video display terminal (VDT) use. With me today from the Institute are Dr. Philip Landrigan, Director of our Division of Surveillance, Hazard Evaluation and Field Studies, and Dr. Barry Johnson, Director of our Division of Biomedical and Behavioral Sciences. Dr. Landrigan and his staff are responsible for the reproductive effects study and Dr. Johnson's staff has conducted the majority of the research on dealing with radiation, stress and ergonomics.

Scope of the Problem

In my lifetime no innovation has had so sweeping a change on American society as the computer. Had we predicted 10 years ago, the degree to which American office work would now be computerized, nobody would have believed us.

The most obvious evidence of this is the ever present video-display terminal, that electrical machine on which humans communicate with computers. At home, at school, and at work, the VDT is increasingly common. It is not an exaggeration to say that the VDT represents a medium through which American life is being drastically and irrevocably changed. No one can accurately predict all the social ramifications of this change.

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Because the possibilities are not clearly defined, workers have many anxieties about computerization. Some of these are very pragmatic: Will the change cost me my job? Will my skills become obsolete? Will the computer make my job more stressful? Whether these anxieties are rational or not is beside the point. In fact, no one can dispel all these fears because no one can see where all of this is going.

As this technology has emerged NIOSH has focused on the possible impact of video-display terminals on the health of the workers using them. We have been interested because we are concerned about prevention. If this new technology does produce hazards to health, we want to know about it so we can recommend appropriate actions to protect the worker.

There is another aspect as well: In our society, workers are frequently those who first encounter a new substance or technology; therefore they are the first to be put "at risk." Unfortunately, in the past workers often have been the earliest victims when a serious hazard is present. In this sense, dangers to workers often serve to raise a general alarm for the community as a whole.

In general, our investigations suggest that the VDT revolution in the workplace has produced impressively few problems considering the scope of the technologic change. To be sure, we have identified some problems associated with the use of VDTs, but the evidence to date indicates that these are relatively minor, and will not retard the rapid increase in use of this technology.

Nonetheless, the perception that VDTs are hazardous is widespread, and will no doubt continue. We expect to be responding to such concerns for a long time.

To date the concerns about VDTs and their possible implications for health have focused on three areas:

1. Is the VDT a source of dangerous radiation?
2. Does the VDT increase psychological stress and musculoskeletal strain on workers using it?
3. Does the VDT affect reproductive function?

The evidence we have so far, though incomplete, permits us to respond to these questions.

1. We do not find VDTs to be a source of dangerous radiation.

2. Yes, there is some evidence that VDTs can increase both physical and emotional stress in workers; our studies also suggest measures by which these stresses can be prevented.

3. Although we do not see any physiologic mechanism whereby VDTs could impair reproductive function, as yet we do not have the information to definitively rule out an effect of VDTs on reproduction. Therefore, we have begun to plan a major epidemiologic study designed to definitively answer the question.

With this general overview of the situation, I will attempt to briefly summarize the important findings of our investigations to date.

Radiation

In 1977, NIOSH performed the first survey of ionizing and nonionizing radiation emissions from VDTs. The survey was prompted by the occurrence of cataracts in two newspaper reporters, both of whom were males under the age of 35. Similar surveys were done subsequently in 11 workplaces involving several hundred terminals. Since then, other groups in the United States, Canada and Western Europe have conducted field and laboratory studies that confirm and complement the NIOSH surveys.

There is no occupational exposure standard specifically for VDTs. However, all measurements of radiation emissions from VDTs are far below the present national occupational exposure guidelines and standards for radiation. The ultraviolet , visible, and infrared emissions are less than 1/100 of the allowable level in the applicable standard; the RF radiation and x-ray levels are less than 1/10 of the allowable limits. Although no national standard has been established for extremely low frequency (ELF) radiation, measured levels from VDTs have been found to be less than those emitted by hair dryers, irons, and other typical household appliances. All forms of radiation measured were at levels well below those documented in the scientific literature as necessary for causing adverse biological effects. These data indicate that the radiation shielding that is already an integral part of the VDT equipment is adequate in protecting the worker against the radiation produced by the machine.

Ergonomic and Stress Research

NIOSH has conducted questionnaire surveys in particular workplaces to determine the range and nature of health complaints potentially linked to VDT use. In these surveys, VDT workstations were also evaluated for ergonomic problems, those associated with the interaction of man with machine. In some cases, radiation emissions were also measured. Results indicate that VDT operators report frequent visual and musculoskeletal strains and discomfort. The visual complaints are most frequently eye fatigue, eye irritation, and blurred vision. The musculoskeletal complaints are pain or stiffness in the neck, shoulders, back, arms, wrists and hands. These effects are most prominent among workers who: (a) engage in repetitive VDT work with little opportunity for variation, (b) spend long, uninterrupted periods at the VDT, and (c) undertake VDT work requiring intense, visual concentration. Operator complaints most often relate to glare, poor illumination, and workstations shown by ergonomic evaluations to be ill-suited for VDT viewing.

There have been few clinical examinations of VDT workers to establish the presence of functional losses in vision or evidence of other effects to the body. In a 1980 clinical study by NIOSH at a newspaper publishing operation, we did not find an association between VDT use and the prevalence of visual pathology, including cataracts. However, reported musculoskeletal problems, headaches, changes in visual function, and various other symptoms were especially prevalent in operators using VDTs on which screens were improperly positioned or screen glare was present.

Questionnaire data indicate higher levels of psychological stress in VDT operators than in workers engaged in similar tasks but not using VDTs. This may result from the VDT operator's perception of greater work pressures; loss of autonomy; involvement in fractionated, simplistic tasks; and their concerns about job security. Because work situations differ widely, it is difficult to make universally applicable recommendations on VDT use.

NIOSH laboratory studies have focused on ergonomic issues, and have been directed to two goals: (1) to relate visual complaints of eye fatigue and irritation to objective measures of dysfunction, and (2) to determine the optimum environmental and workstation features that will reduce visual and musculoskeletal stress and strain. Four exploratory studies, using such visual function measures as eye movements, pupillary response, depth perception, visual acuity, and contrast sensitivity, have not indicated any alterations coincident with the visual demands of VDT work or with operator complaints. This finding may suggest that the visual complaints of VDT operators represent discomfort but have no more serious significance. Long-term studies to evaluate possible chronic effects of VDT exposure on vision have not yet been done, thus questions about the cumulative effects of visual strain due to video viewing remain unanswered. NIOSH is currently pursuing the possibility of such a long-term study.

Three studies by NIOSH contrasting good and poor conditions of glare control, workstation adjustability, seating and work/rest regimens were designed to determine the effects of these conditions in simulated VDT operations. The findings underscored the importance of glare control, certain workstation

dimensions, chair adjustability and back support, and rest breaks in easing operator discomfort. Improving ergonomic conditions reduced visual and musculoskeletal complaints and increased work efficiency.

Research on Reproductive Effects

We are aware of reports that have appeared in the news media of 10 clusters of adverse pregnancy outcomes among VDT users. In each cluster, a small group of women experienced several adverse pregnancy outcomes. In the smallest cluster, 3 women have reported these problems; in the largest cluster, 24. In some cases, these exceeded what would have been expected in the general population. Although it is possible such clusters may reflect a relationship with VDT use, it seems likely that they represent a chance occurrence that is statistically predictable.

However, because of these recurring reports of clusters of adverse pregnancy outcomes, NIOSH plans to study the effects of VDT use on reproductive health. The study requires that NIOSH identify a large group of married, reproductive-aged working women, in non-management positions in a limited geographic area and define their status as users and non-users of VDTs. At least 1,500 women must be recruited into <u>each</u> group and remain in contact with us throughout the study. A self-administered questionnaire will be used at three nine-month intervals to obtain information on the health and reproductive and occupational histories of the women, their personal habits (such as the consumption of alcohol, caffeine, and use of tobacco) and the characteristics of their duties and workstations. Complete, chronologic employment histories will be determined from personnel records. Using this

study design, we should have a 90% to 95% chance of detecting an increase in spontaneous abortions from 1.5 to 2.0 times that in an unexposed population, and a similar chance of detecting birth defects in liveborns from 2.5 to 3.0 times that in unexposed groups. The length of the study is expected to be approximately three years. We are currently in the process of identifying an appropriate study group.

NIOSH Recommendations

As a whole, the findings to date suggest that visual and musculoskeletal problems are the most frequent complaints of VDT operators. These problems seem amenable to control by making ergonomic improvements. The stress issues are more complex and are probably influenced by numerous factors in the workplace and not just to the use of VDTs. Whether long-term VDT use causes significant visual dysfunction or degeneration remains unknown and requires further investigation. Based on extensive radiation measurements and reported health data, NIOSH has concluded that VDTs do not present a radiation hazard to the VDT operator or to the developing fetus. No scientific evidence exists that the reported clusters of miscarriages and birth defects are associated with radiation exposure from VDTs. However, because alleged clusters of adverse reproductive health effects continue to be reported, further research into the possible link between VDT use and adverse reproductive outcomes is warranted.

Recognizing the state of knowledge regarding ergonomic, stress and radiation issues in VDT work, NIOSH recommends the following general guidelines, which may require modification in specific situations:

(1) Workstation design: Maximum flexibility should be designed into VDT units, supporting tables, and operator chairs. VDTs should have detachable keyboards, work tables should be height adjustable, and chairs should be height adjustable and provide proper back support.

(2) Illumination: Sources of glare should be controlled through VDT placement (i.e. parallel to windows as well as parallel and between lights), proper lighting, and the use of glare control devices on the VDT screen surface. Illumination levels should be lower for VDT tasks requiring screen-intensive work and increased as the need to use hard copy increases. In some cases, hard copy material may require local lighting in addition to the normal office lighting.

(3) Work regimens: Continuous work with VDTs should be interrupted periodically by rest breaks or other work activities that do not produce visual fatigue or muscular tension. As a minimum, a break should be taken after 2 hours of continous VDT work and breaks should be more frequent as visual, mental and muscular burdens increase.

(4) Vision testing: VDT workers should have visual testing before beginning VDT work and periodically thereafter to ensure that they have adequately corrected vision to handle such work.

NIOSH is continuing its research to address the complex, interactive nature of ergonomics and stress factors in VDT work and remains vigilant to other health issues involving this new technology. The results of such efforts may suggest refinements to the recommendations just noted or additional recommendations to

further minimize the operator's health risk. Thank you for the opportunity to describe NIOSH activities in this area. We will be happy to answer any questions the Subcommittee may have regarding this issue.

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15. Supplementary Notes

16. Abstract (Limit: 200 words) This testimony concerned the work of NIOSH in the field of worker health relating to exposure to video display units. In general the research has indicated that the computer revolution has produced impressively few problems for worker health considering the scope of the technological change. Even so, the perception that video display units are harmful was widespread, causing continuing doubts. The question concerning the video display unit have included levels of radiation, psychological stress and musculoskeletal strain, and effects on reproductive function. Research had indicated that video display units were not a source of dangerous radiation, that there was some evidence that the units can increase both physical and emotional stress but that there are ways these side effects can be reduced, and that no physiologic mechanism has been advanced whereby use of video display terminals could impair reproductive function. A major epidemiologic study has been designed to definitively answer questions concerning effects on reproductive function.

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