



SOUTH ASIA
BIOSAFETY PROGRAM

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SABP

The South Asia Biosafety Program (SABP) is an international developmental program initiated with support from the United States Agency for International Development (USAID). The program is implemented in India and Bangladesh and aims to work with national governmental agencies to facilitate the implementation of transparent, efficient and responsive regulatory frameworks for products of modern biotechnology that meet national goals as regards the safety of novel foods and feeds and environmental protection.

SABP is working with its in-country partners to:

- Identify and respond to technical training needs for food, feed and environmental safety assessment.
- Develop a sustainable network of trained, authoritative local experts to communicate both the benefits and the concerns associated with new agricultural biotechnologies to farmers and other stakeholder groups.
- Raise the profile of biotechnology and biosafety on the policy agenda within India and Bangladesh and address policy issues within the overall context of economic development, international trade, environmental safety and sustainability.

HIGHLIGHTS OF THE AGTECH GLOBAL SUMMIT HELD AT AURANGABAD, INDIA

The AgTech Global Summit 2012 was held in Aurangabad, India from December 9 to 13. The event was inaugurated by Dr. S. Ayyappan, Secretary, Department of Agricultural Research and Education (DARE) and Director General, Indian Council of Agricultural Research, Government of India. Dr. Ayyappan, while addressing the gathering, said "In order to meet the growing demand for food grains adequate use of modern technology is essential. Private sector and government should join hands to enhance food production. We will be able to import airplanes and mobiles from across the world but we won't be able to get wheat and rice if we fail to be independent in food grain production."

The event was attended by more than 100 participants from India and abroad. The summit brought together scientists from public and private sectors to discuss the need to work together to fast track the development and delivery of agricultural technology to face the challenge of climate change and mitigate global hunger and poverty. It was, however, stressed that appropriate benefit sharing mechanisms should be developed and implemented especially with reference to germplasm and technology exchanges. Innovative partnerships between academia and industry should be nurtured to generate the next generation of leaders with the practical knowledge and business skills to promote entrepreneurship for public good.

The scientists strongly emphasized the fact that regulatory data generated during the past two decades confirm the

safety of genetically modified (GM) crops and products that are currently being grown globally. They suggested that the GM crops that have been approved and grown for more than a decade must be released. The scientists also suggested that the regulatory costs of bringing GM crops to market should be lowered to make it affordable for public sector institutions, small and medium enterprises and innovators. Government should also support such development in public sectors generously.



The stakeholders stressed that the rapidly evolving tools of modern biotechnology (for example, molecular markers, genetic engineering and genomics) should be integrated into crop improvement programs to make agriculture more productive and sustainable. Further, the need to create better understanding of science and technology among policy makers, the media, and the general public was stressed so as to avoid misunderstandings and misconceptions about GM technology and other scientific developments.

The summit was sponsored by Bejo Sheetal Seeds Pvt. Ltd and organized by Bejo Sheetal Bio-Science Foundation in collaboration with Michigan State University, USA and Mahatma Phule Krishi Vidyapeeth Rahuri.

Based on inputs provided by Dr. B. Mazumdar, Organizing Secretary, AgTech Global Summit 2012

FIRST INTERNATIONAL CONFERENCE IN BANGLADESH ON "BIOSAFETY AND BIOSECURITY IN DEVELOPING COUNTRIES"

Dr. Asadulghani, Head, Biosafety and BSL3 Lab, International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), Email: asadulghani@gmail.com

Held at Dhaka, December 7 - 8, 2012, the 1st International Conference in Bangladesh on Biosafety and Biosecurity in Developing Countries was jointly organized by International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), Bangladesh Livestock Research Institute (BLRI), Institute of Epidemiology Disease Control and Research (IEDCR), North South University (NSU), Dhaka University (DU), Food and Agricultural Organization of United Nations (FAO), Bangabandhu Sheikh Mujib Medical University (BSMMU), Office of the Director Disease Control & Line

Director Communicable Department of Health and, in a key role, Bangladesh Biosafety and Biosecurity Association (BBBA).

The goal of the conference was to create a forum for the exchange of conceptual understandings of biosafety and biosecurity in order to develop a strategic road map for national biosafety capabilities and capacity building. Participants were from 38 Bangladesh institutions and government departments.

BBBA envisions that this workshop, combined with plans for subsequent workshops and seminars and interaction with the National Committee on Biosafety (NCB) and the Biosafety Core Committee (BCC) will lead to:

- i) the establishment of a coordinated national biosafety and biosecurity network;
- ii) standardization of biosafety, biosecurity and containment procedures and practices;
- iii) development and advancement of all aspects of national biosafety and biosecurity expertise that is accessible to national regulatory groups.

Held at University of Dhaka and BSMMU, special guests at the inaugural ceremony included Prof. S.M. Ali, Adviser to the Minister on Health and Family Welfare and Social Welfare Affairs and Dr. P.G. Datta, Vice Chancellor of BSMMU. The keynote speech, a history of the eradication of smallpox and polio, newly emerging infectious disease threats, the cause of emerging infections and the biosafety and biosecurity concerns of modern biotechnology, was given by Prof. Naiyyum Choudhury, Professor of Biotechnology, BRAC University. The conference consisted of one technical and two scientific sessions followed by discussions.

The conference's technical session was built around the role of laboratory facilities in maintaining biosafety and biosecurity and included the following presentations:

- Laboratory facilities to support research and diagnostics with infectious materials.
- Biosafety cabinet: the crucial mechanism of biosafety.
- Bangladesh laboratory response network: an initiative towards national laboratory capacity building and advancing biosafety biosecurity status.

There were two scientific sessions. The first, about biosafety and biosecurity in developing countries, and included the following presentations:

- Biosafety and biosecurity in infectious disease control.
- Enhancing biosafety and biosecurity by certifying new BSL3 laboratory in Bangladesh.
- Biosafety and biosecurity in research and diagnosis with zoonotic diseases in Bangladesh.
- Rabies elimination strategy of Bangladesh: status of implementation.

The second concerned biosafety and biosecurity in agriculture, livestock and poultry and the strategic and integrated approaches that encompass policies and regulatory frameworks instrumental in analyzing and managing risks in food, animal and plant lives or in their health or environment.

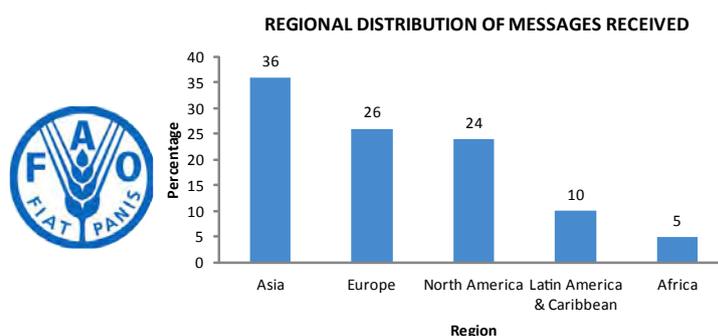
There were two discussion sessions.

- The need for biosafety biosecurity education to enhance development.
- Safe disposal of research and diagnostic laboratory waste.

FAO BIOTECHNOLOGY FORUM: GMOS IN THE PIPELINE

The FAO Biotechnology Forum hosted its latest e-mail conference from 5 November to 2 December 2012 on "GMOS in the pipeline: Looking to the next five years in the crop, forestry, livestock, aquaculture and agro-industry sectors in developing countries". Its goal was to inform the debate about genetically modified organisms (GMOs) in the pipeline, considering the specific kind of GMOs that are likely to be commercialized in developing countries over the next five years, and to discuss the likely implications of these new GMOs for developing countries. A Background Document (<http://www.fao.org/docrep/016/ap109e/ap109e00.pdf>) was published before the conference began. The conference summary document, entitled "An FAO e-mail conference on GMOS in the pipeline in developing countries: The moderator's summary" (90 KB) was published in January 2013 (<http://www.fao.org/docrep/017/ap998e/ap998e.pdf>).

A total of 770 people subscribed to this conference on 'GMOS in the pipeline' and, of these, 59 (i.e., 8%) submitted at least one message. Of the 109 messages that were posted, 36% came from people living in Asia; 26% from Europe; 24% from North America; 10% from Latin America and the Caribbean; and 5% from Africa. The messages came



from people living in 24 different countries, the greatest number coming from India (31 messages) followed by the United States (25 messages). A total of 55 messages (i.e., 50%) were posted by people living in developing countries. A total of 30% of messages came from people working in universities; 18% from participants from non-governmental organizations; 17% from people working in research centres; 12% from people working in the private sector; 11% from people working as independent consultants and 8% from people in Governments. All of the 109 messages posted during the 4-week moderated conference can be viewed at http://www.fao.org/fileadmin/user_upload/biotech/docs/conf18msgs.pdf.

The FAO Biotechnology Forum covers 'agricultural biotechnologies', a term which includes a broad range of technologies that are used in crops, livestock, forestry, fisheries and aquaculture, and agro-industry. They are used for a number of different purposes, such as the genetic improvement of plant varieties and animal populations to increase their yields or efficiency; the characterization and conservation of genetic resources for food and agriculture; plant or animal disease diagnosis; and vaccine development. Some of these technologies may be applied to all the food and agricultural sectors, such as the use of molecular markers or genetic modification, while others are more sector-specific, such as tissue culture (in crops and forest trees), embryo transfer (livestock) or sex-reversal (fish). For more information, please see <http://www.fao.org/biotech/biotech-forum/en/>.



The Reading List

. . . new and notable articles

CHARACTERIZING THE MECHANISM OF ACTION OF DOUBLE-STRANDED RNA ACTIVITY AGAINST WESTERN CORN ROOTWORM (*DIABROTICA VIRGIFERA VIRGIFERA* LECONTE)

Bolognesi R, Ramaseshadri P, Anderson J, Bachman P, Clinton W, Flannagan R, Ilagan O, Lawrence C, Levine S, Moar W, Mueller G, Tan J, Uffman J, Wiggins E, Heck G, Segers G.

RNA interference (RNAi) has previously been shown to be effective in western corn rootworm (WCR, *Diabrotica virgifera virgifera* LeConte) larvae via oral delivery of synthetic double-stranded RNA (dsRNA) in an artificial diet bioassay, as well as by ingestion of transgenic corn plant tissues engineered to express dsRNA. Although the RNAi machinery components appear to be conserved in Coleopteran insects, the key steps in this process have not been reported for WCR. Here we characterized the sequence of events that result in mortality after ingestion of a dsRNA designed against WCR larvae. We selected the Snf7 ortholog (DvSnf7) as the target mRNA, which encodes an essential protein involved in intracellular trafficking. Our results showed that dsRNAs greater than or equal to approximately 60 base-pairs (bp) are required for biological activity in artificial diet bioassays. Additionally, 240 bp dsRNAs containing a single 21 bp match to the target sequence were also efficacious, whereas 21 bp short interfering (si) RNAs matching the target sequence were not. This result was further investigated in WCR midgut tissues: uptake of 240 bp dsRNA was evident in WCR midgut cells while a 21 bp siRNA was not, supporting the size-activity relationship established in diet bioassays. DvSnf7 suppression was observed in a time-dependent manner with suppression at the mRNA level preceding suppression at the protein level when a 240 bp dsRNA was fed to WCR larvae. DvSnf7 suppression was shown to spread to tissues beyond the midgut within 24 h after dsRNA ingestion. These events (dsRNA uptake, target mRNA and protein suppression, systemic spreading, growth inhibition and eventual mortality) comprise the overall mechanism of action by which DvSnf7 dsRNA affects WCR via oral delivery and provides insights as to how targeted dsRNAs in general are active against insects.

PLOS ONE. (2012);7(10):e47534. DOI: 10.1371/JOURNAL.PONE.0047534. EPUB 2012 OCT 11. THE ARTICLE CAN BE DOWNLOADED FROM <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0047534>

THE MODIFICATION OF PLANT OIL COMPOSITION VIA METABOLIC ENGINEERING—BETTER NUTRITION BY DESIGN

Haslam RP, Ruiz-Lopez N, Eastmond P, Moloney M, Sayanova O, Napier JA.

This article will focus on the modification of plant seed oils to enhance their nutritional composition. Such modifications will include C18 Δ 6-desaturated fatty acids such as γ -linolenic and stearidonic acid, omega-6 long-chain poly-

unsaturated fatty acids such as arachidonic acid, as well as the omega-3 long-chain polyunsaturated fatty acids (often named 'fish oils') such as eicosapentaenoic acid and docosahexaenoic acid. We will consider how new technologies (such as synthetic biology, next-generation sequencing and lipidomics) can help speed up and direct the development of desired traits in transgenic oilseeds. We will also discuss how manipulating triacylglycerol structure can further enhance the nutritional value of 'designer' oils. We will also consider how advances in model systems have translated into crops and the potential end-users for such novel oils (e.g., aquaculture, animal feed, human nutrition).

PLANT BIOTECHNOLOGY JOURNAL. (2012) OCT 16. DOI: 10.1111/PBI.12012. [EPUB AHEAD OF PRINT] THE ARTICLE CAN BE DOWNLOADED FROM: <http://onlinelibrary.wiley.com/doi/10.1111/pbi.12012/abstract>

NON-RECESSIVE BT TOXIN RESISTANCE CONFERRED BY AN INTRACELLULAR CADHERIN MUTATION IN FIELD-SELECTED POPULATIONS OF COTTON BOLLWORM.

Zhang H, Wu S, Yang Y, Tabashnik BE, Wu Y.

Transgenic crops producing *Bacillus thuringiensis* (Bt) toxins have been planted widely to control insect pests, yet evolution of resistance by the pests can reduce the benefits of this approach. Recessive mutations in the extracellular domain of toxin-binding cadherin proteins that confer resistance to Bt toxin Cry1Ac by disrupting toxin binding have been reported previously in three major lepidopteran pests, including the cotton bollworm, *Helicoverpa armigera*. Here we report a novel allele from cotton bollworm with a deletion in the intracellular domain of cadherin that is genetically linked with non-recessive resistance to Cry1Ac. We discovered this allele in each of three field-selected populations we screened from northern China where Bt cotton producing Cry1Ac has been grown intensively. We expressed four types of cadherin alleles in heterologous cell cultures: susceptible, resistant with the intracellular domain mutation, and two complementary chimeric alleles with and without the mutation. Cells transfected with each of the four cadherin alleles bound Cry1Ac and were killed by Cry1Ac. However, relative to cells transfected with either the susceptible allele or the chimeric allele lacking the intracellular domain mutation, cells transfected with the resistant allele or the chimeric allele containing the intracellular domain mutation were less susceptible to Cry1Ac. These results suggest that the intracellular domain of cadherin is involved in post-binding events that affect toxicity of Cry1Ac. This evidence is consistent with the vital role of the intracellular region of cadherin proposed by the cell signaling model of the mode of action of Bt toxins. Considered together with previously reported data, the results suggest that both pore formation and cell signaling pathways contribute to the efficacy of Bt toxins.

PLOS ONE. (2012). 7(12):e53418. DOI: 10.1371/JOURNAL.PONE.0053418. EPUB 2012 DEC 28. THE ARTICLE CAN BE DOWNLOADED FROM <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3532162/>.

(continued on page 4 - see Reading List)

CALENDAR OF EVENTS

Event	Organized by	Date and Venue	Website
INDIA			
Challenges Ahead for Agriculture: Soil, Water, Energy, Technology	The Associated Chambers of Commerce and Industry of India (ASSOCHAM)	January 22, 2013 The Claridges Hotel New Delhi	http://www.assochem.org/agriculture/index.php?section=forthcoming&page=agriculture-2012-delhi
10th National Symposium on Biotechnological Approaches for Plant Research: Constraints and Opportunities	ICAR Research Complex for Goa and Society for Plant Protection Sciences	January 27 - 29, 2013 Goa	http://icargoa.res.in/Goa_Symposium_2013_brochure.pdf
International Conference on Agriculture and Climate Change (ICACC2012)	The Energy and Resources Institute (TERI)	January 29 - 30, 2013 New Delhi	http://www.teriin.org/index.php?option=com_events&task=details&sid=530
Bangalore INDIA BIO 2013	Government of Karnataka and Vision Group on Biotechnology	February 4 - 6, 2013 Bangalore	http://www.bangaloreindiabio.in/BIO2013/index.php
Indian Seed Congress 2013	National Seed Association of India	February 7 - 9, 2013 New Delhi	http://nsai.co.in/isc/
International Conference on Advances in Biotechnology and Patenting (ICABP 2013)	Bharatidasan University	February 18 - 21, 2013 Tiruchirapalli, Tamil Nadu	http://icabp2013.webnode.com/
INTERNATIONAL			
World Soybean Research Conference IX	Hosted by the Protein Research Foundation, the Oil and Protein Seeds Development Trust, and organized by Paragon Conventions	February 17 - 22, 2013 Durban, South Africa	http://www.wsrc2013.co.za/
Strategic Approaches in the Evaluation of the Science Underpinning GMO Regulatory Decision Making	ICGEB	July 1 - 5, 2013 Trieste, Italy	http://www.icgeb.org/tl_files/Meetings/2013/TS_BIOSAFETY_1-5%20July_2013.pdf

READING LIST - continued from page 3

CHALLENGES IN TESTING GENETICALLY MODIFIED CROPS FOR POTENTIAL INCREASES IN ENDOGENOUS ALLERGEN EXPRESSION FOR SAFETY.

Panda R, Ariyaratna H, Amnuaycheewa P, Tetteh A, Pramod SN, Taylor SL, Ballmer-Weber BK, Goodman RE.

Premarket, genetically modified (GM) plants are assessed for potential risks of food allergy. The major risk would be transfer of a gene encoding an allergen or protein nearly identical to an allergen into a different food source, which can be assessed by specific serum testing. The potential that a newly expressed protein might become an allergen is evaluated based on resistance to digestion in pepsin and abundance in food fractions. If the modified plant is a common allergenic source (e.g., soybean), regulatory guidelines suggest testing for increases in the expression of endogenous

allergens. Some regulators request evaluating endogenous allergens for rarely allergenic plants (e.g., maize and rice). Since allergic individuals must avoid foods containing their allergen (e.g., peanut, soybean, maize, or rice), the relevance of the tests is unclear. Furthermore, no acceptance criteria are established and little is known about the natural variation in allergen concentrations in these crops. Our results demonstrate a 15-fold difference in the major maize allergen, lipid transfer protein between nine varieties, and complex variation in IgE binding to various soybean varieties. We question the value of evaluating endogenous allergens in GM plants unless the intent of the modification was production of a hypoallergenic crop.

ALLERGY. (2012). DEC 4. DOI: 10.1111/ALL.12076. [EPUB AHEAD OF PRINT] SEE ALSO: <http://onlinelibrary.wiley.com/doi/10.1111/all.12076/abstract>

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