NVLAP AND DOELAP DOSIMETRY ACCREDIATION PROGRAMS

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"NVLAP AND DOELAP DOSIMETRY ACCREDITATION PROGRAMS"

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ABSTRACT

There are two programs that are operated by U.S. Government agencies for the accreditation of personnel dosimetry processors. They are the National Voluntary Laboratory Accreditation Program (NVLAP) and the Department of Energy Laboratory Accreditation Program (DOELAP). These two programs exhibit many similarities, but there are some notable differences. Both have been in operation for a number of years, and this paper will discuss their experiences to date and plans for their future development.

INTRODUCTION

The accreditation process provides a means for demonstrating that a program is in adequate compliance with a set of established performance requirements. Accreditation is a form of quality assurance which serves to provide documentation that: equipment functions properly, that proper procedures are established and implemented, data analysis is correct, and a specified level of accuracy is maintained. When an organization has met these criteria, it is accredited for a specified time interval. At the conclusion of this interval, the organization must apply for re-accreditation and again demonstrate its proficiency in the required areas.

The personnel dosimetry accreditation programs require that an applicant pass a proficiency test and that its processing facilities undergo an on-site assessment by technical experts. The on-site assessment provides direct observation and evaluation of an applicant's quality assurance program, documentation, personnel, processing systems, equipment calibration and maintenance, data reporting and record-keeping. The proficiency test

requires an applicant to demonstrate that their processing system can meet the performance criteria specified in the testing standard.

NVLAP initiated their dosimetry program in 1984 at the request of the Nuclear Regulatory Commission (NRC). The NRC then promulgated a regulation requiring that all of its licensees obtain dosimetry services from a NVLAP accredited processor.

The Department of Energy (DOE) studied the performance of selected personnel dosimetry systems in use at their facilities. Accordingly, DOE developed a comprehensive standard for performance testing its personnel dosimetry systems (DOE 1986). This testing became mandatory with the issuance of DOE Order 5480.15.

Current Status of the Programs

NVLAP accredited the first group of dosimetry processors in 1984 and currently has 63 processors accredited with two additional processors being evaluated for first time accreditation. Each participating processor must undergo an on-site assessment and perform proficiency testing at least once every two years. Since the program began in 1984, some processors have undergone on-site assessments and proficiency tests as many as four times.

Once every two years, each processor must test each model dosimeter in each radiation category for which it desires accreditation. A retest is required after a failure. Processors are offered four chances (rounds) to test each year, beginning on January 1, April 1, July 1 and October 1. Testing is conducted according to the American National Standards Institute (ANSI) N13.11 standard (ANSI 1983).

Table I shows a cumulative summary of NVLAP proficiency test results from 1984 through 1989 (a total of 24 rounds). The performance tolerance level is 0.30 for categories I and III, and 0.50 for categories III through VIII.

Table I. NVLAP Proficiency Testing Results 1984 Through 1989

Test Category	Average Value of Performance	Tests Attempted/ Tests Passed (%Pass)
I. Accidents, Low-Energy Photons	0.15	137/109 (80)
II. Accidents, High-Energy Photons	0.14	173/165 (95)
III. Low-Energy Photons	0.19	155/140 (90)
IV. High-Energy Photons	0.15	202/201 (99+)
V. Beta Particles	0.19	183/175 (96)
VI. Photon Mixtures	0.19	152/141 (93)
VII. Beta Photon Mixtures	0.17	193/181 (94)
VIII. Neutron Mixtures	0.15	139/131 (94)

Analysis of these data provides some interesting observations. The cumulative average performance in all categories is much lower than the performance tolerance level, which indicates that most participating processors are well within the limits. All participants are apparently able to perform excellent dosimetry for Cs-137 at protection level doses (category IV), whereas many processors appear to have trouble with low-energy x-rays at accident level doses (category I).

Table II. DOELAP Performance Testing Results 1985 Through 1989

Category	Tests Attempted/ Tests Passed	(% Pass)
I. Low-Energy Photons, High Dose	36/52	69
II. High-Energy Photons, High Dose	50/57	88
III. Low-Energy Photons	37/66	56
IV. High-Energy Photons	53/60	88
V. Beta Particles	49/62	79
VI. Neutrons	26/51	51
VII. Mixtures		
III + IV	40/52	77
III + V	21/46	46
IV + V	46/54	85
III + VI	33/43	77
IV + VI	37/45	82

Since the DOELAP pilot test session in 1984, 9 performance test sessions have been completed (Sessions 2-10). The results of those performance tests are shown in Table II. Session 7 was the first session begun after DOE Order 5480.15 was issued that required accreditation of DOE contractor dosimetry programs. The irradiations have been completed for Session 11, but the data have not all been reported yet. Session 12 has just begun.

The data show several things. In general, there has been significant improvement in recent sessions for the most difficult categories (III and III + V). However, the performance in the neutron categories declined because several participants tested a variety of commercial neutron dosimeter systems (combinations), few of which passed.

The number of DOE facilities passing the tests has been lower than those passing the NVLAP tests, primarily due to the more stringent DOELAP tolerance level of 0.30. In addition, there are more test categories. Some of them (x-ray + beta, neutron only and general beta) are technically more difficult, especially if the facilities are participating in the other categories as well. The protection level x-ray categories use several different beams during a test.

As of February 1990, 17 of 37 programs were accredited. To date, only multi-element thermoluminescent dosimeter (TLD) systems have been able to pass a broad range of categories that includes x-ray beams.

Future Plans

During the course of conducting these accreditation programs, some areas for potential future work have been identified. The ANSI N13.11 (1983) standard, which forms the basis for the NVLAP program is being updated by a working group of the Health Physics Society Standards Committee. This group is considering several modifications of the standard including: the use of SI quantities and units, and the incorporation of new radiation sources. The working group is also addressing issues such as the development of an unexposed dosimeter category, the inclusion of an extremity dose category, the distance from source to phantom, the conversion factors and dose equivalent reporting conventions (Sims 1988).

The DOELAP program is examining several new areas of accreditation, including, extremity dosimetry and bioassay testing. The proposed extremity accreditation standard would be similar to the whole body standard, but would be somewhat simplified due to the nature of extremity dosimeters and their intended use. A DOE working group has been formed to develop the extremity dosimetry performance testing standard. This group is also considering the irradiation categories, irradiation levels, dose calculation factors and performance criteria (Harty et al., 1990).

The DOELAP program is developing a bioassay testing program which will accredit bioassay processors. Both in-vivo and in-vitro tests have been planned. Procedures have been developed for the preparation of artificial urine and feces with known amounts of radioactivity, and standard whole-body counting phantoms are also under development (Fenrick and MacLellan 1988).

Summary

The NVLAP and DOELAP programs have been in operation for several years and they have achieved the goal of providing increased assurance as to the quality and reliability of personnel dosimetry. The organizations that provide dosimetry services to DOE and NRC-licensee facilities have found that there is a benefit to the recognition received from accreditation. In addition, the technical experts conducting on-site assessments often provide useful information and suggestions for improvements to the programs.

The general level of dosimetry programs in DOE and NRC-licensee facilities has improved markedly over the last few years. Some of this improvement can be attributed to the increased scrutiny of health and safety programs in general. However, it is also fair to say that the need to satisfy

DOELAP or NVLAP requirements has justified the improvements in their external dosimetry and calibration programs.

The future direction of these programs is aimed toward accrediting additional aspects of health physics activities. The standards are being reviewed periodically because technological advances are being made in all aspects of dosimetry. National and international standards are also being reviewed as to their applicability to the programs. As a result of these changes, the programs are expected to broaden in scope.

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