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WORKSHOP OF THE NETWORK OF LABORATORIES FOR THE DETECTION AND IDENTIFICATION OF LIVING MODIFIED ORGANISMS
Ispra, Italy, 25-27 November 2013

SUMMARY OF THE ACTIVITIES UNDER THE ELECTRONIC NETWORK OF LABORATORIES FOR THE DETECTION AND IDENTIFICATION OF LIVING MODIFIED ORGANISMS (2012-2013)

I. INTRODUCTION

1. Paragraph 5 of decision BS-V/9 invited Parties to nominate national and international reference laboratories with the view to establishing, through the Biosafety Clearing-House (BCH), an electronic network of laboratories to facilitate the identification of living modified organisms (LMOs) as well as the sharing of experiences.

2. Furthermore, paragraph 1 (c) of the same decision requested the Executive Secretary to organize regional workshops for heads of laboratories involved in the detection of LMOs to exchange information and experience on the implementation of relevant standards and methods.

3. The Network of Laboratories for the Detection and Identification of Living Modified Organisms was launched in March 2012. Activities in 2012 included a series of discussion groups with the aim of (i) sharing information and experiences and (ii) identifying challenges in the identification of LMOs.[1]

4. In 2013, the number of participants in the Network increased to a total of 68, with nominations continuing on an ongoing basis.[2]

5. Section II of this document summarizes the discussions of the electronic network of laboratories during 2013 to date.

II. SUMMARY OF ACTIVITIES

6. In 2013, the activities of the Network resumed with a series of online discussion groups held from 20 May to 28 July. The objectives of the online discussions of the Network are to (i) develop a strategy to address Parties' needs regarding detection and identification of LMOs, to be presented as a set

[1] The 2012 discussions are summarized in document UNEP/CBD/BS/COP-MOP/6/INF/9, available at http://www.cbd.int/doc/meetings/bs/mop-06/information/mop-06-inf-09-en.pdf.

[2] See notification SCBD/BS/CG/KG/da/77120 (2013-015), dated 14 February 2013, available at http://www.cbd.int/doc/notifications/2013/ntf-2013-015-bs-en.pdf.

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of recommendations for consideration of the Conference of the Parties serving as the meeting of the Parties to the Cartagena Protocol on Biosafety (COP-MOP) at its seventh meeting; and (ii) compile laboratory methods for the detection of LMOs, in particular LMOs that are unauthorized or unintentionally released into the environment, for publication in the Biosafety Technical Series.

7. The following topics were selected for discussion by the Network as relevant to the detection and identification of LMOs, with a view to making progress toward the implementation of the Strategic Plan for the Cartagena Protocol on Biosafety for the period 2011-2020:[3]

(a) National regulatory context and current capacity for detecting LMOs;

(b) Overview of existing networks for LMO detection and identification;

(c) Compilation of laboratory methods for the detection and identification of LMOs;

(d) Access to DNA sequence information and reference material;

(e) Specificity, sensitivity and costs of established methods for LMO detection;

(f) Emerging techniques for LMO detection;

(g) Challenges and progress in the detection of LMOs unintentionally released into the environment and unauthorized LMOs.

8. During the online discussions, there were 36 postings to the forum. Summaries of the discussions that took place on each topic are presented in section III of this document.[4]

9. A second round of online discussions is foreseen after the workshop of the network of laboratories for the detection and identification of living modified organisms being held from 25 to 27 November 2013, and will focus on the outcomes of the workshop, namely the implementation strategy for detection and identification of LMOs and the recommendations to the COP-MOP identified during the workshop.

III. SYNTHESIS OF THE DISCUSSIONS

Topic 1: National regulatory context and current capacity for detecting LMOs

10. The aim of this discussion was to acquire information on laboratories with capabilities for research and development projects including accessibility to required laboratory materials.

11. Countries are currently active in establishing detection laboratories to detect and monitor LMOs within the context of their national regulatory frameworks. The postings under this discussion indicated that the laboratories are working within national frameworks that differ in their requirements for labelling and threshold levels of tolerance to LMOs. These range from those that do not have any labelling or threshold requirements to those that are currently in the process of working towards establishing their labelling and threshold requirements and those that are working within well-defined and accepted regulations. Participants who shared their experiences indicated that there exist one or more functioning

[3] Available at http://bch.cbd.int/protocol/issues/cpb_stplan_txt.shtml.

[4] Discussions can be found at http://bch.cbd.int/onlineconferences/portal_detection/discussions.shtml.

laboratories in their countries, and several of these have either achieved ISO 17025 accreditation or are taking active steps towards achieving the standard.

12. Participants also shared some of the challenges that they face in their laboratories. The most common included lack of reference materials, lack of standardized and validated detection methodologies, and the high costs of analysis. Furthermore, with the continuous advent of novel LMOs, the challenge of dedicating the resources needed for the research and development of methods to detect them becomes prominent both in the context of environmental monitoring and detection in shipments.

Topic 2: Overview of existing networks for LMO detection and identification

13. Two interventions detailed the establishment and activities of three regional and/or national networks of laboratories for detection of LMOs or genetically modified organisms (GMOs): the European Network of GMO Laboratories (ENGL), the Latin America and the Caribbean Network for GMO Detection and Analysis (RLAC-OGM), and the National Network of Laboratories for the Detection, Identification and Quantification of GMOs (RNLD-OGM) in Mexico. Participants shared information about the efforts of the networks in building capacity, both at national and regional levels, and in providing solutions to common problems that are faced by the member laboratories through the sharing of technical expertise and establishing linkages among experts in the field for greater scientific dialogue.

14. It is noted that several regional laboratories around the world have also taken steps towards bringing together scientists in the field of GMO detection to help provide support and capacity-building among themselves in order to strengthen their collective knowledge in the field. For example, there have been workshops organized in the Middle Eastern and North African countries, as well as by the ASEAN GM Food Testing Network, among others, to bring together scientists for sharing experiences and networking. In 2009, the Southern African Network of GM Detection Laboratories (SANGL) was launched to bring together nine countries with the objective of providing technical support for LMO testing, establishing guidelines for best practices in LMO detection, facilitating training in LMO detection, and organizing proficiency testing among participating laboratories.

Topic 3: Compilation of laboratory methods for the detection and identification of LMOs

15. Participants were invited to upload and discuss relevant methodologies that are currently in use in their laboratories. A total of 10 submissions were made in this discussion. These methodologies ranged from best practices for extraction methods to end point PCR set-up and product detection or quantitative Real-Time PCR methods, amongst the various techniques that can be used in detection and identification laboratories.

Topic 4: Access to DNA sequence information and reference material

16. Several participants indicated that there exist some sources where certified reference materials (CRMs) could be accessed but noted the challenges involved as a result of logistical issues such as costs, unreliable quality, and long, unpredictable delivery times.

17. Furthermore, the CRMs that are available for purchase do not necessarily satisfy laboratories' need for CRMs that originate from locally produced LMOs or those from tropical LM crops. Several participants indicated that, as a solution to these challenges, they have been developing their own CRMs according to their needs. Participants showed strong interest in this solution and called for the development of guidelines outlining the best practices for laboratories to generate their own CRMs, e.g., matrix CRMs or plasmid CRMs. The local development of CRMs, however, has its challenges, including

lack of access to the raw materials needed to generate such CRMs as well as possible costs associated with their development.

18. There was also support for the creation of a portal where general information on commercially, and possibly locally, available CRMs/RMs could be stored and accessed by laboratories. This information could include, for example, suppliers, costs, and experiences from users on the quality of the CRMs to enable access to a single repository of information to colleagues in the field.

19. Finally, the discussion touched upon issues regarding the development of detection methodologies, and how to access sequence information or appropriate literature on the best practices to follow for the development of these new methodologies.

Topic 5: Specificity, sensitivity and costs of established methods for LMO detection

20. The interventions that were made indicated that laboratories employ a wide variety of methodologies using DNA and protein based assays to detect LMOs, using both commercially available kits and in-house designed methodologies to satisfy the detection requirements within their national frameworks. Participants also indicated that laboratories are active in carrying out research projects to locally develop innovative and cost-effective methodologies for the detection of LMOs. Laboratories do face limitations in their work as a result of the costs associated with carrying out analyses.

21. A few points for further discussion and consideration of the present workshop include (i) how to integrate the various methodologies within each laboratory's workflow to maximize the quality and amount of information obtained from the analysis of the samples while ensuring that costs remain low; and (ii) cost-effective strategies that can be adopted by laboratories to detect adventitious LMOs as well as unauthorized or unintentionally released LMOs.

Topic 6: Emerging techniques for LMO detection

22. While laboratories do have standardized and validated protocols that are used for routine detection work, a few participants have reported that they are actively engaging in research with a view to improving their existing protocols and introducing new methodologies that can help in increasing throughput and sensitivity while decreasing cost per sample. An example of such research was recently published by Cottenet et al., optimizing a multiplex real-time PCR protocol to detect up to 47 LMO targets (http://link.springer.com/article/10.1007/s00216-013-7125-5).

23. To facilitate the process of integrating novel protocols, participants placed emphasis on the importance of exchanging experiences and collaborating with other laboratories to share resources and information. Examples where the exchange of information among laboratories could have an impact include laboratory troubleshooting and improvement of protocols. A possible solution noted during the discussion is the inclusion of such information in a portal on CRMs as suggested above. Furthermore, as previously noted, the availability of reliable CRMs poses a technical barrier that slows down the process of developing new methodologies. Finally novel methodologies would also need to be developed to keep up with the advent of novel LMOs, such as those that express modified protein expression through RNAi-mediated technologies.

Topic 7: Challenges and progress in the detection of LMOs unintentionally released into the environment and unauthorized LMOs

24. With regards to the use of the terms "unauthorized LMOs" and "unintentionally released LMOs", as for the purposes of this discussion, participants indicated that there was no uniform use of the terms

within their national regulatory contexts. Furthermore, the various national regulatory contexts sometimes use the terms interchangeably and also have an additional variety of terms and definitions to describe the different types of occurrences of LMOs. This variation is also mirrored in the differences in threshold requirements on the permissibility of approving imports containing LM material already authorized and being produced in other countries, but not yet approved in the importing country. A possible point of consideration is whether or not there is a need to harmonize the terminology in order to help streamline discussions on the topic and on related issues such as the setting of thresholds and labelling requirements.

25. Participants further noted that the detection of unauthorized and unintentional LMOs is a challenge to detection laboratories (note: see also a review paper by Holst-Jensen et al. “Detecting un-authorized genetically modified organisms (GMOs) and derived materials” http://www.sciencedirect.com/science/article/pii/S0734975012000377).

26. Participants highlighted various methodologies for the detection of unauthorized or unintentionally released LMOs. These methodologies range from using and optimizing a matrix-based approach to more advanced techniques, such as the use of high throughput sequencing methodologies, which however come with considerations regarding cost of analysis per sample.

27. Access to information regarding which unauthorized or unintentionally released LMOs could potentially be present in a given shipment can facilitate the selection of LMOs targeted for detection, leading to an improved laboratory workflow process, and help reducing the costs (for example through improved documentation-based tracing of potential target LMOs as outlined in Ruttink et al. “Knowledge-technology-based discovery of unauthorized genetically modified organisms” http://link.springer.com/article/10.1007%2Fs00216-009-3218-6).
