



PVEN News, Issue 2
24 April 2008

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Workshop:

- Location & Attendance** The Plant Virus Ecology Network, an NSF-funded Research Coordination Network, held its first workshop at the Kellogg Convention Center on the campus of Michigan State University, East Lansing, Michigan on 19-21 March 2008. PVEN participants present were; Akhtar Ali, Juan Manuel Alvarez, Yiming Bao, Nilsa Bosque-Pérez, Steven Castle, Ian Cooper, Christian Delgado, Siobain Duffy, Denis Fargette, Karen Garrett, Lava Kumar, Jiban Kundu, Allen Miller, Charles Mitchell, Rick Nelson, Israel Pagán, Sunny Power, Valerii Polischuk, Nancy Robertson, Marilyn Roossinck, Mark Tepfer, Mike Thresh, René van der Vlugt, Anna Whitfield, John Wylie, Carolyn Malmström, Ulrich Melcher and Abbie Schrottenboer
- Introductory** Dr. Doug Buhler, Associate Director of the Michigan Agricultural Experiment Station welcomed attendees. Malmström reviewed workshop details and policies. Particularly, it was stressed that attendees should feel free to discuss science without concern about another attendee misusing that information. Melcher related the process that led to NSF funding of this Network. Malmström made a presentation of the goals of PVEN based on the proposal that resulted in its funding. These were: developing a nucleus of international plant virus ecology community, developing research agenda and resources; expanding plant virus ecology community; and communicating with broader society. She also listed some questions that could guide inquiry from an ecological perspective: what processes determine species distributions and biodiversity patterns?; what roles are there in the physico-chemical functioning of ecosystems; what's the interaction between biology and land use changes?
- Preliminary Issues** At this point, the participants each presented their research interests relevant to PVEN to the assembled group. Thereafter, there was directed discussion of what participants would like to see as goals of the meeting. Of concern, to at least some attendees were definitions of the following terms in plant virus ecology: "emerging", "diagnosis" vs. "detection", "fitness", "millennium assessment" and "ecosystem services". Science topics thought of particular importance included: the influence of intraspecies diversity of vectors and viruses on transmission and other processes; host plant resistance; complementation and competition; invasive species of viruses, plants and vectors; the plant itself as ecosystem; ecological differences along the agricultural to natural ecosystem gradient. Infrastructure improvements needed included databases, detection and diagnostics, application of fitness modeling. Relative to the network itself, various groups to which PVEN could reach out to recruit further participants were listed; the benefits of establishing a Wiki site were discussed; the size of future workshops and the career demographics of attendees were concerns.

- **Paleocology and Virus Evolution** The afternoon of 19 March began with a session led by Fargette on Paleocology and Virus Evolution as one of several key questions in plant virus ecology research. Fargette explained that despite large increases in our understanding of mechanisms affecting virus evolution, there have not been many advances in determining the time scales of evolutionary events. Methods that can be, and have been, used to date apparent evolutionary events were briefly reviewed. Duffy discussed establishing rates of evolution and stressed that molecular clocks do not necessarily tick uniformly due to periods of adaptation and periods of stasis. Assumptions made in phylogenetic inference were described and similar rates of nucleotide substitution were seen for a diverse variety of virus groups. Roossinck explored with the term paleoecology.
- **Vectors and Viruses** The second part of the afternoon examined questions of vectors and ecology and was led by Anna and summarized by Alvarez. Bosque-Perez discussed the influence of virus-induced changes of the plants on the behaviour of aphid vectors. Particularly emphasized were the alterations of plant volatile production that direct the aphids to infected tissue. Castle addressed differences in the degree of dependency of virus transmission on particular species of vectors and suggested that the mode of transmission was an important factor. The afternoon concluded with a session with discussions of results on posters brought by various attendees.
- **Plant Ecology and Viruses** The 20 March first morning session covered questions of the ecological interactions among plants and viruses. It was led by Power with presentations by Garrett and Mitchell. Garrett explained the idea of ecosystem services. Mitchell delineated many of the factors that can alter the picture of plant virus interactions. Infrastructure was the topic of the second morning session. Melcher reported on recent development in planning for National Ecological Observatory Network (NEON) in relation to microbes. Bao then reviewed available databases on viruses and what information they contained and van der Vlugt described a database that was being constructed in the Netherlands.
- **Break-out Groups** In the afternoon, the group discussed what topics it would like to break up into to consider what actions. The group decided that science ideas for possible write-up into manuscripts should be discussed first as topics before deciding on writing tasks.
- **Detection and Diagnosis I** One group discussed issues in detection and diagnosis of viruses. "Detection" was defined as asking whether a specific virus was present in the sample and "diagnosis" was defined as determining which virus was present in a sample. Some stressed that the two require somewhat different approaches. It was agreed that a great range of virus detection methods have been described but not all were currently in routine use. The recognition of virus-like particles which has inferential value is no longer an option because electron microscopes are expensive to buy and maintain and are no longer available to researchers even in the best equipped virus laboratories. The isolation of infectious agents in manually inoculated (or vector inoculated) indicator plants is no longer the method of first choice because glasshouses managed for the production of virus indicator species and people trained to work with such systems have diminished-particularly in recent years. Against this background, the range of methods that can be applied is tending to diminish and no single method could be recommended as adequate by itself when seeking to isolate or characterise viruses infecting natural (=wild) plants. The search for

double stranded RNA in plant material was recommended by some as a blind screening method.

- **Detection and Diagnosis II** When faced with an unknown virus-like disease, especially one in a wild species, it is increasingly likely that researchers will use serological screening methods complemented by the tests on nucleic acids extracted and that these tests will be done either using “shop bought kits” or will be done remotely: ie characterisations will be farmed out to a commercial company able to offer a range of detection systems (for example, Agdia). A broad range of diagnostic sera or combinations of sequence specific primers is not now routinely available outside such organisations -and even these tend to focus on large scale phytosanitary needs and a narrow range of crop plants. Although companies such as Agdia have licences and facilities to enable them to hold potentially threatening agents and can facilitate access to the licences necessary for movement of suspected viruses across state boundaries, carriers do not have a uniform policy. This can be a substantial constraint.
- **Intraspecies Diversity, Transmission and Invasion** Participants identified climate change as a major factor in determining shifts in virus distributions. Independent species range shifts can occur. They can lead to novel coinfections with consequent recombination to produce new viruses. Landscape and land use changes, whether climate driven or not, are also major determinants. Additional factors identified were increases in pathogen virulence, and shifts in vector populations.
- **Emergences** The discussion considered emergences, variation, disappearances, and several larger questions. One figure mentioned was that 80% of emergences are new introductions of viruses into naïve areas, for which emergences no adaptations are needed. Mutations become fixed both when there are host shifts, providing large bottlenecks, and by vector transmissions in which few particles are transmitted. Climate change affects emergences by extending or contracting ranges of viruses, hosts and vectors and by changing what is planted. Getting out of the first infected plant after landing seemed highly important for emergence. The main discussion around variation was about speciation: potyviruses and CMV are roughly equally well distributed among plant hosts, but one consists of a large number of species, while the other is a single species of viruses: why?
- **Infrastructure Issue: Databases** Mechanisms were discussed that might encourage submitters of data to GenBank to provide more information about the source of isolation of a virus sequence. Amalgamating existing archival knowledge about virus distributions even if not associated with a sequence was also discussed and deemed to require funding. The problem of continuing databases after establishment was acknowledged. Participants bemoaned the sad state of collections.
- **NEON** The group came up with an outline of a message from PVEN to NEON explaining what information would be useful to PVEN scientists.
- **Joint Publication** A discussion centered on plant resistance and its ecological influence as review topics. Participating in Wikipedia was a controversial idea. Participation in the Encyclopedia of Life was raised as a possible activity.
- **Outreach** On the final morning, attendees heard two presentations on scientific outreach. One was from Robin Buell, a former TIGR genomicist who has joined the MSU faculty. She explained how she worked in outreach into her efforts in plant pathogen genomics. The second was from Cyrus Miller of the Impression 5 Science Staff. Impression 5 is a children’s science museum in Lansing MI and is

under contract from PVEN to develop exhibits that excite youngsters about viruses in particular and science in general.

- **Next Workshop** The next meetings were discussed. Possibilities raised for the 2009 workshop were Italy, Kansas, Oklahoma. For 2010, attendees decided to accept the invitation to hold a joint meeting with the International Plant Virus Epidemiology Symposium that will be held at Cornell University around June 21. Participant Stuart Gray, not present at the workshop, will be the organizer with several PVEN members assisting. Melcher volunteered to be the official liaison with PVEN. That this meeting would occur in grant year four was mentioned. There will be time to resolve this issue. Participants suggested other organizations that PVEN could interact with: NESCENT, NCEAS, ICGP, FAO, CGIAR.

Workshop followups:

- **NCBI News** Yiming Bao, at the suggestion of the break-out group concerned with databases, discussed the feasibility of NCBI issuing a reminder to submitters of virus data to include information on date and location of harvest, the nature of the host organism(s) and other similar information that will be of general use. NCBI has decided that this can be done, as long as it is understood that submission of this information is not required.
- **NEON** Karen Garrett prepared a draft of thoughts to be sent to NEON scientists. The draft is currently being examined by committee members.

Other news:

- **PVEN Website** A temporary website exists at http://bioinfosu.okstate.edu/pve_rcn/PVENhome.html.
- **IPVE** Melcher's attendance at the International Plant Virus Epidemiology Symposium in Hyderabad resulted in the discussions that led to the decision to participate in the North American meeting in 2010, described above.
- **RCN meeting** Melcher also attended the biannual meeting of Research Coordination Networks at NSF and presented PVEN's interests. PVEN is included in the list of RCN websites and represented by its logo (found at the top of this newsletter).

Send other news to:

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Co-Coordinator**