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PLANTFOODSEC NEWS

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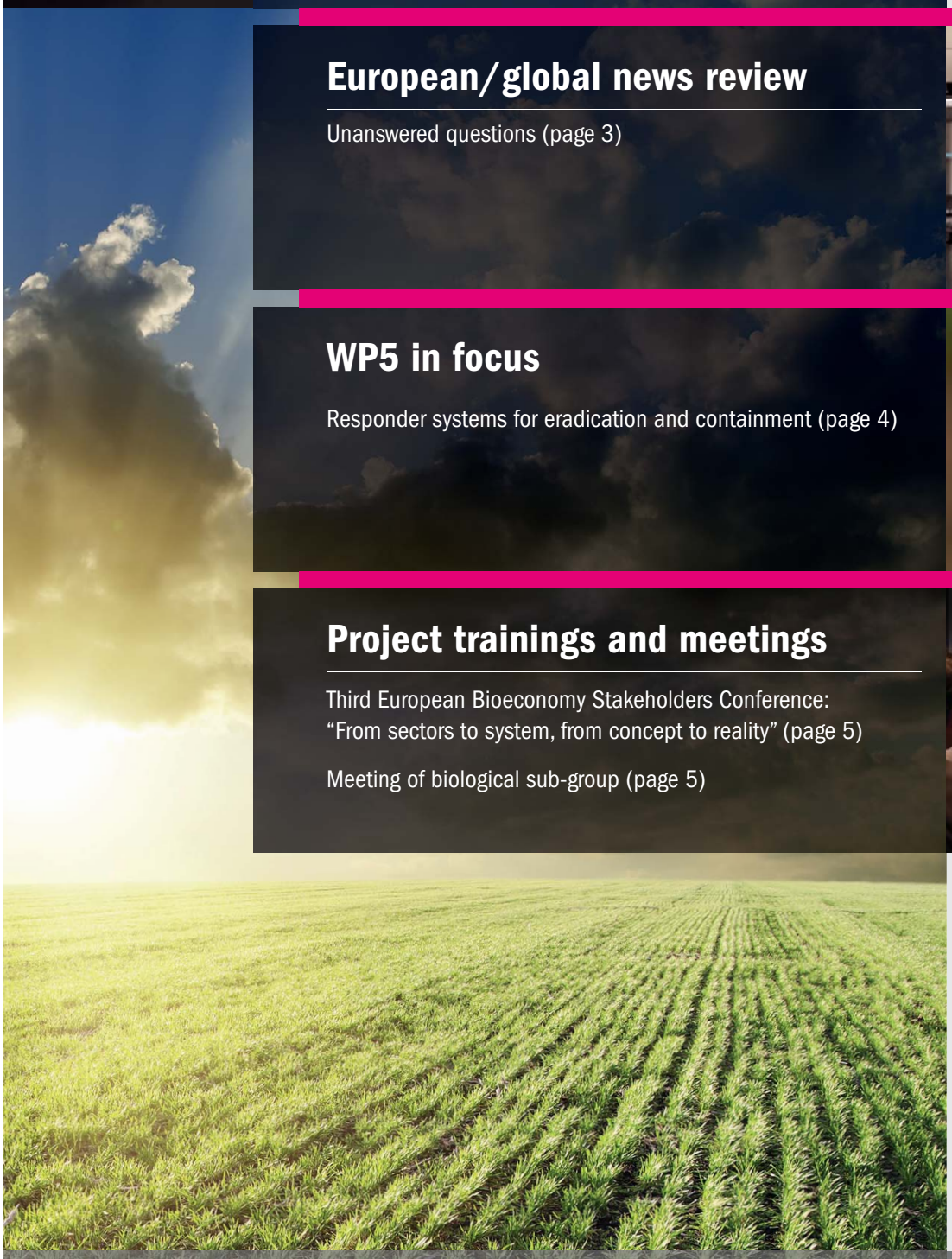

European Commission
Enterprise and Industry

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EDITORIAL

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The essence of Work Package 5 (WP5), Response systems for eradication and containment, is the elimination of emerging pests and their negative attributes from production systems. This involves the complex activities of detection, risk assessment and strategy adoption, and the careful execution of control procedures.

The introduction of a harmful crop pathogen poses a threat to a country's agricultural sector, economy and trade. If a harmful pathogen is detected, the goal is therefore its elimination from the production system and its products. Successful management requires preparedness, rapid response and an appropriate strategy. The exclusion of high-consequence pathogens incorporates all agricultural practices that are relevant to crop production and have an impact on pest onset or suppression. The exclusion of a pest involves its rapid and effective containment in all potential reservoirs (volunteer plants, vectors etc.). After containment, eradication measures are used to eliminate the pest from the affected environment.

The adoption of strategies to eliminate an invasive pathogen depends on the realistic assessment of the effectiveness of the various approaches and their feasibility. A quantitative assessment of all factors that influence the eradication process can lead to the adoption of an appropriate eradication strategy. However, other social, political and demographic constraints may influence the selection of the most appropriate strategies and measures.

The *Fusarium proliferatum – Allium cepa* pathosystem was chosen as the research model for this EU project. It provides an excellent case study of an epidemic chain involving plant, animal and human health. *F. proliferatum* is a plant pathogen and also an endophyte dwelling in a very wide host range across many plant families. Symptoms may or may not be evident. Distributed globally, *F. proliferatum* was first reported in Israel in 2008 in infected onion bulbs and has since been isolated from corn, garlic, cucumber, tomato, watermelon and pumpkin crops throughout Israel. The fungus produces an array of mycotoxins (e.g. fumonisin, fusaproliferin and moniliformin) that are toxic to humans and animals, and therefore represents a food and feed safety concern.

Activities carried out under WP5 in relation to the *F. proliferatum – A. cepa* pathosystem have brought new research disciplines to the front line, including the implications of mycotoxin production in food crops, forensic studies, and the provision of a decision-making toolbox for assessing the deliberate introduction of the pathogen. They have also provided new insights into epidemiology and the differences between pathogen strains within a given region and across countries and continents.

WP5 also deals with the practical management of *F. proliferatum*. We first studied the entire crop-pathosystem, including pathogen establishment and disease spread. We then apply an integrated approach, including the production of pathogen-free seeds and sets, supplemental treatments during crop production, and a validated system of traceback. The production of mycotoxin-free products is the essential goal of this approach.

RECENT EVENTS

Turin (Italy), July 13–17, 2014

Seventh International Symposium on Chemical and Non-chemical Soil and Substrate Disinfestation (SD2014)

In intensive cropping systems, the disinfestation of soil and substrate is crucial in order to combat soil-borne plant pathogens, weeds and arthropod pests, and to maintain productivity at high levels.
The SD2014 symposium was organised in Turin, Italy, between July 13 and 17, 2014, by the Centre of Competence AGROINNOVA, University of Turin, under the aegis of the International Society for Horticultural Sciences (ISHS) and the International Society of Plant Pathology (ISPP).
The symposiums provide a forum for open discussion on the available technologies for soil and substrate disinfestation, as well as the need for research to promote scientific progress, stimulate the free exchange of ideas and findings, and facilitate integration, cooperation and synergy between research institutes and the private sector.
See www.sd2014.org for further information.

Turin (Italy), July 21–25, 2014

TESTA project summer school

High-quality seed produces high-quality, high-yielding crops that ensure European and global food security. Seed is traded globally and can spread diseases and pests. Controls are in place to reduce these risks but must be supported by methodologies for risk assessment, sampling, the detection of pests and pathogens, and disinfection.
The EU FP7 TESTA project (Seed health: Development of seed treatment methods, evidence for seed transmission and assessment of seed health) aims to develop innovative methods to control diseases and pests, including faster, more accurate assessment of transmission, economical and practical sampling to detect low levels in large seed lots, new and efficient detection, non-destructive testing and improved disinfection.
AGROINNOVA organised the TESTA summer school "Seed Disinfection Strategies" in Turin, Italy, on July 21–25, 2014, focusing on the biology, epidemiology and diagnostics of seed-borne pathogens, and seed disinfection methods. Participants were from Italy, the Netherlands, Morocco and Spain.
See https://secure.fera.defra.gov.uk/testa/showNews.cfm.

EUROPEAN/GLOBAL NEWS REVIEW

Unanswered questions

A new analysis of Northern Europe's deadly 2011 *E. coli* O101:H4 outbreak has raised questions regarding the way in which the pathogen was spread. According to Serbian-German researchers, it is still not clear whether the pathogen was spread accidentally or deliberately. They have called on the EU to conduct further epidemiological, microbiological and forensic investigations into the incident. Their analysis can be found in the *European Journal of Public Health*.

The outbreak began on May 1, 2011, and killed 53 people, mostly in Germany. By the time the outbreak was declared over on July 26, 2011, there had been 2,987 cases of *E. coli* O104:H4 that did not develop into hemolytic uremic syndrome (HUS) but still resulted in 18 deaths. Of the 855 HUS cases, 35 were fatal.

According to the EU'S official explanation, the outbreak was caused by contaminated fenugreek sprouts imported from Egypt. However, this explanation has always been open to question.

The research teams used "epidemiological assessment tools" to differentiate between natural, accidental and deliberate epidemics. They point out that these techniques are not new, having been used to investigate the 1984 salmonellosis outbreak in The Dalles, Oregon; the 1996 shigellosis outbreak in Dallas, Texas; the 2001 anthrax cases in the US; the 1979 anthrax cases in Sverdlovsk, Soviet Union; and the 1999 West Nile virus outbreak in New York City.

However, the team was the first to analyse the 2011 outbreak using these investigative models, and concluded that there is no evidence to rule out the accidental or intentional introduction of the pathogen into the food chain. "From the onset of the outbreak, there was confusion about the source and mode of transmission. On June 10, 2011, German authorities announced contaminated sprouts of one particular charge of fenugreek seeds imported from Egypt in 2009 as the most probable culprit source of this outbreak", the new report states. "The conclusions of the EHEC Task Force were accepted by the European Food Safety Agency (EFSA), who supported the investigations. However, although it might have been expected, no data or evidence on similar outbreaks in Egypt caused by the new German EHEC O104:H4 strain and on the origin of the suspected seeds were available."

The EFSA warned some years ago that raw sprouts may be contaminated under poor hygienic conditions and become a health risk. However, neither the fenugreek seeds nor the remains of the suspected sprout lots distributed in Germany were positive for EHEC O104:H4.

"In conclusion, after using three published models for the analysis of unusual epidemic events, the generally accepted assumption that the outbreak in 2011 was a natural one may not be accepted without reserve. This is the first time ever that an *E. coli* O104:H4 pathotype of a high virulence suddenly emerged, which may indicate an unnatural phenomenon." In the interests of the safety and biosecurity of food chains, the researchers therefore argue that further epidemiological, microbiological and forensic analyses are needed in order to determine the precise nature of the outbreak.

Funding for the study was provided by the Serbian Ministry of Education.

This news item is based on an article by Dan Flynn, which appeared in *Food Safety News* on April 30, 2014

WP5 IN FOCUS

Responder systems for eradication and containment

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WP5 aims to prevent the establishment and spread in EU countries of deliberately introduced pathogens by outlining the measures to be taken. Pest management is a complicated set of procedures due to the heterogeneity of production systems and pest infestations.

The pathosystem *Fusarium proliferatum – Allium cepa* was selected as an emerging disease with actually reported outbreaks that can offer excellent case studies of the epidemic chain. *Fusarium proliferatum* can produce mycotoxins including fumonisin, fusaproliferin and moniliformin, which can have a significant impact on food safety and human health.

The fungus is disseminated by infested seeds and other propagation material. It was first reported in Israel in 2008, after being isolated from infected onion bulbs in the south of the country. The first step in validating the pathogenic capacity of *F. proliferatum* was by artificial inoculation in greenhouse trials. Cultures of *F. proliferatum* isolated from infected onion bulbs were used for the inoculation tests. The survey included agricultural crop plants that are of significance to the study. We also tested the potential of volunteer plants, such as weeds and other plants within or outside the infected fields. The following agricultural plants were found to host *F. proliferatum* after artificial inoculation in greenhouse experiments or from infested fields: onion, corn, garlic, cucumber, tomato, watermelon and pumpkin. The volunteer plants found to host *F. proliferatum* following isolation from plants grown in infested fields were *Phragmites australis* (wild cane), *Sonchus oleraceus*, species of *Portulaca*, species of *Amarantus*, species of *Chenopodium* and species of *Tamarix*.

The fungus is transmitted by propagation material: seeds from stocks of onions were sampled from various commercial batches and tested for infection with *F. proliferatum*. In general, most of the seeds were found to be free of the fungus. However, seeds of white onion cultivars were found to be infested at rates of 0.1 to 10 percent. Similar results were found in an analysis of corn seeds.

The potential of onion sets to harbour and carry the fungus was tested by sampling batches of onion sets from different sources. It appears that the fungus had colonised the tissues of all tested onion cultivars. Although the frequency of set infestation varies, all cultivars are susceptible.

Based on the collected data, the model below is suggested (Fig. 1). The model defines the spectrum of onion production practices and identifies the possible introduction of *F. proliferatum*. The possibilities of infestation, also defining vulnerability, are also shown in Figure 1.

A systematic approach is applied to address all aspects of mitigating *F. proliferatum* in onions. It takes into consideration the use of pesticides, biopesticides and other chemically and biologically based compounds at all stages of seed production and set production and in commercial onion fields. Special attention is given to application methods and technology to ensure maximum impact on the targeted pathogen. We also placed special emphasis on minimising negative effects on the crop, environment and consumers, by reducing the use of toxic pesticides. All measures also ensure food safety during harvest and after storage.

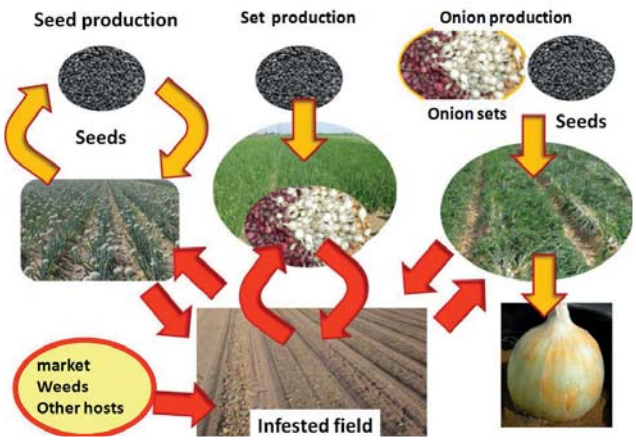


Figure 1: Epidemiological model and possible mechanisms of infestation of *Fusarium proliferatum* in onions.

PROJECT TRAININGS AND MEETINGS

Third European Bioeconomy Stakeholders Conference: "From sectors to system, from concept to reality"

Over the last decade, the European Commission has recognised the importance of investing in research and development to support the European bioeconomy. New bio-processing technologies and approaches are expected to deliver a vast array of sustainable and renewable value-added bio-based products from biological waste streams, including agro-food and forestry residues. These bio-based products will contribute to economic growth and jobs within the EU, while at the same time limiting negative impacts on the environment and reducing our dependency on fossil resources.

The third European Bioeconomy Stakeholders Conference will be held in Turin on October 8 and 9, 2014. Organised by the Italian Presidency of the Council of the European Union in collaboration with the European Commission, it follows the first two in the series of stakeholder conferences held in Copenhagen in 2012 and Dublin in 2013. The conference will bring together experts and a wide range of stakeholders from industry and academia, as well as end users, to discuss ways to close the industrial research–market gap and maximise the knowledge-based development potential of local regions in five bioeconomy areas. See http://bioeconomy.miur.it/ for further information.

Meeting of biological sub-group

On June 10 and 11, 2014, the European Commission hosted a meeting of the biological sub-group of its Chemical, Biological, Radiological and Nuclear (CBRN) and Explosives (E) Advisory Group in Brussels. The EU CBRN Action Plan, published in 2009, aims to reduce the threat of and damage caused by CBRN incidents of accidental, natural or intentional origin, including acts of terrorism. It puts forth 17 actions specifically addressing the risks related to the misuse of biological toxins and agents.

In order to contribute to the implementation of these biological actions, the biological sub-group of the CBRN-E Advisory Group brings together representatives of member states, technical experts and other stakeholders, including, where appropriate, the private sector. The aim of the meeting in June was to review the progress achieved to date in the implementation of the biological actions, and also to discuss and identify priorities for continued progress in the near future. Representatives from PLANTFOODSEC were invited to present the project's goals, tasks and activities, and input was also provided by the EC, other EU agencies, stakeholders and representatives from other relevant ongoing projects. Participants were encouraged to share information and good practices from their own initiatives.

The meeting documents are available in the public library of the CBRN eCommunity.
See https://europa.eu/sinapse/directaccess/eu-cbrn/Public-Library/ for more information.

WORK PACKAGE NEWSFEED 1/2

WP1

Plant disease epidemiology applied to crop biosecurity

The main result so far is the establishment of a list of "candidate pathogens", including 522 harmful organisms, insects, fungi, bacteria, viruses and nematodes, and a list of target plants and crop products, including 451 crops categorised into 11 groups. Criteria for prioritisation have also been identified. The partners have improved epidemiological knowledge of *Fusarium proliferatum* and have worked on epidemiological studies of primary inocula of two of the most damaging European wheat diseases (*Puccinia triticina* and *Mycosphaerella graminicola*). The following tasks have been undertaken: 1. Updating the list of "candidate pathogens" established under the EU project CropBioterror with a new list, including pathogens and pests relevant from the previous list as well as new pathogens and those that will be used for research. 2. Updating the list of target plants (crop products) relevant to the project and to the pathogen list by qualitative and quantitative analysis. Generalised templates will be built by developing the broad type-based classification of target crops (three to five groups). 3. Producing comprehensive epidemiological knowledge of *Fusarium proliferatum* (ongoing). 4. Assessing the build-up, persistence and release of primary inocula and the early stages of epidemics of selected pathogens to differentiate between the consequences of natural and deliberate field contamination (ongoing).

WP2

Food biosecurity

Following an outbreak of microbially caused foodborne illness, investigators must assess whether it was caused intentionally in order to determine the need for a criminal investigation. Scientists from OSU are creating a decision-making tool for investigators (due January 2015). Using an example scenario of a foodborne illness, trainees will be guided to use the tool to decide if a fictitious case of foodborne illness should be regarded as natural or intentional.
The report "Directory of EU Laboratories Involved in Foodborne Illness Investigation", prepared by METU, is available on the PLANTFOODSEC website. It evaluates capabilities and resources for the forensic investigation of foodborne illness outbreaks in the EU. Response systems in selected EU member states, the US and Turkey were compared, and gaps and needs identified. A strategy was developed to identify a standard protocol for handling outbreaks. An inventory of EU laboratories responsible for investigating foodborne illness outbreaks was compiled, and the *Escherichia coli* O104:H4 outbreak in Germany was reviewed to identify needs and gaps in the response system.
Scientists from OSU have developed an enhanced strain discrimination assay, multilocus variable number tandem repeat analysis (MLVA), for non-O157 Shiga toxin–producing strains of *E. coli*, which are increasingly implicated in outbreaks in the US and EU.

WP3

Analysis of risks posed by the intentional introduction of new pests and disease agents

WP3 has been considering pest/crop/scenario combinations for evaluation using the PLANTFOODSEC risk assessment tool developed in this work package. The initial elicitation phase and parameterisation are complete and inputs for the tool have been collated into a single database by ANSES. Over the next few months, Imperial College London will run these inputs through the model. The analysis will allow scenarios and crop pest combinations to be ranked in terms of potential impact. The ordering will be based on expected utility and uncertainty. The 10 to 20 pest/crop/scenario combinations presenting the most significant risk will be examined and risk management measures will be identified that could be applied to each. These will be elicited from experts by staff from INRA/ANSES. The experts' data will be used to quantify risk reduction and re-evaluate the impact of those pest/crop/scenario combinations when risk mitigation measures have been simulated.

WP4

Diagnostic and detection systems

The diagnostic network central to WP4 continues to develop, with the addition of more functionalities and information. Interaction with the European Plant Protection Organization has been important in creating parts of the structure, and the complementarity between plant and food security objectives and the statutory remit of national plant protection organisations is well established. A visit to Kansas State University was invaluable in framing detailed network operation approaches. The introduction of a Europe-wide accreditation system for advisory diagnostic labs managed through the network was considered, but was found to be not feasible within the project. The ability to review and map diagnostic sample results within countries will provide diagnosticians with valuable information about emerging diseases and will remain a key element. A functioning network structure will be delivered by the end of the project, and there are plans to attract users from outside the project in 2015. A report on traceability mechanisms for food produce consignments is being developed by METU partners and will provide an overview of the physical means of tracing produce that may be contaminated with human pathogens. This will complement the molecular forensic techniques developed by WP2.

WORK PACKAGE NEWSFEED 2/2

WP5

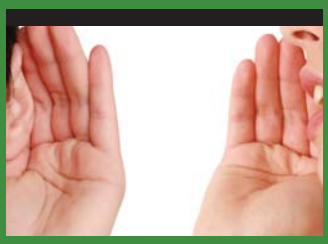
Response systems for eradication and containment

WP5 is identifying measures to prevent the spread of deliberately introduced pathogens in the EU. WP5 first reviewed and compared the regulations applicable in EU member states and other participating countries with regard to accidental or deliberate introductions of non-indigenous harmful organisms. This review was accompanied by a white paper highlighting possible means of cooperation between countries and agencies in order to mitigate threat situations. The current focus of WP5 is to provide a system approach strategy for the containment and eradication of introduced pests by incorporating all practices that have a potential impact on the introduced pest along with a decision-making tool for assessing the application of each component. The pathosystem *Fusarium proliferatum – Allium cepa* was selected as it offers excellent case studies of the epidemic chain and can have a significant impact on food safety and human health.
A systematic approach is applied to address all aspects of mitigating *F. proliferatum* in onions. It targets all stages of seed production, set production and commercial onion growing. Special attention is given to ensure maximum impact on the targeted pathogen and minimum negative impacts on food safety. Forensic technologies are also being developed specifically for assessing the source occurrence of a disease caused by *F. proliferatum* in commercial onion fields in southern Israel.

WP6

Training on plant and food biosecurity

The work of WP6 to enhance the mobility of researchers is central to ensuring the improvement of partner capacities. Along with the dissemination and communication tasks of WP7, it is part of a comprehensive strategy to enhance knowledge in target groups and provide information to stakeholders. Partners have delivered 14 courses on diagnostics, 29 on plant pathogen forensics, 10 transnational multi-sector training courses on responding to outbreaks, two courses on legislation and contained-use licensing, three lectures on the dual-use consequences of bio-research, and two summer schools. Four PhD exchanges/internships have been completed.
The first summer school was held in Cambridge, UK (NIAB) in September 2011 and focused on plant disease identification. The second was held in Turin, Italy (UNITO) in July 2012 and the third in York, UK (FERA). The fourth summer school will be organised by METU in Turkey in 2015 and will concentrate on food safety.



WP7

Dissemination, awareness and communication on plant and food biosecurity

The team has developed a database of relevant European food security networks and contacts, which will serve as a platform for developing a stakeholder network for the project. All WP7 activities are aimed at raising awareness of the threat of biological weapons to agriculture, forestry, livestock and poultry, and of the preventive role of bio-scientists. The communication strategy will be designed and implemented in line with national and EU rules, and will:
- ensure public awareness of biosecurity issues;
- provide information to policy makers to enable the continual updating of non-proliferation agreements on bioweapons;
- give a consistent message to the media and the public;
- use a database of experts to ensure that reliable information is available to the media and the public;
- ensure that sensitive information is not released inadvertently; and
- validate information presented on the website.

All deliverables, including issues of the newsletter, are available in the publications section of the project website.
The project was presented at the meeting of the biological sub-group of the Chemical, Biological, Radiological and Nuclear (CBRN) and Explosives (E) Advisory Group of the EC in Brussels.

WP8

Management and monitoring

Networking activities have taken place both within and outside Europe, and at the same time links have been established with other projects and organisations that deal with agriculture, food and biosecurity.
Two PLANTFOODSEC representatives joined the meeting of the biological sub-group of the Chemical, Biological, Radiological and Nuclear (CBRN) and Explosives (E) Advisory Group of the EC, held on June 10–11, 2014, organised by the EC's Directorate-General for Home Affairs.
The fragmentation of partners' research has been analysed in cooperation with WP3 as part of the research of INRA SenS (Science in Society), leading to Deliverable 8.18 "Biosecurity at the frontier: Building capacity with fragmented research networks".
Seven project meetings have been held since the start of PLANTFOODSEC. The eighth project meeting will be hosted by METU in Antalya, Turkey, on September 25-27, 2014.
One important item on the agenda of the Antalya meeting is the second external review, based on the implementation of project results covered by the second intermediate project report (August 2012– January 2014). It has already been agreed that the ninth project meeting will be hosted by the REC in Hungary in March 2015.
Further details and exact dates will be announced in due time.

THE PROJECT // Five years, EU funding of EUR 6 million, 13 partners, eight work packages and three continents: these are the numbers that sum up the project "Plant and Food Biosecurity, Network of Excellence" (PLANTFOODSEC), launched in February 2011. The aim is to build a virtual centre of competence in order to increase the quality and impact of plant and food biosecurity training and research in Europe, thus enhancing preparedness and response capabilities to prevent, respond to and recover from biological incidents or deliberate criminal activity threatening the European agri-food system.

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