



Activities of the ICGEB in the Area of GMO Biosafety Capacity Building for Developing Countries

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Abstract: The role of International Centre for Genetic Engineering and Biotechnology (ICGEB) in the area of biosafety regulation in term of capacity building activities for developing countries is enumerated in this paper. The various initiation made by ICGEB are explained along with the establishment of a special unit for information dissemination and training programmes. These initiations of ICGEB would be success if linking and support from other organization is also ensured.

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The International Centre for Genetic Engineering and Biotechnology (ICGEB) has a long-standing engagement in capacity building that was initiated in 1991 with the launching of the ongoing series of biosafety training courses, and the Centre has progressively extended and enriched its engagement in biosafety with other activities. A major step was made in 1997, when the ICGEB set up a dedicated Biosafety Unit, in order to enhance the Centre's ability to provide institutional services related to the biosafety of genetically modified organisms (GMOs) and their environmental release. In a recent development, starting at the end of 2004, with the support of the Fondazione Cassamarca, the ICGEB has created a Biosafety Outstation, primarily focused on GMO biosafety research. The Unit and the Outstation work closely together in three major sectors, namely: (i) information dissemination and the establishment of a biosafety clearing-house; (ii) scientific training in risk assessment for the environmental release of GMOs (capacity building and technology transfer); and (iii) international cooperation with other international agencies involved in biosafety.

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Resources for Dissemination of Information on GMO Biosafety

By virtue of a Memorandum of Cooperation entered into with the Secretariat of the Convention on Biological Diversity, the pre-existing ICGEB biosafety bibliographic database¹ is now fully accessible through the Biosafety Clearing House, the main portal for internet-based information developed by the CBD in the framework of the Biosafety Protocol. This database now contains more than 5000 scientific articles (full references and abstracts), published in international, peer-reviewed, scientific journals since 1990, selected and classified by the ICGEB according to specific topics that could raise concern over the environmental release of GMOs.

Another important informatics tool developed by the ICGEB with the support of the Italian Ministry of the Environment, the Risk Assessment Searching Mechanism (RASM),² also continues to expand. This device, which should prove to be very useful for the decision-making process according to Article 10 of the Cartagena Protocol, provides access to an index of the existing risk assessment documents related to official governmental decisions for the release of GMOs. The RASM now contains 475 records of risk assessment documents, relating to 122 different transgenic events from 14 plant species, issued by 18 official authorities from several countries.

As of 2003, ICGEB is also involved, together with partners in France, Germany and Hungary, in a European initiative to enhance communication regarding GMO biosafety research, named GMO RES COM.³ One of the objectives of the project is the creation of a web-based, public-access database of past and current projects in GMO biosafety research. This database should improve communication within the scientific community, as well as between researchers and the public at large, while providing access to information to worldwide stakeholders. In its present phase, the GMO RES COM participants are entering projects into the database, but it is expected that biosafety research project leaders will spontaneously enter their projects. In a future refinement, a direct link between the GMO RES COM database and the existing ICGEB bibliographic database will be created.

Through these three linked databases, the ICGEB is equipped to play a central role in providing access to information on the biosafety of GMOs.

The ICGEB is playing an increasing role in the publication of scientific articles in the area of GMO biosafety. The Italian Ministry of

the Environment has provided funds for publication of an information booklet on GMOs, as well as the first issue of the *Collection of Biosafety Reviews*, a compilation of scientific studies in areas of major interest for biosafety and risk assessment, prepared specifically for ICGEB by internationally recognized scientists. The second issue is currently being finalized, and focuses on specific examples of GMO release and on the possible use of predictive models for the invasiveness and impact of introduced alien species for the purposes of GMO risk assessment. In addition, the ICGEB Biosafety Outstation at Ca' Tron now houses the editorial office of a multidisciplinary international journal, *Environmental Biosafety Research*,⁴ which is the official journal of the International Society for Biosafety Research,⁵ and has appeared quarterly since late 2002.

Training Courses for GMO Biosafety Capacity Building

The ICGEB has long-standing experience in providing training in the area of GMO biosafety.⁶ Since 1991, some 900 scientists from over 80 different countries have attended ICGEB's biosafety workshops, which have been held once or twice each year. For instance, the ICGEB and the Italian Institute for Overseas Agronomy (IAO) have jointly organized a course in 2004 that was attended by 44 scientists from 22 countries. Until this year, the workshops have focused on general principles of GMO risk assessment, with both introductory and advanced workshops proposed. They have attracted an extremely diverse group of participants, including both members of the competent authorities involved in evaluation of proposed releases of GMOs and also scientists active in biotechnology.

In 2005 a new type of workshop was held, devoted to providing experience in the examination of the scientific data that are evaluated to produce an environmental risk assessment (ERA) report. It was attended by 36 scientists from 17 countries. Many nations are in the process of developing or implementing a national biosafety framework and their competent authorities need to gain experience in evaluation of ERAs. This workshop was organized by the ICGEB Biosafety Unit and the IAO, as in previous years, but also with the staff of the newly established ICGEB Biosafety Outstation at Ca' Tron. Although this type of workshop is intended primarily for officers or designated experts working in the area of GMOs risk assessment at an official level (governmental agencies, scientific institutions, private sectors etc.), it should also prove useful for people actively developing GMOs, since

having a clear idea of how an ERA is evaluated would be of great use for scientists by helping them to recognize key areas of risk assessment to be integrated into their biotechnology projects.

Thanks to new personnel at the Biosafety Unit and Outstation, the ICGEB is planning to expand its offering of biosafety training courses, to include a broader range of course subjects, and also to organize similar regional courses. Future plans also include short courses including practical laboratory experience in addition to lecture presentations.

Seminars in GMO Biosafety Research

With the opening of the ICGEB Biosafety Outstation at Ca' Tron in 2004, the ICGEB has significantly enhanced its capacity in the area of GMO biosafety research (see below: *Research Training in GMO Biosafety*). The outstation is also ideally equipped to host small scientific meetings. The ICGEB proposes to use these facilities to hold a series of informal seminars that would serve as brainstorming sessions in specific research areas pertinent to GMO biosafety. These would include questions of immediate concern for GMOs already in or close to the commercial release stage. The comparison of strategies and results obtained worldwide would help define questions requiring further research, would be an ideal platform for developing international consortia for addressing the most important points, and would also be favourable to the development of a stronger international consensus on the conclusions to be drawn from scientific results.

In order to give an idea of what is proposed, a brief description is given below of three potential workshop topics in the area concerning the impact of plant-to-plant gene flow.

- A topic of great general interest is the impact of gene flow from GM rice to wild/weedy rice. In this case, there are widespread rice relatives that are already serious weeds (e.g. "red rice"), and there is concern that certain transgenes could contribute significantly to their weediness. At a time when commercial release of GM rice is projected in the very near future, a worldwide examination of the potential impact of various types of GM rice would contribute to clarifying numerous issues related to different types of GM rice projects.
- Sugar beet is an extremely important crop in many European countries, and the possible impact of gene flow from transgenic sugar beet to the weedy forms of beet that have resulted from crosses between

wild and sugar beet is an area of considerable concern. Weed beet already constitutes a serious agronomic problem in certain areas, and one might well wonder if acquisition of a gene conferring resistance to an herbicide or to a virus would increase the invasiveness of weed beet, or make management of weed beet more difficult. This is an area that has been studied in several European labs, and it would be particularly useful to convene a meeting in order to draw the conclusions as they stand today, and to clarify if further research is necessary to come to a soundly based decision on deployment of the presently proposed transgenic sugar beets, and if further research is required, exactly what is necessary, and exactly how this would support the decision-making process.

- At a more fundamental level of research, there is apparently a methodological problem for assessing the effects of gene flow on weediness. There are relatively well-established means for assessing changes in fitness that could be caused by dissemination of a transgene, but it is much less clear if this will lead to the phenomenon of ecological release; i.e., will the new trait lead to increased population size of those plants having introgressed the transgene? Changes in population size would be the clearest measure of increased weediness, so developing research strategies that would enable prediction of the likelihood of environmental release would be extremely useful.

Numerous other questions of equivalent interest could easily be identified in this and other areas relevant to GMO biosafety. In particular, questions in areas of more fundamental research, not as directly related to immediate questions, should also be studied. This would include questions in the areas of mechanisms that could lead to impact, and also to baseline studies of equivalent non-transgenic systems. The ICGEB proposes to serve as a centralized resource for organizing such research seminars. This would include opening periodic calls for subjects for discussion, assisting the organizers in developing the programme, and providing the infrastructure for holding the seminars.

Research Training in GMO Biosafety

The ICGEB Outstation at Ca' Tron is a fully equipped laboratory for studies on genetically modified plants. The research of the two groups working there, Plant Virology and Plant Bacteriology, focuses on one of the central aims of the ICGEB as a whole: to carry out first class

fundamental research that is or will be of importance for biotechnology in the developing world. This clearly includes providing training in biosafety research. At Ca' Tron, this fundamental research will focus on biosafety questions related to GM plants and their associated pathogens. However, the sense given to this research will be provided by development projects, which will include creating pathogen-resistant transgenic plants expressing transgenes that will have been designed – in the light of the fundamental research – in order to minimize the potential epidemiological and environmental risks. The aim is for these two activities to in effect create a world-class centre for research on pathogen-resistant transgenic plants. The research carried out at Ca' Tron is expected to serve as an example that will make it possible for researchers in developing countries to better integrate biosafety concerns into their own projects. It is expected that these projects, in which the Outstation will act as a partner, will constitute a network of collaborative biosafety/biotechnology projects. The collaborative projects will clearly also be a key element in the practical part of the training programme at Ca' Tron, since it is expected that scientists from developing countries will wish to carry out part of their research there.

The research groups working at Ca' Tron are also considering organizing biosafety practical courses in their areas of expertise.

Conclusions

The ICGEB is progressively putting in place a unique resource in the area of GMO biosafety, including several web-based public-access databases, and both theoretical and practical training. This ambitious overall programme can only be carried out fully with the support of other organizations. It will also only reach its greatest usefulness if it is developed to respond to the most pressing needs for training, and this must be done in close cooperation with other organizations involved in providing capacity-building. Overall, this implies developing biosafety capacity-building in the context of collaboration with a broad range of partners worldwide.

Endnotes

- ¹ www.icgeb.org/biosafety/bsfdata1.htm
- ² www.icgeb.org/biosafety/rasm.html
- ³ www.inra.fr/europe/gmorescom/
- ⁴ www.edpsciences.org/ebr/
- ⁵ www.isbr.info/
- ⁶ www.icgeb.org/MEETINGS/CRS05/Meetings2005.htm