Germplasm Enhancement Breakout Group

1) Problem:
Powdery mildew

2) Goal:
Reduction in expense in applied pesticides (80%) in new plantings in 15 years

3) Research objectives for the goal:
Breed, evaluate, and release new varieties (table, raisin (natural DOV), wine, juice, other)

Identify perfectly linked informative molecular markers for all sources of powdery mildew resistance and use these in developing new varieties.

4) Identify who will serve as leader for each objective
ARS:
Table and raisin grape breeder (Ramming at Parlier)
Molecular geneticist/plant pathologist, (Cadle-Davidson at Geneva)

5) Determine resources currently available

- Table and raisin grape breeder (Ramming at Parlier)
- Molecular geneticist/plant pathologist, (Cadle-Davidson at Geneva)
- Elite breeding populations in table and raisin grape; segregating populations are available in several grape categories (wine)
- World's best grape germplasm collection (a part of USDA ARS National Plant Germplasm System) with vineyards at Geneva and Davis, includes many sources of powdery mildew resistance for future development and characterization.

- Genotyping infrastructure is available, although fastest evolution of services may occur outside ARS.
- ARS scientists are supported from appropriated funds and are receiving additional support for powdery mildew resistance breeding from competitively funded grants, including from grape/wine industry and NIFA (AVF, CTGC, CRMB, Viticulture Consortium)

- Rapid breeding system (such as described by R. Scorza) could be implemented in grape; germplasm is available, but needs to be converted to table, raisin, wine grape backgrounds.

Outside of ARS:

- Marker development: Australia, France, Germany, other international cooperators

- Table grape breeding (private industry, US); not focused on powdery mildew resistance, but a resource for implementing delivery of powdery mildew resistant varieties to growers (new variety development happens not only in ARS)
- University cooperators: they are working on powdery mildew resistance and marker development and will be key partners

1. UC Davis: Andy Walker/Dept. Viticulture and Enology
2. Cornell: Bruce Reisch, Dept. Horticulture
3. Missouri State: Wenping Qiu/Chin-Feng Hwang, Mountain Grove

6) Determine additional resources needed and potential sources

- Sufficient scientific and technical staff to design, implement, and interpret breeding, genetics, and pathology experiments.

- Populations segregating for trait(s) of interest (powdery mildew resistance/response)

- Rigorous system for thorough phenotyping: well described and replicated
  Disease resistance specifically:
  multiple powdery mildew isolates
  multiple tissues (leaf, rachis, berry, cane)

  Other traits
  multiple locations
  multiple years

- **Land and resources for population evaluation**
  - planting, training, trellising, vineyard care and maintenance
  - Locations in grape and wine production regions: opportunities for planting in commercial vineyards.

7) Develop a plan for obtaining additional resources

Opportunities for new resource development:

- Partnerships with grape and wine industry in vineyard plantings for population evaluation
- Consider partnerships with companies that develop and market fungicides: approach powdery mildew management from a broader approach that considers genotype and chemistry together, not just either or (Plant new variety X and use chemistry Y together for best results; think of RoundUp Ready soybeans and corn as an example of linked development and marketing)
- Competitive funding/grants: new sources of funding might include NIFA (SCRI, AFRI); NSF (in partnership with university cooperators); European Union funding programs (in partnership with European cooperators)

Outline the Project Management Plan

- **Who will do what and by when?**