

Report and Minutes of the Fourth APS/USDA-National Plant Disease Recovery System Workshop

Held at the Embassy Suites Dallas Park Central in Dallas, TX

March 6-8, 2011

The purpose of the Fourth National Plant Disease Recovery System workshop was to review completed recovery plans and response guidelines developed as part of the NPDRS responsibilities under Homeland Security Presidential Directive No. 9 (HSPD-9), and to discuss the selection of plant diseases and other pests for future plans and guidelines (Attachment 1).

Federal Agency Activities Relevant to HSPD-9

The 46 government, academic, and industry scientists attending were welcomed by Don Huber for APS and Sheryl Kunickis for USDA. Each of the seven Federal agencies [USDA APHIS (Russ Bulluck), HHS NIH (Paul Lewis – Attachment 2), USDA FS (Kerry Britton – Attachment 3), EPA OPP (Dan Rosenblatt – Attachment 4), USDA NIFA (Kitty Cardwell), FBI (Neel Barnaby), USDA ARS (Deb Fravel – Attachment 5)] with responsibilities involving plant disease recovery activities reviewed their programs. This was followed by a review of State [National plant diagnostic network –NPDN (Carla Thomas – Attachment 6), National Institute for Microbial Forensics (Jacque Fletcher – Attachment 7), Kansas Biosecurity program (Jim Stack) and crop protection industry activities involved in recovery (Ray McAllister, CropLife America). Kent Smith's (USDA ARS – Attachment 8) review of the NPDRS Strategic Plan for 2011-2015 was followed by a discussion of the "Know New Pathogens" Federal Interdepartmental Initiative led by Kerry Britton (ITAP-PP– Attachment 9) and proposed development of a National Culture Collection presented by Rick Bennett, Univ. AR (Attachment 10).

Special concerns for HHS NIH included potential abuse or misuse of 'dual use' activities (alteration of host range, generation of novel pathogens or toxins, or enhanced susceptibility of hosts), the need for a "Code of Conduct" for responsible research, and inclusion of synthetic biology in security risk assessments. Plants for planting are the most probable source of new introductions followed by wood and wood packaging materials, with 75% of new organisms in shipments going undetected because of the sheer volume of shipments. Reorganization of the National Institutes of Food and Agriculture (NIFA) into the 'Institutes' format placed a major emphasis on plant production and protection to involve academic and industry cooperation. NIFA provides funding to a number of program areas involved in food security and researchers are encouraged to access their Web site at www.nifa.usda.gov/afri for more information. The new edition of "Strategy of Invasive Species Research" can be obtained through Kerry Britton (USDA FS).

Considerations for safe and effective pesticide use recognizes the need for emergency EPA exemptions to prevent, slow, or stop the spread of high consequence plant diseases, but clearance can sometimes be obtained before arrival of a potential pest through the NPDRS program. The FBI provides monitoring, surveillance, identification, and intelligence capabilities to facilitate investigations of epidemiology and criminal activity as well as education and training. USDA

ARS has received some flexible funding recently to support collaborative research with universities for emerging pathogens.

State and Industry Activities Relevant to HSPD-9

The National Plant Diagnostic Network (NPDN) contains essential diagnostic expertise and provides equipment, supplies, standard operating procedures for various diseases (SOPs), training protocols, and coordination of communications so that first reports of pests in a state can be rapidly shared with others. A breakout of reports shows about 7.5 % of reports are of abiotic etiology and 9.5 % are confirmed as viruses while almost 89 % of new pests are negative for known viruses. The various disciplines involved in plant pathology forensics are brought together to promote early detection and diagnosis in liaison with law enforcement and other agencies and to coordinate with the European Commission Security program. There are notable differences between forensics and customary plant pathology. BSL 3 laboratory facilities are available at Kansas State University and the USDA ARS facility at Frederick, MD to study high consequence exotic plant, animal, and human diseases in partnership with the University of MN, USDA, and the Agency for International Development.

Ray McAllister of CropLife America, an industry trade group for agricultural pesticides reported that the high regulatory and research costs, and long time line involved for approval, has discouraged the development of new protective chemicals and resulted in emphasis on new uses or improved efficiency of existing chemistry with little focus on needs to control exotic or emerging pests. Although research may be opportunistic, it will always be market driven and usually after the initial need is experienced.

USDA NPDRS Strategic Plan, ITAP-PP “Know New Pathogens” and APS Culture Collection Initiative

In providing background information on general preparations for new pathogens, Kent Smith said the first formal review of the USDA NPDRS Strategic Plan will be conducted in 2012. Three to five new Recovery Plans and another four to five updates of existing plans are planned for each year. Since the emphasis of the recovery plans is on how to achieve recovery from a disease, disease management becomes a key component since long-term containment is not possible for most pathogens once they are introduced.

Improved data sharing and collaboration are objectives of the “Know New Pathogens” program since it is difficult to know or anticipate what will cause serious disease under U.S. environmental conditions. The program is currently under-represented for non-fungal pathogens and a workshop is planned for the annual meeting of the APS-IPPC meeting in August. The sheer volume of plants imported makes it physically impossible to inspect each plant or to grow out everything here. Most inspection is based on symptom expression with limited testing potential available. Since the highest risk of importation of an exotic pathogen is with live plants, there is some discussion of limiting initial imports of plants for planting to tissue culture. Greater

emphasis should probably be placed on industry involvement to include a disease management focus.

The APS is spear heading the plan to permanently fund a national microbial culture collection and germplasm system to include data base, backup facility and curation at 10 to 30 specialized centers. Each center will focus on a specific microbial group (viruses, bacteria, fungi, etc.) to provide correct taxonomic identification and data on distribution, toxicology, epidemiology, etc. by building on existing programs and interacting with the international community. Culture collections should be represented in recovery plans when possible.

Review of completed Recovery Plans

Recently completed recovery plans for laurel wilt of redbay, *Raffaelea lauricola* (Bud Mayfield), Rathayibacter poisoning, *Rathayibacter toxicus* (Anne Vidaver), red leaf blotch of soybean, *Phoma glycinicola* (Glen Hartman), and stem rust of wheat, *Puccinia graminis* f.sp. *tritici* Ug99 (Tim Murray) were made available for review prior to the meeting. Kent Smith presented background information to recovery plans and emphasized that recovery plans are a concise, targeted presentation of critical information needed by decision makers that recommend priority research, extension, and education needs to achieve recovery in a priority manner (Attachment 11). Each Chair of completed recovery plans then presented an overview of their plan that was followed by breakout sessions for further discussion and consideration. Finalized plans will be added to the NPDRS data base (<http://www.ars.usda.gov/research/npdrs>).

The breakout discussions were directed to insure that the executive summaries were focused, that the subject categories in each document were adequate and sufficiently developed, and that the research, extension, and education priorities are on target. Recovery plans should follow-up on response plans when available. The third NPDRS workshop recommended that each new recovery plan have a section defining where in the continuum from response to recovery, the emphasis moves to recovery and suggested that this could probably be best identified through a “decision tree” concept with tipping points based on regulatory status, timeliness of detection, possibility of eradication, and potential for mitigation/control. If eradication is not possible, movement to mitigation and recovery should proceed rapidly to minimize damage to commerce since delayed mitigation or recovery efforts after establishment of an exotic disease puts production at further risk. Current participants suggested that a separate section be included in the plans to describe whether recovery would be possible based on current knowledge of the disease, what would be required for recovery, and a time-line for recovery.

With laurel wilt (Attachment 12), there is not much known about the close synergism between the Ambrosia beetle and *Raffaella* in its native habitat; however, it has had a serious environmental impact along the Eastern U.S. since its introduction. It's broad host range on common plant species in the environment and prohibitive cost of control will probably mean that this disease will have to run its course without the economic opportunity to prevent its destructive movement throughout much of the Eastern coastal areas. There may be a need to consider a germplasm conservation program as the geographic spread of the disease is monitored and impacts on host species in the environment are assessed.

Rathayibacter toxicus (Attachment 13) is a cross-domain pathogen with a very complex life cycle and causes greater damage to animals than plants. Poisoning is known in Australia, Japan, and South Africa; however, there is some uncertainty with respect to observance in the U.S. since the nematode vector, susceptible grasses, and a related bacterium are already present in the U.S. It can go undetected for years and the bacterium and nematode vector can survive for many years without the other although *Rathayibacter* cannot cause disease without the nematode.

Although red leaf blotch of soybean (Attachment 14) is in Africa and not currently in the U.S., it was questioned why this disease was on the Select Agents List because of its low potential for rapid spread and the imposed regulatory limitations on research that can be done here for organisms on the SA list. The few scientists that are familiar with this disease will retire soon.

Human spread is the most likely route of entry of the highly virulent Ug99 (TTKSK) race of wheat stem rust (Attachment 15) that is virulent on 80 % of the world's wheat varieties. Potential crop loss is great and the USDA Cereal Rust Lab functions will be critical to recovery if it is introduced to North America.

Review of Response Guidelines

Criteria for recent response guidelines were reviewed by Russ Bulluck (USDA APHIS – Attachment 16). A New Pest Advisory Group makes recommendations on whether there should be a response or not for a newly introduced pathogen based on the life cycle and plant health emergency. Recovery is not necessarily the responsibility of PPQ, but there is a continuum of activity climaxing in recovery. One of the recommendations of the 2008 NPDRS meeting was for an earlier and better-defined transition from response to recovery activities partially based on the ability to contain and eradicate the disease. New pest response guidelines are generic with each Specific Action Plan being specific to an individual pest situation. Response guidelines can be viewed at: <http://www.aphis.usda.gov/importexportplants/manuals/emergency/index.shtml>.

Individual response plans for *Phytophthora* spp. (Karen Maguylo, Attachment 17), red palm weevil, *Rhynchoporus ferrugineus* (Katherine Kamminga, Attachment 18), Huanglongbing, *Candidatus Liberibacter* spp. (Stefano Costanzo, Attachment 19), and temperate terrestrial gastropods (Alonso Suazo) were reviewed. Discussion and comments on the response plans continued in subsequent breakout sessions. Twenty-four species are covered in the response plan for *Phytophthora* spp, with *P. kernoviae* selected as the model. Primary route of introduction of a new species is in infected plant materials although natural spread of spores and non-plant pathways (soil or stream movement) of dissemination are significant after introduction. One of the difficulties in detection is the inability to distinguish between new and established species of *Phytophthora* with current diagnostic techniques.

The red palm weevil is native to South East Asia, but has spread throughout the Arabian Gulf, South West Asia, North Africa, Southern Europe, and is present in the U.S. (Florida and California). Weevil larvae feed on soft palm tissue to cause economic loss of coconut, date, oil,

and sago palms. Spread is primarily through commerce (propagative parts) since the adult weevils can't fly very far. Methods for eradication are needed.

The Huanglongbing disease of citrus has become well established throughout Florida, Georgia, South Carolina, Louisiana, Texas, and Northwestern Mexico since its introduction to Florida in 2005 (probably since 1998 with identification of the vector). The psyllid vector of HLB is now present in California and Arizona, and these states are now under quarantine (harvest of this years citrus crop was stopped). Response emphasis is on control of the insect vector and elimination of infected trees. The long (several years) lag time for symptom expression of HLB in mature trees after infection, and the inability to contain this insect vectored disease (as demonstrated with the epidemiology of HLB in Florida, Georgia, South Carolina, Louisiana, and Texas) indicates that the current (2008) response guideline for HLB needs to be updated since another strategy is needed to prevent eradication of the industry by the regulatory response imposed. There has been significant advancement in control of HLB through nutrient management programs in Brazil and Florida that permit economical production even in the presence of the pathogen. Response and recovery plans should be updated regularly to reflect new management practices for control without destroying the industry.

In addition to their direct damage to plants, temperate terrestrial gastropods can transmit pathogens to humans and animals. They are frequently intercepted at ports of entry in commercial products and containers, but natural introductions are very unlikely. Limited funding has precluded development of recovery plans for insect pests except as they have served in a vector relationship with a plant disease. The paragraph on NPDRS only deals with diseases although vectors have been assumed. It was discussed whether a recovery plan should be developed for non-vector insect pests under HSPD-9. It was concluded that the very limited funding currently available for the large number of diseases of concern would make it unwise to further dilute the effort mandated by HSPD-9 for diseases until additional resources are available. Liaison with the Entomological Society can provide efficiencies for each group in their areas of responsibility.

Recovery Plans Currently Being Developed

Recovery plans for *Phytophthora* diseases of woody and nursery plants (Jennifer Parke), wheat blast, *Magnaporthe grisea* (Barbara Valent), thousand canker disease of walnut, *Geosmithia morbida* (Ned Tisserat), avocado wilt, *Raffaelea lauricola* (Randy Ploetz), and a generic plan for root knot and cyst nematodes (Tom Powers) are currently being completed. The current HLB response plan will be updated relative to more recent information available on managing this disease.

Prioritization of Threat (high consequence) Pathogens

The large number of plant species, hundreds of cultivars within each species, and multitude of potential pathogens has made it difficult to prioritize threat pathogens. Various approaches to do this have been used over the past 40 years, and the previous three NPDRS workshops have

devoted serious discussion of ways to improve the priority ranking process. As a follow-up to the 2008 discussions of “decision tree” and other approaches for prioritization, Ray Martyn (‘Martyn method’) and Forrest Nutter (‘pathogen matching’ method) presented detailed disease prioritization matrixes for consideration this year as a basis for ‘generic’ plans. These ‘generic’ plans then could be used to develop plans for specific diseases as appendices in a more timely manner as needed.

In Ray’s presentation of the Martyn Method, examples of the numerous possible matrices and their two or three way combinations (economic value, area of impact, type of host crop; type of pathogen; pathogenicity, epidemiology, dissemination, over-seasoning, etc) that could facilitate the process were presented (Attachment 20). Although the combinations and possibilities are never-ending, most combinations will cover most of the potential pathogens. There will still be a need for some individual recovery plans. A limiting factor in determining risk or threat from a pathogen is the high degree of uncertainty because of the limited data available on many exotic pathogens under our environmental conditions. A pathogen may co-evolve with its host in a country and not cause a problem (or have eliminated all highly susceptible hosts so there is no apparent problem).

Forrest Nutter (Attachment 21) reviewed the ‘pathogen matching’ approach where the decision could be based on known pathosystems and move to potential threats. Sixteen ‘model’ pathosystems were developed and other diseases matched epidemiologically with them. Dissemination, response, and mitigation could be generic in this system, with other areas more specific. In this system, the first consideration would be whether the pathogen/disease could be eradicated, with the recognition that some pathogens are not possible to prevent. There could be a ‘mix and match’ process in going from response to recovery with this system to achieve the greatest reduction in impact.

There are common considerations in both the matrix and matching plans; however, the response and recovery plans focus should be based on what to do when the pathogen gets here to emphasize mitigation strategies. Discussion of the matrix and match presentations identified the need for special considerations such as annual versus perennial, special situations for seed production, and the potential for germplasm preservation. A task force to develop templates for pathogen evaluation is forming (Ray Martyn, Forrest Nutter, Judy Brown, Carla Thomas, and Jim Stack will collaborate on this task force).

After evaluation of various potential threat pathogens, the following diseases were recommended for new recovery plans and guideline development:

1. Bacterial leaf blight/streak of rice (*Xanthomonas oryzae* all pathovars)
2. Cotton leaf curl virus.
3. Citrus black spot (*Guignardia citricarpa*)
4. Cowpea mild mottle virus, and
5. Zebra chip on solanaceous crops (*Candidatus Liberibacter solanacearum*) if funding is available. Chrysanthemum white rust (*Puccinia horiana*) was also considered but not recommended at this time.

Recommended update of existing recovery plans included HLB, downy mildews (to combine *Sclerophthora rayssiae* and *Perenosclerophthora phillipensis* plans), *Ralstonia solanacearum* Race 3 biovar2, plum pox, and potato wart based on new information available in the management of these diseases. Don Huber will obtain the chairs to develop new plans or upgrades as funds permit.

The workshop adjourned at approximately 3:30 PM.

ATTACHMENTS:

- Attachment 1. Meeting agenda
- Attachment 2. Lewis HHS NIH
- Attachment 3. Britton USDA FS
- Attachment 4. Rosenblatt EPA OPP
- Attachment 5. Fravel USDA ARS
- Attachment 6. Thomas NPDN Diagnostics
- Attachment 7. Fletcher NIMF Forensics
- Attachment 8. Smith NPDRS Strategic Plan
- Attachment 9. Britton ITAP-PP Know New Pathogens
- Attachment 10. Bennett National Culture Collections
- Attachment 11. Smith Recovery Plan Guide
- Attachment 12. Mayfield Laurel Wilt of Redbay
- Attachment 13. Vidaver Rathayibacter Poisoning
- Attachment 14. Hartman Red Leaf Blotch of Soybean
- Attachment 15. Murray Stem Rust of Wheat (Ug99)
- Attachment 16. Bulluck Response Guidelines Guide
- Attachment 17. Maguylo Phytophthora spp.
- Attachment 18. Kamminga Red Palm Weevil
- Attachment 19. Costanzo Huanglongbing (HLB)
- Attachment 20. Martyn Matrix System
- Attachment 21. Nutter Pathogen Matching System