The Joint International Symposium on EPR dosimetry and dating (EPR) and the International Conference on Biological Dosimetry (BioDose)

11 – 15 June 2018 I Munich I Germany
Neuherberg Campus of the Helmholtz Centre Munich

Abstracts

HelmholtzZentrum münchen
German Research Center for Environmental Health

Bundesamt für Strahlenschutz

Bundeswehr Institute of Radiobiology
affiliated to the University of Ulm

Under the auspieces of EABERD

PP - 56

D.RE.A.M.: A software for uncertainties analysis in retrospective dosimetry

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Introduction
Accidental exposures to ionising radiations are nowadays managed with assistance from biological and physical retrospective dosimetry which are able to provide individual estimates of dose absorbed by victims. The aim of this work is to describe the development of biodosimetry analysis software within the "EURADOS Working Group 10—Retrospective dosimetry" Task group 10.6.

Methods
The software has been developed in Python code language that is easy to learn, read, use and extensible (it is possible to add new modules). It can implement C/C++/Fortran, Java functions. It is embeddable in applications and is open source. It is extremely portable to Unix/Linux, Windows, Mac operating systems. The memory management is automatic.
The software uses many free scientific python packages (such as numpy, scipy and sympy) and has a user-friendly graphical user interface.

Results
The software developed was named "Dose REconstruction by Analytical and Monte carlo methods" (D.RE.A.M.) and enables performance of uncertainties analyses though various mathematical methods. In particular, it facilitates:

Analytical calculation of combined standard uncertainties Monte Carlo estimation of combined uncertainties

Dose reconstruction from least square calibration curves by
1) analytical inversion of the calibration curve function
2) Monte Carlo calculation

Dose reconstruction with using Bayesian Method (Markov Chain Monte Carlo Method). This last analysis is still under validation process. After complete validation process this software will be freely available for everybody and will guide the user to the requested results.

Conclusion
The above-mentioned features of the D.RE.A.M. software provide a useful and promising toolkit for uncertainty analysis, helping biodosimetry practitioners carry out effective and accurate uncertainty assessment. Further methods can be added according to the developing needs of the community. In future such software could facilitate easier communication between scientists with different backgrounds (such as biologists and physicists).

References
EA Ainsbury, et al. Review of retrospective dosimetry techniques for external ionising radiation exposures, Radiat prot dosim, (2011) 147, 4, 573-592.