GRAPE RESEARCH NEWS

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New "Risks" in Wine: Are They Meaningful?

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Risk is defined as the possibility of suffering harm from a hazard and is quantified by calculating the mathematical probability of receiving such injury. This concept is not new because all human activities carry some degree of risk. Some risks are so commonplace that they are accepted with little thought. Some – the risk of dying from a motor vehicle accident or from a home accident or the probability of dying from any cause at a specific age – are known with a relatively high degree of accuracy because data have been collected on their historical occurrence. However, when it comes to risk assessment of hazards in food or drink (e.g., chemical carcinogens), where there is little or no observed cause-and-effect in humans, then uncertainties can be quite large. Can a specific, relatively low level (dose) of a chemical carcinogen be established for an increased cancer rate (usually over one case per 100,000 or 1,000,000 people) from an experimentally applied high dose of the carcinogen in laboratory animals? Regulatory agencies, of course, must do risk assessments, but since uncertainties are large, to be on the safe side the assessments are usually quite conservative. Then the public hears about some "newly discovered" hazard and perceives a high risk. Whether or not there is really a high risk, public opinion develops into an outrage. These outrages usually occur in the following circumstances: 1) when perceived high risks are chronic or delayed after many years, such as with cancer; 2) when risks have received a great deal of media attention, such as with Alar use on apples; and/or 3) when children are, or may be, exposed to some specific hazard.

Most scientists define a risk as a known hazard that may be counteracted by known safeguards. Salmonellosis is a leading form of foodborne illness. This bacterial problem, that occurs to a large extent from consuming poultry products, can be overcome by sufficient cooking of these products. Peter Sandman of Rutgers University has stated, "When the public pays little attention to hazards and safeguards and the experts ignore outrage, then it should come as no surprise that the two groups rate risks very differently."

Ethyl Carbamate (Urethane)

Ethyl carbamate (EC), also known as urethane, occurs in numerous foods and beverages including table wines. It apparently is generated from urea or other nitrogen sources through an imperfectly known mechanism. EC is a "multipotential" carcinogen that can induce many types of tumors in lungs, liver, thymus, skin and mammary tissue of laboratory animals. Concern in this country over EC began in November, 1985, with news reports that Canadian authorities had detected this chemical in certain wines and distilled spirits. The FDA and BATF had several meetings with industry groups to chart a course for the source of EC in alcoholic beverages and instituted measures aimed at lowering its levels as much as possible. In January, 1988, FDA also accepted an EC reduction plan for table and dessert wines from the major U.S. wine producers. The plan called for EC levels to average no more than 15 parts per billion (ppb) in table wines, starting with wines produced from the 1988 harvest. For dessert wines, containing more than 14% alcohol, EC levels are to average no more than 60 ppb, starting with wines produced from the 1989 harvest. The wine associations have also set a goal that, beginning with the 1995 harvest, no more than 1% of table wines will have EC levels exceeding 25 ppb, and no more than 1% of dessert wines will have levels over 90 ppb.

FDA and BATF are working with wine exporting countries to reduce EC levels of exported wines and other alcoholic beverages to coincide with the domestic levels. In 1986, a Washington D.C.-based advocacy group, The Center for Science in the Public Interest, published *Tainted Booze.* This publication severely criticized FDA for not establishing specific EC limits on wines and other alcoholic beverages as Canada had done.

A risk assessment developed for EC consumption by the California Department of Health Services was set at 0.7 micrograms per day. This means that an adult consuming one ounce of wine containing 25 ppb of EC would be at a cancer risk of greater than 1 new cancer case among 100,000 people. In this risk assessment there was no recognition of the work with laboratory animals since 1987, that showed that alcohol intake delays EC metabolism and reduces tumor formation induced by relatively low levels of EC (yet higher than levels analyzed in wine). Studies in our laboratory have recently shown that wine intake in laboratory animals reduced tumor formation to an even greater extent than that shown by ingestion of alcohol alone. Components of wine other than the alcohol apparently account for this depression in EC induced carcinogenesis.

Lead in Wine

Lead in wine became an issue in June, 1991, when a *Wall Street Journal* article was published under the heading, "Wine Contains Too Much Lead, government Tests Find." The BATF had completed a wine sampling survey in which samples of wine were taken either by pipette directly from within the bottle or by pouring from the bottle after the lead capsule had been removed, but without wiping the mouth of the bottle. The results of these analyses showed that wine can pick up considerable amounts of lead when wine is poured from a bottle which wore a lead foil. Many U.S. wineries have stopped using lead foil on their bottles and lead will not be allowed to be used on wine bottles next year.

Children are particularly at risk from lead ingestion since the lead ion from various lead salts is absorbed more readily from the intestinal tract of children compared to that seen in adults. Much has been published on the role of lead in causing mental retardation in young children. Indeed, the U.S. drinking water standard for lead for many years has been 0.05 mg/L. Due to evidence that children and the developing fetus can be affected by somewhat lower levels of lead than has previously been thought, the U.S. drinking water standard will be lowered to 0.015 mg/L.

From a survey taken in New York City about 20 years ago (when most gasoline contained lead additives), canned vegetables, meat and bakery products were the foods found to be highest in lead content. The level of lead in canned vegetables (0.44 micrograms per gram) was attributed to extraction of lead from soldered seams in the cans. When the percentage of lead contributing to the total diet was calculated, lead in meat contributed about 30%, baked goods 14%, and canned vegetables slightly under 10%. The amount of lead found in wines (a product essentially used only by adults) in the recent BATF surveys should be closely compared, with similar instrumental techniques, to today's lead levels in foods, especially meats, baked products and canned vegetables. FDA has recently shown that lead concentration in spaghetti with meat sauce was 0.06 micrograms per gram. It should be noted that the concern regarding lead toxicity is how much an individual consumes per body weight per day, not simply the lead content per gram or per liter of the product.

Wine and Health

There has been a steady movement by neo-prohibitionists who would like to eliminate all forms of alcoholic beverages, including wine. A strong effort is being made to convince the public and our lawmakers that any use of alcoholic beverages of any kind constitutes abuse and is inherently dangerous to the health of society. In the past few years, with the publicity of the naturally occurring carcinogen, EC, present in wine (no mention being made that toast and soy sauce EC levels can be higher), together with a toxic metal (lead) also present, the impression given is that drinking wine constitutes a rather high risk in humans. Alcohol, EC and lead are poisons present in wine that should not be consumed is the argument made by "consumer protection" groups. These groups ignore, or intentionally suppress, evidence that started with Robert Bales' observations, almost 50 years ago, that cultures that drink almost exclusively wine (e.g., Italians, Greeks, southern French, Spaniards, Portuguese, and southern Russians) have very low rates of alcoholism. Essentially, these cultures drink wine with meals and with moderation. It is interesting that in nearly all of these low risk groups, children are introduced to wine at an early age. The initiation occurs most often at the family table, presented in small quantities and usually in highly diluted form. It is offered as a food, without any implication of either virtue or vice. Parents set the example of drinking at meals and in moderation. Immoderate use of wine or any other beverage is regarded unfavorably and is considered gluttonous.

Blood alcohol curves of wine drinkers are lower than those in drinkers taking the same amount of alcohol from spirits. A part of this lowered blood alcohol level has been

shown to be due to the rates at which alcohol is apparently metabolized. Normal individuals can handle an average of 8 g of alcohol per hour in the form of whiskey, but up to 12 g per hour in the form of table wine. Alcohol absorption is also slower when wine is used with meals.

The temperate use of wine can lead to an astonishing 50% reduction in risk of sudden death due to heart disease. Wine stimulates gastric secretion and motility, while increasing bile flow that enhances the digestion of fats. White table wines have been found effective in the treatment of the malabsorption syndrome that usually follows gastrectomy and other gastric and intestinal surgeries. Wine is most widely recommended in geriatric medicine and convalescent care. The tranquilizing action of wine, gentle sedation in overcoming insomnia, stimulation of poor appetites and digestive processes, and even reducing the severity and frequency of anginal attacks give the elderly and convalescent patients an improved and generally more positive attitude. Indeed, William Dock stated 30 years ago, "What is needed in American hospitals, nursing homes, and other centers for ailing or aged people is a regular alcohol ration, such as is normal everywhere in Europe."

All foods – meats, vegetables, fruits, cereals – contain small amounts of many toxicants, to a large extent naturally occurring chemicals, but also a variety of contaminants. Yet, the average life span of both men and women, with some exceptions, has been increasing. Hazards certainly do exist in our foodstuffs; but we also have many safeguards that include enzyme systems in our livers and other organs that can assist in quick elimination of many toxic chemicals. Epidemiological studies have shown that, in general, moderate drinkers have a higher life expectancy than do abstainers, while both of these groups' life expectancies are very much higher than those of heavy drinkers. Wine taken in moderation has been and continues to be a pleasant, healthful food, and may be considered to be part of a healthy lifestyle. ■

FROM THE EDITOR

Martin Goffinet

By this time all grape-related businesses in New York are aware of the tremendous year we've had in terms of grape yields and fruit quality. Winery operators are especially enthusiastic about the vintage they will bottle from this year's crop. However, the topic of wine as a health risk continues to raise its head. Recent health alerts about lead in wine and government restrictions on permissible lead concentrations can be added to our concerns about public perceptions of health risks associated with consumption of alcohol or other possible contaminants of wine, such as ethyl carbamate. In this issue Gil Stoewsand, a toxicologist in the Department of Food Science & Technology, New York State Agricultural Experiment Station at Geneva, reviews the perceptions about health risks relative to wine consumption, in light of research data supporting the view that wine is a safe food.

Another area of the grape growing business that has felt regulatory pressure is that of pesticide application. Such pressures result from both real and perceived risks associated with the application of chemicals to food crops and to soil, air and water. Awareness of growers, consumers and the general public about environmental and food safety issues has prompted increasing pressure to reduce pesticide applications on the farm. Such concerns, as well as regulatory mandates for reductions in pesticide use, have stimulated creative scientists to seek alternative disease and pest reduction strategies that may provide environmentally sound but effective controls for grapevine fungal diseases. In this issue, Dave Gadoury and Roger Pearson, Department of Plant Pathology at the Geneva Experiment Station, explain preliminary attempts to introduce into the vineyard a fungus that will attack the powdery mildew fungus. The idea is to reduce use of fungicidal sprays for this serious disease while providing acceptable control.

This latter article is extracted from a presentation the authors gave in March of this year at the First Nelson J. Shaulis Viticulture Symposium, held at the Geneva Station. The symposium title was *Integrated Pest Management of Grape Diseases: Present and Future Strategies.* I have completed the editing of the proceedings of this symposium. A full announcement of their availability can be found elsewhere in this issue.■

Biological Control of Grape Powdery Mildew

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The fungus *Ampelomyces quisqualis* is a common parasite of powdery mildews in general, and in particular of the grape powdery mildew pathogen, *Uncinula necator*. A general term for fungi, such as *A. quisqualis*, that parasitize other fungi is mycoparasite. *Ampelomyces* grows within colonies of the powdery mildew fungus and forms a spindle-shaped fruiting structure within the various parts of the mildew pathogen. Within 10 days after infecting the powdery mildew fungus, *Ampelomyces* can release new spores. Within a few minutes of wetting by rain, its spores are released in a jelly-like ribbon and then dispersed by splashing rain. Free water is required for infection of mildew colonies by *Ampelomyces,* and at temperatures between 10 and 25 C, infection takes place within 24 hours after inoculation.

Although a high proportion of mildew colonies are parasitized by *Ampelomyces* every year, this always occurs far too late in the year to hold powdery mildew at tolerable levels in commercial vineyards. There are four key processes in the concurrent development of grape powdery mildew and *Ampelomyces* in vineyards: 1) there is an increase in the incidence of foliar infection by powdery mildew; 2) the overwintering structures (cleistothecia) of powdery mildew begin to form when various mildew colonies merge on the leaves; 3) the cleistothecia of powdery mildew are dispersed in rain to the bark of the vine; and, 4) the senescing powdery mildew colonies are infected by *Ampelomyces*. All in all, this is a very nicely evolved system in which powdery mildew is allowed to colonize its host, reproduce, and then in turn serve as the host of the mycoparasite. Our objective in the present research project is to disrupt the timing in this system by introducing the mycoparasite in the early stages of a powdery mildew epidemic.

Selection of an isolate of *A. quisqualis* for vineyard trials

We isolated several strains of *A. quisqualis* from infected mildew colonies on grape leaves. Based upon stability and spore production in culture, and its pathogenicity towards a broad range of grape powdery mildew isolates, we selected an *Ampelomyces* isolate for vineyard trials that we named G273. Controlled inoculation of mildew colonies with G273 results in collapse of 90% or more of a mildew colony within 48 hours, and the mycoparasite reproduced in the parasitized areas of the colony within 10 days.

Deployment of the mycoparasite in vineyards

There are several considerations in trying to establish *Ampelomyces* in vineyards about three months before it is found naturally. You must be able to culture the mycoparasite in sufficient quantity for effective inoculations. You must have a means to deliver the mycoparasite to the mildew colonies. And finally, inoculations must be performed when conditions for infection by the mycoparasite are optimal. Raising an inoculum supply is quite easy with *Ampelomyces* because it produces spores in 7-10 days on various agar media. However, delivering that inoculum in a vineyard and having it in a viable state when conditions are right for infection is more complicated. Of course, we could spray the vines with a spore suspension just as we would a traditional fungicide, but this would have to be applied at the onset of rain or under sprinkler irrigation; neither of which is practical for commercial vineyards.

On the other hand, if we could establish the mycoparasite in the trellis, then *Ampelomyces* inoculation of mildew colonies might be accomplished naturally by rain, under ideal conditions for infection of the mildew colonies by the mycoparasite. We succeeded in growing *Ampelomyces* on cotton twine that had been soaked in diluted malt agar. Within 14 days after inoculation, fruiting bodies had formed on the surface of and within the twine. The twine was removed from the culture jars and dried in the greenhouse overnight before applying the twine to vineyards.

Two-meter lengths of the twine were suspended from the trellis wire above Riesling grapevines when shoots were 6 inches in length only, at bloom only, or at 6 inches of shoot growth and again at bloom. The incidence of powdery mildew on fruit and foliage was assessed at weekly intervals and was compared to disease progress on control vines within the same vineyard.

Release of spores from the twine-cultures into rainwater was measured by funnel traps suspended beneath the trellis.

Large numbers of *Ampelomyces* spores were released from twine-cultures in each rain event. We trapped from 250 to 4,500 spores per square centimeter of funnel surface in each rain event. The actual numbers trapped were correlated with the amount and duration of rainfall in each event. *Ampelomyces* spores were released from a single twine culture over a three month period in our vineyard trials.

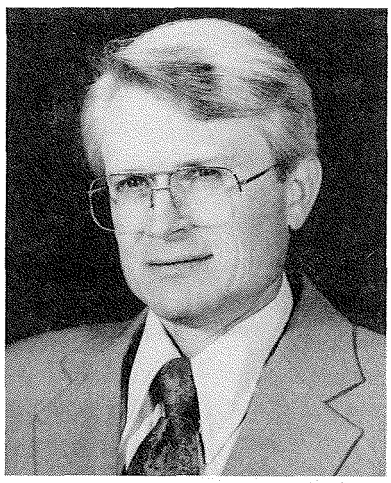
All *Ampelomyces* treatments significantly reduced the number of mildewed leaves per shoot. The severity of mildew infection on leaves was reduced below the level of the controls by single treatments of *Ampelomyces* at 6 inches of shoot growth or at bloom, but the greatest reduction of mildew occurred when twine-cultures were installed in the trellis at 6 inches of shoot growth and again at bloom. Fruit infection was not reduced when treatment was delayed until bloom, nor did retreatment at bloom provide additional suppression of fruit infection. Early establishment of the mycoparasite appeared to be the single most important factor in suppressing fruit infection.

Summary

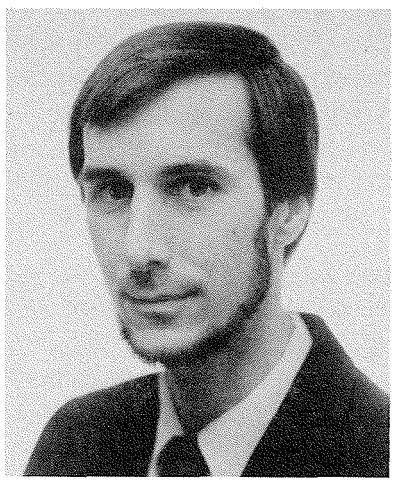
We have selected an isolate of *Ampelomyces quisqualis* that is pathogenic towards many isolates of grape powdery mildew, *Uncinula necator*. Secondly, we have demonstrated that establishment of the mycoparasite in the early phases of a powdery mildew epidemic results in a substantial reduction of disease. And finally, installation of the mycoparasite on a substrate suspended over vines in the field can result in natural dispersal of inoculum in rainwater, and effective inoculation of the powdery mildew pathogen under ideal conditions for infection by the mycoparasite. The amount of disease that developed in treated vines was above what would be tolerated in commercial production of wine grapes. Therefore, in future studies we will expand the vineyard trials to include grape cultivars with more resistance to powdery mildew, determine the sensitivity of *Ampelomyces* to fungicides used in viticulture, and investigate other substrates for the culture of *Ampelomyces*. ■

Funding for this research is being provided by the Northeast Experiment Stations Directors' Competitive Grants Program.

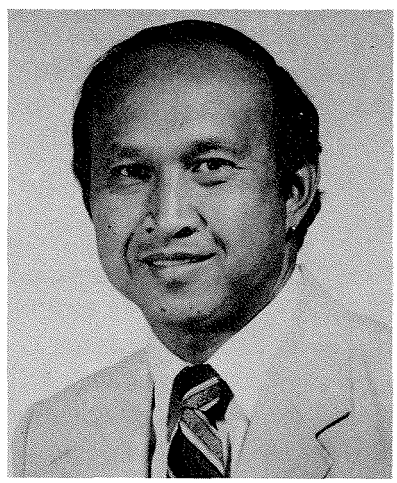
Grape Researchers Receive Recognition



Roger Pearson



David Gadoury



Dennis Gonsalves

Roger Pearson and David Gadoury, Professor and Research Associate, respectively, Department of Plant Pathology at the Agricultural Experiment Station, Geneva, NY, received the Lee M. Hutchins Award from the American Phytopathological Society (APS) at its annual meeting, August 21, in St. Louis. This award recognizes their pioneering research on grape powdery mildew epidemiology and control. Their article in this issue gives an example of their research efforts in this field.

Dennis Gonsalves, also of the Department of Plant Pathology at the Geneva Station, was named a Fellow of APS at the same meeting for his work with fruit and vegetable viruses. His research includes his outstanding work on identification, isolation, characterization, and development of indexing techniques for several grape viruses.

Upcoming Meetings

1992 Annual Meeting of the New York State Wine & Grape Foundation will take place January 14, 15, at Riverside Convention Center, in conjunction with the concurrent **Annual Meeting of the New York Horticultural Society** (January 14–16). A sizable trade show will be a part of the offerings. A mailing detailing the informational program on grapes and wine, as well as the business aspects of the meeting, will be sent out in December to Foundation members, or write to the NY Wine & Grape Foundation, 350 Elm Street, Penn Yan, NY 14527. Other groups involved with the grape and wine industry will also be holding their business meetings concurrently at the Convention Center. For information on the Horticultural Society's program, contact the New York Horticultural Society, 2680 Ridge Road West, Suite 107, Rochester, NY 14626.

The Long Island Agricultural Forum is January 22 and 23, 1992, at Riverhead, NY. The grape session will be given on January 23. Contact Alice Wise, Long Island Horticultural Research Lab, 39 Sound Avenue, Riverhead, NY 11901. Phone: 516-727-3595.

The 20th Annual Great Lakes Regional Grape Growers Conference takes place on February 20, 1992. For further information, contact Jim Kamas Viticultural Research Laboratory, 412 East Main Street, Fredonia, NY 14063. Phone: 716-672-2191.

The 1992 New York Wine Industry Workshop meets March 4, 5 in Jordan Hall, New York State Agricultural Experiment Station, Geneva, NY. Technical presentations will be given by members of the wine industry, researchers, and suppliers to the industry. The workshop also includes a wine tasting and banquet. To obtain a complete copy of the program, contact Dr. Thomas Henick-Kling, Cornell University, Department of Food Science and Technology, New York State Agricultural Experiment Station, Geneva NY 14456-0462. Phone: 315-787-2277.

The 1992 Finger Lakes Regional Grape Growers Conference has been set for Saturday, March 7, at Keuka College, Penn Yan, NY. Dave Peterson, Finger Lakes Regional Grape Specialist, is preparing a program which will be mailed later. You can contact Dave for details at the Yates County Cooperative Extension Office, 110 Court Street, Penn Yan, NY 14527. Phone: 315-536-3381.

Proceedings of the First Nelson J. Shaulis Viticulture Symposium Now Available

On March 5 & 6, 1991, the First Nelson J. Shaulis Viticulture Symposium was held at Jordan Hall, New York State Agricultural Experiment Station, Geneva. The topic of the symposium was *Integrated Pest Management of Grape Diseases: Present and Future Strategies.* Contributions included reviews of disease life cycles in the vineyard, disease forecasting, cultural control methods, fungicide modes of action, integrated control programs, fungicide resistance, breeding vines for disease resistance, and biological control strategies. The published proceedings are now available for $7.50 per copy (includes postage and handling). Make a check out to: New York State Agricultural Experiment Station. Send check with your request to Beverly Dunham, Bulletin Room, NYSAES, Geneva, NY 14456. Supplies are limited.

International Workshop Held on Modeling Downy Mildew

On August 26–30, more than 30 scientists from the United States and nine other countries attended the International Workshop on Grapevine Downy Mildew, held at the New York State Agricultural Experiment Station, Geneva. The workshop was organized by Robert Seem, Department of Plant Pathology and Associate Director of the Station, and Peter Magarey, Department of Agriculture, South Australia.

The program brought together for the first time a group of internationally recognized scientists who are developing and implementing models for the management of grapevine downy mildew disease. The program emphasized improving current models by sharing information and by determining how future cooperative research can be designed and implemented. In-depth discussions included the biology and epidemiology of the fungus, models and simulation of grapevine downy mildew, disease management practices, fungicide resistance, and strategies of combined control of diseases, among others.

The workshop was sponsored by the U. S. Department of Agriculture Office of International Development, Cornell University, and the New York Wine and Grape Foundation. Proceedings of the workshop will be published and will be available for interested individuals. Its availability will be announced later.■

Help Keep NEW YORK GRAPES The Best of the Bunch!™

This newsletter and the extensive grape research it is based on are made possible by funding from the **New York Wine & Grape Foundation.** The Foundation's budget depends totally on private sector contributions which are matched by the State of New York. And now extensive cuts in State funding have made these private sector contributions more vital than ever.

If the Foundation's research and promotional programs are to continue, we need your support through modest dues—a rate schedule and membership application are below. (Wineries and juice manufacturers have already made financial contributions of up to $15,000 each to support the effort.) Please join your neighbors and industry associates in forging a more productive and profitable future. **(Join using this form and we'll send you a "Best of the Bunch!" T-shirt.)**

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After completing this form, please send it and a check for the appropriate amount payable to the New York Wine & Grape Foundation, 350 Elm St., Penn Yan, NY 14527. THANK YOU!

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Question: _____

Gratitude is expressed to those organizations whose support makes possible ongoing and valuable research activities for the benefit of the State's grape industry. Major funding is provided by the **New York State Wine & Grape Foundation; the Grape Production Research Fund, Inc.; and, the J.M. Kaplan Vineyard Research Program.**

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Got A Question? We are trying to address the many questions from grape growers and processors that come to Cornell's grape research community. We invite you to write to us at *Grape Research News* to bring to our attention any questions you have about grapes. We will see to it that those questions are answered by someone knowledgeable in the area of your concern.
Save yourself a long distance phone call. Put it in writing on the back of form below, cut it out, and send it to us.

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