F28 Operator Exposure to Scatter Radiation From a Portable Hand-Held Dental Radiation Emitting Device (Aribex™ NOMAD™) While Making 715 Intraoral Dental Radiographs

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After attending this presentation, participants will understand the relative potential risk of operator exposure to backscatter radiation while using a portable hand-held dental radiation emitting device (Aribex™ NOMAD™). Specifically, attendees will be able to evaluate and compare the operator backscatter radiation dose received to Maximum Permissive Dose (MPD) and to dose levels of equivalent daily background radiation when positioning this device in a forensic (atypical) setting. The presentation will provide the forensic dental community and others whose disciplines require the use of this devise with the knowledge required to evaluate a radiation safety risk/benefit paradigm for the use of this instrument.

Specifically, attendees will be able to evaluate and compare the operator backscatter radiation dose received to Maximum Permissive Dose (MPD) and to dose levels of equivalent daily background radiation when positioning this device in a forensic (*atypical*) setting. Based on this study, similar comparisons can also be made to the MPD and equivalent daily background radiation when the devise is used according to the manufacturer's positioning recommendations in routine (*typical*) dental settings.

This presentation will impact the forensic community by presenting results which indicate that operator exposure to backscatter radiation from the use of a NOMAD™ dental radiation emitting device in forensic dental settings is minimal, and not clinically significant. Thus, risk of backscatter radiation exposure to the operator while using this unit in a morgue facility or multiple fatality incident scenario is similar to that received when the devise is employed in standard dental settings.

Introduction: The NOMAD™ radiation emitting unit received FDA approval in 2005 and had been authorized for use in multiple fatality incident situations associated with hurricane Katrina and the Indian Ocean tsunami forensic team mobilizations. Despite these facts, the radiation safety division of the Nevada State Board of Health required that a study of the backscatter radiation to the operator during dental related radiography be conducted prior to authorizing use of this device in the State of Nevada. This study was conducted at the UNLV School of Dental Medicine after review and approval by the school's Institutional Review Board (IRB) for Human Research.

Materials and Methods: Operator exposure to backscatter radiation while using an Aribex™ NOMAD™ radiation emitting device was determined while the operator employed various *typical* and *atypical* use scenarios during the exposure of 715 digital and/or film based dental radiographs. Additionally, 100 digital and 100 film based radiographs were exposed as controls in *typical* modes according to manufacturer recommendations.

Results: Study data was compared to the radiation safety Maximum Permissive Dose (MPD) and to equivalent daily background radiation. Results showed the reproductive organs received the highest dose and the thyroid the least. The average operator whole body study dose was determined to be 0.065 mSv (6.58 mrem) or 0.13% of the annual MPD and the effective dose of 0.034 mSv (3.4 mrem) to be 0.95% of annual background radiation or an added 3.5 days.

Extrapolating the data as an expression of averaged annual operator exposure resulted in a whole dose of 0.629 mSv (62.9 mrem) or 1.26% of the annual MPD. The extrapolated whole body effective dose was 0.331 mSv (33.1 mrem) which is equivalent to 9% of the annual background radiation or an added 33.5 days. These results are compatible with those published by the manufacturer.

Conclusions: Used in a *typical* manner, the manufacturer of the NOMAD™ hand-held radiation emitting device acknowledges that the unprotected operator will sustain a small additional amount of radiation (<1% of the MPD). This additional radiation exposure is directly related to the operator position within the "safe zone" provided by the acrylic/lead shield on the end of the primary beam collimator.

This study documented operator backscatter exposure in *atypical* situations in which the operator was not positioned according to complete compliance with the "safe- zone" recommendations of the manufacturer. Despite this fact, the results of this *atypical* use study for this device are similar to those of the manufacturer. The additional exposure of 0.065 mSv (6.58 mrm) in this study falls well below the 5.0 mSv (500 mrem) occupational limit at which dosimeter monitoring is required for dental personnel in Nevada.

The additional backscatter dose contribution is not incompatible with other occupations in which there are potential radiation exposure hazards. Any operator concerned about additional exposure when using the NOMAD™ device in an *atypical* configuration can choose to take appropriate shielding precautions.

Operator Radiation Exposure, Portable Radiation Emitting Device, Maximum Permissive Dose

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