

# RASS

## Risk Assessment Summer School

### EDUCATION AND PROFESSIONAL DEVELOPMENT OF YOUNG TOXICOLOGISTS

Education is usually associated with acquiring knowledge and knowledge with facts. However, knowledge regarding toxicology is not just facts but also skills, recognition and understanding. Therefore training in toxicology requires a broader approach than ordinary education. Furthermore toxicology is just not a scientific discipline but also a profession, which also underlines the necessity to consider the special training needed. This report describes the Risk Assessment Summer School (RASS) programme sponsored by IUTOX, initiated by SOT together with European Society of Toxicology (EST), with the aim to provide a specialised training taking these aspects into account.

Before the birth of modern toxicology (around 1960) toxicology was an unnoticed discipline and most toxicologists were self-made originating out of various biomedical professions. Toxicology dealt mainly with effects in humans, mainly poisonings – safety and risk assessments were not on the agenda. When the thalidomide calamity fired off the “Big Bang” in toxicology education became high fashion. New “modern” toxicologists were needed because of the “discovery” that all chemicals could be poisonous to everything alive. Investigations and inventories were made to solve the problems of recruiting toxicologists. Curricula and programmes were put together in the developed world and they looked almost the same all over. The pedagogic principles were almost the same as for other scientific disciplines. To promote toxicology as a science and a profession, societies of toxicology and certification of toxicologists were created.

### THE HISTORY OF RASS

At the beginning of the 80-ties Bo Holmstedt suggested that EST and Society of Toxicology of USA should initiate a summer school in toxicology to foster the qualified toxicologists needed for the future development of toxicology. As a model for a summer school he had in mind the Gordon Conferences and the meetings between Nobel laureates and young scientists at Mainau, where the main principle was informal discussions in order to share knowledge and experience. The term summer school did not only imply that it was conducted during the summer but also that its main pedagogic principle was the fulltime interaction between students and masters under pleasant conditions.

When Holmstedt became President of IUTOX in 1983, it was decided that the summer school should be co-sponsored by this global organisation to reach an international audience. Risk assessment was timely chosen as an appropriate topic for the intended pedagogic model, as it is based to a great extent on judgements and experience. Torbjörn Malmfors was asked to organise and conduct the first two courses agreed upon by EST and SOT. The summer school was given the name Risk Assessment Summer School, with the acronym RASS.

Thirteen courses have been conducted during 25 years. The students have been scientifically qualified in toxicology at the doctoral level, having some practical experience, having academic, industrial or regulatory affiliation, not more than 35 years of age and able to communicate in English. Three hundred and thirty (330) students from 53 countries have attended, see Table.

RASS No	Time	Venue	Country	Number of students/countries
I	August, 1985	Menstrup Kro	Denmark	23/7
II	August 1987	Airlie House, Virginia	USA	27/8
III	October 1990	Hotel Europa, Anacapri	Italy	28/14
IV	August 1992	Grotto Bay Hotel	Bermuda	20/11
V	August 1994	Manor of Groves	England	24/15
VI	Aug- Sept 1996	Royal Garden, Hua-Hin	Thailand	24/11
VII	August 1998	Toftagården, Gotland	Sweden	28/16
VIII	October 2000	Pueblo Acantilado, Alicante	Spain	32/23
IX	October 2002	Ta Cenc, Gozo	Malta	26/20
X	Sept-Oct 2004	Hoeri, Hemmenhofen	Germany	24/16
XI	September 2006	Hoeri, Hemmenhofen	Germany	25/22
XII	September 2007	Hoeri, Hemmenhofen	Germany	25/20
XIII	September 2008	Hoeri, Hemmenhofen	Germany	27/22
TOTAL				330/53

Table. Time, venues and number of students/countries of origin of the RASS courses

In order to fulfil the intentions of Holmstedt two problems were paid special attention, the faculty and the study material. The faculty members were carefully selected among experienced toxicologists, who were interested in the concept of the summer school and agreed to participate during the whole course. They were all outstanding experts with long-time experience of evaluation in the major areas of toxicology. The following experts have participated as faculty members, given lectures and acted as tutors: Anthony Dayan, Jack Dean, Elaine Faustman, Helmut Greim, Marie Haag Grönlund, Ernie Harpur, Sonja Jeram, Martin Kramer, Bengt Källén, Bo Lambert, Torbjörn Malmfors, John Newman, Tony Palmer, Paul Peters, Emil Pfitzer, Iain Purchase, and Garry Williams. Besides toxicologists, a psychologist – Paul Slovic – a well-known expert in risk perception, was invited to cover the judgemental issues of risk assessment.

The study material consisted of lectures and discussions. After introductory lectures each faculty member presented their topic of expertise in a two 45 minutes long sessions, followed by discussions both in plenum and in break out groups. Instead of the faculty providing material for the discussions, which were the major activity, the students were instructed to write a study case on risk assessment of a real chemical or product in advance. First the cases were discussed in detail in the break out groups with a faculty member as tutor. Then the cases were further discussed among the group members or with the tutor, if necessary, and after that the author prepared himself/herself for the plenary discussion a day later. All cases were discussed in plenum. After a short presentation by the author two groups were prepared to ask question or make comments before all students and faculty members were invited to take part in the discussion.

There were also some other aspects, albeit not that important, which were considered from the beginning. To facilitate transportation for participants from all over the world the venue should be located close to a convenient airport but still fairly isolated to prevent the students from disappearing to other activities. To promote the learning process the venue was selected to provide a stimulating and creative environment for both mind and senses – combining pleasure and education. Each course lasted nine days, including two half days of excursions.

## **THE RASS APPROACH**

Hopefully future education in toxicology should, at least to some extent, be based upon the ideas of RASS in order to fulfil the visions of the old toxicologists. Even if the learning methods and overall program have been fairly similar on all occasions some basic principles have evolved during the years. These principles of the conduct and experience of the RASS programme will be summarised below. More details can be found in a written manual published on the IUTOX website.

### **Risk Assessment**

Risk assessment is more than a collection of facts and data. It is an intellectual process. While the amount of data describing the toxicity of chemicals has grown enormously, even with the aid of modern technology, such as computers, our capacity to interpret this information wisely poses a continuing challenge. Risk assessment involves a thorough understanding of the scientific basis of the toxic phenomena, the overall process of risk assessment and the ability to integrate the critical information necessary to present the risk of exposure to a chemical.

Experience, judgements, perceptions, and various philosophical ideas influence the way in which individuals conduct risk assessments. Thus it is no surprise that different experts may reach different conclusions from performing risk assessment on a chemical in similar circumstances. Semantics, or the meaning and use of words, also has an influence on how one perceives risk assessment. Thus definitions of concepts, like hazard, exposure, toxicity, and risk are important when discussing risk assessment issues. It follows from this analysis that risk assessment, as it is generally practised, is not a discipline by itself but a way of making use of and organising scientific data and skills.

There are different ways to structure the risk assessment process, but the structure used at RASS covers:

- a critical scientific evaluation of data
- extrapolation of experimental data to real life
- prediction of what might happen in the future to humans and the environment
- an understanding of the impact of risk assessment on attitudes of the public to risk
- evaluation of the probability and the severity of the possible harmful effects

Thus, risk assessment forms the final phase of a process, which uses the results of all available scientific work in toxicology. It utilises what is known about the adverse effects observed in experimental or epidemiological studies, including all inherent uncertainties of these studies, and must take account of the fact that there will be insufficient data in virtually every risk assessment.

We have to realise and accept that risk assessment is a judgmental process different from the more familiar methods of recording and reporting data objectively. Thus it is obvious that risk assessment requires knowledge, both of the data related to the chemical and experience of integrating it into a risk assessment. However, one of the most important uses of risk assessment is to present qualitative and quantitative statements about the risk to humans of exposure to chemicals and to inform decisions on how various chemicals can be used in an acceptable way.

### **RASS - a method for training in risk assessment**

#### *Goal, objectives and means of RASS*

- RASS offers young toxicologists the opportunity to broaden their knowledge and experience in the field of chemical risk assessment and to achieve a better understanding of how to evaluate data and inform decision makers.
- RASS has few formal lectures but provides ample time for discussion initiated by the lectures, for cases prepared by faculty members and most important of all, for study cases, written by the students themselves before the course. The student cases form an excellent basis for hands-on training.
- The purpose of the discussions is to convey the knowledge and the experience of the faculty to the students and to open new vistas for those who are eager to learn and to take on new challenges.
- RASS combines the principles of participatory education with a stimulating and creative environment for both the mind and the senses.
- RASS offers sufficient incentives for the students to continue their risk assessment training indefinitely with emphasis on broad, international perspectives.
- RASS provides an informal atmosphere for establishing good relations between faculty members and other students and provides valuable future contacts in the field of risk assessment. It promotes an exchange of thoughts and ideas, which in the future is a valuable means of keeping up with the development of the subject.

#### *The educational principles of RASS*

Knowledge in a broad sense can be thought of as facts on the one hand and experience or tacit knowledge on the other. Experience can be considered as the acquisition of skills and the ability to recognise and understand these issues. Facts, like numbers, can easily be described in writing or in lectures, and hence teaching can be used for conveying facts. Other types of knowledge, e.g. experience and skills, are more effectively acquired by learning, which includes training and practising using practical examples. Thus an educational program combining teaching and active learning is the best method of improving an individual's ability to carry out risk assessment.

These principles follow the basic tenets of educational theory, which rely on promoting participation and active learning. Individuals retain information best when they are actively involved in problem-solving exercises and hands-on learning. It is said that they remember 20% of what they hear, 40% of what they hear and see and 80% of what they hear, see and do. "Hands on learning" refers to activities such as abstracting information, critical appraisal or other applications of knowledge.

The training approach used in RASS and described in this manual is a participatory approach to education. This approach is characterised by the following features:

- it is interactive
- it is based on real life experience
- it incorporates dialogue between and among teachers and students
- it critically analyses facts and conclusions

Education is most effective when it recognises the context in which it takes place and provides students with the opportunity to engage in multiple-learning modalities: listening, looking at visual aids, asking questions, role playing, reading, writing and discussing critical issues. The use of participatory methods should include activities that help students develop critical thinking, practice problem solving and decision-making and gain confidence in their profession.

It is important to create a positive and stimulating environment, as learning is not just a cognitive process but also influenced by perceptions and emotions. The training atmosphere should be open-minded, exploring, courageous, honest, non-prestigious, non-prejudiced, warm-hearted and friendly. It is the responsibility of all participants, including both faculty members and students, to contribute to this environment.

Training, like risk assessment itself, is based on communication. The principles of communication are simple to enunciate but communication itself is not that easy. Many languages are used in the minds of the faculty members and students as they have different mother tongues, even if English is used as the written and spoken language during the training. Not only are there language differences but education, culture and personal experience vary considerably in a group of international students. It often happens that what is obvious to one student can be a complete riddle to another. Thus, all communication has to be performed in a proper way; this means not just providing information but ensuring that it has been received and understood.

The methodology used for risk assessment training is important but following that methodology is not sufficient to achieve the objectives of RASS. It is also necessary for the trainee to contribute to the outcome, or as Axel Munthe, a Swedish physician, stated: "You can get help to improve your knowledge but you have to find wisdom by yourself".

### *The experience from RASS*

We have accumulated some useful information and experience from the thirteen RASS courses. Besides the practical arrangements, e.g. the announcement, program time schedule etc., there are many details, which play an important role in the overall outcome of the course.

The following features are worth mentioning:

- the preparation of study cases in advance by the students
- the presence of all faculty members during the entire course, which makes the interaction between teachers and students most effective
- the social activities including excursions, which break down barriers and give new cultural perspectives
- the venue and accommodation which provide a pleasant environment despite hard work

### *The evaluation of RASS*

The outcome of the courses has been surveyed at the end of each course. From these surveys it is obvious that the overwhelming value of RASS to the students has been the preparation, discussion and presentation of their written study cases. However, the real value of the course for each individual can only be judged by the individuals themselves.

The faculty continuously evaluates the progress and its work during the course and between the courses. In short the value of RASS is well described by Iain Purchase in a report from RASS IV:

*"What benefit is it to the students? Right before the eyes of the faculty, they learn to challenge the assumptions, seek out the weakness in their own and others' work. They grow in confidence as they work with a small team supervised by a member of the faculty; they present their own case and argue the issues constructively. Even the most shy student glows with a sense of achievement, develops a network of contacts and makes good friends.*

*But it is not only the students who learn. Faculty members are seen discussing issues late into the night, coaching individual students and generally learning more about the other disciplines. And where else would they have the chance to debate the merits of assessments of risks of a number of industrial chemicals, microbial pesticides, arsenic in the diet, lead in the dust, food chemicals, medicines, personal care products and even the toxic risk of cassava consumption, all subjects of students' risk assessment? Carcinogenic, mutagenic, reproductive, phototoxic and other toxic risks were all discussed. There is also the satisfaction of seeing the students flex their minds and visibly grow in knowledge and confidence.*

*There were unexpected pleasant surprises. One afternoon we had a tour of the island by bus and the bus driver gave us an impromptu course in herbal remedies - most successfully as one of the faculty was seen curing his headache by wrapping leaves around his somewhat balding head!*

The students were encouraged to express their views during the course or later in writing. Some citations from letters received from the students after the course:

*"I came away with a broader knowledge of toxicology and its implications for different societies."*

*"The greatest amount of information was gained in conversations that occurred outside the formal sessions."*

*"I feel I have gained a much greater critical awareness. I now realise that I have a different attitude as regards my and other people's work."*

*"The way I think about risk has been deeply changed."*

*"The friends I made should be very useful in the future for keeping abreast of scientific advances in the rest of the world."*

*"I had an unforgettable experience and left very stimulated as a result of the discussions and the interactions which took place throughout the week."*

*"I came to the course frightened that I was very behind and confused in my approach to risk assessment and came away with enthusiasm and confidence."*

*"I must confess that initially I felt like a stranger in a strange land."*

*"It was the single most effective education experience of my professional life."*

## CONCLUSION

It is difficult to know if RASS has fulfilled the hopes of the late Bo Holmstedt, i.e. that it should promote toxicology, but it is noteworthy that many former RASS students can be found at leading toxicology positions even within SOT. Furthermore it has successfully combined pleasure and toxicology education.

After 25 years and thirteen RASS courses we concluded the RASS program by having a seminar with the faculty members to discuss what RASS gave and what we could give back for the future by trying to answer the question: How could toxicology/risk assessment contribute to the future of mankind?

Besides the satisfaction of the students the success of RASS is evidenced in the fact that the faculty members have kept on coming back course after course without any extra compensation than accommodation and sometimes travel expenses. During the years the faculty has become a strong team, which enthusiastically has supported and further developed RASS into a very special event. They have really fulfilled the vision of a summer school by being present all the time to share their experience with the young experts-to-be. Their contribution has been invaluable, very much appreciated by the students and heartily acknowledged by the organisers of which Birgitta Lewander has carried out the administrative work.

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