ARN Training Course on Advance Methods for Internal Dose Assessment: Application of Ideas Guidelines

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ARN TRAINING COURSE ON
ADVANCE METHODS FOR INTERNAL DOSE ASSESSMENT: APPLICATION OF IDEAS GUIDELINES

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Dose assessment in case of internal exposure involves the estimation of committed effective dose based on the interpretation of bioassay measurement, and the assumptions of hypotheses on the characteristics of the radioactive material and the time pattern and the pathway of intake. The IDEAS Guidelines provide a method to harmonize dose evaluations using criteria and flow chart procedures to be followed step by step. The EURADOS Working Group 7 `Internal Dosimetry`, in collaboration with IAEA and Czech Technical University (CTU) in Prague, promoted the `EURADOS/IAEA Regional Training Course on Advanced Methods for Internal Dose Assessment: Application of IDEAS Guidelines to broaden and encourage the use of IDEAS Guidelines, which took place in Prague (Czech Republic) from 2nd to 6th February 2009. The ARN identified the relevance of this training and asked for a place for participating on this activity. After that, the 1st training course in Argentina took place from 24th to 28th August for training local internal dosimetry experts.

This course was organized with the aim to provide advanced information and training on internal dosimetry, mainly based on the work material from `EURADOS/IAEA Regional Training Course on Advanced Methods for Internal Dose Assessment: Application of IDEAS Guidelines.

It was design focusing these two major tasks:

- To present, explain and provide occasion of training in internal dosimetry, using the IDEAS Guidelines.
- To provide a personal training using the software AIDE developed in the frame of the IAEA Regional Project on Internal Dosimetry in Latin America.

Course mode

The activities were entirely the responsibility of professionals that belong to the Scientific Support Branch of National Regulatory Authority.
At the first day the lectures were focused on refreshing knowledge about the internal dosimetry methodology and handling biossay data.
From the second day the participants were motivated to solve cases increasing in complexity day by day on special topics of interest.

The cases were distributed to participants in a printed guide. They had the same information in a CD for working in their PC during the course.

Previous to the resolution of each case, an specific lecture on the new topic was presented explaining the concepts to be taken into account.
Two seminars were included to contribute to the consolidation of criteria for internal dose assessment.
The course was held in the ARN Training Classroom, at the Ezeiza Atomic Center during five days from 9 AM to 4 PM. All the work material was installed previously in the ARN PCs available in this room.
Participants were motivated to actively participate in the cases resolution and discussions. The last day they were asked to respond a multiple choice questionnaire for testing the comprehension of the main topic cover during the week.
At the end of the course a questionnaire for feedback on the training course was distributed

Topics

The different topics were covered through two types of sessions

1.- Theoretical sessions and
2.- Practical sessions

1.- Theoretical sessions

a) Lectures:

1) A review of the internal dosimetry methodology

2) Handling of monitoring data
3) The presentation of the IDEAS Guidelines: Use of flowcharts
4) Demonstration of the available software developed in the frame of the IAEA Latin-American Project: AIDE

b) Seminars:

1) Emergencies
2) Monitoring programme design

2.- Practical sessions

Seven cases of study were selected to be solve by the participants during these sessions.

Cases of study descriptions

Case 1
Simulated case of inhalation of ^{241}Am in a working environment for an adult male.
- The results of eight urine samples are given in terms of measurement counts. Enough information is provided, so the participants could obtain the daily urine excretion for each sample. (excreted volume, sample counts time, etc.)
- The participants were instructing in calculating type A error and the Total Scattering Factor (SF).
- The participants had to provide the estimate of intake and quantify the goodness of fit using the chi-squared test statistics.
- The exercise was solved using Excel spread spread sheets.

Case 2

Simulated case of inhalation of ^{235}U in a working environment for an adult male
- Data of urine monitoring were given (10), together with creatinine excretion. Another set of 10 fecal samples are also given.
- The participants were instructing in dealing with both set of data and to provide the estimate of intake and quantify the goodness of fit using the chi-squared test statistics.
- The exercise was solved using Excel spread sheets.

Case 3

Inhalation of ^{131}I in a Hospital unit of Metabolic Therapy, were personnel are monitored by means of thyroid monitoring every 14 days.
- The participants were asked to evaluate three consecutive thyroid measurements of a worker.
- The aim of this exercise is to instruct the participants in dealing with routine monitoring where the contribution of previous intakes have to be evaluated.
- The exercise was solved using Excel spread sheets.

Case 4

Accidental acute inhalation of ^{131}I as aerosol.
- A set of four successively measurements of thyroid burden were provided.
- The ICRP 78 tables and the AIDE software were used.
- The participants were asked to provide the intake and the corresponding Committed Effective Dose using both tools.

Case 5

Accidental acute inhalation of ^{131}I as aerosol in a Radiochemical Laboratory.
- A set of three successively measurements of thyroid burden were provided.
- The aim of this exercise is that the participants gain skillful in using most of the features of AIDE software.
- The participants were asked to provide the intake and the corresponding Committed Effective Dose.

Case 6

Accidental inhalation of ^{131}I in a gaseous form, in a Nuclear Medicine Facility.
- Three data of thyroid burden and three of excreted activity were given.
- The participants had to find the most probable date of the intake using the available data and the corresponding intake and Committed Effective Dose, using software AIDE.

Case 7

Accidental inhalation of ^{239}Pu in a reprocessing plant during handling exhausted fuel: Type S and AMAD = 10 μm.

- Eight urine samples data and eight feces samples data were available.
- The aim of this exercise is to use the feature of the AIDE Software that allows the user to generate bioassay tables
- The participants were asked to follow IDEAS guidelines and provide the best intake estimation and dose.

Syllabus

1.- Introduction:
    1.1. Review of internal doses assessment methodology.
    1.2. Criteria for rejecting data. Maximum likehood method

2.- Handling and Interpretation of individual monitoring data (Part I)::
    2.1. Data processing before use.
    2.2. Assessment of uncertainties on data.

3.-. Practical session (I):
    3.1. Case 1: handling one set of data: urine excretion data
    3.2 Case 2: handling multiple biossay data: urine and faecal excretion data

4.- Handling and Interpretation of individual monitoring data (Part II):
    4.1. Intake estimation
    4.2. Goodness of fit evaluation

5.- General Overview of IDEAS GL
    5.1 Introduction
    5.2 Phylosophy: Hartmonization. Accuracy. Proporcionality
    5.3 Levels of task
    5.4 Stages

6.- Practical session (II):
    6.1 Case 3: Application of IDEAS GL:

    Stage 1 – No assessment
    Stage 2: Evaluation on contribution of previous intake
    Stage 3: Default or site specific evaluation of intake and dose

7.- Software AIDE: General overview. Demonstration

8.- Practical session (III):
    8.1 Case 4: Resolution applying ICRP 78 and AIDE.

8.2 Case 5: Acute internal exposure. Resolution with AIDE
8.3 Case 6: Determination of date of exposure
8.4 Case 7: Special monitoring. Resolution with AIDE

9.- Criteria for individual monitoring implementation:
    9.1. Objective of monitoring
    9.2. Design of monitoring programmes
    9.3. Reference levels

10.- ISO Standars on internal dosimetry: Presentation of documents produced by WG13

11.- Internal dosimetry assessment criteria for emergencies:
11.1. Objective of monitoring in the emergencies
11.2. Monitoring procedures: Area and individual.
11.3. Handling monitoring data: possible interferences

12.- Technical Test

13.- Discussion of results of technical test

14.- Questionnaire for feedback on the training course

Participants

This course was organized in response to a requirement from CNEA Nuclear Safety Manager for training the personnel on internal doses assessment.
Even though the training course was targeted to professionals from CNEA, it was decided to extend the invitation to other Argentine companies responsible of the control of internal exposure of workers.
The condition of acceptance was to be involved on internal dose assessment (e.g. from internal dosimetry services), and to have basic knowledge about terminology, concepts, models and computational tools of internal dosimetry.
The distribution of participant accordingly their Company/Institution belonging is shown in the Table 1.

Conclusions

Accordingly with the questionnaire for feedback on the training course completed by the participants, the quality of material, the presentations of the IDEAS GL, the general contents and the introductory exercises explanations were found very satisfactory by the attendants.
Suggestions were received mainly pointing out the

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interest for a future specific training course focus in the internal doses assessment due to uranium exposures. The principal interest was about the complexity for the interpretation of uranium excretion data.

So that, ARN compromised their future effort to collaborate with the dosimetry services to identify their difficulties on that field. After that, an specific course would be organize to deal with the application of the IDEAS GL to the internal doses assessment of uranium exposure.

Table 1. This table shows the Companies/Institutions participants.

Company/Institutions	Participants
CNEA[1]	15
ARN [2]	2
NASA-CNA I [3]	1
NASA-CNE [4]	1
CONUAR [5]	1
INVAP [6]	1

[1]Comision Nacional de Energía Atómica
[2]Autoridad Regulatoria Nuclear
[3]Nucleoelectrica Argentina Sociedad Anónima. Central Nuclear Atucha
[4]Nucleoelectrica Argentina Sociedad Anónima. Central Nuclear Embalse
[5]Combustibles Nucleares Argentinos
[6]Investigación Aplicada

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