RISK ASSESSMENT ADVANCED TRAINING PROGRAM (RAAP) GUIDELINES

Final draft revised April 24, 2009

INTRODUCTION
This document is the outcome of the mandate issued by DG SANCO on December 13, 2007 appointing EUROTOX as coordinator to draft guidelines to promote the establishment of a network of European organizations prepared to structure and implement a training pilot program to provide individuals with appropriate academic backgrounds with the knowledge and practical training needed to understand and participate in the risk assessment process.

PURPOSE
The purpose of this working document is to present draft guidelines for the development of an advanced training program in risk assessment (RAAP). The training program includes a modular course program of eight, 1-week-long courses and an applied training period provided by selected institutions throughout Europe. After passing a final assessment, an accreditation/certification as a European Risk Assessor would be awarded.

The Risk Assessment Advanced Training Program (RAAP) is based on common European criteria, easily adoptable by academic institutions across Europe and focusing on risk assessment methodology and procedure. It fills an important need in the training of toxicologists into areas of risk assessment by establishing a clearly and recognized definition of training criteria and a recognition mechanism to qualify risk assessors.

This training program aims to fill the existing gap of training schemes and provides opportunities for practical, on the job training on risk assessment to young scientists or new graduates interested in pursuing this area of expertise, as well as trained toxicologists attracted by the opportunity to serve as members of various scientific committees and bodies at EU and national levels.

RAAP focuses on identifying the profile and training requirements of risk assessors in order to design a training program covering a range of disciplines in risk assessment and providing a model to establish guidelines for the training and recognition of risk assessors in accordance to a well-defined and properly acknowledged training standard. RAAP deals with training in the area of chemicals health risk assessment and does not cover environmental risk assessment (the exception being those aspects of environmental risk assessment that
result in human exposure via the environment) and non-chemical stressors risk assessment (microbiological, physical, radiation etc).

**BACKGROUND**

The current need for trained risk assessors with a strong background in toxicology and familiarity with the current legislative framework in Europe is well known. In fact, members of the European Commission’s Scientific Advisory bodies, independent scientists, Member States, and societal stakeholders have repeatedly voiced their concern over the shortage of trained risk assessors in Europe and the potential effects this may have on the long-term sustainability of risk assessment advice to EU and national bodies, as well as the private sector. The relatively short time (three years in most instances) EU scientific body and agency panels serve stimulates turnover of members serving in these committees/bodies and creates a greater demand and constant need to add new experts to the pool of serving members. In addition, specific regulatory initiatives in the area of chemical risk assessment such as REACH have created a further demand for risk assessors.

Key factors attributed to the short supply of risk assessors include the limited training opportunities in the field of risk assessment and the lack of training schemes and opportunities for practical, on the job training on the risk assessment approach.

Findings of a preliminary study commissioned by the Health and Consumers Directorate General (DG SANCO) in 2007 (Tender SANCO/2006/C7/024) indicate that training courses specifically covering risk assessment are not currently available. In addition, even fully trained risk assessors, need training to integrate and function as scientific committee members. In addition, neither a clear and recognized definition of the profile of risk assessors nor an official certification mechanism for the qualification of risk assessors, qualified risk assessors exist, allowing consultants without proper training to present themselves as risk assessors.

In the context of initiatives of the European Commission non food Scientific Committees Inter Committee Coordination Group¹ to promote the scientific dialogue in broad areas of risk assessment, Dr. Bernardo Delogu and Dr. Takis Daskaleros from the Risk Assessment Unit of DG SANCO commissioned EUROTOX (Federation of European Toxicology Societies) a mandate to coordinate in collaboration with key academic institutions, and representatives of the Commission’s non food Scientific Committees a series of meetings to establish guidelines for an advanced risk assessment training program leading to an EU certification or accreditation system for trained risk assessors. The institutions and participants of the WG drafting these guidelines are listed in Annex I.

This document provides specific guidelines to develop a training program in risk assessment based on new common European criteria, easily adoptable by academic institutions across Europe, and focusing on risk assessment methodology.

¹ COMMISSION DECISION setting up Scientific Committees in the field of consumer safety, public health and the environment, OJ L 66, 03.03.04
The program will provide professionals possessing already appropriate academic backgrounds with the theoretical and practical knowledge needed to understand the risk assessment process and be actively involved in the development and follow up phases. The training scheme will also include, a practical traineeship period.

The overall deliverable would be a certified level of competence in risk assessment according to a well-defined and properly recognized training standard.

The program guidelines aim at establishing a novel model of an integrated and advanced training for risk assessors firmly based on available high standard education in toxicology at the Master level in several European countries.

DISCUSSION KEY FINDINGS

1. Several plausible explanations have been provided for the apparent shortage of skilled assessors trained in toxicological sciences. The most commonly mentioned reasons are: 1) the decline of toxicology disciplines being taught across European universities, 2) the complexity of the required different disciplines (chemistry, biology, clinic and regulatory, and 3) the shifting of student preferences to more ‘high profile or fashionable’ study areas like biotechnology, or stem cells.

2. Experience with the general functioning of the Commission’s Scientific Committees, indicate that risk assessors need ‘familiarisation’ with the modus operandi of the EU Scientific Bodies before becoming fully integrated and functional members.

3. There is a decreasing offer of basic training in the key areas of toxicology and eco-toxicology. Institutes are closing down or shifting towards pharmacological disciplines. This is aggravated by the poor image of toxicology (sometimes wrongly presented as an old fashioned, nineteen century discipline not at the hedge of scientific development, heavily relying on unethical animal testing practices...).

4. There seems to be a short supply of properly trained, experienced risk assessors as not all academic courses in Toxicology teach the basic risk assessment methodology which by definition is multidisciplinary and based on a case by case scientific approach. In addition training of risk assessors outside the confines of traditional chemical risk assessment (e.g. UV effects, EMF, 3R, etc) is limited.

5. Not enough is done in particular those in charge of education, academic and national authorities, to reverse this trend. The growing needs for risk assessors with a toxicological/eco-toxicological background does not seem to be well recognized.

6. A number of experts (in particular consultants) are presenting themselves as risk assessors, but only have a specific background sometimes limited to biology, chemistry, genotoxicology, etc.

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7. No clear and officially recognised definition of the professional profile of risk assessor exists. Also a mechanism to accredit or recognized qualified risk assessors is currently not available.

8. There is a need to provide more training in the risk assessment process to young scientists with different backgrounds.

9. There is a lack of opportunities for practical, on the job training, which is essential to become a risk assessor.

10. DG SANCO Scientific Committees seem to require different levels of training depending on the objectives which can go from generic understanding of the process up to critically examining the quality and validity of a risk assessment, coordinating a risk assessment or drafting the details of an assessment as shown in table 1. The nature of the expertise and requirements for each level, however, should be further identified.

<table>
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<tr>
<th>Levels of expertise</th>
<th>SC</th>
<th>WG</th>
<th>Secretariat</th>
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<tr>
<td>i. Awareness/orientation (consistency and coherency with past opinions)</td>
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<td></td>
<td>X</td>
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<tr>
<td>ii. Contribution to risk assessment dossiers in specific fields of risk assessment</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>iii. Write/oversee the production of risk assessments but still with a core discipline</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>iv. Assess risk assessments of various kinds but still with a core discipline</td>
<td></td>
<td>X</td>
<td>X</td>
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</table>

11. In addition to modules of increasing depth on the general risk assessment approach, particular aspects would deserve specific training modules, in particular exposure assessment.

12. Exposure assessment is the weakest part of most risk assessments and therefore particular attention to the development of this area should be given within the program.

13. Some training experiences already exist that can be used to help design an optimal risk assessment training programme.

14. Expertise to learn how to translate experimental scientific results into relevant conclusions for chemical risk assessment at a foreseen level of exposure remains a vital aspect in the professional development of toxicologists and consequently risks assessors.

3 Notes on the requirements for risk assessment experts by Jim Bridges, November 2007.
15. Training in toxicology does not equal training in risk assessment and therefore a specific post graduate training programme is needed.

16. Practical experience ('stage') gained at national health agencies, EU Scientific Advisory bodies, industry and academia should be included in the training activities.

CONCLUSIONS

In order to reverse the shortage of trained risk assessors in the EU, actions will be needed on three interlinked areas:

1) University training and academic research in (eco)toxicology;
2) Post-graduate training in risk assessment sciences;
3) Certification of trained Risk Assessors.

Exploring the possibilities for the establishment of a EU certification/accreditation system for trained Risk Assessors is seen as the catalyst for improving/increasing efforts on pillars 1 and 2 above;

The objective of the proposed initiative is to define the specifications for a European Risk Assessment training programme to provide certificated and recognised professionals.

Specifically, this initiative should define:

- Desired previous training and experience of the trainees
- Knowledge, capacities and experience to be acquired by the trainees
- Structure of the training programme
- Expertise and profile of the faculty involved
- Criteria for EU recognition of risk assessors

PROGRAM PROPOSAL OVERVIEW

Because the risk assessment process is more than a collection of facts and scientific data and should address also how to deal with extrapolation, uncertainties and data gaps, the proposed programme should consist of a balanced curriculum based on the fundamental areas that are needed to understand the response of living organisms to chemicals and to introduce students to the best currently available scientific approaches to evaluate what these responses mean for human health.

The aim of the program is to train individuals to make decisions on the basis of the most recent and critically evaluated research findings and potential chemical hazards for human and animals in the constantly changing area of toxicological sciences.

Specific program objectives include:

1) Provide intensive, in depth hands on training in hazard characterization and dose response assessment for developing human health risk assessment sciences.

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2) Train participants in the assessment of dossiers in order to produce supporting documentation of risk values and acceptable limits for the environment and population, as well as a monograph with results of the risk assessment.

3) Provide systematic training in current assessment practices as well as in the latest methods in human health chemical assessments

The learning outcomes of the program are:

1) Understand and describe the process of risk and exposure assessment and risk analysis; make a distinction between risk assessment and risk perception
2) List the eventual sources assisting the process of risk and exposure assessment and risk analysis
3) Demonstrate the ability to conduct a risk assessment and risk analysis
4) Describe the difference between the levels of risk and what might be seen as an acceptable risk and an unacceptable risk
5) Assessment of dossiers prepared for registration of pesticides, biocides, cosmetics, food additives, veterinary drug, OGM food, novel food, food of biotech origin, etc.
6) Case studies for substances of interest
7) Performance of risk assessment for workers, operators, bystander, and consumers
8) Definition of acceptable limits (NOAEL, ADI, ARfD, AOEL, BMD)
9) Design, performance and evaluation of a specific research project when data is missing

Learned Program Skills

After completing the program, students should be proficient in the following areas:

General environment and public health

1) Recognize adverse health consequences of major environment exposures and other exposures affecting human health
2) Identify mechanisms of toxicity
3) Apply appropriate biostatistics and epidemiology methodology to evaluate risks affecting public health in order to define safe exposure concentrations

Risk Science

1) Apply the principles of environmental physical-chemistry to the identification of environmental risks
2) Apply current exposure models to identify, characterize and quantify exposure results
3) Evaluate dose-response relationships and identify properties of chemicals with potential hazard health properties

Risk Assessment

1) Characterize the risk for a wide range of applications (i.e. general population, workplace, children, pregnant women, elderly, etc)
2) Identify and manage the main risks and impacts of current a new chemicals and products
3) Evaluate relationships between exposure to chemicals and health outcomes
**Risk Management and Communication**

1) Render more transparent the steps of the risk assessment process and how to come to decisions. Analyze the risk issues relevant to an organization and the role this could play.

2) Understand risk assessment terminology to support risk management in decision making.

3) Describe and apply formal tools for risk assessment.

**AUDIENCE**

The program is designed for graduate students with toxicology training interested in developing skills in the field of human health risk assessment, as well as trained toxicologists in industry, national health agencies, EU Scientific Advisory bodies, consultancy companies, and academia who perform or are responsible for the review and management of chemical assessments, or are involved in policy making and therefore need to better understand the process involved in the risk assessment review process.

**PROGRAM DESCRIPTION**

As shown in table 2, the program will consist of a combination of specific program fundamentals including:

1. Eight one-week modules of intensive, self-contained advanced classroom lectures. Teaching methods will include lectures, discussion panels, syndicate groups, tutorials, case studies, demonstrations, e-learning and home assignments. The program is modular therefore the training will be customized to the individual’s needs and based on the participant’s educational and professional level. Participants demonstrating a good knowledge of arguments covered in specific modules may waive part of the modular requirements.

2. A practical, training period lasting of at least 450 hours either in the form of in-house training or by performing a stage in institutions performing toxicological risk assessments as their daily activity will be provided allowing trainees to acquire hands-on experience in following the consecutive steps in the toxicological risk assessment process. Collaboration partners will be called for support during this phase and special attention will be given to find adequate training in EU risk assessment structure agencies (DG SANCO, EFSA, ECHA, EMEA, etc), and research institutes.

3. The preparation and oral presentation of a risk assessment case study in front of an internal commission.

**Table 2 – European Risk Assessment Training Program Overview**

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
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<tbody>
<tr>
<td>Class room</td>
<td>Eight one-week modules in health risk assessment topics, lectures and practical lessons</td>
</tr>
<tr>
<td>Hand on Training</td>
<td>Applied training period of at least 450 hours at an institution performing risk assessment such as regulatory agencies, research institutes or industry</td>
</tr>
<tr>
<td>Case Study</td>
<td>Preparation and presentation of a case study</td>
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</tbody>
</table>
Accreditation is given when all the components in the training programme have successfully been completed.

The training period is also flexible and can be carried out in various ways depending on the particular situation of the individual as seen in table 3.

Table 3 – Training period options

<table>
<thead>
<tr>
<th>Training</th>
<th>Location</th>
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<tbody>
<tr>
<td>In house</td>
<td>This could be the case of an individual whose program is being paid by his direct employer. The training in this case can be conducted in-house.</td>
</tr>
<tr>
<td>Relocation</td>
<td>This could be the case of an individual that is not currently employed and is willing to relocate for the entire duration of the training with possible financial support from a sponsor or auto-financed.</td>
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**PROGRAM DURATION**
The total duration of the program may vary based on the evaluation of each participant’s professional and education background and their specific needs. The modular sessions will be held several times a year by key European institutes and once the personalized curriculum of the participant is defined, they can select when and where they want to complete the module.

**PROPOSED PROGRAM MODULES**

1. **Classroom modules**
Each module in the program will be designed to fulfil requirements required to obtain accreditation or recognition in risk assessment. Each module is an intensive, self-contained course, preceded by preparatory study (for which carefully selected distance learning material will be provided) followed by a final assessment at the end of the each module through a written exam and an oral presentation. The modules will form a coherent structure in terms of topics to give a complete training in risk assessment and cover the main areas in risk assessment procedure.

**MODULE 1: Introduction to risk assessment and management, with special attention to chemical risk assessment**
   a. What is risk assessment
   b. Purpose of risk assessment
   c. Regulatory frameworks, including classification and labelling
   d. Risk perception, risk communication and risk management
   e. GLP and QA
   f. Study guidelines

**MODULE 2: Role of ADME in risk assessment**
   a. Mathematical models
   b. Species specificity
   c. Dose-transition
d. Examples of PBPK

e. Use of in vitro data and alternative methods

**MODULE 3: Identification and assessment of organ toxicity, including neurotoxicity, immunotoxicity**

a. Dose-response relationship (definition of NOAELs and/or BMDs)
b. Mode of action and human relevance of the toxic effects
c. Extrapolation to humans, including sensitive subpopulations
d. Chemical Specific Adjustment Factors
e. Route-to-route extrapolation

**MODULE 4: Identification and assessment of genotoxic vs non-genotoxic carcinogens**

a. Dose-response relationship (definition of NOAELs and/or BMDs)
b. Mode of action and human relevance of the toxic effects (e.g. IPCS framework)
c. Extrapolation to humans, including sensitive subpopulations
d. Chemical Specific Adjustment Factors
e. Route-to-route extrapolation

**MODULE 5: Identification and assessment of reproductive toxicity and endocrine disruption**

a. Dose-response relationship (definition of NOAELs and/or BMDs)
b. Mode of action and human relevance of the toxic effects
c. Extrapolation to humans, including sensitive subpopulations
d. Chemical Specific Adjustment Factors
e. Route-to-route extrapolation

**MODULE 6: Exposure analysis in risk assessment**

a. Deterministic and probabilistic
b. Aggregate and cumulative
c. Environmental and biomonitoring
d. Modeling

**MODULE 7: Epidemiology and statistics in toxicological risk assessment**

a. Dose-response in epidemiology
b. Uncertainty evaluation
c. Variability evaluation
d. Sensitivity analysis

**MODULE 8: Supplementary modules in a selected area of risk assessment** Existing modules organized by participating institutions or external organizations will be used e.g. cosmetics, plant protection products and biocides, consumer products, medicines and veterinary drugs, contaminants in food, soil and water, occupational exposure, risk communication, industrial chemicals, 3Rs in risk assessment

With the exception of Module 1 *Introduction to risk assessment and management* and any of the *Supplementary modules*, participants demonstrating a good knowledge of arguments discussed in these modules may waive up to a maximum of two modules.
2) Practical training
The purpose is that participants acquire hands on experience in the toxicological risk assessment process. Activities may include: assessment of dossier for registration, study of substances of interest, performance of risk assessment for workers, consumer or environmental projects, planning, execution and evaluation of toxicological tests, critical review of the literature on a specific subject, etc.

3) Case Study
Writing a study case is mandatory for all students and should be completely carried out by the candidate. The study case should preferably be prepared according to a provided outline. The study case should reflect a realistic problem making use of data either from the literature or from the student’s own work. Since this is a major task, it whenever possible, the study evolves from the student’s work environment. The practical training and case study can preferably be combined.

ACCREDITATION
After completion of all required modules and training period with satisfactory results, participants will be awarded the European Risk Assessment accreditation or recognition under the guidance of DG SANCO. It is suggested that the accreditation is renewed every five years based on evidence of pursuing a program of continuing professional development and by maintaining an active involvement in risk assessment.

PROGRAM ENTRY REQUIREMENTS
1a) Master’s degree (or similar university degree) in toxicology, or alternatively
1b) Master’s degree (or similar university degree) in other life sciences such as medicine, veterinary medicine, biology, biochemistry, chemistry, environmental science, public health, bioengineering, food chemistry with at least two years of work experience in toxicological research or hazard assessment.
2. Good command of the English language

APPLICATION REQUIREMENTS
Selection of admission should consist in the evaluation of the application containing the following elements
1. Candidate’s curriculum vitae
2. List of publications or study/technical reports
3. Motivation for course participation: the statement should describe the reasons for applying to the programme, the candidate’s preparation for this field of study, research interests, future career plans, and other aspects of the candidate’s background and interests which may aid the selection committee in evaluating your aptitude and motivation to participate in the program.
4. At least one reference letter written either by a faculty member or employer’s supervisor supporting the candidate’s intellectual ability, aptitude in research and professional skills.
5. Evidence of English Language Proficiency (TOEFL or IELTS scores) or evaluation of English language command either in a personal or telephone interview.
FACULTY MEMBERS
Faculty members should be experts with previous teaching experience in their specific field, prepared to lecture on most of the important aspects of toxicology and chemicals risk assessment, and be interested to take part in a challenging program involving a constant exchange of information and instructions between student and faculty members. Members of the faculty should have different affiliations covering academia, industry, and regulatory agencies, and have different nationalities.

STUDENT EVALUATION
1) Classroom period
Students learning should be periodically assessed at the end of the specific module through final through written exams and oral presentations.

2) Training period
Evaluation of the participant's training period should be assessed by the hosting structure where the student will carry out his/her training period through a standardized questionnaire and/or evaluation letter.

3) Case Study
Students will present the individually prepared case study prepared to an evaluation commission consisting of program staff members, representatives of DG SANCO and other experts in the field of risk assessment.

PROGRAM EVALUATION
An evaluation should be conducted upon the conclusion of the program by a designated task force. The objective is to obtain the level of satisfaction of students, and obtain comments and suggestions in future training activities and course improvements. In addition, quality control questionnaires distributed to students at the conclusion of each module can help to better understand the quality of the module organization, the level of the instruction, evaluate the training methodology and areas of discussion covered.
## ANNEX I - Program Participants

<table>
<thead>
<tr>
<th>Institution</th>
<th>Participant’s name</th>
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<tr>
<td>EUROTOX</td>
<td>Prof. Corrado Galli</td>
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<td></td>
<td>Dr. Giuseppe Malinverno</td>
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<tr>
<td>University of Surrey</td>
<td>Prof. Shirley Price</td>
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<td></td>
<td>Prof. George Kass</td>
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<td>University of Milan</td>
<td>Prof. Angelo Moretto</td>
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<td>Karolinska Institute</td>
<td>Prof. Helen Hakansson</td>
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<td></td>
<td>Prof. Annika Hanberg</td>
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<td></td>
<td>Prof. Johanna Ziliacus</td>
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<tr>
<td>University of Düsseldorf</td>
<td>Prof. Regina Kahl</td>
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<tr>
<td>IRAS</td>
<td>Prof. Mieke Lumens</td>
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<td></td>
<td>Prof. Bas Blaauboer</td>
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<tr>
<td>SCCP</td>
<td>Prof. Vera Rogiers</td>
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<td>SCENIHR</td>
<td>Prof. James Bridges</td>
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<td>SCHER</td>
<td>Prof. Helmut Greim</td>
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